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论文汇编

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论文发言

OR-001

首发未用药青少年重性抑郁症患者脑白质结构网络的拓扑学研究

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目的：基于图论法研究首发未用药青少年重性抑郁症（MDD）患者脑白质结构网络的拓扑组织变化。方法：招募 12-18 岁的青少年 MDD 患者和健康对照（HC）。所有患者均为首次发病且未经过任何抗精神病药物治疗。采用 17 项汉密尔顿抑郁量表评估患者的症状严重程度。采用 3.0-T 磁共振扫描仪采集所有被试的高分辨率解剖图像和扩散加权图像。应用图论分析法研究脑白质结构网络的拓扑组织，包括全局拓扑指标、局部拓扑指标、富人俱乐部和模块化属性。结果：共纳入 94 例青少年 MDD 患者和 78 例 HCs，两组间年龄、性别、受教育年限和体重指数均无统计学差异（均 $P>0.05$）。与 HC 组相比，青少年 MDD 患者的全局效率（$P<0.001$）、局部效率（$P<0.001$），聚类系数（$P=0.004$）和模块化 Q（$P=0.002$）值显著降低，而特征路径长度（$P<0.001$）和标准化的特征路径长度（$P<0.001$）值显著升高。青少年 MDD 患者多个脑区的节点中心性减低，包括双侧内侧额上回、双侧海马、右侧枕上回、右侧角回、双侧楔前叶、左侧尾状核、双侧豆状壳核、右侧颞上回和右侧颞上回颞极部（均 $P<0.05$）。在富人俱乐部、feeder 和 local 连接上，青少年 MDD 组均显著低于 HC 组（均 $P<0.001$）。在组平均白质结构网络中共划分出五个结构模块，并且青少年 MDD 患者在各个模块内及模块间的结构连接均显著低于 HC 组（均 $P<0.05$）。结论：本研究表明青少年 MDD 患者脑白质结构网络拓扑组织破坏，网络的局部分离和全局整合能力均受损，表现为广泛的白质结构失连接。这些发现从脑结构连接组学的角度进一步阐释了青少年 MDD 的病理生理机制。

OR-002

Evaluation of White Matter Microstructure by Automated Fiber Quantification in Relapsing-Remitting Multiple Sclerosis: A Cross-Sectional and Longitudinal Study

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Background: Diffusion tensor imaging (DTI) can noninvasively assess white matter (WM) microstructure of relapsing-remitting multiple sclerosis (RRMS) patients. And automated fiber quantification (AFQ) is a novel algorithm that can automated perform the reconstruction and segmentation of WM fiber tracts at anatomically multiple equivalent locations along their trajectories. Therefore, the purpose of this study was to characterize the whole-brain WM fiber tracts by AFQ cross-sectionally and longitudinally, and explore the correlations between the changes of DTI metrics and cognitive assessments.

Methods: 114 patients diagnosed with RRMS and 71 healthy controls (HC) were enrolled and follow-up investigations were performed in 46 RRMS patients. The DTI

metrics, including fractional anisotropy (FA) and mean diffusion (MD) at each node along the 20 identified WM fiber tracts by AFQ were investigated cross-sectionally and longitudinal in patients with RRMS in entire and pointwise manners. The further partial correlation analyses with age, gender, and education level as covariates were performed between the abnormal DTI metrics of WM fiber clusters or entire fiber tracts and the cognitive assessments scores.

Results: At baseline, compared with HC, the microstructural pattern of WM in RRMS showed a widespread FA decrease (11/20) and MD increase (18/20) among tracts. While in the pointwise comparison, within the more detailed tract abnormalities localized to specific positions (FA: 14/20, MD:18/20). At follow up, compared with baseline, although there was no statistical difference in FA and MD values based on the entire fiber tracts, FA reduced significantly in the posterior portion of the right superior longitudinal fasciculus (R_SLF) and MD elevated significantly in the anterior and posterior portion of the right arcuate fasciculus (R_AF) based on the pointwise analysis. Furthermore, the altered DTI metrics were widely correlated with cognitive performance in RRMS.

Conclusions: RRMS patients showed a widespread WM microstructure alteration at baseline and some certain regions alterations at follow-up, which will enhance our understanding of WM microstructural abnormalities in RRMS patients. In addition, the altered DTI metrics were correlated with cognitive performance in RRMS, which can be used as imaging markers for early identification of cognitive impairment in RRMS.

OR-003

Causal associations of genetically determined tinnitus with neuroimaging traits: evidence from a Mendelian randomization study

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Objective: Potential reverse causality and unmeasured confounding factors are common biases in previous studies of the relationship between tinnitus and neuroanatomical features. Additionally, the causal association between neuroimaging features and the presence of tinnitus is unclear. The aim of this study was to investigate the causal role of tinnitus in the alteration of brain volumetric measures using Mendelian randomization (MR).**Methods:** Summary-level data from a genome-wide association study (GWAS) of tinnitus were derived from the UK Biobank (n = 117,882). GWAS summary statistics for total brain volume, white and gray matter volume, and cerebrospinal fluid volume were also obtained (n = 33,224). A bidirectional MR analysis was performed to investigate the causal relationship between tinnitus and neuroanatomical features.

Results: Genetic susceptibility to tinnitus was causally associated with increased white matter volume (odds ratio [OR] = 2.36, 95% confidence interval [CI] 1.03 - 5.39, p = 0.04) and total brain volume (OR = 2.39, 95% CI 1.05 - 5.46, p = 0.04) but inversely associated with cerebrospinal fluid volume (OR = 0.36, 95% CI 0.16 - 0.83, p = 0.02). However, no causal effect of total brain volume, white matter volume, gray matter volume, or cerebrospinal fluid volume on the presence of tinnitus was detected in the reverse MR study.

Conclusions: The genetically predicted risk of tinnitus was causally associated with higher white matter volume and total brain volume, independent of any confounding factors, while neuroanatomical features were not causally associated with the presence of tinnitus. Our findings provide evidence supporting the hypothesis that tinnitus has a neurodevelopmental origin at the genetic level.

OR-004

Altered Brain Functional Networks in Coronary Heart Disease: Independent Component and Graph Theoretical Analysis

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Objective

Coronary heart disease (CHD) increases the risk of cognitive impairment and mental disorders. Whether and how coronary heart disease affects functional network connectivity that, in turn, influences brain functions and quality of life remains to be determined. The aim of this study was to investigate the characteristics of functional connectivity and topological properties of brain networks in CHD.

Methods

The experiment was authorized by the Ethics Committee of Xiamen Cardiovascular Hospital, and written informed consents were obtained from all participants. Twenty-seven CHD patients were recruited from the Xiamen Cardiovascular Hospital from April 2020 to December 2021. Forty-four age-, sex-, and education-level-matched control subjects were included.

All MRI data were obtained using a 3-Tesla MRI scanner (SIGNA Pioneer, GE Healthcare, Milwaukee, WI). High-resolution structural images were acquired using a 3D T1-weighted inversion recovery prepared fast spoiled gradient-recalled echo (IR FSPGR) pulse sequence with following parameters: TE = 3.2 ms; TR = 8.3 ms; TI = 450 ms; FA = 12° ; FOV = 240 mm × 240 mm; thickness = 1.0 mm; matrix = 240 × 240. Resting-state fMRI images, including 185 volumes, were acquired by a 2D gradient-recalled echo echo-planar imaging (GRE-EPI) pulse sequence in the axial plane with following parameters: TE = 30 ms; TR = 2000 ms; FA = 90° ; FOV = 240 mm × 240 mm; thickness = 4.0 mm; matrix = 64 × 64.

Resting-state functional MRI (rs-fMRI) data were first preprocessed by CONN software with slicing timing correction, motion correction, normalization, smoothing, linear detrending, and nuisance covariate regression. After preprocessing, the independent component analysis (ICA) and graph theoretical analysis (GTA) were

calculated. Differences in ICA networks and the area under the curve (AUC) of each network metric (including small-world property, network efficiency and nodal metrics) between CHD and control groups were compared by independent two-sample t-test using SPM8 software (http://www.fil.ion.ucl.ac.uk./spm/). Because these analyses were exploratory in nature, we used a statistical significance level of P < 0.05. Correlation analyses between these index and clinical characteristics were further assessed in CHD patients.

Results

Ten functional networks out of 36 independent components were obtained. An Independent two-sample t-test indicated significant internetwork functional connectivity between CHD and the control group. In comparison with controls, patients with CHD exhibited increased functional connectivity between the posterior default mode network and visual network (t =2.4798, P = 0.0156) as well as decreased functional connectivity between the left frontoparietal network and auditory network (t = -2.0265, P = 0.0466). For the GTA results, the local node efficiency of left putamen in the CHD group is significantly lower than that in the HC group (t = 3.6724, p < 0.0001). There was no significant difference between the altered network measures and clinical variables in CHD patients.

Conclusion

In this study, patients with coronary heart disease showed abnormal brain connectivity within default mode and frontoparietal network with a central role in modulating cognition, which provided preliminary insights into the potential neural mechanism related tobrain dysfunctions in patients with CHD. Future prospective studies are warranted to determine the applicability of these findings to a clinical coronary heart disease population.

OR-005

多模态神经功能影像数据揭示智力特异性神经生物学相关性

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目的：探讨基于多模态神经功能影像数据的脑连接组预测模型（CPM）是否可以提高智力预测模型性能，并探讨智力潜在的神经生物学机制。 **方法：**数据集 1 包括 159 例健康被试，收集临床资料包括全智商（FIQ）、操作智商（PIQ）、语言智商（VIQ）；数据集 2 包括健康被试 550 例，行为学数据包括联合瑞文智力测试（CRT）、贝克抑郁量表（BDI）、状态焦虑（SAT）和特质焦虑（TAT）。所有被试影像数据后处理获得 ALFF、DC、ReHo 及 VMHC 图，分别采用 Brainnetome 246 及 Shen 268 图谱构建功能连接（FC）矩阵及提取影像特征。利用 FC 数据采用经典 CPM 方法构建正、负网络及一般线性模型，利用多模态数据（FC、ALFF、DC、ReHo 及 VMHC）构建联合模型（一般线性模型），以预测 FIQ 得分。进一步用由 FIQ 识别的智力相关网络及脑区构建模型预测智力子域（PIQ 和 VIQ）、其他智力量表得分（CRT）及非智力得分（BDI、SAT 和 TAT）。**结果：**当使用 Brainnetome 246 脑图谱时，基于 FC 的经典模型能很好预测 FIQ 得分（P 均＜0.001）。基于多模态数据的联合模型性能优于任一经典模型。在控制被试头动及采用 Shen 268 脑图谱重复上述分析，发现类似结果。基于 FC 数据，与智力相关的功能脑网络主要包括额叶内、额顶、额颞及颞顶网络，而基于 ALFF、DC、ReHo 及 VMHC 数据，与智力相关的脑区包括双侧额下回及左侧顶上小叶。我们用 FIQ 识别的智力相关网络及脑区构建模型可以很好预测 PIQ、VIQ 和 CRT 得分（P

＜0.001），而不能预测 BDI、SAT 和 TAT 得分（P 分别为 0.15、0.06 和 0.37）。**结论：**多模态神经功能影像数据可以提高智力预测模型性能，智力具有特异的相关功能网络及功能脑区，智力主要与额顶、额颞及颞顶网络相关。

OR-006

多系统萎缩患者伴冻结步态症状与小脑灰质体积及小脑-大脑网络改变相关

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目的：步态冻结是多系统萎缩常见的致残症状。神经影像学研究发现，小脑是多系统萎缩最一致的损伤区域，参与患者的姿势和步态控制。本研究的目的是评估小脑在多系统萎缩伴步态冻结症状患者中病理生理学的作用。

方法：在这项横断面研究中，43 名多系统萎缩伴步态冻结患者、27 名无冻结步态患者和 42 名健康对照者被纳入并接受多模态磁共振扫描。使用空间无偏倚集模板基于体素的形态测量法来获得小脑亚区灰质容量改变。此外，基于种子点的功能连接方法评估异常的小脑-大脑皮层环路的改变。 Spearman 相关性分析用于评估小脑结构变化、小脑-大脑皮层环路异常和冻结严重程度之间的相关性。

结果：小脑亚区分析显示，步态冻结患者右侧小脑 VIII 和左侧小脑 VI 亚区灰质体积小于非冻结组，并且基于右侧小脑 VIII 和左小脑 VI 作为种子的二次功能连接分析显示，小脑 VIII 与左侧顶叶下小叶和左侧 Crus I 之间的功能连接增加；小脑 VI 小叶与双侧颞上回、右侧中额叶皮层、左直回、左侧岛叶、右侧额上回、左侧枕中回和左侧中扣带皮层之间的 FC 增加。

结论：上述研究结果表明，小脑亚区灰质体积的减少和内在小脑-大脑皮层“执行控制”和“视觉-听觉”神经网络与多系统萎缩患者的步态冻结症状有关。

OR-007

神经影像领域国家自然科学基金申请“攻略”

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目的：国家自然科学基金是广大科技工作者获取科研经费的主要渠道，本书收录了本影像医学科研团队中精神分裂症、抑郁症、木僵三个精神疾病方向负责人所撰写的国家自然科学基金青年项目申请书原文，对申请书的撰写要点，注意事项和技巧进行了生动而详尽的阐述，对申请书的专家评审过程中的经验教训进行了深度的自我剖析与总结反思，力求在青年项目申请过程中，

能够对初出茅庐的青年科技工作者、对申请书撰写评审有疑问者申提供实用性的参考和借鉴，帮助他们少走弯路，提高申请书的写作水平和基金申请的成功率。

方法：作者于 2018 年、2022 年先后获批国家自然科学基金影像医学领域青年项目与面上项目，结合个人经验，联合其他 5 位青年科技人员，主编本书，并获曹丰教授、印弘教授、李涛教授、林铮教授、刘军教授题跋。

结果：《影像医学中的精神障碍：国家自然科学基金青年项目申请书“解密”》于 2022 年出版，销量 940 本，捐赠图书馆及同行 160 本。

结论：近年来，国家自然科学基金委显著加强了对优秀青年人才的培养和支持，对青年科学基金支持的力度逐年加大。本书由具有多年青年基金申请经验的几位科技工作者撰写而成，主要围绕着影像医学中的精神疾病，分为六章，涉及《国家自然科学基金项目指南》节录、影像医学中的精神疾病项目申请经验、申请书原文及其审议意见与反思。结合他们在撰写，审议过程中的宝贵经历“现身说法”，不仅展示了他们的国家自然科学基金青年项目申请书原文，还对申请书的撰写要点，注意事项和技巧进行了生动而详尽的阐述。

OR-008

自动加权净水摄取率是急性缺血性卒中机械取栓后恶性脑水肿的预测指标

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目的

恶性脑水肿与脑组织净水摄取率(NWU)、脑梗死体积相关。本研究的目的是评估经脑梗死区域加权的 NWU (wNWU)是否能预测急性缺血性卒中机械取栓后恶性脑水肿。

方法

连续纳入 2018 年 8 月至 2023 年 2 月在温州医科大学附属第一医院行机械取栓术的大脑前循环闭塞的急性缺血性卒中患者。收集患者临床信息，在入院首次平扫 CT 上基于自动 ASPECTS 软件计算 NWU。通过将 NWU 乘以缺血半球侧受影响的 ASPECT 区域数量获得 wNWU。采用单因素和多变量 logistic 回归分析探讨 wNWU 与恶性脑水肿的关系。

结果

发生恶性脑水肿患者的 NWU [5.9 (3.1, 7.8)]和 wNWU [20.2 (4.6,45.0)]显著高于未发生恶性脑水肿的患者[NWU 4.2 (2.2, 6.6)，wNWU 7.9 (2.8,21.4)]。多变量 logistic 回归分析提示，NWU 不能预测急性缺血性卒中机械取栓后是否发生恶性脑水肿(校正 OR 1.05，95%CI 0.97-1.14)。血管再通情况影响 wNWU 预测恶性脑水肿的性能。在机械取栓后血管成功再通的患者中，wNWU 是恶性脑水肿的独立预测因子(校正 OR 1.65，95%可信区间 1.20-2.26)；纳入 wNWU、NIHSS 评分、ASPECTS 和侧枝循环评分的模型能有效预测恶性脑水肿(AUC 0.79，95%CI 0.73-0.86)。在血管未成功再通的患者中，wNWU 不能预测恶性脑水肿的发生(校正 OR 0.87，95%CI 0.51-1.50)。

结论

在入院平扫 CT 上获得的 wNWU 可以作为接受机械取栓术患者术后恶性脑水肿发生的预测指标，并可能有助于早期临床干预。

OR-009

Performance of deep learning-based autodetection of arterial stenosis on head and neck CT angiography: an independent external validation study

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Objectives To externally validate the performance of automated stenosis detection on head and neck CT angiography (CTA) and investigate the impact factors using an independent bi-center dataset with digital subtraction angiography (DSA) as the ground truth.

Methods Patients who underwent head and neck CTA and DSA between January 2019 and December 2021 were retrospectively included. The degree of stenosis was automatically evaluated using CerebralDoc based on CTA. The performance of CerebralDoc across levels (per-patient, per-region, per-vessel, and per-segment) and thresholds (≥ 50%, ≥ 70%, and = 100%) was evaluated. Logistic regression was performed to identify independent factors associated with false negative results.

Results 296 patients were analyzed. Specificity across levels and thresholds was high, exceeding 92%. The area under the curve ranged from poor (0.615, 95% CI: 0.544, 0.686; at the region-based analysis for stenosis ≥ 70%) to excellent (0.945, 95% CI: 0.905, 0.985; at the patient-based analysis for stenosis ≥ 50%). Sensitivity ranged from 0.714 (95% CI: 0.675, 0.750) at the segment-based analysis for stenosis ≥ 70% to 0.895 (95% CI: 0.849, 0.919) at the patient-based analysis for stenosis ≥ 50%. The multiple logistic regression analysis revealed that false negative results were primarily more likely to specific stenosis locations (particularly the M2 segment and skull base segment of the internal carotid artery) and occlusion.

Conclusions CerebralDoc has the potential to automated stenosis detection on head and neck CTA, but further efforts are needed to optimize its performance.

OR-010

磁共振实时透视技术引导颅脑病变穿刺活检术临床应用与研究

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目的：研究 1.0-T 开放式磁共振实时透视技术引导颅脑病变穿刺活检的可行性、安全性、及诊断价值。

材料与方法：回顾性分析 106 例 1.0-T 开放式磁共振实时透视技术引导的颅脑病变穿刺活检病例。分析患者一般资料、影像学及手术资料、病理学诊断结果。106 例患者的 106 个脑内病灶根据病灶最大直径分为两组，分别为≤1.5cm 组（n=25）及>1.5cm 组(n=81)。

穿刺活检病理学结果与外科手术病理学结果及随访观察诊断结果对比，计算诊断诊断准确率，Fisher's 精确检验对比两个组（≤1.5cm，＞1.5 cm）诊断率。＜0.05 为有统计学显著性差异。

结果：106 例平均病灶最大直径 2.2±0.8cm（0.9-4.5cm），≤1.5cm 病灶 25 例，＞1.5 cm 病灶 81 例。手术操作时间 39±4.6min(29-49min)。

101 例患者获得了明确的穿刺活检病理诊断结果，诊断率为 95.3%（101/106）。5 例患者未获得明确病理学诊断，包括 3 例异型细胞及 2 例胶质细胞增生。≤1.5cm 及＞1.5 cm 组的病灶诊断率分别为 92%（23/25）、96.3%(78/81)，两组间诊断率比较无统计学差异（P=0.337）。48 例患者穿刺活检后进行了外科手术切除并且获得了术后病理学诊断，58 例患者通过随访确定了最终诊断，平均随访 16 个月(12-24 个月)。通过外科手术病理及随访诊断与穿刺活检病理结果对比，计算诊断准确率为 94.3%(100/106)。

无严重并发症发生，轻微并发症包括 4 例穿刺术中少量颅内出血，包括 1 例硬膜外出血，3 例脑出血，并发症发生率为 3.8%（4/106）。

结论

1.磁共振实时透视技术引导颅脑病变穿刺活检安全、可行，具有良好的诊断价值；

2.磁共振实时透视技术引导颅脑病变穿刺活检可以明显缩短手术时间及简化手术流程，可作为一种新的引导技术应用于颅脑病变穿刺活检中。

OR-011

Differentiating tumor progression from pseudo-progression in glioblastoma patients: A mono-exponential, bi-exponential, and stretched-exponential model-based DWI study

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Objectives: To investigate the diagnostic performance of parameters derived from mono-exponential, bi-exponential, and stretched-exponential diffusion-weighted imaging models in differentiating tumor progression from pseudo-progression in glioblastoma patients.

Methods: Forty patients with pathologically confirmed glioblastoma exhibiting enhancing lesions after completion of chemoradiation therapy were enrolled in the study, which were then classified as tumor progression and pseudo-progression. All patients underwent conventional and multi-b diffusion-weighted MRI. The apparent diffusion coefficient (ADC) from a mono-exponential model, the true diffusion coefficient (D), pseudo-diffusion coefficient (D*) and perfusion fraction (f) from a biexponential model, and the distributed diffusion coefficient (DDC) and intravoxel heterogeneity index (α) from a stretched exponential model were compared between tumor progression and pseudo-progression groups. Receiver operating characteristic curves (ROC) analysis was used to investigate the diagnostic performance of different

DWI parameters. Interclass correlation coefficient (ICC) was used to evaluate the consistency of measurements.

Results: The values of ADC, D, DDC, and α values were lower in tumor progression patients than that in pseudo-progression patients ($p < 0.05$). The values of D* and f were higher in tumor progression patients than that in pseudo-progression patients ($p < 0.05$). Diagnostic accuracy for differentiating tumor progression from pseudo-progression was highest for α (AUC=0.94) than that for ADC(AUC=0.91), D(AUC=0.92), D*(AUC=0.81), f(AUC=0.75), and DDC(AUC=0.88).

Conclusion: Multi-b DWI is a promising method for differentiating tumor progression from pseudo-progression with high diagnostic accuracy. In addition, the α derived from stretched exponential model is the most promising DWI parameter for the prediction of tumor progression in glioblastoma patients.

OR-012

Distinct brain structural-functional network topological coupling explains different outcomes in tinnitus patients treated with sound therapy

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Background and purpose: Topological properties, which serve as the core of the neural network, and their couplings can reflect different therapeutic effects in tinnitus patients. We hypothesized that tinnitus patients with different outcomes after sound therapy would have distinct brain network topological alterations.

Method: Diffusion tensor imaging and resting-state functional magnetic resonance imaging were prospectively performed in 60 patients with idiopathic tinnitus and 57 healthy controls (HCs). Graph-theoretical network analyses of structural connectivity (SC), functional connectivity (FC), and SC and FC coupling were performed. Associations between clinical performance and graph-theoretical features were also analyzed.

Results: Treatment was effective (effective group; EG) in 28 patients and ineffective (ineffective group; IG) in 32 patients. For FC, the patients in the EG showed higher local efficiency than patients in the IG. For SC, patients in both the EG and IG displayed lower normalized characteristic path length, characteristic path length, and global efficiency than the HCs. More importantly, patients in the IG had higher coupling than the HCs, whereas there was no difference in coupling between patients in the EG and HCs. Additionally, there were significant associations between the SC features and clinical performance in patients in the EG.

Conclusion: Our findings demonstrate that tinnitus patients exhibited significant brain network topological alterations, especially in the structural brain network. More importantly, patients who demonstrated different curative effects showed distinct SC-FC topological coupling properties. SC-FC coupling could be an indicator that could be used to predict prognoses in patients with idiopathic tinnitus before sound therapy.

OR-013

Spatiotemporal selectivity of substantia nigra and cerebral cortex neurodegeneration in Parkinson's disease

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Background:

In Parkinson's disease (PD), the degeneration of dopaminergic neurons in the substantia nigra (SN) is uneven, which might be the pathological mechanism behind heterogeneous symptoms in PD patients.

Objective:

This study aimed to investigate the spatiotemporal selectivity of neurodegeneration in SN functional subregions and their connected cerebral cortex or subcortical nuclei in PD.

Methods:

One hundred and sixty-five PD patients and 120 normal controls (NC) were enrolled in this study. To simulate the longitudinal progression of PD, 165 PD patients were divided into early stage (120 cases) and advanced stage (45 cases) according to the 5-year disease duration. We divided SN, cerebral cortex, and subcortical nuclei into sensorimotor, associative, and limbic regions, respectively. Iron deposition in SN functional subregions was quantified by quantitative susceptibility mapping (QSM). The volumes of the cerebral cortex and subcortical nuclei were measured by T1-weighted imaging and FreeSurfer. Then, region of interest (ROI) and voxel-based analysis (VBA) was performed to explore the spatiotemporal selectivity of neurodegeneration in PD.

Results:

The ROI-based analysis revealed that the QSM values of limbic ($P = 0.009$) and sensorimotor SN ($P = 0.018$) were higher in PD than in NC, while no significant difference was found in associative SN ($P = 0.810$) (Fig. 1). The VBA showed that all SN functional subregions had clusters with higher QSM values in PD than NC ($P < 0.001$) (Fig. 2). Moreover, from early to advanced PD, only limbic SN had progressive iron deposition ($P = 0.018$). In ROI-based analysis, the QSM values of three SN functional subregions were all positively correlated with Parkinson's Disease Rating Scale (UPDRS) II scores (all $P < 0.05$) (Fig. 3). In VBA, the QSM values of VBA_Limbic/Sensorimotor/Associative SN had subregion-specific correlations with UPDRS II, III, and Hamilton Depression Scale (HAMD) scores (all $P < 0.05$) (Fig. 4). Furthermore, the volumes of the limbic nucleus-amygdala ($P = 0.045$), and associative cortex-prefrontal cortex ($P = 0.008$) were reduced in PD. Finally, multiple linear regression analysis showed that HAMD scores were positively correlated with the QSM values of VBA_Limbic SN ($\beta = 25.640$, $P = 0.041$), while negatively correlated with the volume of amygdala ($\beta = -0.003$, $P = 0.042$) in PD.

Conclusion:

Iron deposition was spatiotemporal selective in limbic, sensorimotor, and associative SN in PD, and there was atrophy in the cerebral cortex and subcortical nuclei projected from limbic and associative SN. Furthermore, nigral iron deposition and heterogeneous clinical symptoms have subregion-specific correlations in PD. Our study provides neuroimaging evidence for further understanding the brain pathophysiological changes underlying the clinical symptoms of PD.

OR-014

扩散谱成像在脑胶质瘤术前病理分级、分子分型评估中的应用价值

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目的 利用扩散谱成像技术对脑胶质瘤进行成像，探讨其参数在预测脑胶质瘤病理级别、异柠檬脱氢酶（IDH）、端粒酶逆转录酶（TERT）、O6-甲基鸟嘌呤-DNA 甲基转移酶(MGMT)分子分型的诊断效能，以期为临床医生术前合理选择治疗方案及评估预后提供更准确有效的影像学依据。

方法 前瞻性收集 2021 年 3 月至 2022 年 12 月就诊于广西医科大学第一附属医院的脑胶质瘤患者 41 例，中位年龄 46 岁。所有受试者均进行扩散谱成像（DSI）、常规 MRI 序列（包括平扫、增强）的扫描。DSI 数据经处理获得 DTI、DKI、MAP、NODDI 四个扩散模型共 22 个不同参数图像，在每个参数图像上选取肿瘤实质、对侧正常脑白质作为感兴趣区，分别测量 AD、FA、MD、RD（DTI） /AD、AK、FA、MD、MK、RD、RK（DKI）/MSD、NG、NGAx、NGRad、QIV、RTAP、RTOP、RTPP（MAP）/ICVF、ISOVF、ODI（NODDI）参数值。运用统计学方法比较不同病理级别、IDH、TERT、MGMT 分子分型的影像学参数值差异，选择差异具有统计学意义的参数绘制 ROC 曲线，计算其曲线下面积（AUC）。

结果 41 名脑胶质瘤患者中，24 例为高级别脑胶质瘤，17 例为低级别胶质瘤；21 例为 IDH 突变型，20 例为 IDH 野生型；17 例为 TERT 突变型，24 例为 TERT 野生型；31 例为 MGMT 启动子甲基化阳性，10 例为 MGMT 启动子甲基化阴性。DKI-RD、DKI-RK、NODDI-ICVF 参数分别在评估脑胶质瘤病理级别、IDH、TERT 基因分型中具有最高的诊断效能，其 AUC 分别为 0.963、0.80、0.778。

结论 DSI 可为预测脑胶质瘤患者的病理级别、IDH、TERT 分子分型提供丰富信息，对于术前明确脑胶质瘤病理分级、基因分型诊断具有重要参考价值，有助于临床早期为患者制定个性化治疗方案和评估预后。

OR-015

帕金森病冻结步态与蓝斑退行性变的关系：一项神经黑色素成像研究

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目的：帕金森病(PD)冻结步态(FOG)发病机制不明，有证据表明可能与蓝斑(LC)去甲肾上腺素能功能障碍有关。神经黑色素成像 (NM-MRI)中 LC 的信号特点可反映神经元密度变化、间接评

估其功能状态。我们旨在通过对 PD 患者 NM-MRI 中 LC 信号的分析，验证 PD 患者 FOG 与 LC 退行变的关系。

方法：搜集 46 例 PD 患者与 13 例健康对照组（HC）的 NM-MRI 图像以及临床基线资料，计算 PD 患者双侧 LC 标准化后的 CNR 值，使用两种多因素模型调整混杂因素验证 PD 患者有无 FOG 是否是影响 LC 标准化后的 CNR 值的独立影响因素。

结果：多因素模型显示除目标因素有无 FOG(模型 1：β:0.127,95%CI:0.019~0.236,P=0.023;模型 2：β:0.153,95%CI:0.019~0.287,P=0.026)以外，快速眼动睡眠行为障碍（RBD）（模型 1：β:0.182,95%CI:0.073~0.291,P=0.002；模型 2：β：0.171，95%CI:0.048~0.294,P=0.008）以及性别（模型 1：β:0.150,95%CI:0.042~0.257,P=0.007）均是影响左侧 LC 标准化后 CNR 值的独立影响因素。其中 RBD 影响程度最大，其次是性别和有无冻结。

结论：FOG 的出现可能与 LC 退行性变导致的去甲肾上腺素能功能障碍有关。

OR-016

Effect of Statins on Different Intracranial Plaques and Its Influencing Factors-a High-Resolution Magnetic Resonance Vessel Wall Imaging study

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Objective: High-resolution magnetic resonance vessel wall imaging (HRMR-VWI) is a non-invasive examination that can evaluate intracranial atherosclerotic plaque stability accurately. This study applied HRMR-VWI to evaluate the efficacy of statins on vulnerable and stable intracranial arterial plaques and explore the influencing factors of statin therapy.

Methods: Between July 2017 and August 2021,patients with intracranial atherosclerosis who were treated with statins underwent HRMR-VWI. The plaque characteristics were measured using PACS system and Vessel Explorer software, including plaque length, plaque thickness, plaque burden, luminal stenosis, plaque enhancement ,vascular remodeling, and plaque location. According to the baseline plaque enhancement , each plaque was classified into a vulnerable plaque group(obviously enhanced plaque) or stable plaque group(non-obviously enhanced plaque). The plaque characteristics before and after treatment were compared by using the signed-rank test and paired-samples t test. The plaque characteristics after treatment between the two groups were compared by using Wilcoxon rank sum test. According to the tri-sectional quantiles of plaque enhancement rate change, each plaque was classified into a good or poor effect group, and the baseline plaque characteristics between two groups were compared by using independent-samples t test or Wilcoxon rank sum test. Multiple linear regression was performed to investigate the relationship between baseline plaque characteristics and efficect of statin therapy.

Result: This study included 53 patients with a total of 107 plaques, including 61 stable plaques and 46 vulnerable plaques. In the vulnerable plaque group, plaque enhancement (P<0.001), plaque burden (P<0 .023), and luminal stenosis (P<0 027) in the follow-up period were significantly reduced compared to baseline, while there was no significant change in the stable plaque group. The extent of reduction in plaque enhancement was significantly higher in the vulnerable plaque group than that in the stable plaque group (P<0 025). Compared with the poor effect group, the baseline plaque burden was greater (P <0 . 025) and luminal stenosis was higher (P <0 . 024)in the good effect group. Multiple linear regression showed that plaques located in anterior circulation(B=0. 16,P=0. 014)and those with obvious enhancement at baseline(%,B=-0218,P=0. 007)were positively correlated with a decreased rate of plaque enhancement after statin treatment.

Conclusion: This study confirmed through HRMR-VWI that statins have certain therapeutic effects on vulnerable plaques with obvious enhancement at baseline, and their efficacy is better than that on non-obvious enhanced plaques. The treatment benefit may be greater for plaques that are located in the anterior circulation and have a higher baseline enhancement degree.

OR-017

Altered intersubject functional variability of brain white-matter in major depressive disorder and its association with gene expression profiles

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Background: Major depressive disorder (MDD) is a heterogeneous disorder with remarkable intersubject variability in clinical presentations and neurobiological substrates. Although the altered intersubject variability in functional connectivity (IVFC) within gray matter has been examined in MDD, little is known about the alterations to IVFC within white-matter (WM-IVFC) and the molecular mechanisms associated with these changes.

Methods: Based on the resting-state functional MRI data of 145 MDD patients and 119 healthy controls (HCs), we compared the WM-IVFC between the two groups. In combination with the Allen Human Brain Atlas, transcriptome-neuroimaging association analyses were then conducted to investigate gene expression profiles associated with WM-IVFC alterations in MDD, followed by a set of gene functional characteristic analyses. Finally, we explored possible clinical applications of WM-IVFC, including disease classification and clinical symptom prediction.

Results: We found significantly increased IVFC in the genu of corpus callosum and left inferior fronto-occipital fasciculus and decreased IVFC in left corticospinal tract, inferior cerebellar peduncle, and left cerebral peduncle in MDD. These variability alterations were associated with multiple behavioral domains, including sensorimotor processes and higher-order functions. Moreover, MDD-related WM-IVFC changes spatially correlate with the expression of 855 genes, which were enriched for

synapse function, neuronal system development, and cell signaling, and were predominantly expressed in neurons, microglia and endothelial cells. Furthermore, WM-IVFC could successfully discriminate MDD patients from HCs with high accuracy and could further significantly predict depression severity and suicide risk in MDD.

Conclusion: These results revealed intersubject functional variability changes of brain WM in MDD and its linkage with gene expression profiles, providing potential implications for understanding the high clinical heterogeneity of MDD.

OR-018

Cortical Sulcus Depth Alterations in Patients with Tinnitus Before and After Sound Therapy: A Surface-Based Morphometry Study

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Purpose: As one of the quantitative measures of the cerebral cortex, sulcal depth has been widely used in brain morphology research. This study aimed to explore alterations in brain surface-based morphometry sulcal depth in patients with idiopathic tinnitus before and after 24 weeks of sound therapy.

Methods: Thirty-three tinnitus patients underwent magnetic resonance imaging scans at baseline and after 24 weeks of sound therapy. Twenty-six age- and sex-matched healthy control (HC) individuals also underwent two scans over a 24-week interval. For all participants, 3.0T magnetic resonance imaging (MRI) and high-resolution 3D structural images were acquired with a 3D-BRAVO pulse sequence. Structural image data preprocessing was performed using the DPABISurf toolbox. Tinnitus Handicap Inventory (THI) scores were used to assess the severity of tinnitus before and after treatment. Two-way mixed model analysis of variance (ANOVA) and Pearson’s correlation analysis were used in the statistical analysis. Student-Newman-Keuls (SNK) tests were used in the post hoc analysis.

Results: Compared to HCs, those in the tinnitus group at baseline had significantly lower sulcal depth in the left medial temporal cortex (MTC) and right somatosensory and motor cortex (SMC). After 24 weeks of sound therapy, the tinnitus patients demonstrated significantly increased sulcal depth in the left MTC and right SMC. There were no significant differences in sulcal depth between the tinnitus patients after treatment and HCs. (Fig1-Fig.3)

Conclusions: The remodeling of sulcal depth after sound therapy is an indicator for effective sound therapy. These brain regions may serve as potential neuroimaging biomarkers for the evaluation of tinnitus treatment effects.

OR-019

Spin-Singlet Targeted Glutamate Proton Magnetic Resonance Radiofrequency Pulse Sequence Development and Preliminary Application

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Background Proton Magnetic Resonance Spectroscopy (^{1}H-MRS) can non-invasively measure the concentration of specific compounds in the selected voxel region of living tissue and thus infer the metabolic state of the corresponding brain region. Timely and accurate quantitative analysis of amino acids in vivo can aid in the early diagnosis of central nervous system diseases. The spectral signals of glutamate (Glu) and glutamine (Gln) obviously overlap in the curves obtained by ^{1}H-MRS, which makes it very difficult to separate Glu signals. Therefore, it is very important to selectively isolate the signal of Glu in vivo to study the metabolic process of Glu in normal people and to determine its role in the progression of glioma.

Objective To verify the feasibility of applying targeted Glu sequence to different concentrations of Glu aqueous solution and clinical practice.

Methods 1) Using a 3.0T clinical MRI scanner, Glu-targeted ^{1}H-MRS pulse sequences were developed and tested to selectively detect Glu signals. The tests were performed in Glu aqueous phantom at different concentrations, and a conventional single voxel spectroscopy (SVS) PRESS sequence was scanned simultaneously to determine the reliability of the Glu signal isolated in the aqueous phantom. 2) The SVS PRESS sequence and the Glu-targeted ^{1}H-MRS pulse sequence were applied to healthy controls and glioma patients respectively, to determine the reliability of the Glu-targeted ^{1}H-MRS pulse sequence in clinical applications. The Glu spectral lines obtained from the above SVS PRESS sequence measurements were qualitatively compared with the Glu spectral lines fitted by the LCModel software.

Results The developed pulse sequence of Glu-targeted ^{1}H-MRS was applied to Glu aqueous phantom at different concentrations, different parts of healthy human brain and glioma patients, and the signals of Glu were selectively detected and isolated. The chemical shifts, peaks and waveforms of the obtained spectral lines all converged with the Glu spectral lines fitted by LCModel.

Conclusion The newly developed Glu-targeted ^{1}H-MRS pulse sequence can detect the Glu signal in the water model solution at different concentrations. It can be applied to the selective Glu-targeted detection of normal human brain and glioma patients.

OR-020

Cockayne 综合征颅脑表现的影像诊断

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目的 Cockayne 综合征（Cockayne syndrome，CS）是一种原因不明，进行性加重并累及神经系统各部分的神经变性疾病，是一种罕见的常染色体隐性遗传病。患儿常表现为智力障碍、光敏性皮炎、矮小症、听力障碍和视网膜变性等，因此又称为侏儒-视网膜萎缩-耳聋综合征。本研究探讨 Cockayne 综合征颅脑的 CT 和 MRI 表现，旨在总结其影像特征，进一步提高对本病的认识。

材料与方法 对 2014.1~2023.2 收入我院的 8 例 Cockayne 综合征患者行 CT 平扫和 MR 平扫检查。CT 扫描仪为 GE Revolution CT，MR 扫描仪为 GE 公司 3.0T MR (SIGNA™ Architect)。由两名经验丰富的神经影像医生对患儿颅脑的 CT 及 MRI 征象进行分析、总结。

结果 8 例 Cockayne 综合征患儿于 CT 图像上均显示颅板增厚（n=8），基底节区呈对称性分布的条状或蝶翼状钙化（n=8），7 例可见皮质下白质钙化（n=7），5 例见小脑齿状核钙化。MRI 显示 8 例均呈脑萎缩表现（n=8），且以小脑和脑干的萎缩为著。脑白质呈广泛分布的长 T2 异常信号并弓形纤维受累（n=8），CT 所显示的钙化灶于 MRI 上呈 T1WI 高、T2WI 低信号。

结论 Cockayne 综合征具有典型的颅脑 CT 及 MRI 特征性表现，总结其影像特征，有助于本病的检出及鉴别诊断。

OR-021

残腔 ADC 值构建的列线图模型在预测胶质瘤术后首次进展的临床价值

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目的：探索基于术后胶质瘤残腔平均 ADC（mean apparent diffusion coefficient, mADC）值构建的列线图模型对预测术后首次进展的临床价值。

方法：回顾性分析 2016 年 1 月至 2020 年 12 月于天津市第一中心医院行脑胶质瘤切除术患者的临床及影像资料，所有患者均在术后一周内行增强 MRI 检查，且术后随访复查的 MRI 影像资料完整均包含常规序列、增强序列及 ADC 图。mADC 值的测量方法为两名医师于 PACS 系统定位残腔区域，挑选不同位置进行 5 次 ROI 勾画并计算 ADC 值，其均值即为 mADC 值。通过 X-tile 选取最优 mADC 阈值后进行 Kaplan-Meier 生存曲线分析。采用 Cox 回归分析筛选独立危险因素并构建列线图预测模型，进而预测胶质瘤患者术后进展。使用绘制受试者工作特征（receiver operating characteristic, ROC）曲线评价模型的准确性，通过校正曲线对模型进行准确性的拟合，通过决策曲线（decision curve analysis, DCA）评价列线图模型临床价值。

结果：两次测量的残腔 mADC 值具有良好相关性。Cox 回归分析显示残腔 mADC 值、瘤周强化程度、年龄及肿瘤切除程度是预测胶质瘤术后进展的独立危险因素（P＜0.05）。列线图模型预测胶质瘤患者术后 1、2 年病情进展的 ROC 曲线下面积（area under the curve, AUC） 分别为 0.79、0.76。校正曲线显示模型中观察值与预测值之间有良好的一致性。DCA 显示列线图模型有较好的临床应用价值。

结论：基于残腔 mADC 值建立的列线图模型可直观全面地预测胶质瘤患者术后病情首次进展情况，为临床个性化评估患者生存预后及制订治疗方案提供有力帮助。

OR-022

Diffusion kurtosis imaging reveals abnormal gray matter and white matter development in some brain regions of children with attention-deficit/hyperactivity disorder

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Objective: To investigate the feasibility of using brain diffusion kurtosis imaging (DKI) to identify attention-deficit/hyperactivity disorder (ADHD) in children.

Methods: Sixty-seven children with ADHD and 72 age- and sex-matched healthy controls were included in the study. All children were examined by means of 3D-T1W MRI, DKI and conventional sequence scanning. The volume and DKI parameters of each brain region were obtained by software postprocessing and compared between the two groups of children to determine the imaging characteristics of children with ADHD.

Results: The total brain volume was lower in children with ADHD than in healthy children ($p < 0.05$). The gray and white matter volumes in the frontal lobe, temporal lobe, hippocampus, caudate nucleus, putamen, globus pallidus and other brain regions were lower in children with ADHD than in healthy children ($P < 0.05$). The Ka, MK, FA and Kr values in the frontal lobe, temporal lobe and caudate nucleus of children with ADHD were lower than those of healthy children, while the MD and FAK values were higher than those of healthy children ($P < 0.05$). Additionally, the Ka, MK, FA, and Kr values in the frontal lobe, caudate nucleus, and temporal lobe could be used to distinguish children with ADHD ($AUC > 0.05$, $P < 0.05$).

Conclusion: DKI showed abnormal gray matter and white matter development in some brain regions of children with ADHD.

OR-023

Radiomics feature on Magnetic Resonance Images can predict C5aR1 expression level and prognosis in high-grade glioma

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Background: The complement C5a receptor 1 (C5aR1) plays an important part in the complement cascade-related innate immune response. Recent research has demonstrated that it also plays a role in cancer progression and treatment. However, C5AR1 function in high-grade glioma (HGG) has not been reported. This research sought to

assess its predictive value in HGG and predict C5AR1 expression in a radiomics approach.

Methods: To conduct bioinformatics analysis, 298 HGG patients were collected for bioinformatics analysis, of which 182 cases with MRI image information were used for radiomics analysis besides being split randomly into the training and test cohorts. Kruskal-Wallis, Wilcoxon signed-rank tests and Spearman correlation were utilized to investigate the relationship between C5AR1 expression and clinicopathological characteristics. To investigate the association of C5AR1 with prognosis, Kaplan-Meier and Cox regression analyses were done. GO/KEGG analysis was done to detect the main signaling cascades associated with C5AR1. In the radiomics analysis, mRMR and RFE algorithms were developed to choose the radiomics features. SVM and Logistic regression were employed to build the prediction models. ROC, calibration curve, and DCA were performed to evaluate the models' performance.

Results: C5AR1 gene expression was elevated in HGG patients. It is an independent prognostic factor of HGG patients (HR = 3.984, 95% CI: 2.834-5.607). GO/KEGG analysis revealed that C5AR1-high expression enriched many tumor-related pathways. Two radiomics features were selected to predict C5AR1 expression levels in HGG patients. In SVM model, the AUC of the training and test cohorts were 0.828 and 0.808, respectively. In the logistic regression model, the AUC of the training and test cohorts were 0.824 and 0.806, respectively. The C-index and calibration plots exhibited an effective estimation ability in HGG patients. The rad-score calculated by SVM model showed a high correlation with the overall survival time of HGG patients ($p < 0.01$).

Conclusion: Based on our research, C5AR1 is a crucial player in glioma development and prognosis, suggesting the probable importance of C5AR1 as a biomarker of glioma prognosis. We also developed a model on the basis of machine learning and radiomics that can non-invasively and effectively predict the C5AR1 expression level and the prognosis of HGG patients.

OR-024

Multi-parametric MRI-Based Radiomics for Prognostic Evaluation of Pediatric Medulloblastoma

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Objective: To construct and validate a radiomics model for predicting the outcome of Medulloblastoma (MB) patients based on preoperative multi-parametric magnetic resonance images, and to provide an objective for clinical decision-making and follow-up management.

Methods: The clinical and imaging data of 64 patients with MB admitted to Shenzhen Children's Hospital from December 2012 to December 2021 and confirmed by pathology were retrospectively collected. According to the 18-month progression free survival, the cases were classified into a good prognosis group and a poor prognosis

group, and all cases were divided into training group (70%) and validation group (30%) randomly. Radiomics features were extracted from MRI of each child. The consistency test, t test and the least absolute shrinkage and selection operator (LASSO) were used for feature selection.The support vector machine (SVM) and ROC were used to evaluate the distinguishing ability of the selected features to the prognostic groups. Rad-score was calculated based on the selected features. The clinical characteristics and rad-score were included in the multivariate logistic regression and prediction models were constructed by screening out independent influences. The radiomics nomogram was constructed and its clinical significance was evaluated.

Results: A total of 1930 radiomic features were extracted from the images of each patient, and 11 features were included in the construction of radiomics score after selected. The AUC values of the SVM model in the training and validation groups were 0.946 and 0.797, respectively. The radiomics nomogram was constructed based on the training cohort, and the AUC values in the training group and the validation group were 0.926 and 0.835, respectively. The results of clinical decision curve analysis showed that a good net benefit could be obtained from the nomogram.

Conclusions: The radiomics nomogram established based on MRI can be used as a noninvasive predictive tool to evaluate the prognosis and predict the outcome of children with MB, which is expected to help neurosurgeons better conduct preoperative planning and patient follow-up management.

OR-025

Nomograms based on MRI radiomics for differential diagnosis, histological stratification, and predicting BRAFV600 expression in pleomorphic xanthoastrocytoma and ganglioglioma

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Objectives: Pleomorphic xanthoastrocytoma (PXA, WHO grade 2-3) is a rare neoplasm of the central nervous system (CNS), accounting for less than 1% of all primary CNS tumors. Ganglioglioma (GG, WHO grade 1-2) is the most common tumor among glioneuronal and neuronal tumors accounting for approximately 2% of all primary CNS tumors. Both PXA and GG commonly occur in the temporal lobes of children and adolescents and are closely associated with refractory epilepsy. PXA and GG have similar clinical symptoms and imaging findings, but their biological behaviors are quite different. GG has a relatively favorable prognosis, with a 10-year survival rate of 82-93% after total resection. In contrast, PXA has a higher rate of recurrence and is more prone to metastasis via cerebrospinal fluid, and often requires adjuvant radiotherapy after surgery. Additionally, in patients with PXA, the overall survival and progression-free survival of grade 3 tumors are shorter compared to grade 2 tumors. Furthermore, recent studies have suggested that patients with BRAFV600 mutations in PXA and GG may benefit from targeted therapy with drugs such as

dabrafenib and vemurafenib. Therefore, accurate differentiation, histological stratification and predicting BRAFV600 gene expression in PXA and GG, can help neurosurgeons to assess patient prognosis and develop individualized treatment plans.

Methods: The study retrospectively enrolled 265 patients with histologically diagnosed with PXA (n=113) and GG (n=152). The expression status of BRAFV600 was detected in 153 patients, including 71 cases of BRAF-mut and 82 cases of BRAF-wt. Among all patients with PXA, 35 cases were grade 3 and 78 cases were grade 2. In this study, the patients were assigned to the training cohort and testing cohort at a ratio of 7:3. The 3Dslicer software was used for image pre-processing and tumor segmentation. N4ITK bias field correction and trilinear interpolation resampling were utilized to eliminate the impact of variations in MRI scanners and acquisition parameters. The T2WI sequence was delineated manually by a neuro-radiologist with more than three years of experience. Subsequently, the masks obtained from the T2WI sequence were registered to the T1WI and CET1 sequences. Each patient extracted a total of 3390 features, including first-order, shape, texture, wavelet, and Laplacian of Gaussian (LoG) features. All features were normalized by z-score to eliminate the dimensionality of features. Univariate analysis, Spearman correlation analysis, and the Least Absolute Shrinkage and Selection Operator(LASSO) were used for feature selection. Multivariate logistic regression was used to develop the radiomics model. A total of 11 characteristics including age, sex, and MRI imaging findings were collected for constructing the clinical model. The radiomics score (Rad-score) was calculated by the linear combination of the coefficients of the radiomics features selected by LASSO. In the training cohort, the nomogram based on multivariate logistic regression was established by incorporating Rad-score with clinical risk factors, and the performance of the nomogram was evaluated in the independent testing cohort. The hosmer-Lemeshow test and the calibration curve were used to assess the goodness-of-fit of the nomogram. In addition, decision curve analysis was used to evaluate the clinical usefulness of the nomogram by measuring the net benefit at different thresholds. Finally, the Delong test was used to compare the differences in performance between the different models. The Integrated Discrimination Index (IDI) was used to quantify the improvement in model performance.

Results: In our study, the nomograms achieved the best predictive performance compared to clinical and radiomics models. For the differential diagnosis of PXA and GG, the AUC values of the nomogram were 0.880 (95%CI: 0.830-0.930) in the training cohort and 0.888 (95%CI: 0.811-0.965) in the testing cohort. For histological stratification of PXA, the nomogram achieved AUC values of 0.893 (95%CI: 0.8259-0.9603) in the training cohort and 0.913 (95%CI: 0.8184-1) in the testing cohort. For predicting the status of BRAFV600, the AUC values of the nomogram were 0.873 (95%CI: 0.811-0.936) in the training cohort and 0.851 (95%CI: 0.740-0.963) in the testing cohort. Hosmer-Lemeshow test and calibration curves showed that the predicted probabilities of the nomograms fit well with the expected probabilities. The DCA curves showed that the nomograms provided more net benefit than all treatment or no treatment in a wide range of threshold probabilities. In addition, the integrated discrimination indexes of the nomograms were significantly improved in both the training cohorts and test cohorts compared with the clinical models ($P<0.05$).

Conclusions: The nomograms based on radiomics and clinical semantic features can be used as non-invasive tools for differential diagnosis, histological

stratification, and predicting BRAFV600 expression in PXA and GG, which is valuable for the initial diagnosis of patients and the determination of treatment plans.

壁报交流

P0-0001

Increased Cortical Lesion Load Contributed to Pathological Changes beyond Focal Lesion in Cortical Gray Matter of Multiple Sclerosis: A Diffusion Kurtosis Imaging Analysis

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Purpose: To evaluate the microstructural and morphological changes of the whole brain cortical gray matter (cGM) in relapsing-remitting multiple sclerosis (RRMS) patients with varying degrees of cortical lesion (CL) load by using magnetization prepared rapid gradient echo (MPRAGE) and diffusion kurtosis imaging (DKI), and to determine what factors would dominant the injury in cGM.

Methods and Materials: Participants including 110 RRMS patients and 72 healthy controls (HC) were grouped into four groups (high CL load, low CL load, no CL load and HC groups) based on the CL volume obtained from MPRAGE images. The volume of cGM were also obtained from MPRAGE. The injury beyond focal CL, that is normal-appearing cGM (NAcGM) (cGM for HC group) were measured by the DKI-derived kurtosis fractional anisotropy (KFA), fractional anisotropy (FA), mean kurtosis (MK) and mean diffusivity (MD). Neuropsychological scores were used to evaluate the cognitive status of all participants. Differences among the four groups in DKI and volume parameters were assessed using the univariate general linear model, correcting for age, and in neuropsychological scores were also assessed using the univariate general linear model, correcting for age and years of education. Then, stepwise regression analysis was used to compare the influence of the intracortical lesion (ICL) volume, leukocortical lesion (LCL) volume and other demographic features on the degree of NAcGM injury quantitatively represented by DKI value.

Results: The DKI values of NAcGM (cGM for HC) and the volume of cGM were significantly different among the four groups of participants ($p < 0.001$). Only KFA values were significantly different between every two groups ($p < 0.05$). The KFA value and cGM volume were minimized in high CL load group, followed by low CL load, no CL load and HC groups. In the cognitive assessment, participants in high CL load group had the worst cognitive performance, followed by low CL load, no CL load and HC groups. The KFA value in the whole brain NAcGM was used as the dependent variable representing its damage degree. The LCL volume and age were selected as the dependent variables included in the regression equation ($p < 0.001$), $R = 0.567$, $R^2 = 0.322$.

Conclusions: In RRMS patients, the injury in the whole brain NAcGM, the volume loss in the whole brain cGM and the individual cognitive impairment are increased with the level of CL load. The LCL load and age are the major factors that contribute to the diffused and widespread injury in NAcGM.

PO-0002

末期肾病患者的体素镜像同伦连接改变及其与患者认知功能之间的关系

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目的 运用静息态功能磁共振（rs-fMRI）的体素镜像同伦连接（VMHC）方法探讨终末期肾病患者双侧大脑半球间静息态功能连通性变化及其与认知功能之间的关系。方法 纳入 35 例终末期肾病患者（患者组）及 25 例年龄、性别和受教育年限相匹配的健康志愿者（对照组），2 组受试者均于磁共振检查前 1 小时内完成蒙特利尔认知量表(MoCA)评估认知功能。基于 MATLAB2013b 平台的 DPABIV4.3 软件包进行 rs-fMRI 数据预处理及 VMHC 值计算，采用 DPABI 软件的 Statistical Analysis 模块对两组标准化的 VMHC 参数图进行统计分析，比较两组之间 VMHC 值差异的脑区，并分析终末期肾病患者组 VMHC 值与 MoCA 总评分及亚项评分的相关性。结果 终末期肾病患者组 MoCA 量表总评分及注意、延迟回忆亚项评分显著低于对照组（P＜0.05）。与对照组比较，终末期肾病患者组双侧脑岛、中央后回、顶上回、顶下缘角回、缘上回、颞上回、颞极：颞上回 VMHC 值显著减低（GRF 校正，体素水平 P＜0.001，簇水平 P＜0.05），未见 VMHC 值增高脑区。终末期肾病患者组双侧缘上回平均 VMHC 值与 MoCA 量表总评分呈正相关关系（r=0.408，P=0.015），双侧颞上回平均 VMHC 值与 MoCA 量表中延迟回忆亚项评分呈正相关关系（r=0.526，P=0.001）。讨论 本研究结果显示终末期肾病患者组与对照组相比，其双侧脑岛、中央后回、顶上回、顶下缘角回、缘上回、颞上回、颞极：颞上回 VMHC 值显著减低，且与 MoCA 评分相关，表明终末期肾病患者上述脑区双侧半球间功能协同性减弱，可能是终末期肾病患者发生认知功能障碍的潜在因素之一。此研究结果也证实终末期肾病患者双侧大脑半球间存在镜像功能连接异常并与其认知功能障碍相关，大脑半球的 VMHC 值或许可以成为早期诊断终末期肾病患者知功能障碍的指标之一。

PO-0003

多模态 MRI 在胶质瘤 TERT 启动子突变中的研究进展

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胶质瘤是颅内最常见的原发性恶性肿瘤，端粒酶逆转录酶（telomerase reverse transcriptase，TERT）启动子突变可导致肿瘤细胞端粒酶的高表达，对胶质瘤的诊断和预后等方面有重要影响。然而目前主要通过有创检查如免疫组化和基因测序确定分子分型，多模态磁共振成像的发展为术前无创预测胶质瘤分子标记物提供了可能。笔者简要概述 TERT 启动子突变及其临床意义，并对近年来多模态 MRI 预测胶质瘤 TERT 启动子突变的研究进展进行综述。

P0-0004

TDCS 改善脑梗死后图命名功能的 rs-fMRI 功能连接观察

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目的　采用静息态功能磁共振成像(rs-fMRI)技术对不同时期脑梗死后失语患者经颅直流电刺激（tDCS）治疗前、后语言相关脑区激活变化进行研究，探讨图命名功能的损伤及恢复机制。

方法　选取 28 例脑梗死后失语患者，其中急性期（AP）16 例，恢复期（RP）12 例，采用 tDCS 刺激患者语言相关脑区，分别于治疗前、后行 rs-fMRI 检查及失语量表评分，观察患者相关脑区功能连接(FC)的变化。

结果　梗死后失语患者双侧大脑半球存在多个脑区与 Wernick 区 FC 减低，优势半球更为明显。经过 tDCS 治疗后，AP 组和 RP 组患者双侧额颞叶 FC 显著升高，且 AP 组患者双侧颞枕叶 FC 较治疗前升高。RP 组治疗前 FC 升高的左侧颞叶在治疗后 FC 减低。

结论　tDCS 可有效改善脑梗死失语患者图命名能力，其作用可能与加强双侧额颞叶的语言联络机制有关。急性期患者早期 tDCS 干预可能对视觉通路的功能代偿起到更加积极的作用。非优势半球的语言功能相关脑区激活可能只是一种短期内神经功能代偿机制。

P0-0005

Trans-scale study of blood-based gene expression, neuroimaging brain phenotypes and cognitive performance in schizophrenia and healthy individuals

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Introduction

Cognitive impairments are one of the core symptoms of schizophrenia. However, how this impediment is associated with gene expression profile alterations and brain endophenotypes variations remains poorly understood.

Methods

A trans-scale dataset containing whole-blood mRNA sequence data, cerebral magnetic resonance imaging data, and cognitive data was collected from 43 patients with schizophrenia and 60 healthy individuals. The count data of genes were obtained through extracted total mRNA data from whole blood samples and were used to calculate differentially expressed genes between patients and controls. Based on the Wechsler Adult Intelligence Scale revised in China, the raw scores of six subtests including vocabulary, information, digit span, picture completion, block design, and digit symbol coding were administered and then converted to normalized scores to evaluate IQ. The brain region with the most significant altered grey matter volume in patients with schizophrenia compared with healthy controls was selected as the region of interest for seed-based voxel-wise functional connectivity at the whole-brain level

based on the data-driven manner. The effective connectivity was then characterized to determine the information flow within brain regions which display dysfunction of networks in schizophrenia. Furthermore, to spatially match gene expression data with neuroimaging data, we localized differential genes to specific brain regions (referred to as Target genes) utilizing regional brain gene expression data in the Allen Human Brain Atlas (http://human.brain-map.org/). Finally, the relationships between the Target genes transcriptome Profile, neuroimaging phenotypes, and cognitive ability were measured separately in patients and controls based on the partial least squares analysis and the mediation analysis.

Results

Relative to healthy controls, patients with schizophrenia exhibited the most significant decreased grey matter volume in the right hippocampus/parahippocampal (HIP/PHG) grey, reduced strength of bidirectional excitatory effective connectivity between the right HIP/PHG and right superior temporal gyrus. As for the relationship between brain phenotypes and cognition ability, the strength of the bidirectional effective connectivity between the right HIP/PHG and right superior temporal exhibited the positive correlation with digit symbol coding test score and the negative correlations with the digit span test score as well as IQ in healthy controls, but demonstrated the abnormal negative correlation with information test score in patients with schizophrenia. In healthy individuals, gene-brain-cognition association analysis established the relationships between several Target gene expression levels and brain functional parameters & cognitive ability (r = 0.4797, P = 0.0002) on the one hand, and mediation analysis further disclosed the mediating effect (indirect effect = 0.0242, 95% CI from the bootstrap test = [0.0005 to 0.0524]) of brain phenotypes composite scores, which is principally contributed by the bidirectional connections between the right HIP/PHG and superior temporal gyrus, in the correlation between gene expression and cognitive composite scores on the other hand. Crucially, in comparison with healthy controls, the normal trans-scale associations described above were extensively disrupted in patients with schizophrenia.

Conclusion

In conclusion, this study linked HIP/PHG structure and function as well as cognitive ability to the blood transcription levels of HIP/PHG related genes at the individual level without extracting brain tissue, providing a new perspective for understanding the misaligned gene-brain-cognition biological pathway in schizophrenia. Our findings initially identified a potential neuropathological model probably associated with cognitive dysfunction in schizophrenia, including both genetics and brain function mechanisms.

P0-0006

基于图论的原发性痛经患者功能脑网络研究

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目的：探索功能脑网络拓扑属性在原发性痛经（primary dysmenorrhea, PDM）患者中的改变及其应用价值。方法：共纳入57例PDM患者和50例健康女性，采集所有受试者静息态功能磁共振成像（resting-state functional magnetic resonance imaging, rs-fMRI）的图像后，利用GRETNA软件对数据进行预处理及功能网络构建，然后利用图论分析方法计算网络拓扑属性，通过两独立样本t检验比较组间差异。结果：两组被试在年龄、身高、体重、月经周期、经期持续时间、月经量方面无显著差异（P＞0.05）。两组被试在稀疏度范围内均符合小世界属性特征，脑网络的全局效率、平均集聚系数、平均路径长度等差异无显著性（P＞0.05）；PDM组经期左侧额中回、双侧后扣带回、左侧脑岛的节点效率（node efficiency, Ne）、节点度（node degree, Dc）、节点介数（node betweenness, Bc），左侧中央前回的Bc，右侧中央前回的Dc显著高于HC组；左侧颞下回的Ne、Bc、Dc，右侧岛盖部额下回的Ne、Dc，左侧前扣带回的Bc、右侧眶部额下回的Dc、右侧楔叶的Ne显著低于HC组（P＜0.05）；PDM组经期大脑中左侧后扣带回与右侧距状裂周围皮层、右侧舌回、左侧额中回之间，右侧后扣带回与右侧背外侧额上回、左侧额中回之间，右侧脑岛与左侧枕中回之间的功能连接（functional connectivity, FC）高于HC组（P＜0.001）。结论：PDM患者仍表现有高效的小世界特性，整个大脑在很大程度上仍有良好的组织性，能保持隔离与整合之间的平衡。患者经期部分脑区间功能连接显著正激活，涉及突显网络、默认状态网络、感觉运动网络以及中央执行网络。

PO-0007

Extensive Brain Changes in Cushing's Disease Revealed by Disrupted Small-world Properties: A Multimodal Network Study

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Purpose: To investigate the small-world attributes of functional, anatomical, and morphological brain networks in CD patients by using graph theoretical analysis, and to elucidate the correlations between brain network abnormalities and clinical indexes.

Methods: Thirty-five CD patients and twenty-seven healthy controls (HCs) were recruited.Resting-state functional magnetic resonance imaging, diffusion tensor imaging, and structural magnetic resonance imaging data were used to construct the functional, anatomical, and morphological networks of each participant, respectively.After the construction of whole-brain multimodality networks, we calculated the topological properties of each network at both global and nodal levels by using graph theoretical analysis. A Chi-squared test was used to compare the mean difference in age and education, and a two-sample t-test was used in the comparison of continuous variables (age and gender) as well as network measures between the two groups. Spearman correlation analyses were performed to determine the relationships between the topological attributes showing significant intergroup differences and the clinical variables for CD patients.

Results: Small-world attributes (> 1) in all three brain networks were identified for both the CD and HCs, while in the functional brain network, CD patients showed significant decreases in , and ; In the anatomical brain network, CD patients showed significant decreases in ,,, and ; In the morphological brain

network, CD patients showed increased and ,, and .Particularly, In the morphological network, the 24-h UFC was positively related to , and .Compared with controls, brain regions with network nodal parameter changes were mainly located in the limbic network(including the amygdala, hippocampus, parahippocampal gyrus,temporal pole, insula,and part of orbital frontal gyrus),default mode network(including the posterior cingulate cortex, the precuneus, medial prefrontal gyrus, angular gyrus, supramarginal gyrus,and the bilateral temporal gyrus and parts of the parietal lobe), executive control network, (including the ventrolateral prefrontal gyrus bilateral dorsolateral prefrontal gyrus , dorsomedial prefrontal gyrus and the most of middle temporal and inferior temporal gyrus), salience network(including the anterior cingulate gyrus, anterior insula and anterior supplementary motor area).In the anatomical network, the CD-QOL was negatively related to the of HIP.R ($r = -0.5139$, $p = 0.0015$) and HES.L ($r = -0.5607$, $p = 0.0004$).

Conclusion: This study indicated that CD patients exhibit topological disruptions in the multimodality whole-brain networks on both nodal and global level. Few network parameters have correlations with clinical indexes of CD patients, which may serve as imaging biomarkers to help the clinical evaluation of CD.

P0-0008

Diffusion Kurtosis Imaging in long-term Parkinson’s disease patients with cognitive impairment

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Objective

The incidence of Parkinson's disease (PD) patients combined with dementia increased significantly with the extension of disease course, and increased from 26.3% to 83% at twenty years after diagnosis. Mild cognitive impairment (MCI) is considered to be an independent risk factor for PD dementia (PDD). For better understand of the potential pathological process, this study aims to use diffusion kurtosis imaging (DKI) to detect the pattern of white matter damage in long-term PD patients with cognitive impairment.

Material and method

A total of 42 PD patients with cognitive dysfunction were prospectively enrolled. PD diagnosis was confirmed by neurologist according to Chinese guidelines for the Treatment of Parkinson’s disease (fourth edition) formulated by the Movement Disorders and Parkinson's Disease Group of the Neurology Branch of the Chinese Medical Association in 2020 [2]. The guidelines also included the exclusion criteria of PD. Other inclusion criteria for all PD patients including: (1) history of severe trauma or surgery on brain; (2) history of alcoholism and drug abuse; (3) severe respiratory, cardiovascular, gastrointestinal and other medical system diseases; (4) MR scanning contraindication. All participants underwent Mini-mental State Examination (MMSE) and Montreal Cognitive Assessment (MoCA) by one neurologist with six years working experience to estimate the cognitive state of subjects. PD patient

with MMSE score >24 and MoCA < 26 was enrolled in PD with mild cognitive impairment group (PD-MCI); patient with MMSE score ≤ 24 and MoCA < 26 was enrolled in PD dementia group (PDD) according to the Petersen MCI diagnostic criteria [4]. All PD patients underwent DKI scan on a 3.0T MRI scanner with a 32-channel phase-array head coil, using a single-shot echo-planar imaging (SS-EPI) sequence. The parameters were detailed in Table 1. Raw DKI data were preprocessed using an open online source software - Diffusion Kurtosis Estimator (DKE, https://www.nitrc.org/projects/dke/) to get the fractional anisotropy (FA), mean kurtosis (MK) and mean diffusivity (MD) map for statistical analysis. All images were visually inspected one by one. Demographic data were analyzed using SPSS v26.0 (SPSS Inc. IBM). The Shapiro-Wilk test was used to test the normality of data distribution. The chi-square test was used to analyze gender differences between the PD-MCI and PDD groups. Voxel-wise statistical analyses of the FA, MK, MD maps between the two groups were performed using Trace-based spatial statistics (TBSS) toolbox in FSL software [5]. The intergroup comparison of DKI parameters was performed using independent sample t-test with age, gender, and years of education as covariates. Results were reported at the P < 0.05 level after 5,000 permutations, as well as threshold-free cluster enhancement (TFCE) for multiple comparisons. By FSL's Cluster, statistically significant clusters of the results were identified with two white matter templates: The John Hopkins University (JHU) - International Consortium of Brain Mapping DTI-81 WM labels and JHU White-Matter Tractography Atlas template. Statistical significance was defined as two-tailed P < 0.05.

Results

The demographic and clinical data are detailed in Table 2. Compared to the PD-MCI group, the FA, MK, MD all showed diffuse decrease (TFCE-corrected) in the PDD group, the FA and MK decrease both located in 4 independent clusters (voxels > 200 and atlas regions >3%) and MD located in one single cluster (Table 3, 4, 5).

Conclusion

The long-term PD patients with cognitive impairment had diffuse damage of white matter integrity, low complexity of tissue structure, cell intensity decrease and cell atypia (diffuse FA, MK, MD decrease), which is correlated with cognitive status.

Clinical Application

In patients with Parkinson’s disease, the DKI metrics (FA, MK, MD) of white matter show diffuse downward trend, with the age and cognitive decline. The DKI technique may help to monitor disease progression.

P0-0009

DTI-ALPS index: Imaging marker to predict cognitive impairment in the middle- aged and elderly chronic insomnia patients

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Purpose The glymphatic system in the brain, is a highly organized fluid transport pathway for clearing metabolic waste, and this process mainly increases during sleep. Chronic insomnia might result in glymphatic dysfunction and cognitive impairment. The diffusion tensor image analysis along the perivascular space (DTI-ALPS) offers an opportunity for the noninvasive investigation of the glymphatic system in many diseases. Thus, this study focuses on middle-aged and elderly subjects to explore whether DTI-ALPS could be valuable early markers to identify cognitive decline in chronic insomnia, which would be helpful to prevent the progression of cognitive impairment and highlight the importance of early treatment.

Methos and Materials This study was approved by the institutional ethics committee. We prospectively enrolled 33 patients with chronic insomnia and 20 healthy controls. All participants underwent DTI MRI on a same 3T MRI scanner using 24-channel standard head coil (Ingenia DNA, Philips Medical Systems, Netherlands). DTI was conducted with main parameters as follows: TR/TE = 4472/90 ms, flip angle = 90° , matrix = 240×240, reconstructed voxel size = 2×2×2 mm3, 64 noncollinear directions with b value = 1000 s/mm 2, and acquisition time = 5 minutes. The DTI-ALPS index was calculated from the images. And the differences in the DTI-ALPS index were finally evaluated. Pearman correlation was used to test the associations between DTI-ALPS with MMSE score. The diagnostic accuracy of DTI-ALPS was evaluated using ROC curve analysis. Significance was set at $p < 0.05$.

Results The DTI-ALPS index in chronic insomnia with impaired cognition was significantly lower than that in chronic insomnia with normal cognition and healthy controls . Furthermore, the DTI-ALPS index was significantly positively correlated with the MMSE score in chronic insomnia with impaired cognition group ($r=0.69$, $p=0.002$. Our results of ROC analysis showed that the DTI-ALPS could distinguish chronic insomnia with impaired cognition group, from normal cognition group with accuracy (area under the curve [AUC]: 0.81, sensitivity: 82.4%, specificity68.7%.

Conclusions Our results indicated that non-invasive DTI-ALPS index may be a useful imaging tool to predict cognitive impairment in middle-aged and elderly patients with chronic insomnia. Glymphatic clearance function might play a role in the development of cognitive decline patients in preclinical stage, and it is meaningful to take some measures to prevent disease progression.

P0-0010

Evaluation of glymphatic system activity by diffusion tensor image analysis along the perivascular space index in Rolandic epilepsy

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Objective: To investigate the value of diffusion tensor image analysis along the perivascular space (DTI-ALPS) index on glymphatic system activity in Rolandic epilepsy (RE) patients.

Materials and Methods: Twenty patients with RE and 20 normal children matched in gender and age underwent conventional magnetic resonance imaging (MRI) and diffusion tensor imaging (DTI). Quantitative analysis DTI-ALPS index between two groups. Meanwhile, correlation of DTI-ALPS index with seizure duration, epileptic frequency and cognitive development were respectively explored via Spearman's coefficient (r).

Results: Compared with control group, DTI-ALPS index was higher in control group than patient group (RE: 1.44±0.27, Control: 1.60±0.21; $p<0.05$). DTI-ALPS index positively correlated with age ($r_{patient}=0.564$, $r_{control}=0.484$; $p<0.05$),full intelligence quotient (FIQ) and verbal intelligence quotient (VIQ) ($r_{FIQ}=0.522$, $r_{VIQ}=0.575$; $p<0.05$). However, DTI-ALPS index gradually decreased with seizure duration and epileptic frequency ($r_{seizure\ duration}=-0.748$, $r_{epileptic\ frequency}=-0.470$; $p<0.05$).

Conclusion: Quantitative analysis DTI-ALPS index on MRI might be potential biomarkers for severity of RE and cognitive development.

P0-0011

Association between Coffee Consumption and Striatal Volume in Patients with Parkinson's Disease and Healthy Controls

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Background: Mounting studies have demonstrated that coffee consumption significantly reduces the risk for developing Parkinson's disease (PD). However, there have been few investigations about the role of chronic coffee consumption in nigrostriatal structural neurodegeneration in PD. We aimed to investigate whether chronic coffee consumption is associated with the change in striatal volume in PD.

Methods: In this study, 130 de novo patients with PD and 69 healthy controls were enrolled from the Parkinson's Progression Markers Initiative cohort. Patients with PD and healthy controls were respectively divided into three subgroups, including current, ever and never coffee consumers. Then, striatal volume was compared across the three subgroups. Correlation analyses were performed to assess the relationship between cups consumed per day and striatal volume. Furthermore, we included the factors that may have influenced nigrostriatal dopaminergic neurons in multiple linear regression analyses to identify significant contributing factors to striatal volume in each investigated striatal region.

Results: Current coffee consumers had decreased striatal volume compared with ever consumers in controls but not patients with PD. Furthermore, the correlation analyses revealed that cups per day were negatively correlated with striatal volume in current consumers of patients with PD and controls. In addition, multiple linear

regression analyses showed that current coffee consumption remained as an independent predictor of a decrease in striatal volume in controls.

Conclusions: Our study showed that chronic coffee consumption was negatively correlated with striatal volume. In addition, our study showed that chronic coffee consumption was associated with the change in striatal volume in current- rather than ever coffee consumers, which suggests that the chronic effects of caffeine on striatal morphology may fade and even compensate after quitting coffee. Our study provides evidence for the effect of chronic coffee consumption on striatal volume in human brain in vivo.

P0-0012

Neurovascular coupling changes in unilateral sudden sensorineural hearing loss patients

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ObjectsSSNHL (sudden sensorineural hearing loss) refers to hearing loss at least 30 dB in three sequential frequencies in the standard pure-tone audiogram in less than 3 days (1), affecting unilaterally in over 95% cases (2). The functional metabolism of the human brain depends on the coupling between cerebral blood flow (CBF) and neural activity, yet whether this coupling changes in patients with SSNHL has not been explored. Our study aims to explore whether neurovascular coupling changes (NVC) changes in patients with SSNHL at different periods, which may further help people understand the pathogenesis of SSNHL in different stages and guide treatments.

Materials and methods

38 SSNHL patients and 44 health controls (HC) were enrolled in the current study. Then, the SSNHL subgroups were defined according to the time between onset of the disease and magnetic resonance imaging scanning, early- (n = 16, 0-6 days), intermediate- (n = 9, 7-13 days), and late- stage (n = 13, $\geqslant$ 14 days). To assess the global degree of coupling between CBF and amplitude of low-frequency fluctuations (ALFF), correlation analysis across voxels were performed for each participant. Correspondingly, we performed false discovery rate (FDR) correction in brain regions with significant differences for increasing the reliability of the results. Furthermore, One-way analysis of variance (ANOVA) and post-hoc t-test was implemented in NVC to compare the differences between the SSNHL subgroups and HC.

Results

The function of neurovascular unit could be non-invasively reflected with NVC, the coupling between CBF and ALFF at the corresponding brain region (3, 4). By measuring and comparing NVC, we first revealed that SSNHL cohort manifested decreased NVC in the left TTG ($p = 0.004$), the left ($p < 0.001$) and right STG ($p = 0.026$) (Fig. 1a and b), suggesting a mismatched neuronal excitability and CBF. One-way ANOVA revealed significant differences in NVC of left TTG ($F[3,78] = 6.295$, $p = 0.001$), left STG ($F[3,78] = 11.110$, $p < 0.001$) and right STG ($F[3, 78] = 6.432$, $p = 0.001$) among HC, early-, intermediate- and late-stage SSNHL cohorts (Fig. 1c). Post-hoc t-

test revealed group differences in NVC of left TTG in intermediate- ($p = 0.007$, vs HC, Bonferroni corrected) and late- ($p = 0.021$, vs HC, Bonferroni corrected) stage SSNHL cohorts. Group differences in NVC of left STG in intermediate- ($p < 0.001$, vs HC Bonferroni corrected) and late- ($p < 0.001$, vs HC Bonferroni corrected) stage SSNHL cohorts were also significant. At last, group differences in NVC of right STG in intermediate- ($p = 0.003$, vs HC Bonferroni corrected) and late- ($p = 0.016$, vs HC Bonferroni corrected) stage SSNHL cohorts were also revealed. However, no difference was observed between HC and early-stage SSNHL cohort in the NVC within left TTG and bilateral STG (Fig. 1c). These findings suggested that decreased NVC in TTG, bilateral STG occurred in the intermediate- and late-stage SSNHL cohorts, and NVC might serve as neuroimaging marker for intermediate- and late-stage SSNHL.

Conclusion

Our findings suggested that there was a certain brain compensation during the early-stage SSNHL cohort. Along with the disease development, functional changes led to the NVC decrease, referring to the impaired brain compensation. We then investigated what happened if the brain decompensation lasted for longer time in the late-stage SSNHL cohort.

P0-0013

Central mechanisms of gait alterations associated with chronic ankle instability—based on task-state fMRI

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Objectives: The aim of this study was to determine the differences in brain region activation between dorsiflexion and plantarflexion and to explore their correlation with clinical severity in chronic ankle instability (CAI) patients.

Methods: A total of twenty-seven CAI patients and forty-two healthy participants were enrolled. The ankle dorsiflexion-plantarflexion paradigm was performed in the fMRI part using a short block design. The cerebral excitability patterns between patients with CAI and healthy controls were analyzed using t-tests. Spearman analysis was performed to explore the correlation between the activation regions and patient characteristics.

Results: In the patient group, brain activation was greater during plantarflexion than dorsiflexion, which was different from the control group. Between-group comparison showed that during dorsiflexion, patients with CAI had reduced activation in the ipsilateral precuneus compared to controls, while during plantarflexion it caused increased activation in the ipsilateral superior temporal gyrus, precuneus, supplementary motor area (SMA), superior frontal gyrus, the medial part of the superior frontal gyrus and contralateral postcentral gyrus. During plantarflexion, the number of activated voxels in the SMA was positively related to the KPAFS score ($r=0.0520$, $p=0.005$), and the amount of activated voxels in the primary motor cortex

(M1) and primary sensory cortex (S1) were also positively correlated with the AFOAS score in CAI patients (M1: r=0.453 p=0.018; S1: r=0.486, p=0.010).

Conclusions: Plantarflexion recruited more brain regions activation than dorsiflexion in CAI patients, and there was a positive correlation between the neural activity in sensorimotor-related regions during plantarflexion and clinical severity.

P0-0014

Assessing the alteration of functional activity and connectivity involved in the tinnitus symptoms in patients with vestibular schwannoma

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OBJECTIVE Although the retrosigmoid approach is an effective way to resect a vestibular schwannoma (VS) and preserve some of its neurological function, it is unclear how surgery affects brain activity and how patients experience postoperative changes in tinnitus. This study aimed to investigate and analyze the potential mechanisms underlying postoperative changes in tinnitus symptoms in patients with VS.

METHODS We collected data from 28 VS patients before and after surgery, and recruited 28 healthy controls. We used paired t-tests to identify brain regions where patients had significant changes in amplitude of low frequency fluctuations (ALFF) and regional homogeneity (ReHo) after surgery. Tinnitus severity was evaluated using the Tinnitus Handicap Inventory (THI) and Visual Analog Scale (VAS). And Pearson correlation were applied to assess the relationship between the changes in ALFF and ReHo and the changes in THI and VAS scores postoperatively. Finally, we also conducted seed- and ROI-based functional connectivity (FC) analyses.

RESULTS After surgery, 28 VS patients showed a significant reduction in ALFF in the left cerebellum crus 2 (ROI 1) and a significant reduction in ReHo in the left cerebellum crus 1 (ROI 2) and the right precuneus (ROI 3). Conversely, ReHo was significantly increased in the right precentral gyrus (ROI 4) (cluster-level p value family-wise error [pFWE] < 0.05). Additionally, the changes in ALFF values were negatively correlated with changes in the VAS score on the left side ($r = -0.32$, $p < 0.05$). Moreover, the FC strengths of patients between ROI 2 and the left and right posterior cingulate gyrus respectively were significantly decreased after the surgery (FDR correction, $p < 0.05$).

CONCLUSIONS Surgery can significantly alter the spontaneous activity and default mode of the left cerebellum or other regions in patients with VS. FC associated with default mode network (DMN) or somatomotor network can be changed, suggesting that brain regions related or unrelated to hearing can influence the postoperative brain changes in patients with VS, which may be potential therapeutic targets for tinnitus in postoperative patients with VS.

PO-0015

脑灰质结构特征联合机器学习方法对伴中央颞区棘波的儿童自限性癫痫患者与正常儿童的分类研究

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目的

伴中央颞区棘波的儿童自限性癫痫(SeLECTS)是一种常见的局灶性、短暂性、发育性癫痫综合征，其脑电特征是单侧或双侧、独立的中央颞区棘波，且容易共患睡眠障碍、多动抽动障碍等疾病。既往研究发现 SeLECTS 患儿的脑灰质体积与结构网络存在异常，提示其存在脑发育障碍。本研究进一步探讨 SeLECTS 患儿与正常儿童脑灰质结构特征差异并通过机器学习方法进行分类研究。

方法

40 例 SeLECTS 患儿和 40 例正常儿童行 3T 磁共振结构成像检查。使用 FreeSufer 软件提取患者组与对照组 68 个脑区的 8 项灰质结构指标（表面积、灰质体积、厚度均值、厚度标准差、平均曲率、平均高斯曲率、折叠指数、曲率指数）。采用两样本 T 检验筛选患者组与健康对照之间差异有统计学意义的特征，然后使用最小收缩算法(LASSO)从差异特征中选择与最相关的关键特征。使用支持向量机（SVM）方法构建分类模型。同时对关键灰质结构特征与患者病程、发作频率及量表进行相关性分析。

结果

选择 15 个关键特征指标构建分类模型，在训练队列和验证队列中 AUC 分别为 0.929 和 0.921。其中双侧下颞叶皮层厚度与多动冲动评分呈负相关（$p<0.05$，FDR 校正）。

结论

本研究进一步证实 SeLECTS 患儿脑灰质结构发育存在异常，通过机器学习方法可以构建 SeLECTS 与正常儿童的分类模型并取得良好效能；双侧下颞叶皮层改变可能与共患多动抽动障碍有关。

PO-0016

Correlation between changes of brain ALFF and cognitive impairment in patients with neuropsychiatric systemic lupus erythematosus

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Abstract：objective：To explore the relationship between brain function changes and clinical serological indicators and behavioral cognitive assessment in neuropsychiatric systemic lupus erythematosus (NPSLE) patients, and to understand the pathogenesis of NPSLE from the perspective of imaging. Methods：The resting-state functional imaging data, clinical serological and behavioral cognitive assessment scores of 28 NPSLE patients and 22 HC patients were prospectively collected. The ALFF obtained from the analysis and processing were correlated with the serological data and behavioral cognitive assessment scores to find out the relationship between these

data. Results：The average age of the NPSLE group was older than that of the HC group, and there were significant differences in education level, AVLT-H and TMT scores between the two groups. The NPSLE group showed increased brain activity in the insula, precentral gyrus and superior temporal gyrus, and decreased brain activity in the superior parietal gyrus. The ALFF of the insula was positively correlated with Anti-β2gp1 antibody, and negatively correlated with Anti-nucleosome antibody and AVL-RC. The ALFF of the precentral gyrus was negatively correlated with AVL-I, AVL-SR and AVL-LR. The ALFF of the superior temporal gyrus is negatively correlated with AVL-RC. The ALFF of the left superior parietal gyrus was positively correlated with CRP. The ALFF of the right superior parietal gyrus was positively correlated with SLEDAI and negatively correlated with AVL-I. Conclusion: NPSLE patients show different brain activity changes in different brain regions, and the abnormal brain regions are correlated with some lupus antibodies, inflammatory factors and cognitive assessment, suggesting that the correlation between the three may provide insights into the pathogenesis of NPSLE.

PO-0017

动态网络的时间和拓扑特性反映视神经脊髓炎谱系障碍患者的残疾

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目的： 视神经脊髓炎谱系疾病（NMOSD）的每次炎症发作都会导致残疾增加,并且伴随着功能网络的改变。然而，目前尚不清楚功能网络如何与 NMOSD 患者的临床残疾状态相关。因此，本研究旨在探索 NMOSD 患者功能网络的静态强度、时变和拓扑特性的改变，以及与残疾的关联。

方法： 本研究一共招募了 30 名 NMOSD 患者（37.70±11.99 岁）和 45 名健康对照者（HC，41.84±11.23 岁）。所有患者都接受了功能 MRI 和残疾评估。使用独立成分分析，我们构建了静息状态功能网络（RSNs），使用方差分析评估 NMOSD 和 HC 之间的 RSNs 的强度、时间和拓扑特性的组间差异，通过斯皮尔曼相关评估 RSNs 参数与残疾的关系。

结果： 与 HC 相比，NMOSD 患者在动态网络而非静态网络中表现出显着改变。时变特征包括 3 种动态状态，状态 1（State 1）的特点是网络内和网络之间的低连接。与 HC 相比，NMOSD 患者在 State 1 中表现出更高的分数时间（P<0.001）和更多的停留时间（P<0.001）以及较少的转换次数（P=0.028）。相关性分析表明 NMOSD 患者 State 1 的更高的分数时间（r=0.421, P= 0.029）、更多的停留时间（r=0.461，P=0.031）和较少的转换次数（r=-0.383，P=0.049）与更高的残疾相关。ROC 曲线分析表明 State 1 的分数时间和停留时间可以显着区分 NMOSD 和 HC（曲线下面积：0.991-0.996）。此外，NMOSD 患者还出现动态网络的中枢节点的度中心性和聚类系数降低（P<0.05，FDR 校正），并且楔前叶（r=-0.387，P=0.046）和丘脑（r=0.406，P=0.036）的聚集系数降低与残疾相关。

结论： NMOSD 患者表现在低连接状态（State 1）表现出更高的分数时间、更多的停留时间和较少的转换次数，与更高的残疾相关。

PO-0018

慢性鼻窦炎嗅觉功能障碍患者静息态脑功能局部一致性研究

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目的 探讨慢性鼻窦炎嗅觉功能障碍患者静息态脑功能自发性活动改变，揭示慢性鼻窦炎对嗅觉功能损害的影响机制。方法 根据慢性鼻窦炎的诊断标准对 50 例慢性鼻窦炎嗅觉功能障碍患者及健康对照组采用症状学量及嗅觉测试价被试者的慢性鼻窦炎症状严重程度。通过静息态功能磁共振成像(rs-fMRI)扫描，计算全脑的局部一致性(ReHo)改变差异，并与临床指标、症状评分进行皮尔逊相关分析。结果 实验组患者左颞中回、右侧枕上回、右侧顶上小叶、右侧角回及左侧楔前叶 ReHo 值升高。左颞中回 ReHo 值与慢性鼻窦炎症状严重程度呈正相关；右侧枕上回和右侧顶上小叶的 ReHo 值与嗅觉功能障碍评分呈负相关。结论 慢性鼻窦炎组患者在静息态下存在多个脑区的异常活动，提示嗅觉功能障碍对慢性鼻窦炎患者的脑功能产生联合损伤效应。默认模式网络(DMN)是慢性鼻窦炎引起脑功能损害的主要靶网络，慢性鼻窦炎可能是导致患者嗅觉功能障碍的关键因素。

PO-0019

T1mapping 技术结合 AAL 脑区分割在锰中毒神经系统应用价值的研究

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目的 使用 T1mapping 技术对锰中毒患者的 AAL 重点脑区的 T1 值进行研究，评估 T1mapping 技术与 AAL 脑区分割技术在锰中毒神经系统研究和应用价值。方法 对 23 名锰中毒患者和 26 名志愿者行 MRI 检查，----使用 BrainQuantAll 软件对 T1mapping 图和 3DT1 加权图进行拟合，以 AAL 脑区分割并选取重点脑区的 T1 值为研究对象，比较锰中毒组与对照组在重点脑区 T1 值方面的差异。结果 各脑区锰中毒组所测量 T1 均值均低于对照组，尾状核、豆状核-壳、豆状核-苍白球、丘脑脑区两组 T1 均值差异显著（p＜0.05），中央前回、中央后回、额中回、颞中回脑区 T1 均值两组差异不显著（p＞0.05），各脑区左右对比 T1 值不存在显著差异（p＞0.05）。结论 T1mapping 和 3DT1 加权图拟合后使用 AAL 脑区分割技术得到各脑区容积和 T1 值，对重点研究的脑区左右对比，脑区容积和 T1 值均不存在显著差异（p＞0.05），锰中毒组在豆状核-壳，豆状核-苍白球，尾状核以及丘脑脑区其 T1 值与对照组之间存在显著差异（p＜0.05），中央前回，中央后回，颞中回，额中回脑区则不存在显著差异（p＞0.05），锰在神经系统沉积在苍白球，黑质、纹状体等部位，锰沉积在脑组织导致组织纵向弛豫时间变短，相应的 T1 值变小。使用 AAL 脑区分割方法研究锰中毒主要脑区的 T1 值的特点，一定程度上减小测量范围差异导致的 T1 值测量差异。T1mapping 技术结合 AAL 脑区分割技术对锰中毒脑组织 T1 值变化的研究，可以更加准确评估各脑区 T1 值变化，锰中毒组灰质核团脑区 T1 值减低较皮质脑区更显著，可以用于锰中毒的辅助诊断和鉴别，皮质脑区 T1 值减小不显著，无法对锰中毒进行区分，T1mapping 结合 AAL 脑区分割技术对锰中毒神经系统研究具有较大的研究和应用价值。

PO-0020

Dynamic Alternations of Interhemispheric Functional Connectivity in Brachial Plexus Avulsion Injury Patients with Nerve Transfer: A Resting-State fMRI Study

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Objectives To investigate the longitudinal changes of interhemispheric functional connectivity and their associations with motor function in brachial plexus avulsion injury (BPAI) patients with Contralateral cervical 7 (CC7) nerve transfer.

Methods Sixty-nine BPAI patients who received CC7 nerve transfer were included. Patients were divided into three groups (23 in each group): the pre-operative group(Pre group), the post-operative short-term group(<2 years, PO-ST group), and the post-operative long-term group(≥2 years, PO-LT group). Voxel-mirrored homotopic connectivity (VMHC) was calculated to reveal the interhemispheric functional connection. The Fugl-Meyer Assessment of Upper Extremity (FMA-UE) scale was used to assess motor function of the affected upper extremity. Finally, the correlations between VMHC values and FMA-UE scores were analyzed.

Results The VMHC value showed significant differences in the precentral gyrus, supplementary motor area (SMA), middle frontal gyrus(MFG), and insula. Compared with the Pre group, the VMHC value of precentral gyrus was significantly increased in the PO-ST group but decreased in the PO-LT group. The VMHC value of SMA showed significantly increased in the PO-LT group. In addition, the VMHC value of the insula and MFG were both decreased in the PO-LT group. The VMHC value of precentral gyrus in the PO-ST group and SMA in the PO-LT group was positively correlated with the FMA-UE scores, respectively.

Conclusions These findings reveal a positive correlation between motor function recovery and increased interhemispheric functional connectivity of primary motor cortex and SMA, which provide possible therapeutic targets for future neuromodulation to improve different stages of rehabilitation for BPAI patients.

PO-0021

脑小血管疾病伴轻度认知障碍患者的静态和动态脑脑网络连接变化

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目的

脑小血管疾病（CSVD）是慢性退行性神经疾病，多伴发轻度认知症障碍，但大尺度脑功能网络连接对 CSVD 受试者认知的影响在很大程度上仍是未知的。本研究结合静态和动态功能网络连通性(FNC)来探索其潜在机制。

材料与方法

前瞻性收集 80 例 CSVD 合并轻度认知障碍（MCI）患者和 83 例性别、年龄和教育程度匹配的健康对照者的临床和影像学资料。采用 GIFT 软件对静息状态功能 MRI 数据进行独立成分分析，选取 17 个独立成分作为内部连通性网络。首先，进行静态功能网络连接(sFNC)分析，了解两组之间网络内部和网络之间功能连接的变化，以及与认知的相关性。然后利用滑动时间窗技术对动态功能网络连通性进行分析。通过聚类分析，获得动态脑功能活动状态和动态时间特性(状态占比、平均停留时间和转换次数)。采用两独立样本 t 检验计算各组间时间特性的差异。采用 ICA 软件分析不同状态组间 FNC 的差异。采用 Spearman 相关分析计算动态时间特性与神经心理学测试结果的相关性。

结果

在 sFNC 分析中，CSVD 伴 MCI 组与 HC 组相比，感觉运动网络(SMN)-视觉网络(VN)和左额顶叶网络(lFPN)-VN 在网络间的连接显著降低，lFPN-VN 网络内的连接显著降低。在 dFNC 分析中，得到了四种最佳脑功能活动状态。CSVD 伴 MCI 组的状态 2 平均停留时间（MDT）高于 HC 组，状态占比和 MDT 与认知功能相关。在 dFNC 中，不同状态下的网络连接变化主要集中在 SMN、DMN、FPN 和 VN 与其他脑网络间。

结论

CSVD 表现为静态和动态的 FNC 改变，且与认知能力下降有关。这些发现可能促进我们对 CSVD 认知的脑功能连接的理解，并为临床治疗提供潜在的提示。

PO-0022

Cerebellar gray matter reductions associate with decreased functional connectivity in Parkinson’s Disease

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Objective: Freezing of gait (FOG) is common and disable symptoms in Parkinson’s disease (PD). Since the cerebellum is known for posture and gait control, in this study, we aimed to evaluate the role of cerebellum in FOG pathophysiology in PD patients.

Methods: In our cross-sectional study, 42 patients with FOG(PD-FOG) and 27 patients without FOG(PD-nFOG) were enrolled along with 43 healthy controls (HC) underwent multimodal magnetic. Cerebellum subregion gray structure alteration were obtained by a spatially unbiased atlas template voxel-based morphometry method (SUIT-VBM), a second seed-based functional connectivity (FC) was used to evaluate cerebello-cortical (CC) circuits abnormal. Spearman correlation analysis was used to evaluate cerebellum structural change (as well as CTC circuit abnormal) and FOG severity.

Results: SUIT-VBM analyses revealed PD-FOG patients showed smaller GM volume in right cerebellum VIII and left cerebellum VI than PD-nFOG cohort. (Fig 1) We also found reduced FC between cerebellum atrophy subregions and brain regions involved in the bilateral STG, right mFG, left insula, right SFG, left MOG and left middle cingulum cortex. (Fig 2) The severity of PD patients’ FOG impairment (assessed by New Freezing of Gait Questionnaire, NFOGQ) was predicted by a combination of left cerebellum VI atrophy and decreased FC in cerebellar-executive control network and occipito-temporal association regions. (Fig 3)

Conclusion: These findings demonstrate decreased cerebellar GM volume and intrinsic cerebellar-cortical FC are associated with FOG in PD.

PO-0023

Milder motor impairment in full-term PVL related to less extensive thalamic damage

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Background Periventricular leukomalacia (PVL) is a common neuroimaging feature in individuals with spastic cerebral palsy. However, the difference in microscopic alterations in grey matter (GM) between premature and full-term infants with PVL is still unclear. In this study, we aimed to analyze GM changes in cerebral palsy patients with PVL, and investigated the impact of ischemic and hypoxic events on grey matter microstructure during different developmental stages.

Methods T1-weighted 3T brain MRI data were collected from 46 patients with periventricular leukomalacia and 38 age- and gender-matched healthy children. The patient group was stratified into the premature PVL group (pPVL, n=27) and the full-term PVL group (fPVL, n=15). Voxel-based morphometry (VBM) was used to compare global structural volumes and regional GM volumes between groups. Between-group differences were corrected for multiple comparisons using Family-Wise Error (FWE) and Monte Carlo z-field simulation with a significance threshold of $p < 0.05$ (2-tailed). Gross motor function assessment (GMFM) and fine motor function assessment (FMFM) were conducted on all participants.

Results

Compared to the HC group, the pPVL group had a reduction in total intracranial volume (TIV), as well as GM and white matter (WM) volume. They also had a reduction in bilateral thalamic volume, whereas the fPVL group only showed a reduction in left thalamic volume ($p<0.001$). Both the pPVL and fPVL groups showed a stronger association of thalamic volume changes with gross motor function scores.

Conclusion

PVL in infants can cause atrophy of deep GM nuclei. The involvement of neural pathways bypassing the thalamus may be associated with movement disorders. Milder motor impairment in full-term PVL may be related to less extensive thalamic damage.

PO-0024

纤维肌痛患者大脑灰质体积改变：基于体素的形态测量学

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目的：纤维肌痛综合征（fibromyalgia syndrome, FMS）是一种中枢性的软组织疼痛疾病，是以弥散性疼痛和肌肉肿胀为特征的慢性疼痛，常伴有睡眠障碍、抑郁、焦虑等。近年来的研究显示，大脑灰质体积的区域异常变化、下行疼痛调控系统的功能连接减少与 FMS 的中枢致敏机制相关。本研究主要应用基于体素的形态计量学（Voxel-based morphometry，VBM）探讨 FMS 患者的大脑灰质体积的异常改变以及其与病程、焦虑自评量表（SAS）及抑郁自评量表（SDS）之间的相关性。

方法：本研究选取 40 名 FMS 患者为实验组，40 名健康受试者为对照组，两组间年龄、性别、教育程度、地域等均相匹配。两组入组时均接受颅脑 3.0T MRI 检查，获得高分辨率结构相 3D-T1WI 数据。结构相数据采用基于 VBM 进行数据处理，在 SPM8 软件中计算全脑灰质体积，观察 FMS 异常大脑灰质体积的变化，以及异常脑区与病程、量表之间的相关性。

结果：与对照组相比，FMS 患者的右侧楔前叶、左侧中央后回的灰质体积减少，差异具有统计学意义（P<0.05,FDR 校正），其余大脑灰质体积差异未见统计学意义（P>0.05)。实验组右侧楔前叶灰质体积与 SAS 评分呈正相关（r=0.34,P=0.04）；左侧中央后回的灰质体积与疼痛持续时间呈负相关（r=-0.26,P=0.01）；左侧中央后回的灰质体积与 SDS 评分呈负相关（r=-0.24,P=0.02），与 SAS 呈负相关（r=-0.22,P=0.04）。

讨论：楔前叶是默认模式网络的中心枢纽，有研究报道 FMS 可引起默认模式网络的功能连接发生变化，所以 FMS 可能是由于默认模式网络的异常连接导致了楔前叶灰质体积的改变。中央后回则参与疼痛信息的感觉辨别，FMS 患者长期疼痛引起感觉功能障碍，从而导致中央后回灰质体积减少，因此，大脑灰质体积的区域异常变化可能参与了 FMS 的病理生理机制。

P0-0025

Multi-b-value Diffusion Stretched-exponential Model Parameters Correlates with MIB-1 and CD34 expression in Glioma Patients, an Intraoperative MR-navigated, Biopsy-based Histopathologic Study

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Background: To understand the pathological correlations of multi-b-value diffusion-weighted imaging (MDWI) stretched-exponential model (SEM) parameters of α and diffusion distribution index (DDC) in patients with glioma. SEM parameters, as promising biomarkers, played an important role in histologically grading gliomas.

Methods: Biopsy specimens were grouped as high-grade glioma (HGG) or low-grade glioma (LGG). MDWI-SEM parametric mapping of DDC_{1500}, α_{1500} fitted by 15 b-values (0-1,500 sec/mm^2) and DDC_{5000} and α_{5000} fitted by 22 b-values (0-5,000 sec/mm^2) were matched with pathological samples (stained by MIB-1 and CD34) by coregistered localized biopsies, and all SEM parameters were correlated with these pathological indices pMIB-1(percentage of MIB-1 expression positive rate) and CD34-MVD (CD34 expression positive microvascular density for each specimen). The two-tailed Spearman's correlation was calculated for pathological indexes and SEM parameters, as well as WHO grades and SEM parameters.

Results: MDWI-derived α_{1500} negatively correlated with CD34-MVD in both LGG (6 specimens) and HGG (26 specimens) ($r=-0.437$, $P=0.012$). MDWI-derived DDC_{1500} and

DDC_{5000} negatively correlated with MIB-1 expression in all glioma patients ($P<0.05$). WHO grades negatively correlated with α_{1500} ($r=-0.485$; $P=0.005$) and α_{5000} ($r=-0.395$; $P=0.025$).

Conclusions: SEM-derived DDC and α are significant in histologically grading gliomas, DDC may indicate the proliferative ability, and CD34 stained microvascular perfusion may be an important determinant of water diffusion inhomogeneity α in glioma.

PO-0026

Altered static and dynamic functional network connectivity in individuals with subthreshold depression: a large-scale resting state fMRI study

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Abstract

Objectives: Dynamic functional network connectivity (dFNC) is an expansion of static FNC that measures connectivity variation among brain networks. The aim of our study is to use dFNC method to investigate the changes of large-scale resting-state functional networks as well as temporal properties alteration in individuals with subthreshold depression (StD).

Methods: Forty-two subthreshold depression individuals and 38 healthy controls were included in this study. Data driven independent component analysis (GIG-ICA) was used to determine the target resting- state networks. Sliding window and k-means clustering analysis were used to obtain dFNC patterns and temporal properties for each subject. We compared sFNC and dFNC differences between the StD and HCs groups. Relationships between clinical symptoms and abnormal dFNC were evaluated using linear regression model.

Results: Regarding sFNC, StD patients showed altered FNC among four different networks, mainly involving in ECN, DMN, SMN and DAN. For the dFNC analysis, 4 recurring FNC patterns were identified. StD patients spent more time, had greater mean dwell time in a weak connected state (state 4), which is associated with self-focused thinking status. In addition, StD demonstrated decreased dynamic connections between DMN and DAN in state 2. The mean dwell time in state 4 was positively correlated with HAMD scores.

Conclusion: Our study provides new evidence on aberrant time-varying brain activity and large-scale network interaction disruptions in StD, which providing novel insight to better understand the neuropathological mechanisms.

PO-0027

精神分裂症视觉处理异常的活动流研究

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目的：精神分裂症是一种极其严重的精神疾病，其中知觉的障碍主要表现为视觉加工的异常。稳态视觉诱发电位作为一种范式能够很好地诱发大脑进行视觉处理。根据感觉门控假说，我们认为视觉加工异常会造成注意力相关的脑区活动，但是并没有在之前的研究中发现。另外，背外侧前额叶已经被证明与注意力转移相关。因此本研究重点使用了活动流映射的方法，结合视觉刺激任务与静息态功能连接探究了背外侧前额叶的分布式信息流。同时探究在精神分裂症患者接收初级刺激任务时，注意力网络是否参与处理过程。

方法：本研究包括 26 例精神分裂症患者及 26 例健康对照。使用三种频率的光闪烁来模拟稳态视觉诱发电位。每个被试在磁共振中分别进行任务态的扫描以及静息态的扫描。然后，进行活动流程分析如下：（1）使用一般线性模型计算两组人的任务态激活，通过方差分析对比精神分裂症患者和健康被试激活差异（2）对每个激活差异区域与背外侧前额叶进行活动流评估。

结果：激活的方差分析结果显示，组别主效应中精神分裂症在右侧舌回和左侧枕下回显著增强，交互作用差异主要分布在右侧海马。海马的活动流结果显示，两组被试在网络层面上存在贡献的差异，主要体现在精分患者注意网络与默认模式网络贡献的降低。另外，精神分裂症患者的背外侧前额叶激活能被成功预测，而健康被试不能。

结论：在研究中发现精神分裂症视觉异常区域的活动流的贡献在注意网络显著降低，可能反应了注意网络在其他区域的贡献增强，说明初级视觉处理出现异常从而影响了高级皮层的功能。另外，本研究发现在精神分裂症组中使用活动流映射能成功预测背外侧前额叶激活，可能是由于精神分裂症患者的感觉门控出现异常，使得视觉处理也需要处理认知的脑区反应，而健康被试则只需要视觉区域处理即可。这些结果说明精神分裂症患者在视觉系统存在障碍可能是由于感觉门控的异常，且活动流分析能很好的将不显著的信息捕捉到。

PO-0028

基于 3.0T MRI 设备的 STN-DBS 影响帕金森病焦虑情绪的功能影像组学研究

常博文
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目的：焦虑是帕金森病(PD)常见且难以治疗的非运动症状之一。然而，少有研究探讨丘脑底核脑深部电刺激术(STN-DBS)后功能连接(FC)与焦虑改善率之间的关系以及 STN-DBS 影响 PD 焦虑的脑功能机制。在本研究中，我们旨在探讨异常 FC 与接受 STN-DBS 治疗的帕金森病患者焦虑改善率的相关性。同时基于最新 3.0T MRI 兼容 DBS 设备探索开机状态下 PD 患者脑功能连接的改变与焦虑改善的关系。

方法： 我们对 25 例焦虑型 PD 患者(aPD)、13 例无焦虑型 PD 患者(naPD)和 32 名健康对照者(HC)的 rs-fMRI 数据进行脑功能连接组学分析。随后对术后 1 年焦虑改善率进行组间比较和相关性分析。我们对 9 例施行最新 3.0T MRI 兼容 STN-DBS 植入术的 PD 患者术后 2 个月开机时的脑功能影像进行了脑功能组学分析。

结果：对 HC 组、aPD 组和 naPD 组进行分析，3 组间 FC 有 24 个显著差异，与额叶眶回（OFC）相关的功能连接差异最明显。组间后测发现，在 naPD 组和 aPD 组中观察到 15 个显著差异

的 FC，同样集中在与 OFC 相关的脑功能连接。此外，aPD 患者的左侧后 OFC 与左侧颞下回之间的功能连接与焦虑改善率显著相关。在 9 例最新 3.0T MRI 兼容 STN-DBS 植入术的 aPD 患者中，焦虑改善组与非改善组之间有多个差异的以 OFC 为种子点的脑功能连接。

结论:aPD 患者的左侧后 OFC 与左侧颞下回之间的 FC 与焦虑改善率显著相关。在 9 例 3.0T MRI 兼容 STN-DBS 植入术的 aPD 患者中，焦虑改善组与非改善组之间有多个差异的以 OFC 为种子点的脑功能连接。基于 STN 腹内侧边缘区与 OFC 的联系及上述功能影像学发现，我们推测，DBS 刺激 STN 腹内侧边缘区调控与 OFC 相关的脑功能连接或脑网络影响 PD 患者焦虑情绪。本研究结果可能有助于揭示 STN-DBS 改善帕金森病患者焦虑的机制。

PO-0029

Amplitude of low-frequency fluctuation-based regional radiomics similarity network: biomarker for Parkinson's disease

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Objectives: To construct regional radiomics similarity network (R2SN) based on ALFF to assess the feasibility of ALFF-based R2SN in differentiating patients with PD from healthy controls, and to explore potential neuroimaging biomarkers and underlying neural mechanisms for PD.

Methods: Data from two independent centers were included in this study. The automatic anatomical labeling (AAL) 116 atlas was used to construct the R2SN. The t-test and least absolute shrinkage and selection operator were used for feature selection, nested 10-fold cross-validation (repeated 100 times) for hyper-parameter optimization and model evaluation, and Gaussian radial basis function support vector machine was used to build the classification model. We tested our results by using the independent external validation set and repeated the above operations with Brainnetome (BN) 246 atlas to validate our proposed method. We selected features which absolute value of weights greater than 20% of the maximum absolute weight in 1000 iterations as discriminative features and calculated Spearman partial correlation between discriminative features and clinical evaluations.

Results: The R2SNs constructed using AAL116 and BN246 atlas showed good reproducibility and stability. The average AUC and accuracy of the model were 0.85±0.02 and 0.81±0.03 in the training set (both $P<0.001$) and 0.77 and 0.70 in the external independent test set (both $P<0.05$). When we used the BN246 atlas, the average AUC and accuracy were 0.83±0.03 and 0.76±0.03, respectively (both $P<0.001$). We identified 35 discriminative features, mainly located in the default-mode, sensorimotor, executive control, visual, frontoparietal network, as well as cerebellum, and striatum. Spearman partial correlation analysis showed that discriminative features were correlated with PD symptom scores (all $P < 0.05$).

Conclusions: The ALFF-based R2SN is a novel, robust potential neuroimaging biomarker for PD and could provide new insights into connectome reorganization in PD, which may help to elucidate the underlying pathophysiological mechanisms of PD.

P0-0030

全脑信号回归可提高脑连接组预测模型的模型性能

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目的： 探讨全脑信号回归（Global signal regression, GSR）是否可以提高脑连接组预测模型（connectome-based predictive modeling, CPM）预测行为学指标（多域智商和年龄）的模型性能。**方法：** 收集健康被试 187 例，所有志愿者进行 MRI 扫描及临床行为学评估，包括全智商（full-scale IQ, FIQ）、操作智商（performance IQ, PIQ）、语言智商（verbal IQ, VIQ）和年龄。应用 DPABI 软件进行常规预处理，其中对于回归协变量进行回归全脑信号回归（GSR）和不回归全脑信号（$GSR_{without}$）两种处理，并应用不同脑图谱分割脑区构建功能连接（functional connectivity, FC）矩阵，用于构建 CPM 模型预测年龄、FIQ、PIQ、VIQ。**结果：** 最终 159 例志愿者进入本研究。应用 GSR 数据采用 Brainnetome 246 图谱构建 CPM（正、负网络模型和一般线性模型） 预测 FIQ、PIQ、VIQ 和年龄，发现所以模型都可以很好的预测相应指标（P 均< 0.05），而采用 $GSR_{without}$ 数据 Brainnetome 246 图谱，除 PIQ 的负网络、一般线性模型及年龄的正、负网络和一般线性模型（P＜0.05）外，余模型均无显著性（P＞0.05）。基于 GSR 的模型性能优于基于 $GSR_{without}$ 的模型性能。在控制被试头动后重复上述分析，发现相同的结果。采用 Shen 268 脑图谱重复上述分析验证上述结果，发现类似结果。**结论：** 本研究应用多图谱、严格控制协变量、多模型方法表明全脑信号回归可提高 CPM 预测模型的预测效能，至少可以提高预测 FIQ、PIQ、VIQ 和年龄的模型性能。

P0-0031

Altered intersubject variability of white-matter functional connectivity in major depressive disorder and its association with gene expression profiles

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Background: Major depressive disorder (MDD) is a heterogeneous disorder with remarkable intersubject variability in clinical presentations and neurobiological substrates. Although the altered intersubject variability in functional connectivity (IVFC) within gray matter has been examined in MDD, little is known about the alterations to IVFC within white-matter (WM-IVFC) and the molecular mechanisms associated with these changes.

Methods: Based on the resting-state functional MRI data of 145 MDD patients and 119 healthy controls (HCs), we compared the WM-IVFC between the two groups. The altered regional WM-IVFC was used as features to distinguish MDD patients from HCs and predict clinical symptoms in patients. In combination with the Allen Human Brain Atlas, transcriptome-neuroimaging association analyses were further conducted to investigate gene expression profiles associated with WM-IVFC alterations in MDD, followed by a set of gene functional characteristic analyses.

Results: We found significantly increased IVFC in the genu of corpus callosum and left inferior fronto-occipital fasciculus and decreased IVFC in left corticospinal tract, inferior cerebellar peduncle, and left cerebral peduncle in MDD. These variability alterations were associated with multiple behavioral domains, including sensorimotor processes and higher-order functions. Moreover, the altered regional WM-IVFC could successfully discriminate MDD patients from HCs with high accuracy and significantly predict depression severity and suicide risk in MDD. Furthermore, MDD-related WM-IVFC changes spatially correlated with the expression of 855 genes, which were enriched for synapse function, neuronal system development, and cell signaling, and were predominantly expressed in neurons, microglia and endothelial cells.

Conclusion: These results revealed intersubject functional variability changes of brain WM in MDD and its linkage with gene expression profiles, providing potential implications for understanding the high clinical heterogeneity of MDD.

P0-0032

Preserved microstructural integrity of the corticospinal tract in patients with IDH-1 mutant glioma: a study using DTI and MAP-MRI based histogram analysis

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Background: To explore the difference of microstructural integrity of corticospinal tract (CST) in patients with different IDH genotypes using diffusion tensor imaging (DTI) and mean apparent propagator (MAP) MRI-based histogram analysis.

Methods: A total of 50 patients with gliomas adjacent to the CST pathway underwent structural and diffusion MRI. The diffusion metric values including fractional anisotraphy (FA), mean diffusivity (MD), mean squared displacement (MSD), q-space inverse variance (QIV), return-to-origin probability (RTOP), return-to-axis probabilities (RTAP) and return-to-plane probabilities (RTPP) along the CST were calculated. The differences of histogram quantitative characteristics in each parameter maps between IDH mutant and wild-type group were compared, and the diagnostic performances were assessed using receiver operating characteristic (ROC) curves.

Results: For the all gliomas, the histogram features of MSD, QIV, RTAP, RTOP, RTPP, and MD in the peritumoral CST had significant differences between different IDH genotypes ($P<0.05$ for all). For the Grade II and III gliomas, the histogram features of MSD, QIV, RTAP, RTOP, RTPP, FA, and MD in the peritumoral CST had significant differences between different IDH genotypes ($P<0.05$ for all). For the Grade IV gliomas, the histogram features of MSD, RTPP, FA, and MD in the peritumoral CST had significant differences between different IDH genotypes ($P<0.05$ for all). For the all gliomas, the mean of QIV demonstrated the highest diagnostic performance (AUC[95%CI]=0.746 [0.603; 0.858], specifcity=78.30% and sensitivity=66.70%). For

grade II and III gliomas, the mean of QIV, the mean of RTAP and the median of RTOP had the highest diagnostic performance (AUC[95%CI]=0.885 [0.711; 0.973], specifcity=68.75% and sensitivity=92.31%), (AUC[95%CI]=0.885 [0.711; 0.973], specifcity=81.25% and sensitivity=84.62%), (AUC[95%CI]=0.885 [0.711; 0.973], specifcity=81.25% and sensitivity=84.62%). For Grade IV gliomas, the Median of MD demonstrated the highest diagnostic performance (AUC[95%CI]=0.846 [0.698; 0.995], specifcity=93.75% and sensitivity=69.23%).

Conclusions: DTI and MAP-MRI are promising approaches for evaluating CST changes with different IDH genotypes. Microstructural integrity of the CST seems to be better preserved in patients with IDH-1 mutant glioma.

P0-0033

Glycemic Variability and Functional Outcomes in Patients with Spontaneous Intracerebral Hemorrhage

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Abstract

Objective: To examine the association between glycemic variability and functional outcomes in patients with spontaneous intracerebral hemorrhage.

Methods: Patients with spontaneous intracerebral hemorrhage with at least five random plasma glucose measurements and complete radiological data were included. We calculated the average, maximum, minimum, standard deviation, and coefficient of variation of blood glucose levels for each patient. Radiological data, including island, black hole, blend, and satellite signs were collected. Functional outcomes were evaluated using the Barthel index. Univariate and multivariate analyses were performed to identify independent predictors of unfavorable outcomes.

Results: Two hundred and thirty-eight patients were included in this study. Unfavorable outcomes occurred in 107 patients (45.0%) at 3 months. Multivariate logistic regression analysis demonstrated that maximum blood glucose levels (odds ratio, 1.256; 95% confidence interval, 1.12-1.404; $p < 0.001$) and island sign (odds ratio, 2.701; 95% confidence interval, 1.322-5.521; $p = 0.006$) were independent predictors of unfavorable outcomes in the nondiabetic group. Meanwhile, patients without diabetes, who experienced hematoma expansion, had higher average blood glucose levels ($p = 0.036$) and maximum blood glucose levels ($p = 0.014$).

Interpretation: Maximum blood glucose levels and island sign were independently associated with unfavorable outcomes in patients without diabetes, whereas no glycemic variability indices were associated with unfavorable outcomes. Glucose levels influenced hematoma expansion and functional outcomes, particularly in patients without diabetes with spontaneous intracerebral hemorrhage.

P0-0034

Reduction of GBCA dosage in brain CE-MRI based on deep-learning models: a multicentre, prospective study

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Purpose:

The safety of gadolinium-based contrast agent (GBCA) has attracted wide attention. This study intended to synthesize virtual surrogate images for brain contrast-enhanced (CE) T1 images through two deep-learning models to reduce GBCA dosage.

Methods:

We prospectively enrolled 962 patients in three centers and collected brain pre-contrast, low dose (10% or 25%), and full dose (100%) T1-weighted images obtained from Siemens, GE, and Philips scanners. Data were divided into the training (659 cases) and test set (303 cases) containing one independent test by acquisition time. Based on 3D U-Net architecture, a low-dose model (low-dose and pre-contrast T1-weighted images) and a zero-dose model (pre-contrast T1-weighted images) were proposed to generate virtual CE images. Image quality was quantified by peak signal-to-noise ratio (PSNR) and structural similarity index (SSIM). Two groups of doctors assessed the number of lesions, and enhancement characteristics including degree, shape, and uniformity in each patient, as well as the diagnosis performance. Patients were further divided into subgroups with low (≤2, affecting diagnosis) and high scores (≥3, diagnosable), and multiple factors were analyzed for their influence on the models.

Results: PSNR and SSIM of the low-dose model were 0.86±0.06 and 31.58±1.66 dB, and the zero-dose model were 0.82±0.06, 30.76±1.46dB. The rates of true negative and positive, single, and multiple enhanced-lesion detections in the low-dose model were 98.4%, 100%, 100%, and 84.2%, and corresponding indexes of the zero-dose model were 80.6%, 83.9%, 86.6%, 73.7%. In the low-dose model, virtual images did not differ from true images (p=0.98-0.99), and in the zero-dose model, did not differ in moderate enhancement, shape, and uniformity from true images (p=0.05-0.06). 99.7% of the low-dose model cases did not affect diagnostic performance and 77.9% of the zero-dose model. More than 90% of cases in the zero-dose model including extracerebral tumors (meningioma, neurilemmoma, macroadenoma, craniopharyngioma), cysts, and ischemic white matter hyperintensity (WMH) were diagnosable. The performance of the models was not influenced by postoperatively or not, low dose (10%, 25%), on-independent and independent tests, and scanners(p=0.05-0.99). The consistency of image assessment by doctors ranged from 0.821 to 0.983.

Conclusions:

The proposed low-dose model has potential universality in different clinical scenarios, and the zero-dose model is feasible, especially in patients with meningioma, neurilemmoma, macroadenoma, craniopharyngioma, cyst, and ischemic WHM.

This finding could guide clinical practice to significantly reduce GBCA dosage in brain MRI-enhanced scanning, or even to avoid GBCA in some clinical scenarios.

PO-0035

Machine learning and CT-based radiomics features for differentiating intracranial contrast extravasation from intraparenchymal haemorrhage after mechanical thrombectomy

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Objective To investigate the value of nonenhanced CT-based radiomics and machine learning model for the differentiation of iodinated contrast extravasation(ICE) from intraparenchymal haemorrhage (IPH) following mechanical thrombectomy.

Methods Patients diagnosed with acute ischaemic cerebral infarction who underwent mechanical thrombectomy in 3 institutions from December 2018 to March 2022 were included in this retrospective study. The study population with a total of 155 high density parenchyma areas were randomly divided into a training set(n=108) and a validation set(n=47) at a ratio of 7:3. A.K software was used to extract texture features of high density parenchyma areas from nonenhanced CT images after mechanical thrombectomy. Correlation analysis and features based on mutual information were used to eliminate confounding variables, and the strongest correlation features were retained. Logistic Regression (LR), support vector machine (SVM), Linear support vector classification (Linear SVC) and Bernoulli Bayes classifier (BernoulliNB) were used to generate the machine learning model. The receiver operating characteristic (ROC) curve was used to evaluate the diagnostic performance of the machine learning model to distinguish ICE and IPH, and the diagnostic performance of each model was compared.

Results Of the 1316 radiomic features, 817 features with intraobserver and interobserver ICC>0.90 were retained. After correlation analysis and mutual information feature dimensionality reduction, 5 features were retained ultimately. For the models generated by LR, SVM, Linear SVC and BernoulliNB, the area under the curve were 0.781, 0.757, 0.784 and 0.669 respectively in the training set and 0.793, 0.705, 0.795 and 0.517 respectively in the validation set. There was no significant difference in AUC between the machine learning models (Delong test, all $P > 0.05$) in the training set. The AUC of BernoulliNB model was significantly different from LR model and Linear SVC model (both $P = 0.014$) in the validation set.

Conclusion The machine learning model based on initial post-operative nonenhanced CT after mechanical thrombectomy can effectively differentiate IPH from ICE with good diagnostic performance. It can be used as an early clinical evaluation tool of ICH transformation after thrombectomy and can help patients receive timely treatment.

PO-0036

基于多组学因子的颅内动脉瘤破裂风险预测深度学习模型的开发与验证

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目的:影像组学组学预测颅内动脉瘤破裂风险的临床能力尚不明确。本研究旨在探讨影像组学的潜在用途，并探讨深度学习(DL)算法在预测动脉瘤破裂风险方面是否优于传统的统计方法。

方法:回顾性研究 2014 年 1 月至 2018 年 12 月中国两家医院经数字减影血管造影确诊的颅内动脉瘤患者 1740 例，共 1809 例。我们随机将数据集(医院 1)分为训练(80%)和内部验证(20%)。使用从医院 2 收集的独立数据进行外部验证。通过 logistic 回归(LR)建立基于临床、动脉瘤形态学和放射组学参数的预测模型。此外，开发了利用积分参数预测动脉瘤破裂风险的 DL 模型，并与其他模型进行了比较。

结果:LR 模型 A(临床)、B(形态学)和 C(放射组学)的 auc 分别为 0.678、0.708 和 0.738(均 $p < 0.05$)。联合特征模型 D(临床和形态学)、E(临床和放射组学)和 F(临床、形态学和放射组学)的 auc 分别为 0.771、0.839 和 0.849。深度学习模型(AUC = 0.929)优于机器学习(ML) (AUC = 0.878)和 LR 模型(AUC = 0.849)。此外，DL 模型在外部验证数据集上表现出良好的性能(AUC 分别为 0.876 vs 0.842 vs 0.823)。

结论:放射组学特征在预测动脉瘤破裂风险中具有重要作用。DL 方法在综合临床、动脉瘤形态学和放射组学参数的 UIAs 破裂状态预测模型方面优于传统统计方法。

PO-0037

Neurophysiological biomarkers for depression classification: utilizing microstate k-mers and a bag-of-words model

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Background

Microstates are analogous to characters in a language, and short fragments consisting of several microstates (k-mers) are analogous to words. We aimed to investigate whether microstate k-mers could be used as neurophysiological biomarkers to differentiate between depressed patients and normal controls.

Methods

We utilized a bag-of-words model to process microstate sequences, using k-mers with a k range of 1 to 10 as terms, and the term frequency (TF) with or without inverse-document-frequency (IDF) as features. We performed nested cross-validation on Dataset 1 (27 patients and 26 controls) and Dataset 2 (34 patients and 30 controls) separately and then trained on one dataset and tested on the other.

Result

The best area under the curve (AUC) of 81.5% was achieved for the model with L1 regularization using the TF of 4-mers as features in Dataset 1, and the best AUC of 88.9% was achieved for the model with L1 regularization using the TF of 9-mers as features in Dataset 2. When Dataset 1 was used as the training set, the best AUC of predicting Dataset 2 was 74.1% for the model with L2 regularization using the TF-IDF of 9-mers as features, while the best AUC of predicting Dataset 1 was 70.2% for the model with L1 regularization using the TF of 8-mers as features.

Conclusion

Our study provided novel insights into the potential of microstate k-mers as neurophysiological biomarkers for individual-level classification of depression. These may facilitate further exploration of microstate sequences using natural language processing techniques.

PO-0038

基于 CT 图像的深度学习预测高血压脑出血早期血肿扩大的应用研究

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目的 本研究旨在构建一种基于颅脑 CT 成像的深度学习算法来进行高血压脑出血患者颅内血肿分割和血肿扩大的预测。方法 回顾性分析 500 名因高血压脑出血在我院行颅脑 CT 平扫的患者资料。所有患者在症状出现后 6 小时内进行基线 CT 扫描，并在随后 24 小时内进行 CT 复查，比较血肿是否扩大。为构建血肿分割与血肿扩大预测模型，患者被按照 7:3 比例随机分为训练集和测试集。训练集共包含 350 名患者，用于训练模型，测试集包含 150 名患者，用于模型的验证。模型采用基于 Attention U-Net 的网络框架对颅脑 CT 的血肿进行自动分割并采用基于 ResNet-34 的网络对血肿扩大进行预测。分割模型的准确度评估采用均交并比(MIoU)和 Dice 系数（Dice coefficient)作为评价指标。预测模型准确度评价采用受试者工作特征曲线下面积。临床定量资料以平均±标准差表示，若符合正态分布及方差齐性检验，则采用独立样本 t 检验比较其差异性，不服从正态分布的连续变量比较采用 Mann-Whitney U 检验。P＜0.05 被认为差异存在统计学意义。结果 血肿扩大组和非血肿扩大组在年龄(P=0.211)和性别(P=0.213)方面差异无统计学意义。非血肿扩大组的血肿体积(16.7 mL vs. 26.7 mL，P＜0.001)、血肿直径(41.7mm vs. 48.9mm，P＜0.001)较血肿扩大组明显变小。分割模型的 mIoU 和 Dice 系数为 0.89 和 0.90。预测模型的 AUC 值为 0.909（95%CI：0.851-0.949），灵敏度和特异度分别为 81.58%（95%CI：65.7%-92.3%）、96.43%（95%CI：91.1%-99.0%）。结论 基于颅脑 CT 图像的深度学习系统可以精准分割颅脑血肿和进行血肿扩大预测。

PO-0039

CLGI 在胶质瘤基因异常共表达及放疗中的作用机制研究

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目的：

胶质瘤具有高度的异质性和放疗抗性。胶质瘤的分子标志在预后判断和治疗中起着重要作用。胶质瘤的基因共表达网络和核心基因值得进一步研究。

方法：

应用加权基因共表达网络分析建立基因共表达网络，检测胶质瘤的候选标志物。进行功能富集分析以研究与核心基因相关的途径。进行 CCK8、划痕和 Transwell 试验，以验证 CLGI 的生物学功能。检测 CLGI 与免疫浸润的相关性，以探讨 CLGI 的导致放疗抗拒的机制。

结果：

使用平均连锁层次聚类，描述了 14 个模块和 159 个核心基因。从最有意义的模块中选出的核心基因与预后不良相关。此外，我们发现 CLGI 通过导致 YKL40 异常过表达促进胶质瘤的进展。CLGI 表达水平也与肿瘤免疫浸润和免疫检查点相关基因表达水平相关。

结论：

CLGI 在胶质瘤基因共表达中居于核心地位，可作为胶质瘤的诊断标志物和免疫治疗靶点。

P0-0040

T2-FLAIR 错配征的定量参数在评价较低级别胶质瘤分子分型的诊断价值

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目的：本研究拟通过回顾性分析具有 T2-FLAIR 错配征的较低级别胶质瘤 （WHO II-III 级）患者影像数据，明确错配征阳性与假阳性的鉴别要点以及图像识别标准。

材料与方法：回顾性分析与我院术后病理证实、并术前磁共振检查提示具有 T2-FLAIR 错配征的较低级别患者 41 例。根据术后分子分型检测结果将患者分为阳性组与假阳性组。由 2 名神经影像学医师在盲法情况下独立进行图像分析。利用伦勃朗视觉感受图像（visually accessible rembrandt images，VASARI）特征集内筛选的 9 个特征对肿瘤区进行分析。并采用热点法对错配区域进行定量分析，测量 T2-FLAIR 错配率以及相对平均表观弥散系数（relative mean apparent diffusion coefficient，$rADC_{mean}$）值。

结果：两名医师对 9 个 VASARI 特征参数进行独立评估结果显示，观察者间一致性较好（Kappa 值为 0.65-1.00）。阳性组肿瘤在增强扫描后无强化发生率高于假阳性组，差异有统计学意义（$p<0.05$）。阳性组 T2-FLAIR 错配率大于假阳性组，差异具有统计学意义（$p<0.001$）。此外，阳性组错配区 $rADC_{mean}$ 值大于假阳性组，差异均具有统计学意义（$p<0.001$）。各参数及多参数联合诊断效能分析结果显示，T2-FLAIR 错配率以及 rADCmean 联合鉴别阳性与假阳性的效能最佳（AUC 值为 0.99）。

结论：由 VASARI 特征集内提取的肿瘤区整体特征以及错配区定量参数能够有效鉴别阳性与假阳性错配征。错配区定量参数有助于提高预测较低级别胶质瘤分子分型的诊断效能，减少假阳性错配征出现的概率，规范 T2-FLAIR 错配征的图像识别标准。

P0-0041

弥漫性中线胶质瘤 H3K27 变异型的影像特征

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【摘要】 目的　通过分析脑弥漫性中线胶质瘤 H3K27 变异型的 CT 和 MRI 影像表现，总结分析其影像学特征，提高对本病的认识。方法　回顾性分析 89 例经手术病理诊断为脑弥漫性中线胶质瘤伴 H3K27 变异型患者的临床和影像学资料。结果　32 例（36.0%）位于丘脑，36 例（40.4%）位于脑干，其余位于脊髓、松果体、三脑室、四脑室、桥臂、小脑、基底节区；66 例（74.2%）形态规则，边界较清；75 例（91.5%）无或轻度瘤周水肿。 肿瘤实性部分 CT 平扫呈等低-稍高密度，T1WI 呈等-稍低信号，T2WI 呈等-稍高或高信号；29 例（32.6%）伴不同程度囊变或坏死，6 例伴出血，7 例伴点状或边缘线样钙化。46 例行 DWI 检查，28 例（60.9%）无或轻度受限，18 例（39.1%）局部明显受限；30 例行 MRS 检查，28 例（93.3%）呈高代谢改变。86 例行 MRI 增强，50 例（58.1%）呈局部花环状高强化，22 例（25.6%）为整体轻度/无强化，12 例（14.0%）呈局部斑片或结节状明显高强化，2 例为整体不均匀明显强化。肿瘤易包绕邻近血管，“基底动脉包绕征”最常见（18 例）；29 例（32.6%）可见“增粗血管进入征”；脑干病灶中 10 例（27.8%）可见“虎纹征”。结论　脑弥漫性中线胶质瘤 H3K27M 变异型具有一定的影像学特征，有助于术前准确诊断。

PO-0042

颅内动脉钙化评价方法在脑小血管病风险评估的可行性研究

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目的：本研究旨在探讨颅内动脉钙化（IAC）评价方法在评估脑小血管病（CSVD）风险的可行性。方法：回顾性分析 2018 年 12 月至 2020 年 7 月住院的 303 例研究对象的临床及影像资料。根据 CSVD 总体负担评分，将实验组分为 4 组（1～4 分），无 CSVD（0 分）人群作为对照组，均进行头颅 CT 及 MRI 检查，在头颅 CT 评价 IAC 情况，在头颅 MRI 评价腔隙、脑白质高信号、脑微出血、血管周围间隙 4 个征象并计算 CSVD 总体负担评分；采用单因素方差分析检验或卡方检验比较 5 组研究对象的临床资料，采用多元有序 Logistic 回归分析评价 IAC 与 CSVD 的相关性。结果：在 5 组研究对象组间比较中，CSVD4 分组的患者年龄最大（67.54±10.4 岁），高血压发病率最高（88.5%），CSVD3 分组的患者糖尿病发病率最高（41.6%），差异均有统计学意义（P＜0.05）。在调整了年龄、糖尿病、高血压 3 个混杂因素之后，CSVD 严重程度与 IAC3～4 级（OR=4.697，95%CI 1.349～16.346；P=0.015）独立相关。结论：IAC 与 CSVD 的严重程度独立相关，IAC 的定量评价有助于临床借助 CT 筛查评估 CSVD 的风险。

PO-0043

帕金森病伴抑郁患者的皮质和皮质下形态学改变

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目的：本研究旨在探讨帕金森病（PD）伴抑郁患者皮层厚度和皮层下灰质体积的变化模式及其与抑郁症状严重程度的相关性。

材料与方法：本研究共招募了 42 名 PD 伴抑郁(PDD)患者，26 名 PD 不伴抑郁(PDND)患者和 33 名健康对照组(HC)。所有受试者行 3.0T MRI 头部扫描，获取 3D-T1 序列。FreeSurfer 软件用于导

出皮质厚度和深部灰质核团体积的测量值。FreeSurfer 的 QDEC 用于皮质厚度分析和相关性分析。基于蒙特卡罗模拟用于多重比较校正聚类 P 值< 0.05 被认为具有统计学意义。评估皮层厚度和汉密尔顿抑郁量表（HAMD）评分之间的相关性。协方差分析用于比较三组之间皮层下灰质核团体积的差异。偏相关分析以评估皮层下灰质体积和 HAMD 评分之间的相关性。

结果：表 1 总结了人口统计学信息和临床数据。PDD 组双侧额上回、左侧颞中回、右侧颞上回、右侧岛叶和右侧颞上回后部皮层厚度减少。PDND 组的左侧额上回、右侧前扣带回和右侧颞上回皮质厚度减少。与 PDND 组相比，PDD 组仅右侧颞上回皮质厚度减少(图 1，表 2)。颞中回皮质变薄与较高的 HAMD 评分存在相关性(图 2)。在皮层下灰质中，PDD 组双侧海马($p<0.05$)、双侧杏仁核($p<0.05$)、左侧丘脑($p<0.001$)和右侧伏隔核($p<0.001$)的体积显著减小。PDD 组左侧丘脑($p=0.008$)和右侧伏隔核($p=0.001$)的体积显著减小。然而，在两个 PD 组中，与 HC 相比，双侧尾状核和壳核的体积显著增加($p<0.01$)(图 3)。右侧丘脑、左侧壳核、左侧苍白球、双侧海马、双侧杏仁核体积减小与较高的 HAMD 评分存在相关性(图 4)。

结论：抑郁情绪对 PD 患者主要在额颞叶、丘脑、伏隔核和边缘脑区出现皮层变薄和皮层下体积损失。有趣的是，这项研究发现 PD 组双侧壳核和尾状核体积增加，这种效应可能是由于早期 PD 患者对受损脑功能的代偿反应。

P0-0044

儿童抗 NMDAR 脑炎首次发病的临床研究

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【摘要】 目的：总结儿童抗 NMDAR 脑炎首次发病的临床特征以及实验室检查、脑电图和 MRI 表现，为该病的早期诊断及治疗提供帮助。方法：回顾性分析 2017 年 1 月至 2022 年 8 月首次确诊抗 NMDAR 脑炎患儿的临床及辅助检查资料，共计 44 例，其中男 19 例，女 25 例，年龄 2.3 岁～16.9 岁，中位年龄 7.6 岁。结果：(1)儿童抗 NMDAR 脑炎女性多见（1.3:1），首发症状多样，以癫痫样抽搐（17 例，38.6%）最为常见，病程中多合并精神行为异常（32 例，72.7%）和不自主运动（20 例，45.4%）。确诊后多数（36 例，81.8%）经一线免疫治疗即可缓解。(2)抗 NMDAR 抗体检测中，脑脊液阳性率（44 例，100%）高于血清阳性率（35 例，82.1%），而且抗体滴度多高于血清（32 例，72.7%）。脑脊液病毒系列抗体阳性率较高（18 例，40.9%），以 EB 病毒系列为主（12 例，27.2%）。(3)脑电图异常率（34 例，77.3%）较高，以弥漫性慢波（13 例，29.5%）和局灶性慢波（10 例，22.7%）为主。而颅脑 MRI 阳性率较低（13 例，29.5%），且多表现为皮层下白质 T2WI/T2-FLAIR 高信号的脱髓鞘样病灶（11 例，25%）。结论：儿童首次发病抗 NMDAR 脑炎中女性多见，多有既往病毒感染为诱因，首发症状中以癫痫样抽搐最为常见，病程中多合并精神行为异常和不自主运动，对可疑病例应尽早检测脑脊液中抗 NMDAR 抗体，同时一线免疫治疗对多数患儿有效；辅助检查特异性不高，脑电图多表现为慢波，而颅脑 MRI 平扫多表现为阴性。

P0-0045

Microstructural degeneration of hypothalamic subnuclei in Parkinson’s disease and probable REM sleep behavior disorder

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Background

Parkinson’s disease (PD) is characterized by a wide range of motor and non-motor symptoms. The pathophysiological mechanisms responsible for PD symptoms, particularly non-motor symptoms such as depression, sleep disorders, and cognitive decline, are mostly unknown, impeding the progress of therapeutic strategies.

The hypothalamus consists of several nuclei with distinct functions, which is critical for emotion regulation, wake–sleep cycle, and other basic vital functions. Given the characteristics of the overlapping between PD symptoms and functions modulated by hypothalamus, it is considered as a potentially vulnerable target and a hub for pathological propagation in PD.

However, it is still controversial whether PD has detectable hypothalamic injury in vivo. Previous structural magnetic resonance imaging (MRI) study has demonstrated a significant atrophy of hypothalamus in PD patients. But a recent study with large sample size found that there was no significant difference in the volume of hypothalamus between PD patients and healthy controls in two separate cohorts. We speculate that two reasons may contribute to the negative findings or the inconsistency among studies. First, conventional volume measures are not sensitive in detecting the abnormality of brain, especially small subcortical nuclei. Diffusion MRI (dMRI) measurements are emerging biomarkers in monitoring the abnormality of brain. The mean diffusivity (MD) of diffusion tenser image (DTI), and mean kurtosis (MK) of advanced diffusion kurtosis image (DKI) has been proposed as sensitive biomarkers for detecting microstructural alterations in gray matter that predate macrostructural atrophy. Therefore, neurodegeneration of hypothalamus may be detectable in dMRI. Second, the hypothalamus is composed of several nuclei, a certain subunit degeneration may not contribute to significant group difference in whole hypothalamus. Further analysis of the subunits of the hypothalamus are needed. Recently, a deep convolutional neural network based fully automated tool for the segmentation of hypothalamus and its 5 subunits provide an appropriate tool for answering the second question.

Therefore, this study quantified the degeneration of hypothalamic subunits in PD patient and probable REM sleep behavior disorders (RBD, prodromal stage of PD) subjects by using the structural and dMRI data and the novel DeepLearning based fully automated tool. The relationships between hypothalamus measurements and clinical symptoms were also assessed.

Methods

Participants

The dataset included 179 PD patients, 67 probable RBD patients, and 186 healthy control subjects. The Unified Parkinson's Disease Rating Scale (UPDRS) scale were used for evaluating motor performance. RBD symptom was evaluated by the RBD Questionnaire (RBDQ-HK), cognition by Montreal Cognitive Assessment (MoCA), and mood by the Hamilton Rating Scale for Depression (HAMD). All participants also underwent the evaluation of the acitivity of daily life (ADL) questionnaire.

MRI data processing

All participants were scanned on a 3.0 T MRI scanner. High-resolution T1-weighted MRI and multi-shell diffusion MRI (b=1000 and 2000) were acquired.

T1-weighted image: A fully automated tool based on a deep convolutional neural network was used for the segmentation of the whole hypothalamus and its subunits from T1-weighted data. We obtained the segmentation information for five subunits including anterior-superior (a-sHyp), the anterior-inferior (a-iHyp), the superior tuberal (supTub), the inferior tuberal (infTub), and the posterior (posHyp) hypothalamus.

dMRI: dMRI data processing were conducted using MRtrix3 and FSL (denoising, removing Gibbs ringing artifact, topup and eddy). MD were estimated using dtifit and MK were estimated using Diffusion Kurtosis Estimator. The b0 maps was linearly registered to the T1-weighted image, the MD and MK maps were then transformed to native T1-weighted image space (*Figure 1*). Regional (hypothalamic subunits) mean values of MD and MK were calculated. The robust mean MD and MK measurements were obtained by excluding ±5% of the voxel with extreme values.

Statistical analysis

Comparisons of clinical and MRI variables between three groups were conducted using ANOVA and post hoc. Partial correlation analysis was used to assess the relationship between MR measurements and clinical variables (age, sex, and education were regressed). $p<0.05$ is considered as significant. FDR was conducted for multiple comparison correction.

Results

Significant differences were found in MoCA, HAMD and ADL among three groups (*Table 1*). Three groups were not significantly different in the volume and MD of 5 hypothalamic subnuclei (*Figure 2A and B*). However, significant differences were found in MK measurement of 4 hypothalamic subunits including a-sHyp, a-iHyp, supTub, and infTub (*Figure 2C*, FDR corrected).

Correlation analysis were conducted in MK measurements of hypothalamic subnuclei showed significant difference in PD patients vs healthy controls and probable RBD patients vs healthy controls. In PD group, MK of infTub was correlated with UPDRS-I score; MK of a-sHyp, infTub, and supTub were correlated with ADL score. MK measurements also correlated with HAMD score were observed primarily in a-sHyp, supTub, and infTub (*Figure 3*). In addition, significant correlations were found between MK of a-iHyp and HAMD score in probable RBD group (*Figure 4*).

Conclusion

Our findings indicate that MK is a sensitive measurement for detecting the degeneration of hypothalamic subunits in both PD patients and individuals with probable RBD (prodromal stage of PD). This implies that hypothalamic MK measurement could potentially serve as an early biomarker for PD. In addition, we suggest that the hypothalamus should receive increased attention in the future, as it may serve as a therapeutic target to enhance patients' emotional state and improve their overall quality of life.

P0-0046

基于 CT 征象及临床信息的大脑中动脉 M1 分叉部破裂动脉瘤的预后模型的建立和验证

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目的：建立并验证基于CT影像特征和临床信息的大脑中动脉M1分叉部动脉瘤破裂预后预测列线图模型。方法：回顾性收集A医院2014年1月至2022年3月收治的117例大脑中动脉M1分叉部动脉瘤破裂出血患者的临床信息、CT平扫征象、CTA动脉瘤形态学特征作为训练集；收集2016年1月至2022年3月于B医院收治的116例大脑中动脉M1分叉部动脉瘤破裂出血患者作为验证集。根据出院时格拉斯哥预后量表评分GOS将患者分为预后良好组（4-5分） 、预后不良组（1-3分）。1.采用logistic回归分析，基于临床信息建立临床预测模型，基于CT平扫征象和CTA动脉瘤形态学特征建立影像预测模型，基于临床信息和CT特征建立联合预测模型。2.使用AUC评价各预测模型的效能，通过H-L检验及校准曲线评价模型的校正性能，以决策曲线分析DCA评价模型的临床应用价值。3.对预测模型进行外部验证，并选择最优模型可视化为列线图。结果：1.训练集117例患者中预后良好者52例，预后不良者65例；验证集116例患者中预后良好者73例，预后不良者43例。2.多因素Logistic回归分析显示，临床预测模型的独立危险因素包括入院时收缩压、格拉斯哥昏迷量表GCS评分；影像预测模型的独立危险因素包括动脉瘤最大径、中线移位；联合预测模型的独立危险因素包括入院时收缩压、GCS、动脉瘤最大径和中线移位。3.在训练集中，临床预测模型、影像预测模型及联合预测模型的AUC值分别为0.874、0.884、0.907。4.在验证集中，三种预测模型的AUC依次为0.861、0.865、0.905。校准曲线、H-L检验显示3种模型预测值和观测值的一致性良好。DCA显示联合模型的临床价值高于临床模型及影像模型，并以此绘制列线图。结论：临床-影像联合模型可以有效地对大脑中动脉M1分叉部动脉瘤破裂出血患者的预后进行预测，为患者的治疗提供依据。

PO-0047

基于聚类探究特发性震颤临床异质性的脑功能磁共振基础

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背景：
特发性震颤（Essential Tremor）是临床上最常见的运动障碍性疾病之一。其典型临床表现是以持续3年以上的孤立性上肢动作性震颤为特征，伴或不伴有其他部位的震颤等。目前越来越多的证据表明ET也常常合并有精神、睡眠、认知、自主神经功能障碍等非运动症状。关于ET的临床表型在不同的个体之间具有很大的可变性，提示ET具有显著的临床异质性，不同的ET临床亚型可能反映了不同的神经生物学基础。
目的：
本研究旨在基于ET的运动及非运动临床特征，利用数据驱动聚类分析的方法揭示ET临床异质性，并结合静息态功能MRI数据探讨其背后的神经生物学基础。
方法：
本研究纳入了103名ET患者，基于临床运动症状（头面声震颤、双上肢震颤、双下肢震颤）和非运动症状（认知、抑郁、焦虑、夜间睡眠、日间嗜睡、自主神经功能），利用K-means方法对103名ET患者进行聚类分析，并结合人口统计学来定义ET的不同临床亚型。之后利用3T静息态功能MRI数据探究ET不同亚型背后的脑功能基础，并与临床症状进行相关性分析。
结果：

K-means 聚类分析定义了两种 ET 亚型：66 名 ET 患者被分类为“ET 未合并非运动症状”亚型，且发病年龄较小，37 名 ET 患者被分类为“ET 合并非运动症状”亚型，且发病年龄较大。3T 静息态功能磁共振分析表明：两组 ET 亚型在右侧基底节区（Peak MNI:12,12,0）脑局部功能一致性（ReHo）指标具有显著统计学差异。与“ET 未合并非运动症状”亚型相比，“ET 合并非运动症状”亚型 ReHo 值显著降低，并且与非运动症状综合评分（NCO）及临床症状全局综合评分（GCO）均呈负相关。

结论：

本研究基于 ET 运动和非运动症状，利用数据驱动探索性地发现了其两种临床亚型及背后潜在的脑功能改变，这对未来更好地理解 ET 临床异质性背后的神经生物学基础提供了影像学依据。

P0-0048

集成磁共振联合高分辨率扩散加权成像在新生儿缺血缺氧性脑病中的应用

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目的　探讨集成 MR 成像联合基于复合灵敏度编码的高分辨率扩散加权成像（MUSE-DWI）在新生儿缺血缺氧性脑病（HIE）中的应用价值。评价各定量参数值与新生儿 HIE 脑损伤程度之间的关系。

材料与方法　收集 2022 年 5 月~2023 年 4 月我院收治的新生儿 HIE 28 例，同期收集 28 例健康受试者作为对照组。所有受试对象均行 MAGIC 集成磁共振序列及 MUSE-DWI 扫描，比较两组定量磁共振参数 T1、T2、质子密度及表观扩散系数（ADC）值的特点。采用二元 Logistic 回归分析诊断新生儿 HIE 的重要指标，用受试者工作特征曲线下面积（AUC）评价诊断效能，并采用 ROC 曲线分析 MRI 参数对 HIE 患儿重度脑损伤的预测价值。

结果 HIE 患儿病变区 T1 及 T2 值高于、ADC 值低于对照组相应区域（F=13.078,H=37.525、34.396,P 均<0.05），质子密度差异无统计学意义（H=3.977,P>0.1）。T2、ADC 值可以作为诊断新生儿 HIE 的重要参考指标，AUC 分别为 0.889、0.872，差异无统计学意义（P=0.55）。T2 联合 ADC 值的 AUC 为 0.906，敏感度、特异度、阳性预测值、阴性预测值分别为 0.833、0.962、0.934、0.887。重度患儿 T1 值及 T2 值明显高于、ADC 值明显低于轻度、中度患儿，中度患儿明显高于轻度患儿（P<0.05）。ROC 曲线结果显示，T1 值、T2 值、DWI 值联合预测重度脑损伤的 AUC 为 0.883（95%CI:0.825～0.939），远大于各指标单独预测的 AUC 值。

结论 集成磁共振成像定量参数 T2 值和 MUSE-DWI 的 ADC 值可以作为诊断新生儿 HIE 的定量参考指标，其中 T2 联合 ADC 值可以提高诊断效能，为临床诊断新生儿 HIE 提供更加可靠的影像学参考依据。T1 值、T2 值、ADC 值联合预测 HIE 患儿重度脑损伤的诊断价值远大于各指标单独预测价值。

P0-0049

When 7T MRI meets cerebrovascular disease: initial experience from cases series

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Background and objective:

Ultra-high 7 Tesla MRI has been walking into the clinic. The fantastic imaging characterizes ultrahigh spatial resolution and advanced functional imaging. Cerebrovascular disease is the leading cause of morbidity and mortality in China. The underlying mechanism of such a disease is not well established. In the study, we compared the imaging exhibition of a spectrum of cerebrovascular diseases including intracranial atherosclerotic stenosis (ICAS), cerebral small vessel disease (cSVD), Moyamoya disease (MMD), aneurysm, developmental venous anomaly (DVA) and arterial venous malformation (AVM) both on 3T MRI and 7T MRI, and reported the initial experience related to the added value of 7T on cerebrovascular disease.

Methods

We retrospectively reviewed cases series of a spectrum of cerebrovascular diseases including ICAS, cSVD, MMD, aneurysm, DVA, and AVM These cases were scanned both on 3T and 7T MRI. The imaging sequence included T1 weighted imaging (T1WI), T2 weighted imaging (T2WI), T2- Fluid-attenuated inversion recovery (FLAIR), and time-of-flight (TOF) MR angiography (MRA), susceptibility-weighted imaging (SWI). Key imaging features of these disorders were identified by two experienced radiologists in consensus on 3T images and 7T images in a sequence-wise manner, and then these key features were compared.

Results

We reviewed 5 patients with ICAS, 5 patients with cSVD, 5 patients with MMD, 2 aneurysms, 2 patients with DVAs, and 1 patient with AVM. Lenticulostriate artery (LSA) on 7T MRA showed excellent visualization whereas LSA on 3T was not able to show LSA structures clearly. In patients with basal ganglia lacunes, LSA was asymmetric and decreased as revealed on 7T rather than 3T MRA. The medullary vein also showed great benefit on 7T than 3T with much more number and much more clear appearance than 3T SWI. T2 showed an obvious increased number of perivascular spaces in all these patients. Micro cortical infarcts were also only visualized on 7T T2WI. in terms of DVA, SWI on 7T showed more extensive venous structures and connection. Pial artery anastomoses were directly seen on 7T MRA for patients with MMD. LSA can also be seen on 7T MRA in these patients.

Conclusion

7T provides considerable details for vascular structure and is promising in uncovering the mechanism of a spectrum of cerebrovascular diseases. The added value of 7T relative to 3T is under further investigation.

PO-0050

癫痫伴无先兆偏头痛患者在背外侧前额叶的代谢改变:一项质子磁共振波谱研究

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目的:利用质子磁共振波谱探讨与无先兆偏头痛患者和健康对照者相比，癫痫伴无先兆偏头痛患者在双侧背外侧前额叶可能产生的代谢改变。

方法:在 3.0T 磁共振波谱研究中，我们连续纳入 29 例癫痫伴无先兆偏头痛患者和 22 例无先兆偏头痛患者，以及 25 例年龄和性别匹配的健康对照者。根据癫痫发作频率将癫痫伴无先兆偏头痛患者进一步分为高频发作组和低频发作组。用 LCModel 软件定量测定代谢物浓度，然后用 Advanced Normalization Tools 校正脑脊液的部分体积效应。所有统计分析均在 SPSS 26 中进行。

结果:代谢物的改变主要发生在右侧背外侧前额叶。癫痫伴无先兆偏头痛患者的双侧背外侧前额叶间 Cho 浓度存在差异，右侧显著低于左侧（1.30±0.22 vs 1.42±0.23,p=0.000）。无先兆偏头痛患者的右侧背外侧前额叶 Cho 水平显著高于癫痫伴无先兆偏头痛患者（1.57±0.42 vs 1.30±0.22,p=0.006）。在癫痫伴无先兆偏头痛患者的右侧背外侧前额叶中，高频发作组的 Glx 浓度高于低频发作组（10.44±1.48 vs 8.89±1.52,p=0.034）。相关性分析显示，癫痫伴无先兆偏头痛患者的双侧背外侧前额叶 Cho 水平与其偏头痛频率呈负相关（左侧，r=-0.420, p=0.046；右侧，r=-0.456, p=0.029）。

结论:这些发现从神经生化的角度揭示了癫痫与无先兆偏头痛共病的机制，并证实背外侧前额叶是反映癫痫与无先兆偏头痛代谢机制的重要脑区。

PO-0051

High-resolution vessel wall imaging-based construction to predict carotid artery dissection vessels Recanalization Nomogram Study

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Title

High-resolution vessel wall imaging-based construction to predict carotid artery dissection vessels Recanalization Nomogram Study

Abstract

Background:Carotid artery dissection is an important cause of stroke in young people. The early diagnosis and treatment of carotid artery dissection and the improvement of revascularisation rates have become an increasing clinical concern. In this study, we retrospectively analysed the general clinical and imaging data of carotid artery dissection, analysed the general characteristics of intramural haematoma type of carotid artery dissection by high-resolution wall imaging, investigated the factors associated with revascularisation and constructed a line graph.

Objective:To investigate and analyze the factors affecting the revascularization of carotid artery dissection based on high-resolution wall imaging and clinical factors, and to construct a column line diagram of revascularization.

Methods:The general clinical data and imaging data of patients with intramural hematoma-type carotid artery dissection admitted through the Department of Neurology, First Hospital of Jilin University from January 1, 2014 to May 31, 2022 were retrospectively analyzed. All patients with entrapment underwent high-resolution wall imaging on admission, and patients were followed up with high-resolution wall imaging or ultrasound. The endpoint event for follow-up was lumen recanalisation or a follow-up period of >1 year. Continuous variables were pooled as mean ± standard deviation (SD) and paired samples t-tests were used if they conformed to a normal distribution, and rank sum tests were used if they did not. Categorical variables were expressed as percentages using the chi-square test. Spss 26.0 was used for statistical analysis. All reported p-values were two-sided and p-values < 0.05 were considered significant.

Results:A total of 129 patients with a total of 168 vessels were included in this study, of which 108 patients with a total of 141 vessels were included in the training set and 21 patients with a total of 27 vessels were included in the external validation set. The recanalisation rate was 45.4% for the training set vessels and 59.3% for the validation set vessels. Multi-factor logistic regression analysis showed that age, smoking, degree of stenosis, and type of intramural haematoma signal were associated risk factors for revascularisation. Age (OR=0.958, 95% CI: 0.928-0.987, P=0.006), smoking (OR=0.353, 95% CI: 0.161-0.774, P=0.009), and vessel occlusion (OR=0.149, 95% CI: 0.046-0.477, P=0.001) were negatively associated with complete revascularisation, and very high signal intermural haematoma (OR=5.149, 95% CI: 1.914-13.849, P=0.001) was positively correlated with revascularisation.

Conclusion:Based on the results of the multifactorial analysis, we have established a column line diagram for predicting revascularization of carotid artery dissection, which is more intuitive in predicting the outcome of dissected vessels and is important for improving the revascularization rate.

P0-0052

应用 DTI-ALPS 技术测量癌痛患者脑类淋巴功能的研究

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目的：应用扩散张量成像分析和血管周围间隙（along the perivascular space, ALPS）探究癌痛对大脑类淋巴系统功能的影响。

材料与方法：研究共纳入 97 名受试者，其中癌痛组 (cancer pain, CP) 40 人，无痛癌症患者 (painless cancer, PLC) 27 人，健康对照组(normal control, NC) 30 人。通过统计分析排除各组性别、年龄构成以及脑白质脱酷销等因素的影响。应用数字评分法(numerical rating scaie, NRS)和视觉模拟评分 (visual analogue scale, VAS) 对癌痛组被试疼痛程度进行评估。通过弥散张量成像测量各组被试投射纤维及联合纤维在不同方向上 （×、y、z 轴）的扩散系数，并加权计算获得反映脑类淋巴功能的 ALPS 指数 ，分析三组间及疼痛药物干预前后各参数的变化和差异。

结果：与 PLC 和 NC 组相比，CP 组的不同方向上的扩散系数和 ALPS 指数显著降低 ($p<0.05$)。而在进行疼痛缓解干预后，CP 组脑类淋巴功能参数均明显升高。与此同时，在 CP 组中 ALPS 指数与疼痛程度呈负相关 ($p<0.05$）。

结论：本研究证实了脑类淋巴功能的改变与癌痛程度密切相关，功能改变的量化反映了癌痛的严重程度。该研究结果提示使用神经成像生物标志物表征癌痛状态的可能性，而通过调节大脑功能状态来实现瘟痛缓解也有待进一步研究。

PO-0053

Comparison of COVID-19 and non-COVID-19 related acute necrotizing encephalopathy in Clinical and Imaging Diagnosis

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Objective To evaluate the clinical characteristics and neuroimaging features of children with acute necrotizing encephalopathy (ANE), including the coronavirus disease 2019 (COVID-19) related and non-COVID-19 related ANE, aiming to improve the understanding of disease.

Methods Clinical and imaging data of 30 ANE patients (11 of COVID-19; 19 of non-COVID-19) of Shenzhen Children's Hospital from January 2020 to December 2022 were retrospectively analyzed, including clinical manifestations, laboratory examinations, brain CT and MRI data. Severity of ANE was evaluated by ANE-SS and MR imaging score. Fisher exact test was used for qualitative data comparison between groups, and independent sample t test (for normal distribution) or Mann-Whitney U test (for skewed distribution) was used for quantitative data comparison.

Results Compared with non-COVID-19 related ANE children, children with COVID-19 related ANE have higher proportion of consciousness ($c2=5.697$, $P=0.020$), cerebellar involvement ($c2=4.474$, $P=0.040$) and pneumonia ($c2=5.662$, $P=0.020$). Diagnosis of COVID-19 related ANE also be confirmed earlier than non-COVID-19 related ANE by brain CT and MRI. There is no significant difference in mortality between two groups.

Conclusions Compared with non-COVID-19 related ANE children, children with COVID-19 related ANE have more severe symptoms, wider involvement and earlier neuroimaging abnormalities. Children with COVID-19 and consciousness should receive MRI or CT examination as soon as possible.

PO-0054

幕上多形性黄色星形细胞瘤和毛细胞型星形细胞瘤的 MRI 征象分析

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目的 幕上多形性黄色星形细胞瘤(pleomorphic xanthoastrocytoma，PXA)和毛细胞型星形细胞瘤（pilocytic astrocytoma，PA）的临床表现与影像学特征具有一定重叠，本研究旨在深入比

较二者间的临床与 MRI 特征的差异，以期实现鉴别诊断。**资料与方法** 回顾性纳入经病理确诊的幕上 PXA 患者 29 例和幕上 PA 患者 26 例，分析比较两组之间的临床特征和 MRI 征象差异，运用 Logistic 回归分析及受试者工作特征曲线分析评价临床和影像学特征对于幕上 PXA 和 PA 的鉴别诊断效能。**结果** 年龄（t=4.096，P<0.001）、发病部位（ x 2=22.132，P=0.001）和瘤周水肿程度（ x 2=10.193，P=0.006）在幕上 PXA 和 PA 间的差异有统计学意义。多因素 Logistic 回归表明，年龄[β=-0.107，优势比(odds ratio，OR)=0.898，P=0.013]和瘤周水肿程度（β=-1.275，OR=0.280，P=0.026）对鉴别幕上 PXA 和 PA 具有较高的诊断价值，年龄联合瘤周水肿的敏感度最高（84.6%），位置联合瘤周水肿的特异度最高（89.7%），年龄联合位置及瘤周水肿的鉴别诊断效能最高[曲线下面积（AUC）为 0.887，敏感度和特异度分别为 76.9%、82.8%]。**结论** 幕上 PXA 和 PA 的好发年龄不同，好发部位与瘤周水肿程度也有差异，术前 MRI 检查有助于二者的鉴别诊断，为临床优化诊疗方案、指导预后提供了理论依据。

PO-0055

The Role of Peritumoral Zone in Glioma Grading Revealed by Integrated 18F-FDG PET/MRI

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Background: Conventional magnetic resonance imaging (MRI) methods are limited for distinguishing high-grade gliomas (HGG) from low-grade gliomas (LGG) due to insufficient characterization of tumor invasion, which make glioma grading diagnosis difficult. We evaluated the diagnostic value of peritumoral zone (PTZ) in glioma grades by the methods of combining glucose metabolism (18F-fluorodeoxyglucose positron emission tomography, 18F-FDG PET) and water molecule movement (DWI) measurements of integrated PET/MRI.

Methods: A total of 16 patients with high-grade glioma (HGG) and 13 patients with low-grade glioma (LGG) who underwent simultaneous 18F-FDG PET/MRI were retrospectively enrolled. Regions-of-interest (ROIs) were measured, including the maximum standard uptake value (SUVmax) and minimum apparent diffusion coefficient (ADCmin), in the solid part of tumor (center for short) and peritumoral zone (PTZ) at 0.5 cm, 1.0 cm, 1.5 cm, and 2.0 cm, and compared between HGG and LGG. Receiver operating characteristic (ROC) analysis was employed to assess the diagnostic performance of these parameters, and the area under ROC curves (AUCs) were compared using DeLong test.

Results: Compared with LGGs, the SUVmax-center and SUVmax-0.5cm of HGGs were significantly higher whereas the ADCmin-center, ADCmin-0.5cm, and ADCmin-1.5cm were significantly lower (all $P < 0.01$). ROC analysis results showed that SUVmax-center (AUC = 0.888) had the highest diagnostic efficacy among all single parameters. Among parameter combinations, only the AUC (0.928) of the SUVmax-c~2.0cm + ADCmin-c~2.0cm was significantly higher than that of SUVmax-center ($Z = -2.055$, $P = 0.040$), with 96.3% sensitivity and 75.4% specificity.

Conclusions: Although the diagnostic capacity of PTZ was limited, it was useful to distinguish HGGs form LGGs. More valuable diagnostic information can be provided

by appropriately expanding the scope under consideration and the combined use of 18F-FDG PET/MR multi-parameters in differentiating glioma grades.

PO-0056

基于临床信息及CT影像学征象预测高血压性脑出血血肿扩大列线图模型的建立和验证

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目的：血肿扩大（HE）是高血压性脑出血(HICH)患者预后不良的危险因素，本研究旨在基于临床信息及CT影像学征象构建HE的列线图模型，并进行外部验证和评价。

方法：本研究为双中心研究，回顾性连续收集重庆市急救医疗中心2017年7月至2022年5月收治的HICH患者作为训练集，遵义医科大学附属医院2018年4月至2022年4月收治的HICH患者作为验证集。采集患者的临床信息及CT平扫影像学征象，采用单因素及多因素Logistic回归分析筛选HE的独立预测因素，并构建列线图模型。采用受试者特征工作（ROC）曲线、校准曲线及Hosmer-Lemeshow检验（HL检验）、决策曲线分析（DCA）进行多角度评价，并进行外部验证。

结果：训练集481人，验证集221人。多因素logistic回归分析显示低密度征[优势比(OR)=2.63, 95置信区间（CI）%:1.57-4.41]、漩涡征（OR=1.88,95%CI:1.12-3.16）、混杂征（OR=2.80,95%CI：1.60-4.89）、中线移位（OR=1.13,95%CI：1.04-1.24）、格拉斯哥昏迷评分（OR=0.85,95%CI：0.78-0.93）、血小板计数（OR=1.00,95%CI：0.99-1.00）为HE独立危险因素，并构建列线图模型。模型在训练集ROC曲线下面积（AUC）为0.779(95CI%:0.731-0.827)，验证集AUC为0.832（95%CI：0.768-0.896）。训练集和验证集的校准曲线均较好贴合理想曲线，HL检验P值分别为0.573、0.698（均大于0.05）。DCA显示模型的域概率范围较广（训练集：0.1-0.9，验证集：0.1-0.8），模型实用性较强。

结论：基于临床信息及CT影像学征象的列线图模型能有效预测HICH患者发生HE的风险，可为临床提供一种直观可靠的指导工具。

PO-0057

Microstructure abnormalities of the right cingulum cingulate in children with attention-deficit/hyperactivity disorder: an automated fiber-tract quantification study

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PURPOSE

To explore the specific alterations of white matter microstructure in children with attention-deficit hyperactivity disorder (ADHD) by automated fiber quantification (AFQ) and tract-based spatial statistics (TBSS), and to analyze the correlation between white matter abnormality and impairment of executive function.

MATERIALS AND METHODS

Twenty-seven patients with ADHD (20 males; 8.89±1.67 years) compared to twenty-two age and sex matched healthy control (HC) volunteers (11 males; 9.82±2.13 years) in this prospective study. All participants were scanned with diffusion kurtosis imaging (DKI) and assessed for executive functions. AFQ and TBSS analysis methods were used to investigate the white matter fiber impairment of ADHD patients, respectively. axial diffusivity (AD), radial diffusivity (RD), mean diffusivity (MD), and fractional anisotropy (FA) of 17 fiber properties (Fig.1) in diffusion tensor imaging (DTI) were calculated using the AFQ. The mean kurtosis (MK), axial kurtosis (AK), radial kurtosis (RK), mean diffusivity (MD_{DKI}), axial diffusivity (AD_{DKI}), radial diffusivity (RD_{DKI}) and fractional anisotropy (FA_{DKI}) of DKI and AD, RD, MD, and FA of DTI assessed the integrity of the white matter based on TBSS. Partial correlation analyses were conducted to evaluate the correlation between white matter abnormalities and clinical test scores in ADHD while taking age, gender, and education years into account. The analyses were all family-wise error rate (FWE) corrected.

RESULTS

ADHD patients performed worse on the Behavior Rating Inventory of Executive Function (BRIEF) test ($P < 0.05$). There were no significant differences in TBSS for DKI and DTI parameters (P-FWE > 0.05, TFCE-corrected). Compared to HC volunteers, the mean AD value of right cingulum cingulate (CC_R) fiber tract showed a significantly higher level in ADHD patients following the correction of FWE (Fig.2). As a result of the point-wise comparison between groups, significant alterations (FWE correction, $p < 0.05$) were mainly located in AD (nodes 36-38, nodes 83-97) and MD (nodes 92-95) of CC_R (Fig.3, Fig.4). There was no significant correlation between white matter diffusion parameters and clinical test scores in ADHD while taking age, gender, and education years into account.

CONCLUSION

The AFQ method can detect ADHD white matter abnormalities in a specific location with greater sensitivity, and the CC_R played a critical role. Our findings may be helpful in further studying the relationship between focal white matter abnormalities and ADHD.

PO-0058

Covid-19 感染后中枢神经系统病变的 MRI 表现

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目的：探讨 Covid-19 病毒感染后各种中枢神经系统病变的影像学表现，为临床治疗提供参考。

方法：收集我院自 2022 年 11 月 10 日-2023 年 2 月 1 日间 Covid-19 病毒感染后，存在神经系统表现并行 MRI 检查的病例 62 例，回顾性分析其影像学特征，并对部分病例的 MRI 随访图像进行

观察。结合临床表现、实验室指标和影像学表现进行影像学诊断并分类。探讨 Covid-19 感染对中枢神经系统的损伤机制。

结果：62 例患者中，诊断为病毒性脑炎者 10 例，渗透性脱髓鞘者 16 例，脑血管炎伴脑梗死及再灌注损伤者 6 例，急性播散性脑脊髓炎者 5 例，格林巴利者 10 例，急性坏死性脑病 2 例，急性脑死亡 2 例，脑出血 2 例，副感染性脑炎表现为边缘叶脑炎伴双侧海马结构肿胀者 7 例。对部分病例（32 例）MRI 随访发现：病毒性脑炎者出现伴层样坏死及脑萎缩表现、渗透性脱髓鞘部分患者临床症状及影像学脑内病变可逆但脑实质异常信号持续时间较长可达 1-2 月；急性播散性脑脊髓炎者病灶缩小；格林巴利患者大部分临床症状完全缓解；副感染脑炎者以癫痫发作表现者病程长短不一，影像学累及下丘脑者临床症状重且恢复慢。脑血管炎者部分血管狭窄加重，部分狭窄程度减轻且临床症状缓解；坏死性脑病者预后差甚至死亡。

结论：Covid-19 病毒感染后可以出现病毒直接感染所致的脑炎，也可以继发感染后脱髓鞘、血管损伤、免疫学脑炎等多种影像学改变，提示此病毒感染影响了中枢神经系统的多种免疫机制。

PO-0059

基于入院 CTP 参数建立动态列线图预测 aSAH 后迟发性脑缺血

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【摘要】 目的 基于动脉瘤性蛛网膜下腔出血 (aSAH) 患者入院 24h 内全脑 CT 灌注 (CTP) 参数建立动态列线图模型，探讨该模型预测迟发性脑缺血 (DCI) 的价值。方法 连续收集 233 例 aSAH 患者入院 24h 内的全脑 CTP 的灌注和渗透性的定性伪彩图、定量参数值及临床数据。先对原始数据进行交互作用分析，再随机划分训练集 (n=164) 和验证集 (n=69) 并通过组间检验，在单因素分析的基础上采用多因素 Logistic 回归分析进行自变量筛选，确定 DCI 发生的独立危险因素。用 R 软件建立动态列线图预测模型并对其辨别、校准能力以及临床实用性进行评估。 结果 DCI 的独立危险因素包括 HT&mTTScH (5.772, P =0.001)、WFNS (OR=4.636 , P =0.00)、 mFS (OR=5.014 , P =0.002) 及 mFEP (OR=2.021, P <0.001)。利用上述 4 因素建立动态列线图 (https://predictdci.shinyapps.io/YPZZZ/) 训练集的 AUC 值为 0.89 (95%可信区间：0.84-0.94)，特异度为 0.90，灵敏度为 0.70，验证集的 AUC 值为 0.87 (95%可信区间：0.78-0.96)，特异度为 0.83，灵敏度为 0.76。结论 基于入院 24h 内的 CTP 参数及临床资料建立的动态列线图模型不仅能很好的预测 aSAH 患者 DCI 的发生，而且能帮助临床医师快捷、方便用该模型对 aSAH 患者进行精准评估。

PO-0060

全病灶 ADC 及 CBF 直方图分析预测原发性中枢神经系统淋巴瘤化疗疗效价值

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目的：探究全病灶表观扩散系数(ADC)及脑血流量(CBF)直方图参数预测原发性中枢神经系统淋巴瘤(PCNSL)化疗敏感性的价值。

方法：回顾性研究 2016 年 9 月至 2022 年 8 月经病理学证实为弥漫大 B 细胞型 PCNSL 并采用 MTX 为基础化疗方案的 35 例患者，分为缓解组和无缓解组，分析两组患者的临床、病理学及 MRI 资料。其中 ADC 及 CBF 图像由 DWI 及 ASL 图像处理生成，采用 ITK-SNAP 软件在 ADC 及 CBF 图上对肿瘤全病灶进行勾画，分别获取 12 个直方图参数，包括偏度、峰度、最大值、最小值、均值以及第 5、10、25、50、75、90、95 百分位数。单因素分析各参数与 PCNSL 化疗敏感性的关系。多因素 Logistic 回归分析影响探究 PCNSL 化疗敏感性的独立预测因素，并得到联合预测概率(PRE)。绘制受试者工作特征曲线（ROC）评估单一变量及联合预测概率的预测效能，Delong 检验比较各指标曲线下面积（AUC）差异。P<0.05 为有统计学差异。

结果：单因素分析结果提示缓解组的 ADC 最大值、峰度、均值和第 50 百分位数以及 CBF 最大值、平均值和各百分位数明显高于无缓解组，差异有统计学意义（p<0.05），其中 CBF 的第 95 百分位数（CBF95）的 AUC 最大，为 0.900（95%CI：0.787-1.000，p<0.001），敏感性和特异性分别为 88.9%、88.5%。多因素 Logistic 回归分析提示 ADC 最大值以及 CBF95 是 PCNSL 患者化疗敏感性的独立预测因子，其联合预测概率的 AUC 为 0.944（95%CI：0.867-1.000，p<0.001），敏感性和特异性分别为 77.8%、96.2%。PRE 的预测效能最好，但是与 CBF95 的预测效能之间无统计学差异(p=0.325)。

结论：全病灶 ADC 及 CBF 直方图参数在预测 PCNSL 患者化疗敏感性中有重要价值。

P0-0061

胶质母细胞瘤 2021 版 WHO 中枢神经系统肿瘤分类变化与影像诊断进展

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目的：通过对 2021 版 WHO CNS 分类变化的了解，探讨胶质母细胞瘤的影像学诊断进展，为临床提供更准确的诊疗依据。

方法：归纳总结 2021 版 WHO CNS 分类在胶质母细胞瘤的变化；回顾性分析 2016 年 1 月-2022 年 12 月 44 例经病理证实胶质母细胞瘤的影像表现，总结其常见与关键征象；并对近期相关影像研究文献分析。

结果：2021 版 WHO CNS 分类引入更多分子学特征与信息，强调整合诊断和分层报告的重要性，新定义了多种肿瘤类型和相关亚型，纳入更多新的诊断技术；胶质母细胞瘤诊断应符合成人患者、弥漫性星形细胞瘤以及 IDH-野生型，同时符合以下表现之一：坏死、微血管增生、7 号染色体扩增和 10 号染色体缺失、TERT 启动子的突变、EGFR 基因扩增。44 例患者均行 MRI 检查，包括男 29 例、女 15 例，年龄 20-77 岁，平均年龄约 55.6 岁。43 例均位于幕上（额颞叶 35/43，顶枕叶 6/43，中线 2/43），1 例位于脑室系统沿脑室壁蔓延生长，与淋巴瘤表现类似致术前误诊；肿瘤异质性导致内部坏死、出血常见，不规则厚壁环形强化及灶内拉网状/絮片状强化是较具特征性征象，实性成分高灌注提示微血管丰富、增生，相应区域 Cho/NAA 比值通常＞2.5；另外肿瘤跨中线生长亦是肿瘤较具特征的生长方式。最新研究表明，MGMT 启动子甲基化对于胶质母细胞瘤的治疗选择与预后相关，具有 MGMT 启动子甲基化预示烷化剂化疗有效并且能改善预后；有学者通过波谱成像 MRS、影像组学等技术手段术前提示胶质母细胞瘤是否具有 MGMT 启动子甲基化从而为临床提供新的诊断依据，具有较大的临床应用意义。

结论：胶质母细胞瘤 2021 版 WHO CNS 分类的变化，为我们更准确地诊断和治疗胶质母细胞瘤提供了重要的指导意义。影像学尤其是 MRI 在胶质母细胞瘤的诊断中具有重要地位，而功能成像及影像组学在分子水平、基因层面为临床提供了预测手段。

PO-0062

慢性单侧大脑中动脉重度狭窄-闭塞患者脑灌注与脑小血管病总负荷的相关性

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目的 探讨症状性慢性单侧大脑中动脉重度狭窄-闭塞患者脑灌注状态与脑小血管病总负荷的相关性。 方法 回顾性搜集 2015 年至 2018 年就诊于解放军总医院第一医学中心的 89 例症状性单侧大脑中动脉重度狭窄-闭塞（狭窄程度≥70%）患者（男性 59 例（66.29%）），所有患者接受了多模态 MRI 检查。按照颅内供血动脉供血区在 ASL 上对 MCA 区域脑血流量进行定量测量，比较 MCA 供血区域患侧与健侧脑血流量差异，并与不同的脑小血管病总负荷评分进行比较；根据相对脑血流量的差异，分析不同灌注程度与其脑小血管病总负荷之间差异。 结果 在单侧大脑中动脉狭窄患者中，患侧的 MCA 供血区的脑血流量明显低于健侧(患侧 47.18±13.91ml /(100g·min) ，健侧 52.28±10.84ml /(100g·min)，t = -4.311，p＜0.01)；将脑小血管病总负荷分为两组（0-2 分为轻中度组，3-4 分为重度组），两组之间的 MCA 供血区域患侧脑血流量存在显著统计学差异（轻中度组 49.02±14.24ml /(100g·min) ，重度组 42.185±11.849ml /(100g·min)，t =2.096，p= 0.039）；将大脑中动脉供血区域按相对脑血流量系数分为低灌注、等灌注、高灌注三组，CSVD 轻中度组与重度组之间差异有统计学意义（ x 2= 6.526，P= 0.038）。结论 在症状性慢性单侧大脑中动脉重度狭窄-闭塞的患者中，患侧脑血流量的减低受到脑小血管病的影响，随着脑小血管病总负荷评分越高，MCA 患侧脑血流量相应有所下降。

PO-0063

Spinal cord and brain atrophy patterns in NMOSD and MS are non-random and clinically relevant

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Background Silent progressive spinal cord and brain atrophies are common findings in neuromyelitis optica spectrum disorder (NMOSD) and multiple sclerosis (MS), but harbor distinct patterns across brain areas leading to inter- and intra-disease heterogeneity, accounting for different physical disability and cognitive decline.

Methods This cohort study used data retrospectively collected from eight neurological centers. Totally, 209 patients with NMOSD, 304 patients with relapsing-remitting MS (RRMS), and 1160 healthy controls (HC) were studied. Non-negative matrix factorization (NMF) was used to determine the atrophy patterns of these two diseases, respectively. Then, the weightings across atrophy patterns were obtained for each

individual using a linear regression model by regarding the individual atrophy profile as dependent variables and the NMF-derived atrophy patterns as independent variables. Next, we associated the individual weighting across each atrophy pattern with cognitive profiles scores and expanded disability status scale (EDSS) scores to explore the contribution of each atrophy pattern to the disease manifestations. An additional longitudinal cohort were conducted to validate the stability and progression of these NMF-derived atrophy patterns.

Results Three atrophy patterns were observed in NMOSD: (1) Spinal Cord-Deep Grey Matter (SC-DGM) pattern associated with decreased Brief Visuospatial Memory Test (BVMT), and higher EDSS scores; (2) Frontal-Temporal pattern associated with decreased Mini-Mental State Examination (MMSE) and California Verbal Learning Test (CVLT) scores; and (3) Cerebellum-Brainstem pattern associated with decreased EDSS progression scores. Three atrophy patterns were observed in RRMS: (1) DGM pattern associated with decreased Symbol Digit Modalities Test (SDMT), Paced Auditory Serial Addition Test (PASAT), MMSE, Montreal Cognitive Assessment (MoCA), CVLT and BVMT, and higher EDSS scores; (2) Frontal-Temporal pattern associated with decreased MoCA scores; and (3) Occipital pattern associated with decreased EDSS progression scores. Additionally, the longitudinal cohort validate the stability of atrophy patterns, and formed trajectories of atrophy progression in NMOSD and RRMS.

Conclusion These findings suggested spinal and brain atrophy patterns in NMOSD and RRMS occurred largely in a non-random manner and developed (at least partly) according to distinct anatomical patterns. Additionally, these offered categorical perspectives that may facilitate clinical trials of stratifying participants who have the most potential to show a treatment effect in physical disability and cognitive impairment.

P0-0064

Quantitative MRI analysis of brachial plexus and limb-girdle muscles as a diagnostic biomarker for upper extremity onset amyotrophic lateral sclerosis

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Objectives: Amyotrophic lateral sclerosis (ALS) is a progressive and fatal neurodegenerative disease by affecting upper and lower motor neurons, with the first symptoms usually presenting in the extremities. The aim of this study was to evaluate the MRI features of the brachial plexus and limb-girdle muscles in ALS patients with upper extremity onset and their diagnostic performance.

Methods: Forty-seven ALS patients with upper extremity onset (28 males, mean age 53.5±8.6 years) as well as 20 healthy volunteers (9 males, mean age 50.7±15.0 years) were retrospectively included in this study. The cross-sectional area (CSA) and nerve-muscle T2 signal intensity ratio (nT2) of the brachial plexus, as well as the CSA and fat fraction (FF) of the limb-girdle muscle were assessed in all

participants using magnetic resonance imaging. The radiological characteristics of both structures were analyzed, and the diagnostic performance was evaluated using the receiver operating characteristic curve (ROC). Correlation analysis was used to investigate the relationship between MRI parameters and clinical variables (disease duration, disability, etc.).

Results: Sixty-seven affected upper limbs were included in 47 ALS patients. The CSA of the brachial plexus was smaller in the affected limbs compared to healthy controls, at all predetermined anatomical sites (root, 19.1±4.6 vs 21.5±5.9; trunk, 14.9±3.7 vs 18.0±3.9; cord, 14.1±3.9 vs 17.0±2.9, $p < 0.001 \sim 0.029$). The nT2 of the BP trunks was also smaller than that of the healthy controls (4.3±1.3 vs 5.1±2.1, p=0.032); nevertheless, no significant differences were found in the BP roots as well as in the BP cords (p=0.938 and p=0.050, respectively). In the subscapularis (SSC), supraspinatus (SSP) and infraspinatus (ISP), the affected limb of ALS showed significantly smaller CSA (SSC, 11.9±3.3 vs 13.5±3.8; SSP, 15.4±5.0 vs 18.7±7.3; ISP, 13.4±4.1 vs 18.5±7.3, p=0.030, p=0.001 and p<0.001, respectively) as well as higher FF(SSC, 21.8±8.4 vs 13.8±3.7; SSP, 21.2±9.3 vs 13.7±4.8; ISP, 17.3±7.6 vs 12.5±3.7, all p<0.001). The model containing parameters such as BP trunk CSA, SSC-CSA, ISP-CSA, and SSC-FF has excellent diagnostic efficacy for ALS (AUC=0.900, 95%CI=0.839,0.916, Sensitivity=71.4%, Specificity=97.5%, Accuracy=81.65%). In ALS patients, increased SSC-FF and SSP-FF were found to be correlated with disease severity (ALSFRS-r) (r=-0.388, p=0.004; r=-0.411, p=0.002), and SSC-CSA negatively correlated with clinical stage of ALS (r=-0.388, p=0.005). Smaller BP trunk and cord CSA were associated with higher SSC-FF (r=0.440, p<0.001; r=0.555, p<0.001, respectively).

Conclusions: Brachial plexus thinning and limb-girdle muscle atrophy and fatty infiltration are valid biomarkers of ALS with upper extremity onset. Combined brachial plexus and limb girdle muscle MRI has a high diagnostic performance in ALS and is helpful in monitoring the evolution of ALS.

Clinical Relevance: The study findings suggest that the use of quantitative MRI analysis of the brachial plexus and limb-girdle muscles can serve as a non-invasive and effective method for diagnosing ALS with upper extremity onset and monitoring its progression. This can aid in the development of individualized treatment plans and improve patient outcomes.

PO-0065

净水摄取率在急性缺血性脑卒中后发生出血转化的预测价值

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目的：探讨前循环急性缺血性脑卒中（AIS）患者梗死病灶的净水摄取率（NWU）对出血转化（HT）的预测价值，并构建预测模型。

方法：回顾性分析福建医科大学附属协和医院 86 例急性前循环大动脉闭塞的缺血性卒中患者，所有患者均于急诊行卒中 “一站式 CT”扫描，计算 NWU。随访患者发病 7 天内 CT/MRI 图像判断是否继发出血转化，将其分为 HT 组（54 例）和非 HT 组（32 例）。比较两组的临

床基线特征、治疗方式、NWU、水肿动力学参数（ NWU/t 与 NWU/log(t+1)），采用二元 logistic 单因素回归分析影响 AIS 患者继发 HT 的独立危险因素，应用 ROC 曲线评价单因素的预测效果，应用 Delong 检验分析筛选出的独立预测因子，并将单因素回归分析中 P<0.3 的因素纳入二元 logistic 多因素回归分析，构建预测 AIS 患者继发 HT 的预测模型。

结果：HT 组与非 HT 组之间 NWU、NWU/t 与 NWU/log(t+1)差异均具有统计学意义（P<0.01、P<0.05、P<0.01）。单因素回归中 P<0.3 的因素有年龄、性别、基线 NHISS 评分、多时相 CTA 侧枝循环评分、NWU 与水肿动力学参数，其中 NWU（AUC=0.88）、NWU/t（AUC=0.74）、NWU/log(t+1)（AUC=0.87)为 HT 的独立预测因子（P<0.01、P<0.05、P<0.01），三者之间只有 NWU/t 与 NWU/log(t+1)的 AUC 存在统计学差异（P<0.05）。在构建的多因素回归模型中，只有 NWU 具有统计学意义（P<0.05，OR=4.18,95%CI 为 1.29-13.59），多因素回归模型的 AUC 为 0.91。

结论：NWU 是急性前循环缺血性脑卒中患者继发出血转化的一个独立预测因子，其构建的多因素预测模型具有良好的预测效果，可用于指导临床再灌注治疗。

PO-0066

前交通动脉瘤形态学特征与破裂后出血体积的相关性研究

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目的　探讨前交通动脉瘤形态学特征与破裂后出血体积的相关性。

方法 收集我院前交通动脉瘤破裂患者的临床资料，所有患者入院采用 320 排容积 CT 扫描仪行头部 CT 及 CTA 检查，评估前交通动脉瘤破裂后出血体积及动脉瘤形态参数，包括最大径线、动脉瘤高度、宽度、瘤颈宽度、尺寸比、纵横比、入射角度、动脉瘤角、载瘤动脉直径，长宽比，以出血体积为因变量，对上述参数进行 spearman 相关性检验，然后行多元线性回归分析。

结果 本研究最终纳入符合条件的 66 名患者，其中男 34 例(51.51%)、女 32 例（48.49%），高血压 38 例(57.58%)，糖尿病 6 例(9.091%)，吸烟 23 例(34.85%)，嗜酒 10 例(15.15%)，平均舒张压（91.03±13.41）mmHg，平均收缩压（154.72±25.73）mmHg，年龄（56.44±11.61）岁。测量的动脉瘤形态特征参数：最大径线（6.06±3.41）mm、动脉瘤宽度（4.66±1.95）mm、动脉瘤高度（5.42±3.30）mm、瘤颈宽度（3.56±1.33）mm、动脉瘤角（71.66±16.35）°、入射角度（124.96±33.44）°、载瘤动脉直径（1.73±0.52）mm、纵横比（1.53±0.67）、尺寸比（3.42±0.47）、长宽比（1.33±0.47）。通过 CT 平扫，获得血肿体积为 21.15（6.47~56.90）mL。以血肿体积为因变量，以临床资料与动脉瘤形态学特征为自变量做 spearman 相关性分析。单因素分析中显著指标年龄（p=0.000），高血压（p=0.040），动脉瘤宽度（p=0.020），入射角度（p=0.032），纵横比（p=0.012）。采用多元线性回归分析，影响出血量的独立危险因素分别为年龄（P=0.001）和纵横比（P=0.018）。结论　较大年龄及较大纵横比可引起前交通动脉瘤破裂后更大的出血量。

PO-0067

基于 DKI 的颞叶癫痫伴睡眠障碍患者大脑白质结构研究

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目的 基于扩散峰度成像(diffusional kurtosis imaging, DKI)探究颞叶癫痫(Temporal lobe epilepsy，TLE)合并睡眠障碍患者的脑白质微观结构改变。 材料与方法 前瞻性纳入 TLE 患者 38 例，健康对照组 20 例，向 TLE 患者组发放睡眠调查问卷评估其睡眠状况，根据睡眠障碍的诊断标准和量表评分将患者分为合并睡眠障碍及未合并睡眠障碍组。采集所有受试者 DKI 序列并测量相关感兴趣区(region of interest, ROI)平均扩散峰度(mean kurtosis，MK)、平均扩散系数(Mean diffusivity, MD)和分数各向异性(fractional anisotropy, FA)三个扩散参数。使用单因素方差分析、Welch’ s ANOVA 检验比较睡眠质量评分、DKI 参数的组间差异。 结果 合并睡眠障碍的 TLE 患者 Epworth 嗜睡量表(Epworth Sleepiness Scale，ESS)、阿森斯失眠量表(Athens Insomnia Scale, AIS)评分均显著高于对照组(P<0.05)，合并睡眠障碍的 L-TLE 患者匹兹堡睡眠质量指数(Pittsburgh Sleep Quality Index，PSQI)评分显著高于对照组(P<0.05)。TLE 患者较健康对照的 FA、MK 值明显减低，MD 值明显升高 (P<0.05)；合并睡眠障碍患者的 L-TLE 患者 MK、FA 值较未合并睡眠障碍者明显减低(P<0.05)，未发现 MD 存在组间差异(P>0.05)；合并睡眠障碍的 R-TLE 患者的 MK 值较未合并睡眠障碍者明显减低(P<0.05)，未发现 MD、FA 存在组间差异(P>0.05)。结论 合并睡眠障碍的 TLE 患者存在特异性大脑白质纤维损伤模式，利用 DKI 序列监测该类患者的治疗效果与预后评估可以提供可靠的影像学标记物。

P0-0068

磁共振多延迟动脉自旋标记技术对椎-基底动脉扩张延长症患者脑血流灌注分析

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目的：比较椎-基底动脉扩张延长症（VBD）患者和健康志愿者脑血流灌注的差异；分析颅外颈内动脉、椎动脉血流速度是否会引起颅内血动力学变化；预测 VBD 患者后循环缺血性卒中发生的风险因素。

方法：本研究于 2021 年 1 月至 2022 年 1 月纳入中日友好医院放射科 32 名 VBD 患者。所有患者由 MRA 诊断为椎-基底动脉迂曲或扩张。同时招募 32 名健康志愿者作为对照组。所有受试者均行多延迟动脉自旋标记（multi-delay-ASL）技术扫描及颅外颈动脉、椎动脉多普勒超声检查。应用 CereFlow 软件对数据进行后处理，获得平均脑血流量（mCBF）、动脉脑血容量（aCBV）和动脉到达时间（ATT）等脑灌注参数。采用独立样本 t 检验比较两组之间前循环（额叶、顶叶和脑岛）和后循环（枕叶、小脑）的差异。使用 t 检验比较两组之间颅外颈内动脉、椎动脉的收缩期峰值速度（PSV）、舒张末期速度（EDV）、平均收缩期峰值速度（mPSV）和平均舒张末期速度（mEDV）。应用多元线性回归分析两组中影响 mCBF 的危险因素。采用受试者特征曲线(ROC)预测 VBD 患者后循环缺血卒中发生可能性。

结果： 病例组前、后循环的 mCBF 及 aCBV 均低于对照组；除双侧岛叶外 ATT 显著长于对照组（P<0.05）。除椎动脉 mEDV 外颅外颈内动脉、椎动脉的血流速度在对照组和病例组之间存在显著差异（P<0.05）。在 VBD 患者中，椎动脉的 mPSV、mEDV 分别与枕叶和小脑的 mCBF 具有显著相关性（P<0.05）。而在前循环中颈内动脉 EDV、颈内动脉 PSV 以及岛叶 ATT 分别与额叶、顶叶和岛叶 mCBF 具有相关性。在 VBD 患者中双侧枕叶及小脑 ATT 是预测后循环缺血性卒中的因素。

结论： VBD 导致前、后循环区域灌注不足，双侧枕叶及小脑 ATT 延长可预测后循环缺血性卒中发生。颅外血流可能会影响 VBD 患者后循环的颅内血流动力学状态。

PO-0069

基于磁共振 QSM 和 3D-ASL 的慢性颅内动脉狭窄灰质核团铁含量与脑灌注的相关性研究

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目的

探讨磁共振定量磁敏感图（QSM）联合三维动脉自旋标记成像（3D-ASL）评估慢性单侧大脑中动脉（MCA）狭窄患者不同的脑灌注状态与灰质核团铁含量变化的相关性。

方法

纳入经临床确诊的慢性 MCA 狭窄或闭塞患者共 61 例。对所有患者行常规 MR 检查，QSM 以及 3D-ASL 检查。基于 QSM 图像，手动勾画感兴趣区，测量双侧尾状核、壳核、苍白球、丘脑、黑质、红核和齿状核的磁敏感值（图 1A-G）。基于 ASL 图像，根据相对脑血流（rCBF）的测量结果，参照 Alberta 卒中项目早期 CT 评分（ASPECTS）的评分规则，对所有患者进行评分，计算出每位患者相应的低灌注亚区的数量（图 1H-I），并相应地将患者分为广泛低灌注组、局部低灌注组和正常灌注组。采用单因素方差分析和事后检验比较三组患者灰质核团磁敏感值的差异。采用偏相关分析，以年龄、病程和 ASL-ASPECTS 评分作为协变量，评估灰质核团的磁敏感值与代表低灌注程度的平均 rCBF 的相关性。

结果

1、单因素方差分析结果显示，广泛低灌注患者患侧壳核和苍白球与正常灌注组相比磁敏感值增高（P＜0.05）。此外，与局部低灌注患者相比，广泛低灌注组的患侧壳核仍表现出明显的增高的磁敏感值（P＜0.05）。而局部低灌注组与正常灌注组灰质核团的磁敏感值无明显差异（P＞0.05）。（见图 2）

2、 偏相关分析结果显示，低灌注组（广泛和局部组）患侧壳核和苍白球的磁敏感值与平均 rCBF 之间分别显示出明显的负相关(壳核：r=- 0.426，P=0.007；苍白球：r=- 0.342，P=0.033；图 3)。

结论

通过 QSM 及 3D-ASL 证实，脑灌注不足是慢性 MCA 狭窄患者部分脑区铁代谢紊乱的原因之一，脑灌注不足会导致铁沉积增加。并且，低灌注的范围以及严重程度均会对部分灰质核团亚区的铁含量产生影响。这一研究进一步加深了对慢性颅内动脉狭窄所致缺血性脑卒中后病理生理过程的认识。

PO-0070

Abnormal brain activity and functional connectivity in asymptomatic carotid stenosis

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Background: Vascular cognitive impairment is the second leading cause of dementia, and it is increasingly affecting global health and aging. Advanced carotid artery stenosis is one of the major contributors to vascular cognitive impairment. Increasing evidence suggests that even clinically “asymptomatic” carotid stenosis (ACS) is associated with multidomain cognitive impairment. However, the neuroanatomical underpinning for this association remains unclear. Advances in multi-modal magnetic resonance imaging (MRI), meanwhile, have greatly enhanced our understanding regarding brain functional or structural changes. These advances enable us to better understand multifactorial interplay underlying ACS from a neuroimaging framework. Therefore, we designed this project to investigate the relationship between ACS and cognition using multi-modal MRI.

Methods: Thirty ACS and 28 healthy controls (HC) were recruited. These subjects underwent a series of neuropsychology tests focusing on cognition and multi-modal MRI brain scans. We examined intergroup differences in ALFF and ReHo to investigate the abnormal regional brain activity in patients with ACS. Based on the ALFF results, the left hippocampus was selected as the seed for calculating FC. The seed-based FC analysis was utilized to identify connectivity changes in brain networks centered on areas showing abnormal variability of local brain activity in patients with ACS.

Results: ACS exhibited abnormal ALFF, ReHo, and hippocampal FC compared with HC. Compared with HC, those with ACS exhibited (1) higher ALFF variability in the left insula, caudate nucleus, hippocampus and inferior temporal gyrus, and right middle cingulum, (2) lower ReHo variability in the right middle frontal gyrus and superior frontal gyrus (3) lower FC variability between the hippocampus and other regions (left inferior cerebellum, and right middle temporal gyrus, superior temporal gyrus, caudate nucleus, superior frontal gyrus, and precentral gyrus). In addition, variability in ALFF, ReHo, and hippocampal FC exhibited different correlations with cognitive scores in ACS patients, respectively.

Conclusions: Our findings highlight that ALFF, ReHo and FC can provide valuable information for detecting brain functional abnormalities in ACS patients. The hippocampus-cerebellum contributed to the memory heterogeneity of ACS. Analyzing the variability in the spontaneous fluctuations of brain activity and connectivity provided a new perspective for exploring the different pathophysiological mechanisms in ACS.

PO-0071

The potential value of pseudo-continuous arterial spin labeling in reflecting cognitive performance for older adults with MRI-negative epilepsy

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Purpose: We aimed to investigate the potential value of cerebral blood flow (CBF) measured by pseudo-continuous arterial spin labeling (pCASL) in reflecting cognitive performance for older adults with MRI-negative epilepsy.

Methods: A total of 80 older people with MRI-negative epilepsy were prospectively recruited, composed of 32 with cognitive impairment (CI) diagnosed as mild cognitive impairment or dementia and 48 with normal cognition (NC). The patients were administrated 3.0-T high-resolution T1 and pCASL scan, followed by a battery of neuropsychological tests, including Mini-mental State Examination, Auditory Verbal Learning Test, Conflicting Instructions Task, Stick Test, Modified Common Objects Sorting Test and Trail-making test. Z scores of five specific cognitive domains including Memory, Attention, Visuospatial function, Language and Executive function were transformed from the raw scores of each test. Whole-brain voxel-level perfusion pattern and cognitive performances were compared between two groups. Partial correlation analysis was conducted to identify the correlation between ROI-based CBF and domain-specific cognitive performances. Receiver operating curve (ROC) was analyzed to determine the diagnostic value of CBF in epilepsy accompanied by cognitive impairment.

Results: Compared with NC group, CI group performed worse in global cognition ($P = 0.015$), memory ($P = 0.009$), attention ($P = 0.007$), and executive function ($P=0.003$). They also exhibited decreased CBF in the left middle frontal gyrus, right middle frontal gyrus, left precuneus, and right postcentral gyrus ($P< 0.05$, cluster-level, AlphaSim corrected). After adjustment of age, gender, education, medical history of chronic diseases, number of anti-seizure medication types and duration of epilepsy, there were positive associations between CBF of the left middle frontal gyrus and memory ($r = 0.202$, $P = 0.043$) and executive function ($r = 0.265$, $P = 0.032$), between CBF of the right middle frontal gyrus and memory ($r = 0.202$, $P = 0.043$) and executive function ($r = 0.263$, $P = 0.033$). CBF of the left precuneus also positively correlated with executive function ($r = 0.262$, $P = 0.034$). The area under curve of the left middle frontal gyrus, right middle frontal gyrus, left precuneus and right postcentral gyrus in diagnosing epilepsy accompanied by cognitive impairment were 0.840, 0.805, 0.746,0.703, respectively.

Conclusions: CBF measured by pCASL may be a useful indicator for cognitive performance in older adults with MRI-negative epilepsy.

P0-0072

Enlarged perivascular spaces and white matter hyperintensities in type 2 diabetic nephropathy

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Objective: The purpose of the study is to investigate the relationship between WMH and EPVS and patients with type 2 diabetic nephropathy (DN) at different stage.

Methods: A total of 213 participants underwent 3T MRI and laboratory analysis. The participants were grouped according to the urinary albumin-to-creatinine ratios (UACR) and/or estimated glomerular filtration rate (eGFR). EPVS number and grade were rated on MRI in the centrum semiovale (CSO-EPVS) and basal ganglia (BG-EPVS). Periventricular (PWMH) and deep (DWMH) were also graded on MRI. The logistic

regression analysis was performed to evaluate the association of risk factors with EPVS and WMH.

Results: eGFR was associated with the severity of DWMH and PWMH (both $p<0.001$), and UACR was associated with the severity of BG-EPVS ($p=0.02$) and DWMH ($p<0.001$). HbA1c showed an association with the severity of DWMH ($p=0.029$). C2/C0 showed an association with the severity of PWMH ($p=0.041$). CysC showed an association with the severity of DWMH ($p=0.001$) and PWMH ($p=0.010$).

Conclusions: eGFR, albuminuria, HbA1c and CysC were associated with WMH, while albuminuria was associated with BG-EPVS in DN.

PO-0073

Predicting delayed cerebral ischemia and 3-month outcome after aneurysmal subarachnoid hemorrhage using machine learning based on CT perfusion data at admission

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Abstract

Objective: To determine whether machine learning (ML) based on computed tomography perfusion (CTP) and clinical data at admission can improve the prediction of delayed cerebral ischemia (DCI) and 3-month functional outcome (FO) after aneurysmal subarachnoid hemorrhage (aSAH).

Methods: Clinical and CTP data within 24 h after admission from 242 consecutive aSAH patients were retrospectively analyzed using five ML models for predicting DCI and 3-month FO, and the optimal model was selected. To verify whether occurrence of DCI has an impact on FO, the occurrence of DCI during hospitalization was combined with admission data to predict FO.

Results: The CatBoost (CAT) model based on clinical and CTP data at admission had the best performance for predicting DCI and FO for aSAH patients in both the training (AUC of DCI, 0.935; AUC of FO, 0.953) and test (AUC of DCI, 0.890; AUC of FO, 0.897) sets and also had the highest sensitivity in the training (sensitivity of DCI, 0.902; sensitivity of FO, 0.940) and test (sensitivity of DCI, 0.923; sensitivity of FO, 0.900) sets. In addition, the CAT model for predicting FO based on admission data combined with occurrence of DCI during hospitalization had higher AUC in the training (0.958) and test (0.911) sets than that based only on admission data, but the overall difference was not significant (P=.870).

Conclusion: We propose an ML model based on clinical and CTP data that, on admission, can reliably identify aSAH patients at very high risk for DCI and poor FO. These patients should be candidates for intensive monitoring at admission.

PO-0074

结合高分辨率黑血可变翻转角成像和压缩敏感性编码技术进行快速豆纹动脉成像

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目的：为了在短时间内显示豆纹动脉(lenticulostriate artery, LSA)，本研究采用压缩敏感性编码(compressed sensitivity encoding, CS-SENSE)加速的高分辨率黑血 t1 加权可变翻转角成像(black blood t1 weighted with variable flip angles, T1w TSE-VFA)的可行性，并进一步确定适合临床常规使用的最佳加速因子(acceleration factors, AF)。

方法：前瞻性纳入 25 名健康志愿者(男 13 名，女 12 名，年龄 27 ~ 68 岁，中位年龄 58 岁)和 20 例脑血管病患者（男 12 例，女 8 例，平均年龄 64.3±8.9 岁）。志愿者在 3 T 下进行不同 AFs 的 T1w TSE-VFA 序列扫描，包括常规并行采集技术 (SENSE) AF=3 和 CS-SENSE AF=3、4、5、6(扫描时间分别为 510s、480s、361s、298s、245 s)。通过客观评价(对比度[CR 胼胝体/白质、CR 脑干/白质、CR 小脑/白质]、LSA 数目、LSA 总长度、LSA 平均长度)和主观评价(总体图像质量、LSA 评分)评价 T1w TSE-VFA 图像的质量和 LSA 显示情况。所有患者同时接受最优 T1w TSE-VFA 和数字减影血管造影(DSA)检查，比较两者的 LSA 数量。

结果：CS3、CS4 和 SENSE3 的两两比较中，客观测量和主观评价上均无统计学差异(均 P > 0.05，图 1 和图 2)。DSA 和 CS4 测得患者单侧 LSA 计数差异无统计学意义(3, 3-3 和 3, 3-3,P = 0.384，图 3)。

结论：CS3 可以提供更好的 LSA 显示，但需要较长时间(480 秒，降低 6%)；CS4 可以平衡 LSA 的可视化和获取时间(361s，减少 30%)，推荐临床常规应用。

PO-0075

3.0T 磁共振磁敏感加权成像（SWI）定量参数预测恶性肿瘤脑转移后无进展生存期和总生存期

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目的

恶性肿瘤脑转移是恶性肿瘤中最常见的并发症之一，对于患者的生存和生活质量产生了严重影响。磁共振磁敏感加权成像（susceptibility weighted imaging, SWI）信号依赖于血管内脱氧/氧合血红蛋白，可监测微血管的情况，肿瘤的微血管的情况在一定程度上反映组织类型及状态。本文旨在探讨 3.0T 磁共振 SWI 定量参数在预测恶性肿瘤脑转移后无进展生存期（PFS）和总生存期（OS）方面的应用价值。

方法

我们对 40 例恶性肿瘤脑转移患者进行了头颅定量 SWI 扫描，选取感兴趣区(肿瘤实性区、瘤周水肿区、正常脑实质区) ，测量定量参数（包括局部相位偏移（LPO）、R2*、L1 和 L2）进行分析。通过 R 软件和 SPSS 27 进行统计分析和生存分析，我们评估了这些参数与 PFS 和 OS 之间的关系。

结果

经过统计分析，发现在治疗后 3 个月的无进展生存期和总生存期两个指标中，SWI 成像参数与 PFS 和 OS 之间存在显著相关性。在 PFS 预测方面，LPO 和 L2 的预测价值显著。在 OS 预测方面，LPO 和 L2 也具有显著预测价值。其 ROC 曲线下面积（AUC）分别为 0.78 和 0.81，分别大于其他参数。

结论

我们的研究表明，基于 3.0T 磁共振 SWI 是一种用于预测恶性肿瘤脑转移后的 PFS 和 OS 可靠的方法。 SWI 定量参数（特别是 LPO 和 L2）可能是有用的预测生存期的生物标志物，并可在制定更准确的治疗策略方面提供有价值的信息。

P0-0076

磁共振脑灌注加权成像及 T1ρ 成像在胶质瘤瘤周水肿区的应用价值

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【目的】 探讨磁共振脑灌注加权成像及 T1ρ 成像在胶质瘤瘤周水肿区的应用价值

【方法】 选取经手术及病理确诊的胶质瘤患者 50 例，其中低级别胶质瘤组 20 例，高级别胶质瘤组 30 例。术前均行常规 MRI、PWI 及 T1ρ 检查；将 PWI、T1ρ 原始数据经工作站软件获得脑血容量（cerebral blood volume, CBV）及 T1ρ 伪彩图，以 1cm 为界，将瘤周水肿区分为近瘤区和远瘤区，分别测量不同级别脑胶质瘤瘤周水肿分区的相对脑血容量（relative cerebral blood volume, rCBV）值、相对 T1ρ 值（rT1ρ）。分别对不同级别脑胶质瘤瘤周水肿分区 rCBV 值、rT1ρ 值进行比较。应用 SPSS 统计软件，计量资料比较采用 t 检验；计数资料组间比较采用 χ2 检验；采用 ROC 曲线分别评估 rCBV 值、rT1ρ 值对高级别胶质瘤的诊断效能，并确定其最佳诊断阈值。以 P＜0.05 为差异有统计学意义。

【结果】 高级别胶质瘤组瘤周水肿近瘤区 rCBV 值明显高于低级别胶质瘤组的，差异有统计学意义（P＜0.05）。远瘤区 rCBV 值组间比较，差异无统计学意义（P＞0.05）。高级别胶质瘤组瘤周水肿近瘤区的 rT1ρ 值低于低级别胶质瘤组，差异有统计学意义（P＜0.05）；远瘤区 rT1ρ 值组间比较，差异无统计学意义（P＞0.05）。

【结论】胶质瘤瘤周水肿近瘤区的 rCBV 值、rT1ρ 值有助于胶质瘤的分级，且诊断准确性较好。

P0-0077

70Kv 联合深度学习的图像重建算法（DLIR）对大脑中动脉 CT 血管成像的影响

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目的：探讨 70Kv 联合深度学习图像重建算法对大脑中动脉 CTA 图像质量的影响。资料与方法：选择疑似头颈部血管疾病的患者 30 例，采用 Revolution APEX CT 进行低剂量头颈部 CTA 成像，管电压 70Kv，管电流为自动毫安秒（NI=7），分别利用滤波反投影重建、40%ASIR-V 重建、深度学习低、中、高重建算法重建出五组图像，测量大脑中动脉及及邻近脑实质内的 CT 值及 SD，

计算 SNR 及 CNR，由两位有 5 年以上诊断经验的医师进行主观图像质量评价，比较五组图像大脑中动脉的 CT 值、SD、SNR、CNR 及主观图像质量的差异。

结果：五组图像大脑中动脉内的 CT 值差异无明显统计学意义（P 值>0.05）。FBP、40%ASIR-V、DLIR-L、DLIR-M、DLIR-H 五组图像噪声分别为 31.74±11.50、28.61±12.22、28.24±11.94、25.57±10.43、23.28±9.77，差异有统计学意义（P<0.05），DLIR-H 重建算法下噪声较 FBP 降低 26.65%，较 40%ASIR-V 降低 18.63%，五组图像信噪比无明显统计学差异（P 值>0.05），对比噪声比差异均有统计学意义（P 值<0.05），DLIR 重建算对下比噪声比均较 FBP 及 40%ASIR-V 提高，DLIR-H 的信噪比及对比噪声比最高。FBP、40%ASIR-V、DLIR-H 五组图像的主观评分分别为 3.53±0.51、3.97±0.56、3.63±0.49、4.17±0.46、4.37±0.49，DLIR-H 主观图像质量评分较 FBP 及 40%ASIR-V 提高（P 值均<0.05）。结论：DLIR 重建算法可以降低大脑中动脉 CTA 图像噪声，提高 SNR、CNR 及主观图像图像质量，而 DLIR-H 噪声最低，信噪比及对比噪声比最高。

P0-0078

Preoperative Vascular Heterogeneity Based on Dynamic Susceptibility-weighted Contrast MRI in Predicting Spatial Pattern of Locally Recurrent High-grade Gliomas

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Objectives: To investigate if spatial recurrence pattern is associated with patient prognosis, and whether MRI vascular habitats can predict spatial pattern.

Methods: In this retrospective study, 69 patients with locally recurrent high-grade gliomas (HGGs) were included. The cohort was divided into intra-resection cavity recurrence (ICR) and extra-resection cavity recurrence (ECR) patterns, according to the distance between the location of the recurrent tumor and the resection cavity or surgical region. Four vascular habitats, high angiogenic tumor, low angiogenic tumor, infiltrated peripheral edema, and vasogenic peripheral edema were segmented and vascular heterogeneity parameters were analyzed. The survival and diagnostic performance under different spatial recurrence patterns were analyzed by Kaplan-Meier and ROC. A nomogram model was constructed by regression analysis and validated by bootstrapping technique.

Results: Progression-free survival (PFS) and overall survival (OS) were longer for ICR (n = 32) than those for ECR (n = 37) (median PFS: 8 vs. 5 months, median OS: 17 vs. 13 months, $p < 0.05$). MRI vascular habitats analyses showed ECR had higher median relative cerebral blood volume ($rCBV_{median}$) at each habitat than ICR (all $p < 0.01$). The $rCBV_{median}$ at IPE had good diagnostic performance (AUC: 0.727, 95%CI: 0.607, 0.828). The AUC of the nomogram based on MRI vascular habitats and clinical factors was 0.834 (95%CI: 0.726, 0.913) and was confirmed as 0.833 (95%CI: 0.830, 0.836) by bootstrapping validation.

Conclusions: The spatial pattern of locally recurrent HGGs is associated with prognosis. MRI vascular heterogeneity parameter could be used as non-invasive imaging marker to predict spatial recurrence pattern.

P0-0079

Distinct Cerebral Small Vessel Disease Impairment in Early- and Late-onset Alzheimer’s disease

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Objective: We sought to explore whether early-onset and late-onset Alzheimer’s disease (EOAD and LOAD) have different cerebral small vessel disease (CSVD) damage patterns and whether CSVD has distinct effects on cognition in two dementia subtypes.

Methods: Diffusion tensor imaging, Florbetapir PET, and plasma p-tau181 were obtained from14 EOAD, 31 LOAD, 13 young and 35 old normal controls (YNC and ONC). We validated results using another independent dataset, including 31 EOAD and 38 LOAD patients. We evaluated CSVD based on the peak width of skeletonized mean diffusivity (PSMD) calculation and conventional visual markers. The CSVD markers were first compared between the patient group and age-matched controls and then repeated in another independent dataset. Based on the linear regression model, we explored the independent effects of CSVD on cognitive function.

Results: We validated that PSMD has better clinical relevance than conventional CSVD markers. Then, we found that LOAD had greater PSMD than ONC, while EOAD showed an increasing trend of PSMD relative to YNC. In the validation dataset, EOAD and LOAD had higher PSMD than their respective counterparts. Based on linear regression, results suggested that PSMD and hippocampal volume contributed to global cognition, memory, and language function in EOAD patients. No significant results were found in LOAD patients.

Conclusion: Although the CSVD burden of EOAD is not as severe as LOAD, vascular factors play a more critical role in cognitive impairment in EOAD patients. Our study highlights that vascular health management in EOAD should not be ignored because of age.

P0-0080

表观扩散系数直方图术前预测少突胶质细胞肿瘤 TERT 启动子突变状态的研究

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目的 探讨表观扩散系数（ADC）直方图分析术前预测少突胶质细胞肿瘤（OG）TERT 启动子突变状态的价值。

材料与方法 回顾性分析 2022 年 1 月至 2023 年 3 月我院经手术病理证实并测定 TERT 启动子突变状态的 34 例 OG 患者，其中 TERT 突变型者 16 例，TERT 野生型者 18 例。基于轴位 ADC 图像进行肿瘤全域勾画，直方图分析软件自动提取平均值、变异度、偏度、峰度、第 1、10、50、90 和 99 百分位数等 9 个直方图参数。比较 TERT 突变型和 TERT 野生型组间各直方图参数间差异。绘制 ROC 曲线以确定评估 OG TERT 启动子突变状态的最佳参数。

结果 TERT 野生型组的偏度大于 TERT 突变型，而第 10 百分位数小于 TERT 突变型，组间差异具有统计学意义(P<0.05)；而 TERT 野生型组和 TERT 突变型间其余直方图参数间差异均无统计学意义（P>0.05）。ROC 分析结果表明偏度是术前评估 OG TERT 启动子突变状态的最佳参数，其曲线下面积、敏感度和特异度分别为 0.795、77.78%和 75.00%。

结论 ADC 直方图分析对术前预测 OG TERT 启动子突变状态具有一定的价值，其中偏度的预测效能最佳，可为患者综合性治疗方案制定提供参考依据。

P0-0081

集成 MRI 技术在新生儿急性胆红素脑病中的临床应用价值

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目的新生儿急性胆红素脑病（ABE）的常规 MRI 表现为双侧苍白球、壳核和丘脑对称性 T1 信号升高，在显示大脑微观结构的变化方面存在局限性。且此处髓鞘发育较早，不同扫描序列对 T1 信号会产生影响。集成 MR（SyMRI）可以量化组织的弛豫时间和质子密度，已广泛用于颅内疾病诊断，可以缩短扫描时间，减少药物麻醉影响。本研究利用 SyMRI 技术对 ABE 患儿行定量、定性分析，评估各定量参数的诊断效能。

方法 2022.1~2023.2 收入我院 NICU 的 30 例 ABE、30 例对照组行常规 MR 扫描(轴位 T1、T2)和 MAGIC 集成序列扫描。采用 GE 公司 3.0T MR (SIGNA™ Architect)。采用双盲法对 MAGIC 图像质量评分，分析图像信号。在 MAGIC 序列 T1 图像上测量双侧苍白球、壳核和丘脑的 T1、T2 和 PD 值。图像质量评分的一致性采用 Kappa 检验。用双样本 t 检验比较 ABE 组和对照组每个部分的 T1、T2 和 PD 值。P＜0.05 有统计学意义。对结果有统计学意义的参数行 ROC 曲线分析，获得各参数的诊断效果，用 Spearman 相关分析比较数据之间相关性。

结果 MAGIC 和常规 T1 均满足临床诊断的需要，两者图像质量评分具有良好一致性。30 例 ABE 和 23 例对照组双侧苍白球、壳核和丘脑 T1 对称性信号增高，25 例 ABE 和 14 例对照组 T1 信号肉眼所见显著增高。ABE 和对照组间苍白球、壳核和丘脑的 T1 值差异有统计学意义，T2、PD 值无统计学差异；ABE（苍白球、壳核）/丘脑的 T1 比值小于对照组，差异有统计学意义（t=2.47，P＜0.05）；ABE（苍白球、壳核）/丘脑的 T1 比值和血清总胆红素水平具有负相关性。ROC 曲线分析得出 （苍白球、壳核）/丘脑的 T1 比值为 0.791 是诊断 ABE 的临界值。

结论 MAGIC 参数值可以显示 ABE 苍白球、壳核和丘脑微观结构的变化，可以提供定量信息，从而为诊断 ABE 提供理论依据。

P0-0082

基于磁共振 QSM-OEF 及 ASL 成像对单侧大脑中动脉闭塞的研究

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目的：

使用磁共振定量磁化率成像（QSM）以及动脉自旋标记（ASL）对单侧大脑中动脉（MCA）闭塞而未发生脑梗死患者的氧摄取分数（OEF）、脑血流量（CBF）以及侧支循环进行研究。

方法：

自2021年3月至2022年10月，利用3.0 T磁共振扫描仪对27名单侧MCA闭塞而未发生脑梗死患者进行QSM及ASL扫描，对QSM图像进行后处理得到OEF图。依据Alberta卒中项目早期CT评分方法（ASPECTS）将MCA供血区域分为M1-M6区，比较各区域患侧与正常对照侧OEF及CBF差异。对ASL患侧各区域动脉穿行伪影（ATA）进行评价，得到ATA评分，以反映各区域侧支循环情况。依据ATA评分将患侧每个区域进行分组，比较各组间OEF以及CBF是否存在差异。利用相关及线性回归分析对各参数进行分析。P＜0.05认为具有统计学意义。

结果：

患侧M1区、M2区及M6区皮质OEF值显著高于正常侧，差异具有统计学意义（P＜0.05），患侧M2区及M5区CBF值高于对侧（P＜0.05）；依据ATA侧支循环分级，发现ATA 3级的OEF值小于ATA 2级及ATA 1级（P＜0.05）；ATA 3级及ATA 2级的CBF值显著大于及ATA 0级（P＜0.01），ATA 2级的CBF值大于及ATA 1级（P＜0.05），其余各组OEF值及CBF值两两比较差异均没有统计学差异。患侧M2区OEF值与患侧MCA区域ATA评分之和存在线性相关（b=-16.933，β=-0.574，P=0.002）。

结论：

1.QSM-OEF可以无创的检测单侧MCA闭塞患者的皮质OEF值变化情况，为临床监测脑血管病患者的OEF变化提供一种可行的影像学手段。

2.单侧MCA闭塞后，脑侧支循环情况较差时，脑组织将提高OEF以满足需氧量。

P0-0083

Gait Impairment-related axonal degeneration in Parkinson’s disease: A Neurite Orientation Dispersion and Density Imaging Study

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Purpose: Microstructural alterations in brain networks of people with Parkinson's disease (PD) is presumed to be correlated with gait impairment.Evaluate the microstructural alterations of white matter fiber tracts by using neurite orientation dispersion and density imaging (NODDI) in PD patients.

Methods and Materials: Twenty-four PD patients and 29 healthy controls (HC) were included. For each participant, NODDI and high-resolution 3D structural images were acquired with a MPRAGE pulse sequence on a 3.0T MRI. The NODDI indicators intracellular neurite density index (NDI), orientation dispersion index (ODI), and isotropic fraction (ISO) were compared between the two groups. Diffusion-weighted data preprocessing was performed using Mrtrix3 software, using orientation distribution function to trace the main nerve fiber tracts in PD patients. Quantitative gait and clinical scales were used to record the medication ON and OFF status of PD patients.

Results: The NDI, ODI, and ISO of the specific fibers was significantly higher in PD patients than HC. Six significant fibers are anterior thalamic radiation,

corticospinal tract, superior longitudinal fasciculus, forceps major, cingulum, and inferior longitudinal fasciculus. The ODI changes correlated with gait velocity, stride length and cadence in the ON state of patients with PD and correlated with gait velocity and stride length in the OFF state; ISO changes correlated with stride time in the ON state and correlated with gait velocity, stride length and time in the OFF state.

Conclusions: We use NODDI data estimate the density and angular variation of neurites (dendrites and axons) in patients with PD,and provide important neuroimaging information in association with clinical behavioral and gait measures of PD.

P0-0084

Quantitative Synthetic MRI evaluation of hippocampus in patients with multiple sclerosis

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Background: The hippocampus is a commonly involved structure in patients with multiple sclerosis (MS), but the advanced quantitative evaluation needs to be tackled before atrophy for subtle early-stage diagnosis in clinical practice.

Objective: To identify the early-stage changes in quantitative and volumetric parameters of hippocampus from patients with MS by using the synthetic MRI and correlate these quantitative changes with clinical variables.

Methods:

For this prospective study, 30 clinically definite MS patients and 26 age-matched healthy controls (HCs) were included between 2020 and 2021. The Synthetic MRI and T1-weighted three-dimensional MRI were performed. The hippocampus and subregion volumes were assessed by using voxel-based morphometry (VBM). Synthetic MRI-derived parameters (T1, T2, and proton density) from bilateral hippocampus and subregion were measured and compared, and their associations with the Expanded Disability Status Scale (EDSS), Symbol Digit Modalities Test (SDMT) scores, and sNfL level were further investigated.

Results: There were no significant differences in the volumes of the hippocampus and its subregions between MS patients and HCs. Compared with HCs, the T1, T2 and PD values of whole hippocampus and its subregion increased in patients with MS. EDSS scores were positively correlated with T2 value ($P = 0.01$, $R = 0.45$) and SDMT score were significantly negatively correlated with T2 value ($P = 0.02$, $R = -0.43$).

Conclusions: Synthetic MRI can detect subtle quantitative changes of the hippocampus and its subregions in early stage when there is no volumetric change of the hippocampus in MS patients. Specifically, the T2 values have significant correlations with EDSS and SDMT, suggesting that synthetic MRI can supply potentially effective imaging biomarker in clinical practice by quantitatively evaluating the hippocampus.

P0-0085

多模态影像技术在脑泡状棘球蚴病中的诊断价值

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目的：泡状棘球蚴病是由多房性棘球蚴囊性病变引起的一种中枢神经系统疾病，病变主要累及脑实质及脑膜。泡状棘球蚴囊性病变主要由多房棘球蚴发育成囊壁构成，囊内有包虫幼虫，可随着脑脊液流动而移动，其影像学诊断主要依赖于对脑脊液的动态监测。因此，对脑实质多模态影像技术研究分析，可以更好地指导临床对泡状棘球蚴囊性病变的诊断和治疗。

方法：选择 14 例泡状棘球蚴病患者，所有病例均行头颅 CT 平扫、增强扫描，获得平扫和增强扫描图像后，进行轴位、矢状位及冠状位观察病灶形态、大小、边缘及内部结构，并进行多平面重建、动态增强扫描。所有病例均行 MRI 检查，包括常规 T1WI 、T2WI、 FLAIR、 DWI 和 MRA 检查。

结果：14 例泡状棘球蚴病患者中，病灶最大直径为（7.50±2.14）cm，均位于大脑半球，病灶多呈等或稍低信号，平扫和增强 CT 检查示脑实质内弥漫性点状、片状低密度灶，病灶内可见囊壁及囊腔，部分可见钙化灶，增强后呈不均匀强化。MRI 表现为病变区大脑半球中脑、延髓、脊髓受累的征象。CT 平扫和增强检查均未见明显异常，而 MRI 平扫呈长 T1 长 T2 信号及低信号影，增强后病灶强化明显。

结论：泡状棘球蚴病诊断时需要结合临床病史和脑脊液检查。在泡状棘球蚴病的诊断中， MRI 可作为早期诊断泡状棘球蚴病的首选检查方法。然而，不同临床分期的患者所采用的 MRI 检查方法不尽相同。因此，在应用 MRI 进行泡状棘球蚴病诊断时应注意不同分期患者所使用的 MRI 检查方法不同，进而确定相应的 MRI 检查方案，以提高对泡状棘球蚴病的诊断正确率。

P0-0086

基于 4D Flow MRI 成像技术的颅内静脉系统血流动力学状态的初步研究

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目的：

本研究旨在通过四维血流磁共振成像技术（4D Flow MRI）初步研究生理情况下正常颅内静脉系统的血流动力学特征。进一步探寻应用于颅内静脉系统的潜力，并提高对其病理生理学的了解。

方法：

本研究共纳入健康志愿者 14 人，均行 MRV、4D Flow MRI 检查。将 4D Flow MRI 扫描得到的原始数据导入后处理软件 Circle CVI42 (Circle Cardiovascular Imaging, Calgary, Canada）进行数据后处理，根据颜色编码直接观察整个心动周期内颅内静脉窦的血流可视化状态，并将分析平面垂直于目标血管，进一步量化血流速度、流量等血流动力学参数信息。

结果：

健康志愿者的 4D Flow MRI 与 MRV 图像显示的静脉窦血管解剖情况存在一致性，且可以观察到生理情况下颅内静脉系统的层流血流模式，即无涡旋的、平滑的规整流线或向量显示，0 例(0%)

显示出紊乱的血流，仅在解剖较为复杂的窦汇汇合处见到少许生理性旋涡。血流速度沿上矢状窦逐渐增加，且右侧血管血流动力学参数数值均高于左侧。

结论：

正常颅内静脉系统血流模式为规整的层流，旨在保持正常血管内皮功能，且右侧血管的血流参数值均高于左侧，证明了由于存在优势引流，左侧横窦发育不良比例更高。

PO-0087

优化的 3.0T MRI 方案应用于阿尔茨海默病、血管性痴呆、混合型痴呆中血管损伤与脑萎缩评估的研究

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目的：本研究旨在调查其血管病变与脑萎缩在阿尔茨海默病（AD）、血管性痴呆(VD)或混合性痴呆(MD)患者中的分布，并检测独特的神经影像学特征。

方法：76 例患者分别诊断为 AD34 例、VD31 例和 MD22 例。分别对三组通过优化的 3TMRI 方案(轴位 FLAIR、T1WI、T2WI、SWI 和 DWI，矢状位 3DT1，斜冠状 T1WI、T2WI 序列)采集的头颅图像进行独立评分。采用脑室周围白质病变(PVL)、深部白质病变(WML)、深部灰质病变(DGML)、血管周围间隙(PVS)、微出血(MB)、内侧颞叶萎缩(MTA)、全脑皮层萎缩-额叶(GCA-F)、顶叶萎缩(PA)视觉评分量表和 Evans 指数进行评估。

结果：血管病变在 VD 或 MD 患者中比 AD 更多。与 AD 相比，MD 的 PVL(p =0.002)、DWML(p =0.006)、Juxtacortical MB(p=0.007)、Deep MB(p=0.003)评分更高，VD 的 DGML(p =0.016)、PVS BG - CS(p =0.005)明显更多。VD 与 MD 比较，血管性病变视觉评分结果无统计学差异，但 VD 患者内侧颞叶萎缩评分显著高于 MD，MTA($p<0.001$)。皮质萎缩评分和 Evans 指数的分布在组间无显著差异。

结论：提出的 MRI 方案在认知障碍患者的诊断评估中取得了有益的进展，可以更准确地检测血管病变(主要是微出血)，且不会显著增加时间和资源消耗。研究结果证实，对 AD 而言，VD 和 MD 以白质和灰质血管性病变为主，VD 以深部灰质病变和扩大血管间隙为主，而 MD 以深部和皮层旁微出血为主，这表明淀粉样脑血管病(CAA)可能是其主要的潜在病理机制。因此在工作中利用视觉评分量表对脑血管病、脑萎缩进行评估可以为诊断过程提供实质性的支持，可用于认知障碍受试者的常规评估。

PO-0088

高介电常数材料提高 7.0T 磁共振小脑成像效果的性能研究

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目的：评估高介电常数材料（high dielectric constant，HDC）对 7.0T 磁共振小脑成像的改善效能。

方法：使用 7.0T 磁共振对 10 例受试者扫描，首先将 HDC 垫放在受试者枕后进行 B1map、T2WI-TSE、T1-mprage 和 DWI 序列扫描；任务结束后移除 HDC 垫，重复整个方案进行比较。对同一人的两次数据进行大脑及小脑图像质量评估。主观评估采用 Likert 5 分量表法，客观评估计通过算图像 SNR 表现。

结果：10 例受试者纳入研究，男 5 例（年龄：30.6±2.58），女 5 例（年龄：29.2±2.99）。在小脑区域，主观评估中，HDC 垫组 T2WI-TSE 和 DWI 序列评分均优于对照组（P＜0.05）。客观评估中，B1map 和 T2WI-TSE 序列 SNR 均优于对照组（P＜0.05）； 在大脑区域，B1map、T2WI-TSE、T1-mprage 和 DWI 序列主客观评估中均没有统计学差异（P＞0.05）；

结论：在 7.0T 磁共振应用中，HDC 能够在不干扰大脑原有图像质量的情况下，提升小脑区域成像质量，为超高场全脑诊断及研究提供了新的机会。

PO-0089

Initial study of the use of low volume and low injection speed with high concentration contrast medium by spectral imaging in carotid CT angiography

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Objective To find the clinical value of using low volume and low injection speed with high concentration contrast medium in carotid CT angiography by spectral imaging.

Methods Sixty patients who were suspected with carotid artery stenosis were included in the study. All of them were divided into two groups which were routine and low dose protocol depending on random number table method. Routine group protocol: 120 kVp after the administration of moderate-concentration contrast medium (320 mg /ml) with 5 ml/s injection velocity. Low dose protocol: spectral imaging reconstructed in 50 % ASiR after the administration of the high concentration contrast medium (400 mg/ml) with 3 ml/s injection velocity. Contrast dose in two groups were calculated by the formula [(test bolus peak time+2s-5s) × injection velocity]. Arterial attenuation, signal-noise-ratio (SNR), contrast-to-noise ratio (CNR), and subjective image quality (IQ) score were recorded and scored to compare the image quality between two groups. In addition, the value of CT dose index volume (CTDIvol), dose length product (DLP) and effective dose (ED) was recorded, respectively. Data are reported as mean values. Data were compared using independent samples t test or Mann-Whitney U test, as appropriate.

Results The mean attenuation, noise, SNR, CNR, subjective image quality score, contrast medium volume, CTDIvol, DLP and ED of routine group was (342 ± 65) HU, (11 ± 3) HU, 28 ± 11, 36±15,

3.0, (60 ± 18) ml, 13.03 mGy,489 mGy • cm and 3.01 mSv, respectively. These values in low dose protocol group were (388 ± 82) HU, (8 ± 3) HU, 52 ± 16, 66 ± 27, 2.0 score, (39 ± 9) ml, 11.25 mGy,

412 mGy•cm and 2.32 mSv, respectively. There were no significant differences in mean attenuation and subjective IQ score between two groups (P>0.05). The noise, SNR,

CNR, contrast medium volume, CTDIvol, DLP and ED were statistically different between the two groups (P< 0.05).

Conclusion Compared with 120 kVp protocol, the low dose scan protocol (low volume and low injection velocity with high concentration contrast medium) by using spectral could provide equivalent image quality and higher SNR and CNR in carotid CT angiography.

PO-0090

短暂性脑缺血发作及缺血性卒中患者的高分辨 MRI 斑块负荷及其与 ABCD2 评分相关性分析

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目的　利用高分辨率磁共振成像探究短暂性脑缺血发作（ TIA）患者低中危组、高危组与急性缺血性脑卒中（AIS）患者组斑块负荷的差异及其与 ABCD2 评分的相关性。方法　回顾性分析 56 例 TIA 及 22 例 AIS 病例，根据风险评分量表 ABCD2 评分分为低中危组（ABCD3<6）与高危组（ABCD3≥6）。测量并计算病变颈内动脉血管狭窄率、最大管壁厚度（maximal wall thickness，WTmax）、最小管壁厚度（minimal wall thickness，WTmin）、病变或参考层面管腔面积（lumen area，LA_{MLN}/LA_{RL}）、病变或参考层面血管总面积（total vessel area，TVA_{MLN}/TVA_{RL}）、 病变或参考管壁面积（wall area，WA_{MLN}/WA_{RL}）:WA=TVA-LA; 标准化壁指数（normalized wall index，NWI）、重构指数（remodeling index，RI）、偏心指数（eccentricity index，EI）。结果　缺血性卒中患者颈内动脉病变 WTmax、WTmin、 LA_{MLN}、RI、NWI 与低中危、高危 TIA 组比较，差异有统计学意义（P<0.05），其中组间比较 WTmax、WTmin 仅低中危组与 AIS 组有统计学意义（P<0.05）,LA_{MLN}、NWI 组间比较低中危、高危 TIA 组分别与 AIS 组有统计学意义（P<0.05）。NWI 显著较好的影响预测缺血性卒中的发生（P=0.004）。ABCD2 评分与 RI(r=0.295,P=0.027）之间存在相关。结论　本研究揭示了低中危组、高危组 TIA 及 AIS 患者颈内动脉粥样硬化斑块特征，NWI 与卒中及 TIA 分层患者存在相关性，RI 与 ABCD2 评分存在弱正相关，是识别高风险 TIA 患者的潜在指标，对早期预防脑血管的事件发生具有重要的临床价值。

PO-0091

Cerebral small vessel disease was associated with impaired financial capacity in cognitively normal older adults

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Background: To investigate the association between small vessel disease (SVD) and financial capacity in cognitively unimpaired (CU) older adults aged 65 to 85.

Methods: Cross-sectional and longitudinal financial capacity was assessed using the Financial Capacity Instrument-Short Form (FCI-SF) in 414 cognitively unimpaired (CU) older adult participants who underwent baseline MRI, amyloid and tau PET scanning. Based on MRI, we calculated the SVD total score and individual SVD severity, including white matter hyperintensities (WMH), dilated perivascular space (dPVS), cerebral microbleed (CMB), and lacune. Based on the linear mixed estimate, we assessed the SVD effects on the baseline and long-term financial capacity, adjusted for age, sex, education, Alzheimer's disease (AD) related pathologies, and a series of vascular risk factors.

Results: SVD total score was associated with baseline bank statement management (BANK, β=-0.12, p<0.05), as well as long-term FCI-SF (β=-0.33, p<0.01) and single chequebook register (SNG, β=-2.03, p<0.05) decline, respectively. For individual SVD, lacune and CMB was associated with baseline financial conceptual knowledge (β=-0.17, p<0.005) and BANK (β=-0.14, p<0.01), respectively; while WMH and CSO-dPVS were associated with FCI-SF decline (β=-0.29 and -0.52, respectively, p<0,05). WMH was associated with the future decline of financial conceptual knowledge (β=-0.05, p<0.05) and single chequebook register (β=-0.14, p<0.01). Effects of SVD on financial capacity were amplified in APOE ε4 carriers.

Conclusions: In CU older adults, SVD was associated with the cross-sectional and longitudinal impairment of financial capacity. Thus, SVD prevention is important for the financial capacity protection of older adults.

PO-0092

定量磁共振成像技术在注意缺陷多动障碍伴孤独症特征儿童诊断中的应用

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目的：探讨定量磁共振成像技术在注意缺陷多动障碍伴孤独症特征儿童诊断中的应用可行性。

方法：前瞻性选取 4-5 岁注意缺陷多动障碍伴孤独症特征儿童（ADHD-ATs）56 名为研究组，选取性别年龄相匹配注意缺陷多动障碍儿童(without ATs)53 名为对照组，所有儿童均行磁共振 ESWAN、3D-PCASL、3D-T1 序列扫描；通过软件后处理获得脑区铁含量（QSM 值）、脑血流量参数（CBF 值），比较分析两组儿童脑区参数值，找出 ADHD-ATs 儿童脑区参数值特点。

结果：ADHD-ATs 儿童额叶、颞叶、海马、尾状核等脑区铁含量低于 ADHD 儿童，ADHD 儿童脑部总铁含量高于 ADHD-ATs 儿童（P＜0.05）；ADHD-ATs 儿童额叶、颞叶、苍白球、尾状核、壳核、海马等脑区 CBF 值低于 ADHD 儿童，ADHD-ATs 儿童脑部总 CBF 值低于 ADHD 儿童（P＜0.05）；ADHD-ATs 儿童额叶、颞叶、海马、尾状核等脑区 QSM 值与 CBF 值呈正相关；额叶、颞叶、尾状核等脑区 CBF、QSM 值能区分 ADHD-ATs 儿童和普通 ADHD 儿童（AUC＞0.05，P＜0.05），QSM 技术 AUC 值最高（0.913）。

结论：ADHD-ATs 儿童脑部额叶、颞叶、尾状核等处铁含量、脑血流量低于普通 ADHD 儿童，磁共振定量成像（QSM、3D-PCASL）技术可区分 ADHD-ATs 儿童，QSM 技术可作为 ADHD-ATs 儿童首选诊断技术选择。

PO-0093

颅内动脉粥样硬化斑块特征预测复发性脑卒中的前瞻性研究

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目的：技术预测复发性脑卒中。本章研究旨在基于三维高分辨率磁共振管壁成像（hr-VW-MRI）通过短期随访和长期随访两个时间维度，探讨经强化药物治疗后患者临床和影像特征的变化规律，并评估复发性缺血性脑血管事件的独立危险因素。

材料与方法：本研究前瞻性分析因急性缺血性脑卒中或 TIA 入院治疗的患者，所有患者均在入院前行三维头颈联合 hr-VW-MRI 检查，并要求患者在强化药物治疗 3 个月后进行临床指标和影像特征的复查评估。在治疗一年后以电话采访形式进行患者症状和体育运动的评估。通过改良兰金量表（modified rankin scale，mRS）来确定预后不佳和神经功能残障。统计分析采用单因素及多因素 Cox 回归预测复发性脑卒中，并计算风险比（HR）和 95%置信区间（95%CI）。

结果：最终纳入研究的患者为 80 人（平均年龄：59.64±12.03），两次 MRI 扫描的平均时间间隔为 92.4±15.9 天，长期随访的平均天数为 583.4±130.8 天。强化药物治疗后，斑块活性减弱（强化率减低，P<0.001；直方图均数值升高，P=0.012）。在复发性卒中的高危因素研究中（图 1），凸月形斑块（图 2）与短期卒中复发显著相关（HR=7.137；95%CI，1.531-33.277；P=0.047），而在长期随访中体育运动与否则是卒中复发的独立危险因素（HR=0.104；95%CI，0.018-0.591；P=0.010）。

结论：hr-VW-MRI 可评估强化药物治疗后斑块变化情况，并有助于缺血性脑卒中患者缺血性脑卒中复发风险的预测。

PO-0094

Identification of Multiple Sclerosis with Cognitive Impairment Based on Cortical Damages Using Radiomics Models

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Objectives To develop a radiomics model to efficiently identify the multiple sclerosis (MS) patients with cognitive impairment (CI) based on clinical data and cortical damages.

Methods Ninety-five patients with MS were divided into CI and normal cognitive (NC) (50/45) cohorts as defined by the Montreal Cognitive Assessment (MoCA). All

participants were randomly divided into train sets and test sets with a ratio of 7:3. The radiomic features including cortical lesions and cortex atrophy were selected by using the least absolute shrinkage and selection operator (LASSO) method. The prediction models for differentiating CI and NC in MS were built with the support vector machines (SVM) classifier by the clinical data, radiomic features, and merge data, respectively. And the patients were further divided according to each cognitive domain including memory, visuospatial, language, attention and executive. Then the most suitable classifier were applied to each domain model for all subjects.

Results A total of 2298 features were extracted, of which 29 features were finally selected by LASSO including 1 clinical data and 28 radiomic features (3 belonging to the cortical lesions, and 25 belonging to the cortex atrophy). The merge model showed the greatest performance with the area under the curve (AUC) of 0.858 (95% confidence interval: 0.810-0.905) in test cohort. However, although the executive domain model showed the highest AUC of 0.810 (95% confidence interval: 0.733-0.886) among the five domain models, all of the domain models did not meet satisfactory results with a relatively low accuracy (ACC) and specificity.

Conclusion The radiomics model based on clinical data and cortical damages had a great potential to identify the MS patients with CI for clinical cognitive assessment.

P0-0095

Prediction of MGMT promoter methylation in glioma based on multimodal MRI radiomics

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Abstract

Objectives: To investigate the predictive value of the conventional sequence model, the functional sequence model, and their fusion radiomics model for the methylation status of the MGMT promoter in glioma.

Methods: sixty-two patients with glioma of grades 2-4 were retrospectively included in the study. A total of 14248 radiomics features of the tumor substance and peritumoral edema areas were extracted from contrast-enhanced T1-weighted imaging (CE-T1WI), T2-fluid-attenuated inversion recovery resection (T2-FLAIR), diffusion kurtosis imaging (DKI) and Diffusion tensor imaging (DTI) images. The features were screened using the least absolute shrinkage and selection operator (LASSO) algorithm in combination with five-fold cross-validation. Comprehensive predictive models of conventional sequence, functional sequence and both were established by logistic regression, and leave-one-out cross-validation (LOOCV) was carried out.

Results: The fusion radiomics model composed of conventional sequences and functional sequences achieved the best prediction performance, with an area under the curve (AUC) of 0.939 (95% confidence interval [CI]: 0.881-0.998) based on LOOCV. The sensitivity (89.19%) and specificity (84.00%), accuracy (87.10%) and Kappa coefficient (0.732) are the highest among all models evaluated in this study.

Conclusion: The fusion radiomics model based on conventional sequence and functional sequence can more accurately predict the methylation status of the MGMT promoter in glioma, which has significant implications for preoperative diagnosis and personalized treatment of glioma patients.

PO-0096

基于 ADC 图的影像组学在预测较低级别胶质瘤 1p/19q 状态的价值

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目的：探讨基于术前磁共振 ADC 图的影像组学模型在预测较低级别胶质瘤（WHO II-III 级）的 1p/19q 状态的价值。

材料与方法：回顾性分析于我院术后病理证实、影像数据完整的较低级别胶质瘤患者 146 例，其中 1p/19q 联合缺失 68 例，1p/19q 未联合缺失 78 例。按照 7:3 的比例随机分为训练组与验证组。由 2 名神经影像医师分别采用盲法独立评价 MRI 图像特征，并使用 ITK-SNAP 软件于 FLAIR 图像上分割除外明显囊变坏死的异常区域，生成感兴趣容积。使用 Python 软件提取影像组学特征，随后利用 Pearson 或 Spearman 相关性分析以及 LASSO 分析用于特征降维以及选择。最终筛选的组学特征构建影像组学标签并计算评分建立影像组学模型，并对模型效能进行评估。

结果：146 例较低级别胶质瘤患者按 7:3 的比例随机分为训练组（n=102）和验证组（n=44），两组之间患者的临床及影像特征方面，均无统计学差异（p>0.05）。通过冗余性以及 LASSO 分析，最终筛选出 15 个非零系数特征，并构建影像组学评分模型。在训练组与验证组内，1p/19q-Codel 组与 1p/19q-Noncodel 组在影像组学评分上存在显著差异(p< 0.001)。同时，影像组学评分模型在训练组及验证组中均显示出良好的预测性能（AUC 值分别为 0.896 与 0.778）。

结论：基于术前 ADC 图建立的影像组学模型可无创性预测较低级别胶质瘤的 1p/19q 状态。

PO-0097

儿童线粒体脑肌病的临床特点及 MRI 特征性表现

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目的 总结儿童线粒体脑肌病（MEM）急性或亚急性发病时的颅脑磁共振成像（MRI）表现以及临床表现，以提高对儿童 MEM 的认识，减少误诊。方法 由两名放射医师回顾性审阅 12 例确诊 MEM 患儿急性或亚急性发病住院时的颅脑 MRI 图像，包括常规平扫、扩散加权成像（DWI）、磁共振血管成像（MRA）、波谱成像（MRS）以及动脉自旋标记灌注成像（ASL）；同时由一名儿科神经医师对临床资料进行总结。 结果 12 例 MEM 主要症状包括：卒中样发作 8 例（66.7%）,头痛 7 例（58.3%）；基因检测阳性 9 例（75%），血清乳酸增高 10 例（83.3%）。11 例颅脑平扫可发现病变，表现为 T1WI 低信号，T2WI/T2-Flair 上呈高信号，包括大片状脑皮质或皮质下区域，以顶颞枕叶（9 例）多见，2 例为对称性分布，分别位于基底节/脑干、小脑半球/脑干，6 例合并脑室扩大或脑萎缩；5 例 DWI 图像中可见弥散受限即（DWI 上高信号，ADC 上低信号），1 例弥散不受限即（DWI 高信号，ADC 图高信号）；6 例 MRS 中在病灶区可探测到升高的乳酸峰；4 例 MRA 中可见患侧大脑中动脉分支增多；3 例 ASL 图像中病灶区均表现为高灌注。结论 儿童 MEM 主要症状以卒

中样发作最多见，基因检测多为阳性，常见血清乳酸增高;MRI 主要表现为片状颞、顶叶皮质和(或)皮质下长 T1、长 T2 异常信号，常合并脑室扩大或脑萎缩；急性期病灶呈弥散受限，高灌注，病灶或正常脑组织中乳酸峰增高，患侧大脑中动脉分支增多。

PO-0098

放射组学评分定义的胶质母细胞瘤不同风险组患者基因信号通路及免疫微环境的临床研究

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目的: 将放射组学与基因组学结合，探索放射组学评分定义的不同风险胶质母细胞瘤（glioblastoma，GBM）患者潜在的富集通路及与免疫微环境之间的关系。

方法：回顾性收集 170 例 GBM 患者 MRI 及转录组基因数据。从增强 MRI 中提取放射组学特征，采用 LASSO 构建放射组学评分，根据放射组学评分的中位值将患者分为高风险组和低风险组。在训练队列和验证队列中评估放射组学评分与 OS 之间的关联。利用“limma”包提取不同风险组差异表达基因(differential expression genes，DEGs)及其表达水平。使用 R“ClusterProfiler”包对差异基因进行功能注释。使用基因本体论（gene ontology，GO）和京都基因与基因组百科全书（kyoto encyclopedia of genes and genomes，KEGG）评估相关功能类别。使用 Cox 回归分析筛选 GBM 患者预后的危险因素（包括 MGMT、IDH、年龄以及治疗方式），构建评估 GBM 患者 OS 的列线图。

结果：170 例患者被分为训练队列和验证队列。使用 LASSO 选择 15 个非零系数的特征，计算每例患者的放射组学评分。低风险组在训练队列、验证队列中位生存期显著长于高风险组($p = 0.001$ 和 $p = 0.034$)。通过“limma”包获得不同风险组的 14 个差异基因，放射组学高风险组患者富集通路与“缺血反应”、“轴突细胞质”、“离子通道结合”、“疼痛感觉”、“神经肌肉过程”相关。基于年龄、治疗方式、MGMT 及放射组学评分构建列线图模型预测 GBM 患者 3、5 年 OS 生存率准确性分别为 0.83，0.85。不同风险组免疫基因和免疫细胞表达存在显著差异。

结论：放射组学评分可以有效预测 GBM 的预后。放射组学揭示了高风险组的基因富集通路及肿瘤免疫微环境的异质性，列线图对预测 OS 和指导个体化治疗具有较大潜力。

PO-0099

基于瘤内和瘤周的多参数影像组学模型预测胶质母细胞瘤 Ki-67 增殖指数：一项双中心研究

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目的 评估基于瘤内和瘤周的多参数 MRI 的影像组学模型对术前评估胶质母细胞瘤 Ki-67 增殖状态的预测能力。

方法 回顾性分析 205 例在两个机构接受多参数 MRI 检查的胶质母细胞瘤患者。来自机构一（n=158）的数据用于开发预测模型以及构成内部测试组，来自机构二（n=47）的数据构成外部测

试组。使用 Spearman 相关系数、单变量排序方法（WLCX）和最小绝对收缩和选择算子算法三步法进行特征筛选。随后，使用逻辑回归（LR）算法建立相应的影像组学模型。通过校准曲线、DCA 曲线、准确度和 AUC 评估模型的预测性能。

结果 基于单个序列（CE-T1WI，T2WI 或 ADC 图）建立的模型中，瘤内、瘤周和组合区域（结合瘤内&瘤周）的 AUC 为 0.596-0.674，彼此间无显著差异；来自多参数（综合 CE-T1WI，T2WI 和 ADC 图的特征）的瘤内、瘤周和组合区域的影像组学模型对比单参数模型的 AUC 均有所提升，AUC 达到了 0.747-0.886，其中综合了瘤内、瘤周的组合区域的多参数特征建立的模型（Multi-Com）表现出了最高的性能，内部测试组 AUC 为 0.886 (95% CI 0.754-1.000)，外部测试组 AUC 为 0.877(95% CI：0.780-0.974)。结合了瘤内和瘤周特征的多参数影像组学模型具有良好的校准能力 (Hosmer-Lemeshow test, p>0.05)。

结论 结合瘤内和瘤周的多参数 MRI 的影像组学模型可用作术前评估胶质母细胞瘤 Ki-67 增殖状态的非侵入性的有效工具。

P0-0100

Predicting the prognosis of glioblastoma based on MRI radiomic model of temporal muscle and tumor: a multicenter study

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Background and Prupose:

Glioblastoma （GBM） is the most common primary malignant brain tumor. Sarcopenia is associated with poor outcomes for tumor patients. This study aims to investigate the prognostic value of radiomics features of temporal muscle in glioblastoma patients.

Methods:

This study comprised a training data set of 435 patients from the University of Pennsylvania Health System (UPENN-GBM) and a testing data set of 126 patients from the Cancer Genome Atlas Glioblastoma Multiforme (TCGA-GBM). All patients underwent pre-operative MRI examination, including postcontrast T1-weighted imaging and T2 fluid-attenuated inversion recovery (FLAIR) imaging, from which radiomics features of temporal muscle and whole-tumor were extracted. After feature selection, uni-variate and multi-variate cox regression were used to build predictive radiomic models. The concordance index (C index) was used to assess the potential value of radiomic models in predicting overall survival (OS). The added value of radiomics feature of temporal muscle to tumor radiomics features and clinical features was also analyzed.

Results:

The temporalis radiomics features (C-index 0.58) had a better predictive ability than temporal muscle thickness (C-index 0.52) and temporal muscle cross area (C-index 0.54). The addition of temporalis radiomics features to tumoral radiomics features showed an improved prediction performance (C-index 0.61 vs 0.58, P ＜.001). The combined model (temporalis radiomic features, tumoral radiomic features and clinical profiles) had the best predictive performance (C-index 0.63).

Conclusion:

Temporalis radiomics features might have potential in predicting clinical outcomes for glioblastoma patients and could be integrated with tumor and clinical profiles to improve predictive performance.

P0-0101

Neuroimaging biomarkers for detecting schizophrenia: a resting-state functional MRI-based radiomics analysis

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Objectives: To identify neuroimaging biomarkers those distinguish patients with schizophrenia (SZ) from healthy controls (HCs) and explore the underlying neural mechanisms of schizophrenia.

Methods: Seventy-two patients with SZ and 74 age- and sex-matched HCs were included in this study, and all subjects completed 3D-T1WI structural and rs-fMRI scans. All subjects' MRI data were routinely processed to obtain degree centrality (DC) and voxel-mirrored homotopic connectivity (VMHC), and the Brainnetome (BN) 246 atlas was used to extract the radiomics features from the DC and VMHC. The t-test and least absolute shrinkage and selection operator (LASSO) were used for feature dimensionality reduction, nested 10-fold cross-validation (repeated 20 times) was used for model evaluation and parameter optimization, and the support vector machine was used to build the classification model, in which the inner loop adopted a grid search method to determine the optimal hyper-parameters (the optimal λ of LASSO), and the outer loop used to evaluate the performance of the model. The 10 features with the most frequently selected for DC and VMHC in 200 iterations were selected to be defined as discriminative features. The above procedures were repeated using automated anatomical labeling (AAL) 90 and Shen 268 atlases to verify the robustness and generalization of the model.

Results: Excluding the subjects with incomplete imaging data and substantial head motion, 122 subjects were finally included in this study (66 HCs and 56 patients with SZ). The mean AUC and accuracy using the BN246 atlas were 0.808 and 74.02%, respectively (both $P<0.001$). The brain regions we identified as being associated with the SZ were mainly located in the subcortical nuclei (bilateral dorsal caudate), front-parietal, somato-motor, limbic, and default mode networks. Repeating the above study using AAL 90 and Shen 268 atlases, the model still had great performance (AAL 90: mean accuracy 66.43%, mean AUC 0.722, $P = 0.002$ and 0.001, respectively; Shen268: mean accuracy 72.21%, mean AUC was 0.758, both $P<0.001$). The BN 246 atlas had the best performance, and AAL 90 atlas had the worst performance among them.

Conclusions: The radiomics-based machine learning method we proposed based on DC and VMHC metrics could classify patients with SZ and HCs with great performance, it had good robustness and generalizability, and it is an effective method to identify SZ neuroimaging biomarkers. Brain dysfunction in subcortical nuclei, front-parietal, somato-motor, limbic, and default mode networks may be the underlying pathological mechanism of SZ.

P0-0102

Magnetic resonance image radiomic features reflects recurrence patterns of glioblastoma

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Objective: The recurrence or progression of gioblastoma (GBM) after treatment is inevitable. We sought to explore non-invasive radiomic characterization of imaging could assist in reflection diverse patterns of GBM progression.

Methods: Three recurrence patterns, including local, diffusion and distant recurrence (83, 18, 11 cases, respectively), were categorized according to the spatial location and signal characteristics of recurrent lesions in conventional MRI images in 112 patients. Quantitative image features capturing the shape, texture, edge sharpness, wavelet features from the whole tumor were extracted. All the image features were analysed by consensus clustering with 10,000 iterations. Median progression-free survival (PFS) and overall survival (OS) of Rps were estimated using Kaplan-Meier methods. When comparing across-cluster clinical features, including sex, age, non-enhancement region, boundary, enhance-pattern (rim-like, irregular and solid enhancement) differences in each cohort, we performed the Kruskal-Wallis test for continuous variables and the Fisher’s exact test for categorical variables. Finally, regression analysis was used to obtain significant clinical parameters for classification cluster group.

Results: The median PFS (4.8 M, 8.9 M, 5.7 M, P = 0.05) and OS (12.3M, 21.0M, 12.5M, P = 0.52) of local, diffusion and distant recurrence. Three distinct radiomic phenotypic “clusters”, including clusters 1-3 (each clusters contained 58, 48, 6 cases respectively), emerged in the development cohort. The median PFS (5.5M, 8.4M, 8.6M, P = 0.05) and OS (10.4M, 19.4 M, 10.0 M, P = 0.016) of cluster 1-3. After Fisher's analysis, we found that cluster 1, 2 mainly includes local recurrence and diffusion recurrence respectively, while distant recurrence was distributed in all three clusters (P= 0.03). Univariate regression analysis showed sex, non-enhancement region and enhancement pattern had significance for each cluster classification. However, the non-enhancement region had significance in multiparameter regression analysis.

Conclusions: Non-invasive radiomic characterization of MR can reflected the recurrence or progression of gioblastoma (GBM) after treatment, providing clinical information for recurrence GBM patients.

P0-0103

基于体素的影像组学模型预测胶质母细胞瘤复发高风险亚区的研究

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目的：基于体素的影像组学方法构建胶质母细胞瘤亚临床浸润区域复发高风险亚区预测模型，评估预测价值，并进一步分析其与肿瘤异质性的关系。

方法：基于南方医科大学南方医院数据库中 2015 年 1 月至 2020 年 12 月经标准治疗后随访确诊复发的胶质母细胞瘤患者。对术前及术后复发的磁共振 T1 增强图像通过 B 样条的非刚性配准后，确定亚临床浸润区域及局部复发区域。在配准后的术前 T1 增强图像上提取基于体素的影像组学特征并分别训练随机森林、梯度提升、自适应提升。用三种机器学习算法基于体素的预测局部复发区域。AUC 曲线评估模型预测效能，DCA 评估模型的临床效用。

结果：58 例胶质母细胞瘤纳入本次研究。局部复发体积平均约占亚临床浸润区域体积的 8.77%。采用了 20 个基于体素的组学特征分别训练了随机森林、梯度提升、自适应提升，测试集的 AUC 结果分别为 0.78（0.768-0.823）、0.76（0.733-0.807）、0.77（0.748-0.809）。在决策曲线分析中，在临床阈值范围内，所有机器学习模型均实现了较大的净效益。

讨论：本研究基于胶质母细胞瘤术前磁共振 T1-增强序列的瘤周 20mm 的组学特征可以准确预测肿瘤复发高风险亚区。这个方法可以提供预测肿瘤早期复发的空间图，以此协助临床能制定有针对性的手术方案，旨在最大限度地提高治疗效果的同时也保持神经功能。

PO-0104

基于多参数放射组学及生境成像预测 GBM 的 IDH 分型

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目的：我们拟通过基于生境成像的放射组学无创性地寻找反应肿瘤分子分型的放射组学特征，构建及优化对预测 GBM 的 IDH 突变分型的放射组学模型，更好地指导临床治疗决策的制定。方法：回顾性研究我院确诊为胶质母细胞瘤(GBM)的患者的影像资料，并提取各影像参数的组学特征。基于勾画的不同区域的 ROI，我们构建了以下模型：全肿瘤的 T2WI 模型，全肿瘤的 CBV 模型，全肿瘤的 ADC 模型，多参数磁共振序列联合模型 (T2WI 整体区域、PWI 强化区域及 ADC 水肿区域)，模型中均纳入了患者年龄、性别、发病部位组成的临床因素分析。结果：92 例 GBM 随机分为训练组 66 人(71%)及测试组 26 人(29%)两组，每个 ROI 提取了 396 个组学特征，所有序列的组学特征的预测准确性高于临床指标。经过 LASSO 分析降维确定特征个数后，选择最具预测能力的特征子集组成影像组学标签 radscore，并对其系数进行评价，各个模型的训练组及测试组的 radscore 在 IDH 野生型和突变型中有显著差异。在放射组学分析中

AUC 最高为 CBV 模型，多序列多区域模型的 ROC 结果，AUC 在训练组达 0.962，测试组达 0.955，对 IDH1 分型的诊断效能高于单一序列模型。结论：基于多参数和多区域 MRI 图像的放射学特征可以更准确地预测 GBM 的 IDH 基因型。

PO-0105

Development of a nomogram based on radiomics and semantic features for predicting chromosome 7

gain/chromosome 10 loss in IDH wild-type low-grade gliomas

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Purpose: Gliomas are the most common primary tumors of the central nervous system and are classified by the World Health Organization (WHO) as low-grade gliomas (LGG, grade Ⅱ-Ⅲ) and glioblastomas (GBM, grade Ⅳ) based on the histological findings. Gliomas have a unique genomic profile, and molecular markers have been identified as an essential basis for glioma classification in the 2021 WHO Classification of Central Nervous System Tumors. IDH wild type (IDH-wt) LGG with chromosome 7 gain or chromosome 10 loss (+7/-10) in adults have been reclassified as GBM due to their clinical outcome and prognosis being similar to that of GBM. Furthermore, the gain of Chr7 was associated with a 4.7-fold increased risk of tumor recurrence, while the loss of Chr10 was linked to a shorter survival. Identifying this pair of major oncogenic-driven genes in IDH-wt LGG not only helps to diagnose the molecular glioblastoma but also facilitates the regulation of the oncogenic signaling pathway at the molecular level for individualized treatment and prognosis prediction. This study aims to predict the status of +7/-10 in IDH-wt LGG patients by machine learning models based on radiomics and semantic features to assist clinicians in accurate diagnosis, prognosis-based stratification and individualized treatment for glioma patients.

Methods: A total of 122 patients diagnosed as IDH-wt LGG were retrospectively included in this study. The patients were randomly divided into a training group and a test group in a ratio of 7:3. N4-ITK bias field correction was performed on all images, and the voxels were resampled to 1×1×1mm. The radiomics features were extracted from axial T1WI, T2WI, FLAIR and CET1 sequences, respectively. All features were normalized by z-score to eliminate the dimensionality of features. Univariate analysis and Spearman correlation analysis were used to eliminate redundant features. The distance correlation (DC) and least absolute shrinkage and selection operator (LASSO) were used to select the radiomics signatures. Three machine learning algorithms including neural network (NN), support vector machine (SVM), and linear discriminant analysis (LDA) were used to develop radiomics models. The models with the highest AUC value in the test group was defined as the optimal radiomics model. A total of 12 characteristics including age, sex, and MRI imaging findings were collected for developing the clinical model. In addition, a nomogram was developed by combining the optimal radiomics signature with clinical risk factors, and the potential clinical utility of the nomogram was evaluated using decision curve analysis.

Results: The LDA+DC model was identified as the optimal classifier among the six radiomics models. Necrosis was determined as a risk factor for +7/-10 in IDH-wt LGG. The nomogram achieved the best performance, with an AUC of 0.854 and an accuracy of 0.778 in the independent test group. The Delong test showed that the nomogram achieved the best predictive performance and significantly outperformed the clinical model in both the training ($P<0.001$) and test ($P=0.039$) groups. Hosmer-Lemeshow test and the calibration curve showed that the predicted probabilities of the nomogram

fitted well with the expected probabilities. The decision curve of the nomogram confirmed its clinical usefulness in a wide range of thresholds.

Conclusion: The nomogram combining radiomics and semantic features can predict the +7/-10 status effectively, which may contribute to the risk stratification and individualized treatment planning of patients with IDH-wt LGG.

P0-0106

A radiomics study of MR imaging for postoperative seizure prediction in dysembryoplastic neuroepithelial tumor and a systematic review

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OBJECTIVE

In this systematic review the authors aimed to evaluate the effectiveness and superiority of radiomics in detecting tiny epilepsy lesions and to conduct original research in the use of radiomics for preliminary prediction of post- operative seizures in patients with dysembryoplastic neuroepithelial tumor (DNET).

METHODS

The PubMed and Web of Science databases were searched from the earliest record, January 1, 2018, to December 29, 2021, for reports of the detection of epilepsy using radiomics, and the resulting articles were carefully checked according to the PRISMA 2020 guidelines. The authors then conducted original research by evaluating MR images in 18 patients, who were then separated into two groups, the epilepsy recurrence group (ERG) and the epilepsy nonrecurrence group. The tumor region and the edema region were segmented manually by 3D Slicer. The radiomics data were extracted from MR images by using “Slicer Radiomics” running on Mac OS X. Tumor regions were observed with T1-weighted imaging, and edema with FLAIR imaging. Radiomics features with significant differences were selected through comparison according to epilepsy relapses performed with the Mann-Whitney U-test. The edema and tumor regions were also compared within groups to identify their distinctive features. Radiomics features were tested to verify their ability to predict recurrence epilepsy by receiver operating characteristic curve.

RESULTS

This systematic review located 9 original articles related to epilepsy and radiomics published from 2018to 2021. The reported studies demonstrated that radiomics is useful for detecting tiny epilepsy lesions. Among the radiomics features used, the predictive ability of the area under the curve was more than 0.8. The heterogeneity of the peritumoral edema region was found to be higher in the ERG.

CONCLUSIONS

Satellite lesions in the peritumoral edema region of DNET patients may cause epilepsy recurrence, and radiomics is an emerging method to detect and evaluate these epilepsy-associated lesions.

PO-0107

Differential Diagnosis of Growth Hormone Deiciency and Idiopathic Short Status Using Texture Feature Model based on contrasted T1WI

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lntroduction:

ldiopathic short status (lSS) and growth hormone deiciency (GHD) are the main causes of short stature in children. Children with GHD have decreased growth hormone levels, while children with lSS have normal GH levels. Growth hormone-binding sites are densest in the pituitary. This study aimed to assess the contrasted T1Wl texture feather model could be used to differentiate GHD from lSS.

Materials and Methods:

This retrospective study included 46 patients with GHD. 21 patients diagnosed lSS. All children underwent conventional MRl. No space-occupying lesions or abnormal signals in the pituitary gland. Delineation of the region of interest and feature extraction of the sagittal contrast-enhanced T1Wl image were performed in the 3D-slicer software. The optimal feature set were selected by least absolute shrinkage and selection operator. All patients were randomly divided into the training group and the test group at a ratio of 7 ： 3. The models were established in the training group by logistic regression, and then veriied by the test group. ROC curves were drawn respectively, and speciicity, sensitivity, accuracy and area under the ROC curve (AUC) were calculated.

Results:

The AUC Values of logistic regression in the training group was 0.82, and the AUC Values of the test group was 0.79, respectively. The diagnostic accuracy of logistic regression in the training group was 80%, and the accuracy of the test group were 71%.

Conclusion ：

Texture Feature Model based on contrasted T1Wl in differentiating GH Deiciency from ldiopathic Short Status is feasible.

PO-0108

Intratumoral Radiomics Based on MRI for Prediction of Spatial Recurrence Pattern in High-Grade Gliomas

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Objective: To explore whether radiomic features extracted from intratumoral region can be used to predict spatial recurrence patterns in high-grade glioma (HGGs).

Materials and methods: We enrolled 118 patients with local recurrence of HGGs after maximum safe surgical resections and standardized treatment (training set, n=82; validation set, n=36). Local recurrence was divided into intra-resection cavity recurrence (ICR) and extra-resection cavity recurrence (ECR) according to the distance between the recurrent tumor and the surgical area or surgical resection cavity. Radiomic features were extracted from the intratumoral region on contrast-enhanced T1-weighted imaging (CE-T1WI). The least absolute shrinkage and selection operator was used to select the radiomic features and build radiomics model. In addition, a nomogram model combining radiomics and clinical factor was constructed and evaluated by calibration curves and area under the receiver operating characteristic curve (AUC).

Results: Eleven features with nonzero coefficients related to spatial recurrence patterns were selected. Notably, the radiomics score of patients with ECR was higher than that of patients with ICR in the training set [0.536 (0.172-0.935) vs. -0.166 (-0.422-0.169), p<0.001] and in the validation set [0.568 (0.380-1.225) vs. -0.068 (-0.430-0.464), p<0.001]. The radiomics model achieved good performance in training and validation sets with AUCs of 0.870 and 0.830, respectively. Likewise, the nomogram model showed good calibration and predictive performance in the training (AUC:0.887) and validation (AUC:0.882) sets.

Conclusions: Radiomic features extracted from intratumoral region through preoperative CE-MRI can be used noninvasively to predict spatial recurrence patterns of HGGs.

PO-0109

Integrating diffusion-weighted MRI radiomics features to predict brain invasion of meningiomas

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Background: Brain invasion is an independent diagnostic criterion for the diagnosis of WHO grade II meningiomas, and preoperative prediction of brain invasion in meningiomas is crucial for making treatment decisions. Therefore, we constructed a radiomics model using multimodal MRI for preoperatively predicting brain invasion in meningioma.

Methods: Seven hundred and twenty-nine consecutive patients with pathologically confirmed meningiomas between 2013 and 2022 were retrospectively studied. Radiomic features of the brain-tumor interface region were extracted from structural MRI, diffusion-weighted imaging (DWI) and apparent diffusion coefficient (ADC). Random

forest and principal component analysis with varimax rotation were used to obtain optimal radiomics features. Support vector machine, linear discriminant analysis and logistic regression were performed to develop radiomics models. The performance of the model was evaluated using receiver operating characteristic (ROC) curve analysis. The 95% confidence interval was estimated by bootstrap with 1000 samples. The integrated discrimination improvement (IDI) index was used to compare the benefits of different models.

Results: Thirteen radiomics features from structural MRI, eleven radiomics features from DWI, and the volume of peritumoral edema were selected for the combined model construction. The combined model had the highest performance in predicting brain invasion in the training (AUC = 0.939, 95%CI: 0.915 to 0.958) and testing sets (AUC = 0.950, 95%CI: 0.905 to 0.970). It showed higher performance than the structural MRI model (AUC = 0.830) and the DWI model (AUC = 0.811). IDI showed significant improvement in predictive value when the DWI radiomics signature was added to the combined model (IDI = 13.37%; $p < 0.001$).

Conclusion: The incorporation of DWI into the MRI radiomics model improved diagnostic performance for identifying brain invasion in meningioma.

书面交流

PU-0001

医学有限元分析结合 3D 打印与 MR 技术在脊柱侧凸的应用研究

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背景：目前国内脊柱侧凸医学有限元研究多以分析韧带与矫形器的力学效果为主，模拟临床手术植入椎弓钉后探究椎体力学效果的研究尚少。且国内暂无探究将 3D 打印与混合现实等三维技术与医学有限元模型相联应用的报道。

目的：以二维 CT 影像数据为基础构建植入椎弓钉的三维模型，模拟临床脊柱侧凸手术进行力学有限元分析。同时借助 3D 打印与混合现实技术使三维有限元模型更直观化，为优化手术方案，便携医患沟通，创新医学培训，辅助临床科研提供新型思路与方法，赋能智慧医疗高效发展。

对象：滨州医学院附属医院脊柱侧凸病例中取一名匿名化女性志愿者病患 CT 影像数据，16 岁，患有特发性脊柱侧凸，胸椎向右侧弯、腰椎向左侧弯，剃刀背畸形。

方法：将特发性脊柱侧弯全长脊柱 CT 扫描图像经 Mimics 进行三维重建并经 Geomagic 优化曲率，再通过建模椎弓钉、椎间盘、皮质骨松质骨构建脊柱侧弯仿真手术模型，将其导入 ANSYS 进行网格化并定义材料属性、受力面与载荷面、接触与连接等仿生模拟受力分布，建立医学有限元分析模型。将有限元模型通过 STL 格式导入打印机计算适印性并打印，同时文件导入虚拟仿真系统借助摄像头可实现虚拟模型在现实世界中的交互。

主要指标：有限元模型的节点单元数、表面接触数目、等效弹性应变云图、总变形云图、STL 有限元三维模型

结果与结论：在载荷面施加 1000N 扭转力模拟椎体扭转畸形，施加 700N 的压力模拟人体重力，得出模拟手术锥体受力分布直观图，病患应变主体部分为椎间盘，且在此方位置钉矫形方案下最大位移为 18.507mm。同时成功地将医学有限元模型与 3D 打印及混合现实技术结合，逼真地实现将高生物仿生效果的有限元模型与三维立体化可视化技术结合，增强直观性。

PU-0002

Aberrant structural network in primary dysmenorrhea revealed by source-based morphometry

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Objects: Primary dysmenorrhea (PD), one of the most common gynecological disorders in the reproductive age. Previous studies have demonstrated that PD patients have the abnormalities of brain structures and functions. However, the pathophysiology of PD remains incompletely understood. This study aimed to investigate the abnormal structural brain networks (SBNs) and covariance pattern in PD patients compared with HCs.Methods: In this study, based on T1-weighted anatomical data derived from 41 PD patients and 35 healthy controls (HCs), we applied a source-based morphometry (SBM) technique to investigate the abnormal SBNs in PD patients compared with HCs. Multiple classic interaction linear model was applied to examine

the difference of covariance pattern in PD patients compared with HCs.Results Compared with HCs, SBNs of patients with PDM included temporal network (mainly located in amygdala, temporal pole, middle temporal lobe and inferior temporal lobe), default network (mainly located in posterior cingulate/precuneus, hippocampus/parahippocampus) and thalamic network alterations (P<0.001).In whole-brain SBNs, we found abnormal Gray matter volume (GMV) coupling between the temporal lobe network and thalamic network in PDM patients. Conclusion Abnormal brain structure may be associated with PDM related pain perception and regulation disorders. In addition, this study identified interactions between temporal and thalamic networks in patients with PDM, and it is hoped that the results of this study will contribute to a better understanding of the pathophysiology of patients with PDM.

PU-0003

Prospective cohort study on neuroimaging of neuropsychological disturbances following ischaemic stroke (CON-NDFAIS) -study design and rational

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Background and purpose

Neuropsychiatric disturbances is a common clinical manifestation in acute ischemic stroke. However, It is frequently overlooked by clinicians.This study aimed to explore the possible etiology and pathogenesis of neuropsychiatric disturbances following acute ischeamic (NDIS) from an anatomical and functional connectivity perspective with the help of neuroimaging methods.

Method/Design

CON-NDFAIS is a prospective cohort study of neuroimaging and its functional outcome in NDIS. Patients with acute ischemic stroke onset within two weeks, age≥18 years and no history of stroke or dementia will be included. The neuropsychological disturbances involved in this study include depression, anxiety disorder, headache, apathy, insomnia, fatigue and cognitive impairment. The NDAIS evaluation battery requires at least 2 hours at baseline. Moreover, all patients will be required to complete 2 years of follow-up, during which the NDAIS will be re-evaluated at 3months, 12months and 24 months by telephone and 6 months by outpatient interview after the index stroke. Functional imaging evaluation will be performed at baseline and 6-month follow-up using specific sequences including resting-state functional magnetic resonance imaging, diffusion tensor imaging, T1WI, T2WI, diffusion-weighted imaging, arterial spin labeling, quantitative susceptibility mapping and fluid-attenuated inversion recovery imaging. In addition, we collect haematological information from patients to explore potential biological and genetic markers of NDAIS through histological analysis.

Discussion

CON-NDFAIS can assist the physicians in understanding the neurobiological mechanisms underlying NDAIS and provide effective treatment targets for the future

PU-0004

终末期肾病患者脑局部高铁沉积与生化改变的相关性分析

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目的：本研究旨在采用定量磁化率图（QSM）阈值法定量评价终末期肾病（End-stage renal disease, ESRD）患者脑铁沉积，并分析铁沉积与临床指标的相关性。

材料与方法：前瞻性招募 ESRD 患者 34 例以及年龄、性别、教育程度相匹配的健康对照组（HCs）45 例进行研究。所有受试者进行 3.0T MRI 扫描，获取高分辨率 3D-T1 序列及 STAGE 序列，利用核磁共振信号处理手动测量两组双侧尾状核、壳核、苍白球、黑质、红核、齿状核的平均磁敏感值(magnetic sensitivity values, MSV)及体积（MSV_M, V_M）以及高磁敏感值及体积（MSV_H, V_H）。所有受试者均接受血液生化检查。使用协方差分析比较两组 QSM 数据。采用两样本 t 检验比较两组间血液生化检查结果。偏相关分析用于评估 ESRD 组中 MSV_H 和 V_H/V_M 数据与血液生化结果之间的相关性，其中性别、年龄和教育水平作为协变量。通过 FDR 校正进行多重比较。

结果：与 HCs 相比，ESRD 患者双侧壳核、齿状核和右侧红核的 MSV_M 降低（表 1），所有灰质核团的 V_M 降低，双侧尾状核、壳核、齿状核和右侧黑质的 MSV_H 和 V_H/V_M 升高（P < 0.05，FDR 校正）（图 1）。ESRD 患者的红细胞、血红蛋白、血小板、肾小球滤过率、总胆固醇水平明显降低，肌酐、尿酸、同型半胱氨酸水平明显升高（表 2）。偏相关分析表明，左侧壳核 MSV_H 与肌酐（P = 0.048，r = 0.371）、尿酸（P = 0.017，r = 0.440）水平呈正相关；右侧黑质 MSV_H 与肌酐（P = 0.004，r = -0.542）水平呈负相关，与肾小球滤过率（P = 0.002，r = 0.564）水平呈正相关（图 2）。

结论：ESRD 患者灰质核团铁沉积增加，体积减少。高铁区域的 MSV 可以更好地评估铁的分布，并与血液生化指标改变有关。

PU-0005

正常成年人高海拔地区低氧暴露适应性变化及失眠与非失眠状态脑结构及功能的 f-MRI 对比研究

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目的 观察正常成年人高海拔地区低氧暴露后大脑适应性变化以及继发失眠者脑结构及功能的差异。方法 前瞻性纳入 26 例援藏工作人员，采集高分辨率三维 T1 加权结构图像和静息态功能磁共振图像（rs-fMRI），以入藏前的磁共振扫描为基线数据，入藏 6 个月后根据匹兹堡睡眠质量指数量表（pittsburgh sleep quality index，PSQI）将 26 例受试者分为失眠组 8 例及非失眠组 18 例并再次行 MRI 扫描。基于体素形态学（VBM）、局部一致性（ReHo）、低频振幅比率（fALFF）、度中心性（DC）对 26 例受试者入藏前-后、失眠组及非失眠组分别进行分析。结果 与入藏前组相比，26 例入藏后组受试者灰质体积（GMV）萎缩的脑区位于左侧额中回、左侧海马旁回以及右顶下缘角回，差异存在统计学意义(P＜0.01)；入藏前-后组之间的 ReHo 值存在统计

学意义(P＜0.01），ReHo 值增加的脑区位于右侧小脑半球；入藏前-后组之间的 fALFF 值存在统计学意义(P＜0.01），fALFF 值增加的脑区位于左侧舌回、左侧颞中回、左侧距状裂周围皮层；失眠组和非失眠组之间的 fALFF 值存在统计学意义(P＜0.01），fALFF 值增加的脑区位于左侧后扣带回；失眠组和非失眠组之间的 DC 值存在统计学意义(P＜0.01），DC 值减少的脑区位于左侧眶部额上回。结论　正常成年人移居高原后及继发性失眠存在多个脑区结构及功能的改变。

PU-0006

检测精神分裂症的神经影像生物标记物：一项基于功能磁共振的影像组学分析

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目的：识别区分精神分裂症（SZ）患者和健康对照（HC）的神经影像生物标记物并探讨精神分裂症的潜在神经机制。

方法：72 例 SZ 患者和 74 例年龄、性别匹配的 HC 纳入研究，所有被试均完成 3D-T1WI 结构像及 rs-fMRI 像扫描。所有被试磁共振数据常规处理得到度中心度（DC）和镜像同伦功能连接（VMHC）图，使用脑连接组（BN）246 脑图谱提取 DC 和 VMHC 图影像组学特征。特征降维采用 t 检验和最小绝对收缩和选择算子(LASSO)，使用嵌套 10 折交叉验证（重复 20 次）进行模型评估和参数优化，使用支持向量机构建分类模型，其中内循环采用网格筛选法确定最优超参数（LASSO 的最优 λ），外循环用于评估模型的性能。选择在 200 次迭代中 DC 和 VMHC 被选择频率最高的 10 个特征定义为“区分特征”。采用 AAL 90 和 Shen 268 脑图谱重复上述流程验证模型的鲁棒性和泛化性。

结果：排除影像数据不全及头动过大被试，最终 122 例被试入组（SZ，56 例；HC，66 例）。使用 BN246 脑图谱模型的平均 AUC 和准确率分别为 0.808 和 74.02%（P 均＜0.001）。我们识别的与 SZ 相关的脑区主要位于皮层下、额顶网络、感觉运动网络、边缘网络和默认网络。使用 AAL 90 和 Shen268 脑图谱重复上述研究，模型依然具有良好的性能（AAL90:平均准确率为 66.43%，平均 AUC 为 0.722，P 分别为 0.002 和 0.001；Shen268：平均准确率为 72.21%，平均 AUC 为 0.758，P 均＜0.001）。

结论：基于 rs-fMRI 的影像组学可以很好分类 SZ 患者和 HC，且具有良好的鲁棒性和泛化性，该方法可有效识别 SZ 神经影像生物标记物，皮层下网络、额顶网络、感觉运动网络、边缘网络和默认网络脑功能异常可能是精神分裂症潜在神经发病机制。

PU-0007

高泌乳素血症患者垂体 MRI 表现的相关研究

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目的　探索单纯高泌乳素血症患者垂体 MRI 表现，为早期精准诊断泌乳素型垂体微腺瘤奠定基础。**材料与方法**　回顾性分析 121 例单纯高泌乳素血症患者及 71 例正常人群的 MRI 表现及高泌乳素血症患者临床症状。分析高泌乳素血症患者临床症状、MRI 垂体形态及相对信号强度、各径线值、体积及动态增强半定量参数（达峰时间、最大强化率、强化斜率）。高泌乳素血症组及正常对照组年龄、垂体前后径、横径及体积差异采用独立样本 t 检验，正中矢状位及最大高度采用非

参数检验。2 组性别、垂体柄位置及垂体形态差异采用卡方检验。泌乳素比值与各测量值间相关性采用 spearman 相关性分析。结果　高泌乳素血症患者中 50.5%月经不调，8.2%表现为溢乳，27.0%不孕，而 9.0%为体检发现血清泌乳素水平升高。高泌乳素血症患者中 19.8%垂体柄出现偏移，其中 6.6%为垂体柄右偏，13.2%为垂体柄左偏。垂体形态中凹陷、平直及隆起型分别占 28.1%、50.4%及 21.5%。动态增强曲线中 77.5%为 I 型，22.5%为 II 型曲线。血清泌乳素水平比值仅与最大强化率相关（*P*=0.025，R=-0.209）。高泌乳素血症组 121 例，（30.88±7.26）岁，其中女性 115 例；正常对照组 71 例，（33.06±8.11）岁，其中女性 65 例。两组间性别及年龄差异无统计学意义（*P*=0.132 及 0.057）。高泌乳素血症组垂体柄偏移及垂体形态与正常对照组无统计学差异（*P*=0.273 及 0.114）。高泌乳素血症组垂体体积大于正常对照组（*P*=0.036），而垂体前后径、横径、正中矢状位高度及最大高度两组间均无统计学差异。**结论**　高泌乳素血症患者与正常对照组垂体形态存在差异，探索分析高泌乳素血症患者垂体 MRI 形态及信号特征为早期精准诊断泌乳素型垂体微腺瘤奠定基础，为临床治疗决策提供客观依据。

PU-0008

ADC 联合 DCE 区分环形强化 GBM 和感染性病变的价值

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【摘要】目的：探讨扩散加权成像（DWI）和动态对比增强（DCE）鉴别同为环形强化的胶质母细胞瘤（GBM）和感染性病变的应用价值。方法：回顾性收集 2015 年 9 月至 2020 年 9 月经病理证实的 GBM 23 例和感染性病变 17 例（脑脓肿 11 例，结核瘤 6 例）。所有患者在术前 2 周内行 3.0T MRI 常规、T1WI 增强、DWI 和 DCE 扫描。分别利用 Firevoxel 软件和美国 GE Omni-Kinetics Version 软件在表观扩散系数图（ADC）和 DCE 图像的病灶最大层面手动勾画 GBM 和感染性病变的强化环壁作为感兴趣区（Region of Ineterest，ROI），比较两组病变的 ADC 第一四分位数（ADC25%）、容积转移常数（Ktrans）、血管外细胞外体积分数（Ve）、曲线下面积（AUC）、速率常数（Kep）、血浆容积分数（Vp）、达峰时间（TTP）、最大斜率（MAXslope）的差异。Ktrans、Vp 和 AUC 比较采用独立样本 t 检验，ADC25%、Kep、Vp、TTP 和 MAXslope 比较采用 Mann-Whitney U 检验。对组间比较有统计学差异的参数，绘制受试者工作曲线（ROC）评估单个参数和联合后对 GBM 和感染性病变的诊断效能。结果：GBM 的 Ktrans 、AUC 和 MAXslope 均显著高于感染性病变，p 值分别为 0.004，0.045 和 0.011，而 ADC25%显著低于感染性病变（p=0.042）。两种技术的所有参数均达到了中度以上的诊断效能，单一参数诊断效能最佳的是 Ktrans，联合 ADC25%、Ktrans 和 MAXslope 三个参数的诊断效能最佳，ROC 曲线下面积、灵敏度和特异度分别为 0.967，0.900 和 1.000。结论：ADC 和 DCE 对环形强化 GBM 和感染性病变均具有一定的鉴别能力，两者联合可显著提高鉴别诊断效能。

PU-0009

Aberrant structural-functional network topological coupling is associated with cognitive decline in patients with non-dialysis-dependent stage 5 chronic kidney disease

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Background: This study investigated the brain network topology and functional-structural coupling characteristics in patients with non-dialysis-dependent stage 5 chronic kidney disease (CKD 5ND) and the correlation between network topological changes and cognitive scores.

Methods: We prospectively performed diffusion tensor imaging and resting-state functional magnetic resonance imaging on 40 patients with CKD 5ND and 47 healthy controls (HCs). Graph theory analysis of functional connectivity (FC) and structural connectivity (SC) was performed. We analyzed the functional-structural coupling characteristics and the association between Montreal Cognitive Assessment (MoCA) scores and network topological characteristics.

Results: For SC, the small-worldness (Sigma), clustering coefficient (Cp), global efficiency (Eglob), and local efficiency (Eloc) were significantly lower in patients with CKD 5ND than HCs, while characteristic path length (Lp) and normalized characteristic path length (Lambda) were significantly higher in patients with CKD 5ND than HCs. For FC, the Sigma, normalized clustering coefficient (Gamma), Eglob, and Eloc were lower in patients with CKD 5ND than in HCs, while Lp was higher in the CKD 5ND group than in HCs. SC-FC coupling was greater in patients with CKD 5ND than in HCs. The functional (Cp, Eloc, Eglob) and structural network parameters (Sigma, Gamma, Eglob) of patients with CKD 5ND were positively correlated with MoCA scores, while Lp was negatively correlated with MoCA scores.

Conclusions: All patients with CKD 5ND exhibited changes in their structural and functional brain network topology that were closely related to mild cognitive impairment. SC-FC coupling was elevated in patients with CKD 5ND compared with HCs.

PU-0010

基于连边分析研究针刺对膝骨性关节炎患者脑功能连接的影响

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目的：探讨针刺治疗膝骨性关节炎（KOA）后患者静息态脑功能连接的变化，为临床针刺治疗KOA提供神经影像依据。**方法：**纳入KOA患者25例进行为期3周的针刺治疗，取犊鼻穴、血海、阳陵泉、足三里、三阴交、内膝眼、梁丘组穴配伍，每周5次，每次30分钟。采集KOA患者针刺前后的视觉模拟量表（VAS）、膝关节功能评分表（KSS）和头颅静息态功能MRI（rs-fMRI）数

据，应用连边分析方法描述 KOA 患者针刺后各脑区间功能连接（FC）的改变，并与临床评分作相关性分析。**结果：**针刺治疗后，KOA 患者 VAS 评分显著降低、KSS 评分显著升高（P 均＜0.001）。连边分析显示，KOA 患者针刺后右侧眶部额下回与左侧梭状回，右侧角回与左侧楔前叶、右侧中央前回，左侧岛盖部额下回与左侧丘脑，左侧中央后回与右侧角回、右侧颞上回的 FC 增强（P 均＜0.001）；相关性分析发现，右侧角回与右侧中央前回（r=0.540，P=0.008）、左侧中央后回与右侧颞上回（r=0.654，P=0.001）的 FC 变化与 VAS 变化呈正相关。**结论：**针刺可能通过正激活部分脑区间的功能连接，加强中枢镇痛区域间的联系来缓解 KOA 患者疼痛、改善膝关节运动障碍，这些脑区主要分布于默认模式网络、感觉运动网络、扣带岛盖网络。

PU-0011

基于 rs-fMRI 的抑郁症脑功能连接改变研究

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目的：抑郁症是一种情感障碍性疾病，发病机制复杂，目前其诊断和治疗均缺乏客观的标志物。静息态脑功能连接（ FC）是一种可靠的研究手段，被认为是找到抑郁症影像学客观标志物的重要技术路径。本研究尝试用静息态功能磁共振（rs-fMRI）的脑功能连接来探索抑郁症的脑功能连接改变，有望为抑郁症发病的神经影像机制提供理论支持。

方法：选择 2021 年 10 月至 2022 年 10 月在我院心理科就诊并确定为抑郁症的患者 15 例。同时招募年龄、性别匹配的健康志愿者 14 例作为对照组。15 例患者中最终有 14 例接受 HAMD、HAMA、贝克抑郁量表评估。患者组及健康对照组（HC）分别接受一次 rs-fMRI 扫描。采用基于种子点的 FC 方法，研究抑郁症组与 HC 组的后扣带皮层（PCC，DMN 种子点）、背外侧前额叶皮层（DLPFC，CCN 种子点）、亚属扣带皮层（sgACC，AN 种子点）与全脑体素的 FC 差异。将抑郁症的异常脑 FC 与 HAMD、贝克抑郁量表做相关性分析，探索抑郁症的异常脑 FC 与量表的关系。

结果：（1）共纳入抑郁症患者 15 例，其中有 14 例完成了全部的量表评估。以基于种子点的 FC 研究发现，抑郁症组与 HC 组相比（P<0.005），右侧 PCC 与双侧内侧额上回 FC 减弱；左侧 DLPFC 与右侧中央后回 FC 增强；右侧 sgACC 与左侧顶下小叶、左侧颞下回、左侧额中回 FC 增强。

（2）提取脑区的 FC 值与 HAMD 量表、贝克抑郁量表作相关性分析（P<0.05），结果发现抑郁症组右侧 PCC-左侧内侧额上回的 FC 值与 HAMD 量表评分呈中等程度负相关，相关系数 r=-0.59，P=0.02；右侧 sgACC-左侧颞下回 FC 值与贝克抑郁量表呈中等程度正相关,相关系数 r=0.57，P=0.03。

结论：抑郁症患者对比健康人群，存在异常的脑网络功能连接。相关性分析显示存在与症状严重程度相关的脑 FC，这为抑郁症发病的神经影像机制提供了新的数据支持。

PU-0012

3D-MPRAGE for evaluation on corpus callosum alterations in children with spastic cerebral palsy

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Objectives

To analyze the morphological changes of corpus callosum in children with spastic cerebral palsy using 3D-MPRAGE and to investigate the correlation between morphological indexes and gross motor (GMFM) function.

Methods

Sagittal T1WI-MPRAGE data were collected from 53 children with spastic cerebral palsy and 42 age- and gender-matched health controls prospectively, and the Gross Motor Movement (GMFM) scale was applied to assess the gross motor function. Independent sample t-test was used to compare the corpus callosum surface area, volume, maximum anterior-posterior diameter, median sagittal area (total area and area of I~V zone) between the two groups. Partial correlation analysis was performed to calculate the correlation between morphological indexes of the corpus callosum and GMFM scores with age as a covariate.

Results

① Children under 3 years of age: the corpus callosum surface area of children in the cerebral palsy group (3887.76±1250.34mm2) was lower than that of the control group (5582.29±1004.03mm2). The volume of the corpus callosum (6221.30±2918.77mm3) was lower than that of the control group (11642.08±2751.42mm3). The maximum anterior-posterior diameter of the corpus callosum (53.73±6.76mm) was lower than that of the control group (57.82±5.57mm) ($P<0.05$).

② Children over 3 years old: the corpus callosum surface area of children with cerebral palsy group (4866.67±1131.63mm2) was lower than that of the control group (6063.36±957.75mm2). The volume of corpus callosum (8118.39±2804.59mm3) was lower than that of the control group (13081.80±2919.82mm3). The maximum anterior-posterior diameter of the corpus callosum (55.12±5.81mm) was lower than that of the control group (59.93±5.78mm) ($P<0.05$).

③ Partial correlation analysis showed significant correlation between corpus callosum volume, maximum anterior-posterior diameter, and median sagittal area and gross motor score ($P < 0.05$) with age as a covariate.

Conclusion

The 3D-MPRAGE technique is useful for the comprehensive assessment of morphological alterations of the corpus callosum in spastic cerebral palsy. The corpus callosum volume, maximum anterior-posterior diameter and median sagittal area may become a neuroimaging reference for the assessment of motor development in cerebral palsy.

PU-0013

Diagnosis and differentiation of stable mild cognitive impairment and progressive mild cognitive impairment based on degree centrality and directed functional connectivity

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Background Stable mild cognitive impairment (sMCI) and progressive mild cognitive impairment (pMCI) were two subtypes of mild cognitive impairment (MCI). Early and effective diagnosis and differentiation between aMCI and pMCI were crucial for targeted early intervention and delay cognitive decline. The purpose of the study was to investigate the intrinsic dysconnectivity pattern of sMCI and pMCI based on degree centrality (DC) and directed functional connectivity (FC) to explore the common and specific neuroimaging mechanisms between sMCI and pMCI.

Method Resting-state functional magnetic resonance imaging combined with DC analysis was used to investigate FC density of 42 sMCI, 31 pMCI, and 82 healthy control (HC). Seed-based directed FC was conducted based on the significant clusters found in DC. Furthermore, partial correlation analysis was conducted between the altered DC and directed FC values and cognitive function. Lastly, receiver operator characteristic analysis was used to evaluate the accuracy of abnormal DC and directed FC values in distinguishing sMCI from pMCI.

Results Compared to HC, pMCI and sMCI both showed increased DC in the left inferior temporal gyrus, left posterior cerebellum lobe (CPL), and right cerebellum anterior lobe (CAL) and decreased DC in the left superior frontal gyrus. Moreover, compared to sMCI, pMCI showed increased FC from right CAL to left inferior temporal gyrus (ITG), which was associated with episodic memory and executive function. In addition, the FC from right CAL to right ITG can discriminated sMCI from pMCI with sensitivity, specificity, and accuracy of 0.5806, 0.9512, and 0.828, respectively.

Conclusions In conclusion, the current study revealed sMCI and pMCI existed common and specific changes on DC and directed FC, which involved in cognitive function. More importantly, the FC from right CPL to right ITG can be used to effectively discriminate sMCI from pMCI.

PU-0014

慢性肾脏病5期未依赖透析患者灰质形态改变、白质微结构损伤与认知功能障碍有关

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目的

采用高分辨结构MRI（sMRI）联合扩散张量成像（DTI）探讨慢性肾脏病5期未依赖透析患者（CKD5ND）灰质形态学、白质微结构随疾病进展的演变规律，与认知功能障碍评分间的关系。

方法

前瞻性分析2022年4月至2023年3月在首都医科大学附属北京友谊医院就诊的84例CKD5期患者的资料，其中CKD5ND 44例、慢性肾脏病5期维持性透析患者40例（CKD-MHD组），另同期纳入与CKD5ND患者年龄、性别和受教育程度相匹配的健康人40名（HC组）。采集所有受试者的sMRI、DTI数据和认知功能障碍评分。使用Freesurfer工具包和PANDA工具包分别对sMRI和DTI数据进行预处理并处理相关参数。采用单因素协方差分析比较3组被试功能灰质形态学参数（表面厚度、大脑的灰质表面积、厚度、体积及皮质曲率）和白质微结构（FA、FD、MA、MD）的差异，采用Spearman相关性分析评估形态学参数和白质微结构的异常与认知共振障碍评分之间的相关性。

结果

与HC组相比，CKD5期患者从CKD5ND到CKD-MHD阶段，其灰质形态学和白质微结构均表现为渐进性破坏，但白质微结构较灰质形态学破坏更加明显（$P<0.001$）。CKD5ND患者白质微结构的破坏与其认知功能障碍评分具有显著负相关性（$P<0.05$，错误发现率矫正），仅大脑的灰质体积与其认知功能障碍评分具有显著负相关性（$P<0.05$，错误发现率矫正）；而CKD-MHD患者的白质微结构的破坏与其认知功能障碍评分具有显著负相关性（$P<0.05$，错误发现率矫正），同时，表面厚度、大脑的灰质表面积、厚度、体积等参数与认知功能障碍评分具有显著负相关性（$P<0.05$，错误发现率矫正）。

结论

CKD5期患者灰质形态和白质微结构均表现为随疾病进展的渐进性破坏，但CKD-MHD组灰质和白质破坏范围均较CKD5ND患者更广泛，且与认知功能障碍评分显著相关。

PU-0015

Histogram model of DCE-MRI in predicting progression of enhancing non-measurable disease after chemoradiotherapy in high-grade glioma

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Objectives

To investigate the potential of histogram models based on volume transfer constant (K^{trans}) between the plasma and extravascular extracellular space and extravascular volume (Ve) in predicting the progression of enhancing non-measurable disease (NMD) persisting after chemoradiotherapy following gross total resection in high-grade glioma (HGG) patients.

Methods

Dynamic contrast-enhanced MR images of patients who underwent temozolomide-based chemoradiation after gross total resection from January 2016 to May 2022 were analyzed retrospectively. The histogram features of K^{trans} and Ve of enhancing NMD were extracted and compared between the progression and non-progression groups. Histogram features with significant differences were included in binary logistic regression to construct histogram models of K^{trans} and Ve to predict progression in 2-3 months. Receiver operating characteristic curves were used to evaluate the prediction performance of different models (K^{trans}, Ve, and K^{trans} + Ve).

Results

A total of 89 HGG patients (mean age ± standard deviation, 47.1 years ± 12.1; 67 men) were enrolled, including 50 in the progression group and 39 in the non-progression group. The histogram model of K^{trans} (10th percentile + 90th percentile + skewness) showed an area under the curve (AUC) of 0.927 in predicting progression. The model of Ve (10th percentile + minimum + skewness) had an AUC of 0.917. Combining K^{trans} and Ve, the model (Ve_10th percentile + Ve_skewness + K^{trans}_ root-mean-squared) had an AUC of 0.953.

Conclusions

The histogram models based on K^{trans} and Ve can predict the progression of enhancing NMDs in HGG following chemoradiotherapy 2-3 months in advance.

PU-0016

基于多模态磁共振探索血液透析患者伴认知障碍的灰质体积及灰质脑血流量的时空变化

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目的：利用基于体素形态学分析、动脉自选标记和静息态功能磁共振成像研究维持性血液透析患者大脑结构、灌注和功能的变化，并探索 MRI 指征与认知障碍之间的关系。

方法：这项研究包括 27 名维持性血液透析(hemodialysis, HD)患者和 30 名健康对照受试者(healthy control, HC)。患者在基线和维持性 HD 治疗约 1 年后分别进行了影像学检查，HC 仅在基线时进行了影像学检查。将 HD 患者基线和随访时的灰质体积(gray matter volume, GMV)和脑血流量(cerebral blood flow, CBF)分别进行配对 t 检验定量比较。然后，以 GMV 和 CBF 同时发生变化的脑区为种子点，进行基于体素的全脑功能连接分析(functional connectivity, FC)。接着，将 HD 患者基线和随访时的 GMV、CBF 和 FC 分别与 HC 进行双样本 t 检验定量比较。最后，进行组间相关性分析，探索 MRI 指标与 MoCA 评分之间的关系。

结果：与 HC 相比，基线 HD 患者的 GMV 显著降低，随访 HD 患者的某些区域与基线 HD 患者相比，GMV 进一步显著降低，特别是在双侧额内侧上回、双侧额背外侧上回和双侧补充运动区。与 HC 相比，基线 HD 患者表现出轻微的 CBF 异常，但随访 HD 患者的一些区域表现出显著降低的 CBF，包括双侧额上回、双侧额背外侧上回、两侧颞中回、双侧颞上回和右额中回。以两侧的内侧额上回(SFG.med)为种子点，两侧的 SFGmed 分别与对侧的额中回和内扣带回之间的功能连接增加。最后，随访 HD 患者双侧 SFG.med 体积的减少与 MoCA 评分的减少呈正相关（r=0.332, P=0.013）。

结论：维持性 HD 患者在结构、灌注、功能三种模态下都存在脑损伤；HD 本身可能会加重患者的脑损伤；内侧额上回可能是 HD 伴认知障碍的关键脑区。

PU-0017

多静息态功能磁共振神经成像指标定位儿童癫痫活动的对比研究

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目的　本研究通过偏最小二乘法回归（PLS）整合 42 个 rs-fMRI 指标，提出一种新的癫痫活动灶定位方法 PLS1，对比观察 PLS1、各 rs-fMRI 指标相比 EEG-fMRI 定位儿童失神癫痫(CAE)和 Rolandic 癫痫的癫痫活动灶的能力，以及 PLS1 和 EEG-fMRI 分类 CAE、Rolandic 癫痫及正常儿童的能力。

方法　回顾性分析 CAE 患儿 30 例，Rolandic 癫痫患儿 60 例的 EEG-fMRI，以及 100 例正常儿童的 rs-fMRI 数据。计算各患者组与对照组的 rs-fMRI 指标，共 42 个，包括不同频段的 ALFF、fALFF、ReHo、DC、Local/Long FCD、Hurst 指数、GCD 相关指标，RSLA、HRF 相关指标。采用 GLM 获得两类癫痫 IEDs 相关 BOLD 激活。使用 PLS 将个体 42 个 rs-fMRI 指标和组水平癫痫激活联系起来，获得和癫痫 IEDs 相关激活最相关的癫痫成分 PLS1。使用 Dice 系数观察 PLS1 和 rs-fMRI 指标与 EEG-fMRI 的耦合程度以评估癫痫灶定位能力。最后评估 PLS1 和 EEG-fMRI 指标 CAE、Rolandic 癫痫以及正常儿童的分类能力。

结果　使用 PLS 回归分析分别得到的 CAE 组 PLS1 和 Rolandic 癫痫组 PLS1 均表现出与相应 EEG-fMRI 高度相似的空间分布模式。个体水平上，在 CAE 组中，PLS1 的 dice 系数显著高于所有的 rs-fMRI 参数。在 Rolandic 癫痫中，PLS1 的 dice 系数显著高于大多数 rs-fMRI 参数。使用 PLS1 和 EEG-fMRI 分类 CAE 以及 Rolandic 癫痫时，PLS1 分类效果高于 EEG-fMRI，此外，PLS1 在分类两类癫痫与正常儿童时也具有很高的分类能力。

结论　所提出的 PLS1 方法有可能作为一种有效可靠的神经成像生物标志物来定位儿童失神癫痫和 Rolandic 癫痫的癫痫灶。

PU-0018

急性创伤后早期脑结构网络小世界属性的磁共振研究

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目的：基于磁共振弥散张量成像(diffusion tensor imaging, DTI)采用图论方法探讨急性创伤后早期脑结构网络拓扑属性，分析小世界属性的变化及其意义。方法：创伤组收集 31 例交通事故受害者， 健康对照组来自同期在社会上招募的年龄、性别、受教育程度与创伤组相匹配的 31 例健康者， 2 组受试者均进行临床数据和 MRI 数据采集，创伤组的数据采集在经历交通事故后 1 周内进行。所得 DTI 数据构建结构网络，分析脑结构网络属性。结果：创伤组与对照组大脑结构网络均具有小世界属性。创伤组 σ 值、γ 值与对照组相比显著升高。结论：急性创伤后早期脑结构网络具有小世界属性，其网络拓扑属性发生改变。

PU-0019

中枢神经细胞瘤 fMRI 表现及 ADCmin 值与 Ki-67 相关性分析

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目的：通过中枢神经细胞瘤（central neurocytoma，CNC）的常规及功能磁共振特征，提高影像诊断准确率，并对 ADC 值与 Ki-67 进行相关性分析，确定 ADCmin 值与 CNC 增值活性的关系。方法：回顾性分析 13 例经手术病理证实中枢神经细胞瘤患者磁共振和病理资料，并通过分析 ADC 值与 Ki-67 表达相关性,确定 ADCmin 值与 CNC 增值活性的关系。结果：12 例典型 CNC 位于透明隔孟氏孔区，WHO II 级，1 例非典型 CNC 主体位于右侧侧脑室后角，颅内及脊髓多发播散，WHO III 级。CNC 形态不规则，均呈分叶状（13/13），以宽基底附着透明隔（11/13）；并发脑积水（10/13）。肿瘤内显示血管流空信号（9/13），囊变（13/13）。DWI 均为高信号（12/12），ADCmin（0.708±0.221×10-3mm2/s）；SWI 均出现低信号（10/10）；PWI 均呈高灌注（10/10），增强扫描轻度强化（6/13）、中度强化（7/13）。10 例行 MRS 检查显示 Cho 峰升高，NAA 峰降低，Cho/NAA（7.1±3.9）及 Cho/Cr（4.4±1.6）比值均增高，Gly/MI 峰升高（8/10）。ADCmin 与 Ki-67 表达具有相关性，P<0.05，相关系数 R2 为 0.618。结论：中枢神经细胞瘤为富血供肿瘤，其位置及影像表现具有一定特征，ADCmin 值与 CNC 增值活性呈正相关，对 CNC 术前诊断及评估提供一定帮助。

PU-0020

Topographical information-based high-order functional connectivity improves diagnostic efficacy in Parkinson's disease

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Objective: To investigate whether topographical information-based high-order functional connectivity (tHOFC) improves the diagnostic efficacy of patients with Parkinson's disease (PD) over conventional functional connectivity (FC), and to explore the underlying pathological mechanisms of PD.

Materials and Methods: Data from two independent centers were included in this study, one as a primary set to train the model and the other as an independent external validation set to validate the model. The resting-state functional MRI data were used to construct the Shen 268 atlas-based FC and tHOFC, respectively. The t-tests and least absolute shrinkage and selection operator (LASSO) were used to perform feature selection, and support vector machine (SVM) was used to construct the classification model, and then we compare the performance of FC and tHOFC-based models. Our results were further validated with automatic anatomical labeling (AAL) 90 atlas. We selected the tHOFC features with a frequency of more than two-thirds in the cross-validation as "discriminative features" and calculated their correlation with clinical symptom scores of patients with PD.

Results: There were no significant differences between patients with PD and HCs in demographic characteristics in the primary and independent external validation sets. We found differences both in FC and tHOFC between patients with PD and healthy controls, with good classification performance for both FC-based (primary set: accuracy = 87.14%, AUC = 0.889; validation set: accuracy = 56.67%, AUC = 0.613) and tHOFC-based (primary set: accuracy = 87.14%, AUC = 0.925; validation set: accuracy = 63.33%, AUC = 0.684) models. Similar results were found when the above analysis was repeated using the AAL 90 atlas. We found tHOFC abnormalities inter and/or intra the default mode network, frontoparietal network, sensorimotor network, visual network, subcortical network, and cerebellar network in patients with PD. Spearman's partial correlation analysis showed that "discriminative features" were associated with PD symptom scores ($P < 0.05$).

Conclusions: The tHOFC-based model outperformed the FC-based model and the results were reproducible and generalizable. PD was associated with abnormal tHOFC inter and/or intra the default mode network, frontoparietal network, sensorimotor network, visual network, subcortical network, and cerebellar network.

PU-0021

Association between cerebral blood flow and iron deposition alteration in patients with hemodialysis

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Purpose: Hemodialysis (HD) is the most common alternative therapy for patients with end stage renal disease by removing waste products such as uremic toxins and excess water from the blood. This study aimed to analysis the correlation between the cerebral blood flow (CBF) and iron deposition alteration in patients with HD.

Materials and Methods: Thirty HD patients and 36 healthy controls (HCs) were prospectively recruited. All subjects were scanned using a 3T MRI to acquire pseudo-continuous arterial spin labeling (pCASL) sequence and strategically acquired gradient echo (STAGE) sequence. The relative values of cerebral blood flow (rCBF) of the whole brain was measured using SPM8. Automatic measurements of magnetic susceptibility values (MSV) of bilateral caudate nucleus (CN), putamen (PUT), globus pallidus (GP), thalamus (THU), substantia nigra (SN), red nucleus (RN) and dentate nucleus (DN) on quantitative susceptibility mapping (QSM) images reconstructed from the STAGE data was done using the signal processing in nuclear magnetic resonance (SPIN) software. All CBF data and MSV data was compared between groups using two-sample t tests. Partial correlation analysis was used to assess correlations between the rCBF data and MSV in the HD group, with gender, age and education level as covariates. A statistically significant P-value was set at 0.05.

Result: Demographic characteristics as shown in Table 1. Compared with the HC group, the HD group exhibited lower rCBF in the bilateral THU and PUT (Table 2, Figure 1) and lower MSV in the bilateral PUT, right THU, right SN, bilateral RN and right DN (Table 3) ($P < 0.05$, FDR corrected). The partial correlation analysis showed that there was no significant correlation between the CBF and MSV in the right THU and bilateral PUT in patients with hemodialysis.

Conclusion: The cerebral blood flow decreased, and the iron deposition increased in patients with hemodialysis, but there was no significant correlation between the CBF and iron deposition alteration.

PU-0022

DCE 灌注成像对胶质瘤 IDH 突变、1p/19q 完整状态及 MGMT 甲基化状态的鉴别

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目的：本研究将通过分析不同分子分型的脑胶质瘤 DCE 灌注参数，研究 DCE 灌注成像在鉴别不同分子亚型胶质瘤中的作用，以期为临床提供一种无创检测胶质瘤基因表达的技术手段。方法：搜集本院 WHO II 级及 III 级胶质瘤患者 30 例纳入前瞻性性研究，术前进行常规 DCE 灌注扫

描，术后石蜡标本进行基因检测，独立样本 T 检验或 Mann-Whitney U 检验用于比较不同分子分型的灌注参数是否存在差异。结果：经 Mann-Whitney U 检验得出，显示 IDH 野生型的 Ve 值(median, 0.930)高于突变型(median, 0.275) (P = 0.0486)，Ktrans, Vep, Vp 在 IDH 野生型及突变型间无明显差异，P 值分别为 0.1838, 0.6767, 0.8604。1p/19q 缺失组 Vp 值(0.1589)高于 1p/19q 完整组(0.07206) (P = 0.0079)，而 Ktrans, Kep,Ve 值在两组中差异无统计学意义。II 级胶质瘤中，1p/19q 缺失组 Vp 值高于 1p/19q 完整组(P = 0.004)，Ktrans, Kep,Ve 值在两组中差异无统计学意义。III 级胶质瘤中，组间各灌注参数值均无差异。MGMT 甲基化的 Kep 值(median 1.36)显著小于 MGMT 未甲基化组(median 4.68) (P = 0.018)；MGMT 甲基化的 Ve 值,Vp 值(median 0.88，0.43)大于未甲基化组(median 0.47, 0.17)，P 值分别为 0.008, 0.05；而两组间的 Ktrans 值无明显差异。结论：DCE 灌注成像的各个参数可不同程度地鉴别胶质瘤的 IDH1 突变，1p/19q 缺失及 MGMT 甲基化状态。

PU-0023

Topological abnormality of structural covariance network in MRI-negative frontal lobe epilepsy

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Background: Frontal lobe epilepsy (FLE) is the second most common type of focal epilepsy, however, imaging studies of FLE have been far less than temporal lobe epilepsy (TLE) and the structural findings were not consistent in previous literature[1-3]. Graph theory based structural covariance network (SCN) of cortical thickness has been applied to investigate in various central nervous system disorders , and considered a promising tool in investigating the brain network alterations in epilepsy, but it was rarely used in FLE patients.

Object：Investigate the changes in cortical thickness in patients with FLE and the alteration of the structural covariance networks (SCNs) of cortical thickness with graph-theory.

Method: Thirty patients with FLE (18 males/12 females; 28.33 ± 11.81 years) and 27 demographically matched controls (15 males/12 females; 29.22 ± 9.73 years) were included in this study. Structural images were acquired with a three-dimensional turbo fast echo (3D-TFE) T1WI sequence with high resolution. The cortical thickness (CT) was determined. Graph Analysis Toolbox (GAT) was used to construct the SCNs based on CT[4]. A linear regression analysis was conducted for each cortical region to adjust the effect of age and gender, so that the corrected cortical thickness was obtained to construct SCN. According to the Desikan-Killiany Atlas[5], a 68 × 68 correlation matrix was established for each group by calculating Pearson correlation coefficients between interregional corrected CT values. Both global and regional topological parameters were analysed and the network hubs were calculated.

Result: Cortical thickness was not significantly different between two groups. Compared to HC group, both the characteristic and normalized path length of FLE group were significantly longer, and the mean node betweenness was also significantly higher in FLE group (Fig 1). Compared to HC group, both the normalized clustering and local efficiency of right precentral gyrus were significantly higher, and that of right temporal pole were significantly

lower in FLE ($p<0.05$ with FDR correction), as shown in Fig 2. Hubs determined for HC group network included left inferior temporal gyrus, left medial orbito-frontal gyrus, bilateral precuneus gyri, and superior frontal gyrus. Hub number for FLE group was reduced, which included left inferior parietal gyrus, right inferior parietal gyrus, and left supramarginal gyrus. Comparing to HC group, network hubs were decreased and shifted away from frontal lobe, as shown in Fig 3.

Conclusion: The topological properties of cortical thickness covariance network were significantly altered in patients with FLE, even without obvious surface_x0002_based morphological damage. Graph-theory based SCN analysis may provide sensitive clues for FLE structural alterations.

PU-0024

Changes in sensory-related brain networks of patients with moyamoya disease with limb paresthesia: A resting-state fMRI-based functional connectivity analysis

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This study’s aim was to investigate functional brain connectivity changes among patients with moyamoya disease(MMD) with limb paresthesia, using functional connectivity analysis based on resting-state functional magnetic resonance imaging (rs-fMRI). A total of 181 patients with MMD were enrolled, including 57 with left limb paresthesia (MLP group), 61 with right limb paresthesia (MRP group), and 63 without paresthesia (MWP group). Encephaloduroarteriosynangiosis (EDAS) was performed in 20 of the 57 patients with left limb paresthesia and 15 of the 61 patients with right limb paresthesia. Twenty-nine age- and sex-matched healthy controls (HC group) were recruited during the same period. All participants underwent rs-fMRI examination, and the patients treated with EDAS were re-examined 3–4 months after the surgery. After data preprocessing, we selected Brodmann area 3 on each side of the brain as the seed region to construct a functional connectivity network of the whole brain, and then we analyzed the differences in functional connectivity between the HC group, MWP group, MLP group, and MRP group. The functional connectivity of Brodmann area 3 (on either side) with the ipsilateral frontal (superior frontal gyrus, middle frontal gyrus, and inferior frontal gyrus) and parietal (supramarginal gyrus, angular gyrus, and superior parietal lobule) cortices was increased among patients with MMD. The functional connectivity enhancement in these brain regions was broader and greater in patients with contralateral limb paresthesia than in patients without paresthesia, and the regions with functional connectivity changes were roughly distributed symmetrically among the MLP group and the MRP group. There were no changes 3–4 months after EDAS in the increased functional connectivity between the frontal and parietal cortices and Brodmann area 3. Limb paresthesia in patients with MMD may be driven by abnormal functional connectivity in the frontal and parietal cortices. Functional changes in associated brain regions may be a target for evaluating the severity of MMD and its response to treatment.

PU-0025

小脑发育不良性神经节细胞瘤的影像表现与临床特征

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目的： 探讨小脑发育不良性神经节细胞瘤的 CT、MRI 影像学特点，同时分析患者的临床治疗、预后以及与 Cowden 综合征的关系，从而提高对本病的认识及鉴别诊断。方法： 回顾性分析经手术病理确诊的 7 例小脑发育不良性神经节细胞瘤的临床及影像学资料，确定术前肿瘤的部位、大小、影像学特点及强化方式等，并结合患者的临床资料判断是否诊断 Cowden 综合征。结果： 7 例患者中 2 例同时累及左侧小脑半球、小脑蚓部及桥小脑结合臂，1 例位于左侧小脑半球及小脑扁桃体，1 例位于左侧小脑半球，3 例位于右侧小脑半球。其中 1 例 CT 显示明显钙化，7 例 T1WI 均表现为层状等、低信号，T2WI 呈层状等、高信号，6 例呈明显“虎斑征”改变，增强 MRI 显示 4 例呈条纹状轻度强化。随访中 2 例患者出现肿瘤复发、1 例诊断 Cowden 综合征。结论： 小脑发育不良性神经节细胞瘤影像学表现特征性“虎斑征”， 多数呈轻度条纹状强化，预后良好，术前全面检查有助于做出 Cowden 综合征诊断。

PU-0026

基于表面的形态学测量原发性痛经磁共振脑结构研究

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目的:原发性痛经(Primary dysmenorrhea，PDM)是育龄期最常见的妇科疾病之一。既往研究表明，PDM 患者存在脑结构和功能的异常，本研究旨在探讨 PDM 患者与健康对照(Healthy controls,HCs)患者脑结构网络(Structural brain networks,SBNs) 的异常及其协方差模式。方法:本研究基于 41 例 PDM 患者和 35 名健康对照(HCs)的 T1 结构像数据，采用基于表面的形态学测量(surface-based morphology,SBM)技术研 PDM 患者和 HCs 的异常 SBNs。采用多元经典交互线性模型分 PDM 组与 HCs 组之间协方差模式的差异。结果:与 HCs 相比，PDM 患者的 SBNs 包括颞叶网络(主要位于杏仁核、颞极、中颞叶和下颞叶)、默认网络(主要位于后扣带回、楔前叶、海马和海马旁)和丘脑网络存在异常（P<0.001）。在全脑 SBNs 中，我们还发现 PDM 患者的颞叶网络和丘脑网络之间存在异常的灰质体积（Gray matter volume，GMV）耦合。结论:脑结构异常可能与 PDM 相关的疼痛感知和调节障碍有关。此外，本研究发现 PDM 患者颞叶网络和丘脑网络之间的相互作用，希望这项研究结果有助于更好地理解 PDM 患者的病理生理。

PU-0027

Global signal regression improves model performance of connectome-based predictive modeling

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Objectives: To investigate whether global signal regression (GSR) can improve the model performance of connectome-based predictive modeling (CPM) in predicting behavioral indicators (multi-domain IQ and age).

Methods: A total of 187 healthy subjects were collected, and all volunteers underwent MRI scans and clinical behavioral assessments, including full-scale IQ (FIQ), performance IQ (PIQ), verbal IQ (VIQ) and age. The DPABI software was used for fMRI data preprocessing, in which the regression covariates were treated with GSR and without GSR (GSRwithout), and different brain atlases were used to segment brain regions to construct functional connectivity (FC) matrices, which were used to construct CPM model to predict age, FIQ, PIQ and VIQ.

Results: Finally, 159 volunteers were included in this study. When using GSR data, and Brainnetome 246 atlas was used to construct CPM (positive and negative network models and general linear model) to predict FIQ, PIQ, VIQ and age, we found that all models could predict the corresponding indicators well (all $P < 0.05$), while using GSRwithout data and the Brainnetome 246 atlas, except for the negative network model, general linear model of PIQ, and the positive, negative network models and general linear model of age (all $P < 0.05$), the remaining models were not significant (all $P > 0.05$). The GSR-based models outperformed the GSRwithout-based models. The above analysis was repeated after the subjects' head motions were controlled, and the same results were found. The above analysis was repeated using the Shen 268 atlas to verify the above results, we found similar results.

Conclusions: This study applied multi-atlas, multi-model approach and multi-behavioral measurements prediction to show that GSR can improve the predictive performance of CPM, at least for FIQ, PIQ, VIQ, and age.

PU-0028

右侧扣带回与帕金森病患者步态和认知功能障碍的相关性研究

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目的：本研究旨在通过高角度分辨率扩散成像(HARDI)评估帕金森病(PD)患者扣带回纤维束的变化，并探讨平均各向异性(FA)值与心理行为学指标及步态指标的相关性。

方法：24 例 PD 患者和 29 例健康志愿者(HC)纳入本研究。对于每个参与者，在 3.0TMRI 扫描仪上用采集 HARDI 序列及 MPRAGE 高分辨 3D 结构像。利用 Mrtrix3 软件进行扩散加权数据预处理，利用方向分布函数追踪 PD 患者的主要神经纤维束，并进行了自动化纤维定量分析。采用 20 英尺长的计算机化 Zeno 步道步态评估毯进行客观的步态评估，量化步速、步幅、步幅时间和步

频，以自我选择步速(SSP)和快步速(FP)进行评估。定量记录 PD 患者服用左旋多巴类药物开期（ON）和关期（OFF）状态下的步态和临床指标。比较 PD 组与 HC 组的临床指标特点、步态特点及白质纤维束特点，分析 FA 值与心理行为学指标及步态指标的相关性。

结果：右侧扣带回的 34-58 段纤维束的 FA 值与简易精神状态检查(MMSE)、Berg 平衡量表(BBS)-OFF 期、BBS-ON 期的得分呈正相关；与 MDS-UPDRS-III-ON 期得分呈负相关。在步态指标的分析中，在 ON 和 OFF 两期，FA 值与步频和节奏域的速度、步频和步幅时间均显著相关(P＜0.05)。

结论：使用 HARDI 数据可以获得详细而准确的右侧后扣带回节段性纤维，可以为 PD 的治疗提供了重要而具体的神经影像学信息与临床心理行为学评估方法。HARDI 结合神经认知和步态评估可能是诊断帕金森病步态和认知障碍的有价值的神经影像学及生物学标志物。

PU-0029

针刺治疗膝骨性关节炎患者的脑结构 MRI 研究

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目的 基于体素的形态学测量（voxel-based morphometry, VBM）探讨膝骨性关节炎（KOA）患者在针刺治疗前后的脑灰质体积改变，进而分析其针刺疗效机制。方法 前瞻性纳入 30 例 KOA 患者，对 KOA 患者行针刺治疗，并在针刺治疗前后进行 VAS、SAS、SDS、MOCA 相关评分量表评估及高分辨率 T1WI 像扫描。采用 VBM 方法分析针刺治疗前后 KOA 患者脑灰质结构差异，分析其与评估量表结果间的相关性。结果 针刺治疗后 KOA 患者对疼痛、焦虑、抑郁均有缓解（P<0.001），认知功能有所提高（P<0.001）。治疗后灰质体积增加的脑区包括左侧舌回、左侧脑岛；灰质体积减少的脑区包括左侧枕中回、中央旁小叶（体素水平 P<0.001，团块水平 P<0.05）。结论 针刺治疗可以明显缓解 KOA 患者的临床症状，同时发现 KOA 患者治疗后多个脑区结构改变，因此推测针刺疗效可能是通过大脑多个脑区相互作用而实现。

PU-0030

异机融合 11C-蛋氨酸 PET/ MR 成像在脑胶质瘤初诊和治疗后评估中的价值研究

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目的 探讨异机融合 ^{11}C-MET PET/MR 成像在疑似原发性和残留/复发性脑胶质瘤患者中的诊断价值，并与 ^{11}C-MET PET/CT 或 MRI 相比较。方法 回顾性分析 2019 年 6 月至 2022 年 12 月于武汉大学人民医院行异机融合 ^{11}C-MET PET/MR 的 65 例疑似原发性或残留/复发性复发性脑胶质瘤的患者资料，其中疑似脑胶质瘤的初诊患者共 41 例，既往接受过脑胶质瘤手术/放射治疗后现疑似肿瘤复发残留/复发患者共 24 例。评估 PET 和 MR 图像特征，测量并计算病灶的半定量指标。采用卡

方检验比较 3 种影像技术在诊断原发性和术后残留/复发性肿瘤的诊断性差异。采用非参数检验比较组间 PET/MR 图像特征及半定量参数的差异。结果 初诊组 ^{11}C-MET PET/MR 诊断的灵敏度(91.7%)明显高于 MRI(66.7%，P<0.05);特异性(94.1%)高于 ^{11}C-MET PET/CT (64.7%)(P<0.05);准确性(92.7%)高于 ^{11}C-MET PET/CT (75.6%)或 MRI(73.2%)(P<0.05)。复诊组中 ^{11}C-MET PET/MR 诊断的灵敏度(100%)高于 MRI(66.7%)(P<0.05);特异性(88.9%)高于 ^{11}C-MET PET/CT(66.7%)(P<0.05);准确性(95.8%)高于 ^{11}C-MET PET/CT(79.2%)或 MRI(70.8%)(P<0.05)。复诊组组间的 SUVmax、MTV、T/N、CBF 和 Cho/NAA 的差异有统计学意义(P<0.05)。结论 异机融合 ^{11}C-MET PET/MR 在诊断原发性或残留/复发性脑胶质瘤病灶方面具有重要价值，其诊断效能高于 ^{11}C-MET PET/CT 或 MRI 单独应用。

PU-0031

核医学脑血流灌注显像参数映射在抑郁症早期诊断研究进展

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本综述旨在探讨脑血流灌注显像参数映射在早期抑郁症诊断中的研究进展。近年来，核医学脑血流灌注显像技术（如 SPECT 和 PET）在抑郁症的早期诊断中得到了广泛关注。通过对脑血流灌注参数（如血流量、血容量和平均通过时间）的定量分析，可以揭示抑郁症患者脑内局部血流灌注的异常，为抑郁症的早期诊断和病因研究提供重要线索。本综述首先介绍了脑血流灌注显像的基本原理和参数映射方法，然后重点讨论了参数映射在抑郁症早期诊断中的应用价值和研究进展，最后对未来的发展方向进行了展望。

PU-0032

基于拓扑信息的高阶功能连接可提高帕金森病诊断效能

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目的：探讨基于拓扑信息的高阶功能连接（tHOFC）是否较常规功能连接（FC）能提高帕金森病（PD）的诊断效能，并探讨 PD 潜在的病理机制。

材料与方法：应用两个独立中心的数据，发现队列用来训练模型，另一个作为独立外部验证队列验证模型性能。使用静息态功能磁共振数据分别构建基于 Shen 268 脑图谱的 FC 及 tHOFC。采用双样本 t 检验及最小绝对收缩和选择算子 算法进行特征选择，分类器使用支持向量机构建，比较基于 FC 及 tHOFC 模型的性能。使用自动解剖标记（AAL） 90 脑图谱进一步验证我们的结果。我们选择在交叉验证中出现频率大于 2/3 的 tHOFC 特征作为“判别特征”并计算其平均权重及其与 PD 患者临床症状评分相关性。

结果：我们发现 PD 患者和健康对照间 FC 及 tHOFC 均存在组间差异，基于 FC（发现队列：准确率为 87.14%，AUC 为 0.889；独立外部验证队列：准确率为 56.67%，AUC 为 0.613）及基于 tHOFC（发现队列：准确率为 87.14%，AUC 为 0.925；独立外部验证队列：准确率为 63.33%，AUC 为 0.684）的模型均具有良好的分类性能。使用 AAL 90 脑图谱重复上述分析发现类似的结果。我们发现 PD 患者默认模式网络、额顶网络、感觉运动网络、视觉网络、皮层下网络及小脑网络间和（或）网络内存在 tHOFC 异常。Spearman 偏相关分析显示“判别特征”与 PD 症状评分相关（P＜0.05）。

结论：基于 tHOFC 的模型性能优于基于 FC 的模型，并且结果具有较好的可重复性及泛化性。PD 可能与默认模式网络、额顶网络、感觉运动网络、视觉网络、皮层下网络、小脑网络间和（或）网络内异常 tHOFC 相关。

PU-0033

Multimodal neuroimaging data reveal intelligence-specific neurobiological correlates

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Objectives : To investigate whether connectome-based predictive modeling (CPM) based on multimodal neuroimaging data can improve the performance of intelligence prediction models, and to explore the underlying neurobiological mechanisms of intelligence.

Methods : Data from two independent centers were included in this study. Dataset 1 included 159 healthy subjects, and the collected clinical data included full-scale intelligence quotient (FIQ), performance IQ (PIQ), and verbal IQ (VIQ) scores. Dataset 2 included 550 healthy subjects, and behavioral data included Combined Raven Intelligence Test (CRT), Baker Depression Inventory (BDI), State Anxiety (SAT) and Trait Anxiety (TAT) scores. All subjects' MRI data were post-processed to obtain amplitude of low-frequency fluctuations (ALFF), degree centrality (DC), regional homogeneity (ReHo) and voxel-mirrored homotopic connectivity (VMHC) maps, and Brainnetome 246 and Shen 268 atlases were used to construct functional connectivity (FC) matrices and extract image features. Positive and negative network models and general linear model were constructed with classical CPM method using FC data, and the combination model (general linear models) was constructed using multimodal data (FC, ALFF, DC, ReHo, and VMHC) to predict FIQ scores. The intelligence-related networks and brain regions identified by FIQ were further used to build models to predict sub-domain IQ (PIQ and VIQ), other intelligence scale score (CRT), and non-intelligence scores (BDI, SAT, and TAT).

Results : When using the Brainnetome 246 atlas, the classical FC-based models could predict FIQ score well (both $P<0.001$), and the combination model based on multimodal data outperformed either classical models. Similar results were found when the above analyses were repeated after controlling head motions and using the Shen 268 atlas. Based on FC data, the brain functional networks related to intelligence mainly included intrafrontal, frontoparietal, frontotemporal and temporoparietal networks, while based on ALFF, DC, ReHo and VMHC data, intelligence-related brain regions include bilateral inferior frontal gyrus and the left superior parietal lobule. Our models constructed with the intelligence-related networks and brain regions identified by FIQ could predict PIQ, VIQ, and CRT scores well (all $P < 0.001$), but not BDI, SAT, and TAT scores (P were 0.15, 0.06, and 0.37, respectively).

Conclusions : Multimodal neuroimaging data can improve the performance of intelligence prediction model. Intelligence has specific related functional networks and brain regions, intelligence is mainly related to frontoparietal, frontotemporal and temporoparietal networks.

PU-0034

血清尿酸相关脑功能连接对 DBS 治疗帕金森病术后疗效的预测作用

常博文
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目的：尿酸是一种天然抗氧化剂，与神经功能的保护息息相关，也与帕金森病的发生发展有密切关系。本研究旨在探索与血清尿酸水平相关的脑功能链接对脑深部刺激术（DBS）治疗帕金森病（PD）术后疗效的预测作用。

方法：纳入 32 名 PD 患者，31 名正常对照组。采集 PD 患者及正常对照组的血清尿酸数值、临床量表、多模态功能核磁共振数据（fMRI）。并对 PD 患者 DBS 术一年进行随访。分析比较血清尿酸水平对 DBS 治疗 PD 术后疗效的影响。通过 fMRI 数据分析与血清尿酸相关的 ALFF、 ReHo 指标，分析得出相关脑区，通过相关脑区构建异常脑功能链接，并据此分析血清尿酸相关脑功能连接对 DBS 治疗 PD 术后疗效的预测作用。

结果：通过分析我们发现血清尿酸水平与 PD 患者 DBS 术后 1 年运动症状呈非线性关系。随着尿酸水平下降到转折点 294 μmol/L, UPDRS-III 评分改善率在停药期下降。然而，当 UA 水平≥294 μmol/L 时，预测的剂量-反应曲线符合水平线。同样，当尿酸水平水平降低到转折点 289.2 μmol/L 时，UPDRS-III 在给药期间的改善率急剧下降。通过对 PD 患者的 fMRI 分析，164 个脑区中有 25 个脑区的 ALFF 值与尿酸值相关；164 个脑区中有 12 个脑区的 ReHo 值与尿酸值相关。以 ALFF 值和尿酸显著相关的 25 个脑区和 2 个脑区的 ReHo 值作为 ROI，计算 ROI wise 的功能连接（FC）值。对 DBS 术后 1 年患者的运动症状改善有良好预测作用。

结论：血清尿酸水平与 PD 患者 DBS 术后疗效呈非线性相关性。血清尿酸相关脑功能连接对 DBS 治疗帕金森病术后疗效的有良好预测作用。

PU-0035

高阶静息态功能连接网络用于精神分裂症诊断

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目的：探讨基于常规低阶静息态脑功能连接网络构建的高阶功能连接网络在区分精神分裂症和健康被试的价值及精神分裂症潜在的脑功能网络异常。**方法**：56 例精神分裂症患者和 66 例年龄、性别匹配的健康被试纳入研究。所有被试 MRI 数据进行常规预处理，利用 Brainnetome 246 脑图谱构建常规功能连接网络，基于常规功能连接网络构建高阶功能连接网络。采用 t 检验和最小绝对收缩和选择算子(LASSO)进行特征选择，使用 10 折交叉验证（重复 100 次）进行模型训练和评估，使用高斯径向基函数支持向量机(RBF-SVM)构建分类模型。比较基于常规和高阶功能连接网络模型的性能。我们选择 1000 次迭代中平均权重绝对值大于最大绝对权重 30%的特征为“区分特征”。应用 AAL 90 重复上述分析进一步验证我们的结果。**结果**：使用 Brainnetome 246 脑图

谱，基于高阶脑功能网络的模型平均 AUC 和准确率分别为 0.802 和 74.66%，而基于常规脑功能网络的模型平均 AUC 和准确率分别为 0.754 和 68.51%。高阶脑功能网络模型的性能优于常规功能连接网络。使用 AAL 90 图谱得到类似的结果（高阶脑功能网络：AUC 为 0.741，准确率为 68.40%；常规功能连接，AUC 为 0.719，准确率为 66.49%）。我们识别的与精神分裂症相关的脑区广泛分布于额叶、顶叶、脑岛、枕叶、皮层下和边缘叶，其是皮层下、额顶网络、感觉运动网络、边缘网络和默认模式网络的核心脑区。**结论**：与常规功能网络相比，高阶脑功能网络在诊断精神分裂症方面可获得更好的性能，表明其可能能更好表征精神分裂症患者脑功能异常，为更全面理解精神分裂症病例机制提供帮助。

PU-0036

Associated high-order resting-state functional connectivity network for diagnosis of schizophrenia

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Objectives: To explore the value of the associated higher-order functional connectivity (aHOFC) constructed based on the conventional resting-state FC in distinguishing schizophrenia (SZ) and healthy controls (HCs) and the potential brain functional network abnormalities in SZ.

Methods: Fifty-six patients with SZ and 66 age- and sex-matched HCs were included in our study. All subjects' MRI data were routinely preprocessed; the conventional FC and aHOFC were constructed using the Brainnetome 246 atlas. The t-tests and least absolute shrinkage and selection operator were used for feature selection, and 10-fold cross-validation (repeated 100 times) with Gaussian radial basis function support vector machine was applied for model training and evaluation. We compared the performance of the models based conventional FC and aHOFC. The features with absolute value of weights greater than 30% of the maximum absolute weight in the 1000 iterations were selected as "discriminative features". The above analysis procedure was repeated using automated anatomical labeling (AAL) 90 atlas to further validate our results.

Results: When using the Brainnetome 246 atlas, the average AUCs and accuracies of the model based on aHOFC and conventional FC were 0.802, 74.66%, and 0.754, 68.51%, respectively. The aHOFC model outperformed conventional FC model. Similar results were obtained using the AAL 90 atlas (aHOFC: AUC, 0.741, accuracy, 68.40%; conventional FC, AUC, 0.719, accuracy, 66.49%). The brain regions we identified as "discriminative features" were widely distributed in frontal, parietal, insula, occipital, subcortical, and limbic lobes, which are the core brain areas of the subcortical, fronto-parietal, sensorimotor, limbic, and default mode networks.

Conclusions: Compared with conventional FC, aHOFC can achieve better performance in diagnosing SZ, indicating that aHOFC may better characterize abnormal brain function network in SZ, and provide help for a more comprehensive understanding of the pathological mechanism of SZ.

PU-0037

Gadolinium Retention in the Brain of Mother and Pup Mouse: Effect of Pregnancy and Repeated Administration of Gadolinium-Based Contrast Agents

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Abstract

Background The association of repeated administration of gadolinium-based contrast agents (GBCAs) with the gadolinium (Gd) retention in the brains of mother and fetus remains unclear.

Purpose To investigate the effects of pregnancy and repeated administration of GBCAs on Gd retention in the brains of mother and pup mice.

Study type Cross sectional cohort toxicity study

Animal Model From gestational day 16 to 19, pregnant (n = 48) BALB/c mice.

Field Strength 9.4T and fast spin echo sequence.

Assessment Half of the mother mice (n = 24) were sacrificed at postnatal day 1 (P1) for inductively coupled plasma mass spectrometry (ICP-MS) and transmission electron microscopy (TEM). Besides the ICP-MS and TEM, four pups were randomly selected from each mother and sacrificed at P1 for ultraperformance liquid chromatography mass spectrometry (UPLC-MS) and Nissl staining.

Statistical Tests One-way analysis of variance and unpaired t-test.

Results In the group of gadodiamide, retention of Gd in the brains of pregnant mice was significantly lower than that of non-pregnant mice in the area of the deep cerebellar nuclei (DCN) (10.35 ± 2.16 nmol/g vs. 18.74 ± 3.65 nmol/g). Retention of Gd in the DCN of pups whose mothers were administered gadoterate meglumine was significantly lower than that of pups whose mothers were administered gadodiamide (0.21 ± 0.09 nmol/g vs. 6.15 ± 3.21 nmol/g) at P1. In mice treated with gadodiamide, most of the retained Gd in the brain tissue was insoluble (19.5 ± 9.5% of the recovered amount corresponded to the intact complex in the DCN).

Data Conclusion In different brain areas of the mother and pup mice, the retention of Gd after gadoterate meglumine administration was lower than that of gadodiamide and gadopentetate dimeglumine administration, and almost all the detected Gd in pups' brains was intact soluble GBCAs.

PU-0038

脑室内多发菊形团形成型胶质神经元肿瘤一例并文献复习

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目的：报道 1 例脑室内多发菊形团形成型胶质神经元肿瘤(RNGT)病例，通过文献复习，总结 RGNT 的临床及影像学特征

方法：根据关键词”RGNT”，在 Pubmed 数据库中进行检索(www.pubmed.gov)，搜索符合条件的病例，回顾总结 RGNT 的流行病学、肿瘤位置及影像学表现

结果：本例为 1 名 41 岁男性患者，半年前突发意识丧失 2 次，影像学表现为第四脑室、中脑导水管及双侧侧脑室内多发肿块，T1WI 呈高低混杂信号，T2WI 呈高信号，增强扫描实性部分呈结节样强化；病理结果：菊形团形成型胶质神经元肿瘤(RNGT)，WHO Ⅰ级。文献共检索 87 例 RGNT，其临床及影像学特征：(1)发病年龄：好发于年轻成年男性，平均年龄为 26.9 岁(范围 6--75)，男女比例为 1.48:1(35:52)；(2)临床症状：多数表现为头痛、步态障碍、眩晕和视觉障碍等，少数为偶然发现(8 例)，病程从数月至数年不等；(3)发病部位：35.6 %(31/87)RGNT 与第四脑室相关；仅有 2.3%(2/87)RGNT 发生在第四脑室并向第三脑室和侧脑室扩散；(4)影像表现：70.7%(53/75)表现为囊实性，22.7%(17/75)表现为实性，6.6%(5/75)表现为囊性。实性部分在 T1WI 上为等或低信号，T2WI 上为高信号，增强扫描后大多数肿瘤发生强化(74.7%,59/79)，以不均匀强化最常见(58.2%,46/79)。

结论：尽管 RGNTs 具有良性组织学特征，但由于播散转移的生长方式，对临床手术和术后管理可能是一个挑战。因此，正确认识并诊断罕见的多发 RGNT，可能有助于临床决策。

PU-0039

Clinical features and radiological findings of spinal parasitic infection

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Objectives: Intraspinal parasitic infection is a rare disease that poses a diagnostic challenge. This study aimed to investigate the clinical and imaging features of intraspinal parasitic infections.

Methods: A retrospective analysis of the diagnosis and treatment of a case of intraspinal parasitic infection admitted to Xiangya Hospital of Central South University in 2023 was conducted. Related literature was also reviewed to support the findings.

Results: The patient was a 41-year-old man who had been hospitalized for over 8 years due to lower limb weakness. He reported a history of consuming raw fish. The physical examination showed level 3 muscle strength in both lower limbs and decreased sensation. Blood routine, stool routine, and other laboratory tests showed no abnormalities. Contrast-enhanced MRI revealed an enlarged L1-S3 spinal canal with a mass lesion within it. The signal was uneven, with significant enhancement and

banded signal changes. The cauda equina could not be clearly distinguished. No invasion or abnormal strengthening of the vertebral body and dura was observed. Non-contrast-enhanced CT scan showed a low-density lesion with no bone destruction in the adjacent vertebra. Intraoperatively, free cord lesions were removed with telescopic and lateral movement. Pathology revealed granulomatous inflammation with the presence of a tapeworm body. Postoperative symptoms improved significantly, and antiparasitic therapy was continued.

Conclusion: Intraspinal parasitic infection is rare and often misdiagnosed. The clinical and imaging manifestations are variable and depend on the parasite's life cycle. Radiographic findings of banded changes should raise suspicion of parasitic disease, and early diagnosis and treatment are crucial to prevent irreversible neurological damage.

PU-0040

星形母细胞瘤的影像表现与病理特征分析

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目的：探讨星形母细胞瘤的影像学及病理学特征。

方法：回顾性分析 12 例星形母细胞瘤患者的临床、影像及病理资料并总结其特征。

结果：12 例星形母细胞瘤均原发于幕上、脑表浅部位，边界较清楚，肿瘤最大直径范围约 2.0~8.2cm，中位数约 5.45cm。肿瘤呈囊性伴结节 2 例（1 例结节位于肿瘤中央区，1 例结节位于肿瘤边缘区）；囊实性 10 例，其中实性部分多发微小囊性灶，边缘多发较大囊性灶，呈“发泡状”；5 例实性部分伴斑点状钙化。CT 平扫实性部分密度较正常脑实质高，囊性部分呈低密度。MR 平扫实性部分呈 T1WI 等/稍低信号、T2WI 等/稍高信号，囊性部分呈 T1WI 低信号、T2WI 高信号。增强扫描实性部分明显强化，部分囊性灶可见囊壁强化。光镜检查瘤细胞围绕小血管分布形成假菊形团或乳头状结构，细胞突起粗短，细胞核远离小血管侧分布，可见血管壁透明变性。免疫组织化学示：阳性反应 GFAP（11/12）、Vimentin(9/12)、Syn（2/12）、S-100(9/11)、Olig-2（6/10）、EMA（5/7）、CD34（1/6）、ATRX（2/5）；7 例低级别星形母细胞瘤 Ki-67 阳性指数为 1%~21%，平均 7.7%，5 例高级别星形母细胞瘤 Ki-67 阳性指数分别为 15~28%，平均 27.8%；其中 5 例行分子病理学检查示 IDH1/2 基因（-）。

结论：星形母细胞瘤是一种起源不明、罕见的神经上皮肿瘤，临床表现缺乏特异性，具有一定影像学特征，多位于幕上、脑表浅部位、体积较大、边界较清楚，囊实性多见，“发泡状”具有一定特征性，可见斑点状钙化，增强扫描实性部分明显强化，瘤周水肿较轻，但确诊仍需依靠病理检查。

PU-0041

新型冠状病毒肺炎相关性脑病的 MR

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目的　　有神经系统表现的新型冠状病毒肺炎(COVID-19) 患者颅脑 MR 影像学表现。探讨其 MR 与临床特征的联系。

材料与方法　回顾性分析不同神经症状的 18 例 COVID-19 患者的异常 MR 图像，COVID-19 患者均经鼻咽拭子的逆转录酶聚合酶链反应（RTPCR）检测出 SARS-CoV-2。男性 10 例，女性 8 例。发病年龄 10-70 岁，平均 45.5 岁。MR 采用常规 T1WI、T2WI 及 FLAIR 序列，6 例患者加扫 DWI 序列。

结果　18 例患者均有不同的 MR 异常表现。1 例表现为桥脑的 T2WI 及 FLAIR 高信号；2 例表现额叶稍高信号，3 例表现为颞叶局灶性稍高信号， 4 例为枕叶稍高信号，6 例为侧脑室周围及皮质下白质的高信号，2 例表现为双侧基底节的斑片状高信号；

结论　COVID-19 患者神经系统可表现为不同的症状，如头痛、头晕、高热、呕吐、抽搐及意识障碍、精神异常、半身麻痹感等。MR 均有不同的异常发现，有关 COVID-19 累及神经系统的机制尚不明确，MR 表现无特异性。但是 MR 的异常表现，在排除常见脑血管疾病的特征，在有暴露史的情况下，要警惕 COVID-19 脑病的可能。

关键词　　新型冠状病毒　　磁共振成像　　神经系统

PU-0042

基于全过程的激励运行模式在放射科医护人员绩效考核管理中的应用

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目的：探讨在放射科实行以全过程的激励运行模式为导向的医护人员绩效考核管理后的应用效果。

方法：于 2021 年 1 月—12 月在我院放射科实施常规绩效激励运行模式，于 2022 年 1 月—12 月在我院放射科开始实施以全过程的激励运行模式为导向的绩效考核管理，包括完善工作绩效考核，融合精神激励、岗位激励、薪酬激励、服务激励等相结合的绩效管理方法，比较实施前（2021 年 1 月 12 月）和实施后（2022 年 1 月—12 月）放射科医护人员离职意愿和工作满意度。

结果：实施全过程的激励运行模式为导向的放射科医护人员绩效考核管理后，医护人员离职意愿总分显著降低，差异有统计学意义（$P<0.05$）。医护人员工作满意度显著提高，差异有统计学意义（$P<0.01$）。

结论：在放射科实行以激励为主的医护人员绩效考核管理，能够有效提升医护人员工作的积极性，降低离职意愿，提高工作服务质量。

PU-0043

PBL 与 LBL 教学法在医学生早期临床实践教学效果的系统评价

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目的:系统评价以问题为基础的教学模式(problem-based learning，PBL)在医学影像实践性教学中的应用效果，为提高临床教学质量，为今后从事临床工作夯实基础，特此研究，以为制定出合理有效的临床教学方案。

方法:所检索的数据库包括:中国知网、维普、万方、CBM、Pubmed、Cochrane Library、Embase 等。搜集有关 PBL 教学模式在我国医学影像生临床实践教学中应用的随机对照试验，检索时限均从 2006 年 1 月至 2022 年 12 月，由 2 名研究者独立筛选文献、提取资料并评价纳入研究的偏倚风险后，使用 RevMan5.3 和 Stata 12.0 软件进行 Meta 分析。

结果:共纳入 24 个 RCT，包括 3651 例研究对象，分析结果显示:PBL 教学模式在我国医学影像生临床实践教学中的理论知识成结[MD=6.8695%Cl (4.74，8.97)，P<0.000 011 、基本技能成绩[MD=5.55，95%Cl(3.52，7.58)，P<0.00001]、病例分析成绩 MD-6.05，95%C(2.62，9.49)，P<0.000011 ，增加学习兴组 RR=1.33，95%Cl(1171.52)，P<0.00011 等方面均优于以授课为基础的传统教学模式(lecture-based learning，LBL)。

结论:当前证据表明，PBL 教学模式通过学生亲身经历和早期临床实践,可激发医学生主动学习兴趣,培养医学生初步临床思维能力，不仅丰富了医学生的医学影像学知识,还加深了医学生对相关临床知识的了解，但是受纳入研究数量和质量的限制，上述结论待更多高质量研究予以验证。从研究中可以得出只有探索或创建新的教育模式，摆脱陈旧的教育模式，才能真正意义上达到教学质量持续改进的目的。

PU-0044

基于 CIPP 模型和柯式模型的评价体系在医学影像住院医师规范化培训中的应用

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山西医科大学第二医院

目的：探讨基于 CIPP 模型和柯式模型的评价体系在医学影像住院医师规范化培训中的应用效果。

方法：选取 2022 年 6—12 月在山西省某三级甲等医院放射科参与组织的 5 次医学影像住院医师规范化培训的 36 名学员及 6 名培训的管理者和培训专家为研究对象。培训完成后，采用基于 CIPP 模型[context（背景）、input（投入）、process（过程）和 product（结果）]和柯式模型的培训效果评价指标体系，对培训效果进行评分并进行使用效果评分。

结果：在评估评分结果方面，培训管理者和专家，其 CIPP 背景评估和 CIPP 过程评估评分高于学员。在评价指标体系的使用性角度，培训管理者和专家理解维度评分高于学员，以上比较差异均有统计学意义（P<0.05）。

结论：基于 CIPP 模型和柯式模型的评价体系在在规范化培训教学中应用效果理想，有助于提高影像诊断效率与质量。建议培训管理者和培训专家需进一步对培训的出发点等进行综合性的分析，以使培训工作更符合学员的需求，以更能提高学生学习积极性和综合素质。

PU-0045

基于德尔菲法的医学影像学医学生临床教学质量双向评价体系的构建

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目的：探讨基于德尔菲法构建医学影像学医学生临床教学质量双向评价体系，以促进临床护理教学质量的提高，为医学影像学医学生考核评价提供参考依据。方法：通过文献研究、理论分析法等方法初步构建医学影像学医学生临床教学质量双向评价指标体系，运用 Delphi 法对 10 位专家进行两轮咨询，根据重要性评分和变异系数确定医学影像学医学生临床教学质量双向评价体系，并运用层次分析法计算各指标的权重。

结果：两轮函询问卷的有效回收率别为 95.45%和 100.00%。两轮专家意见 Kendall 和谐系数比较，差异有统计学意义（P<0.05），最终形成的医学影像学医学生临床教学质量双向评价指标，包括 4 项一级指标、15 项二级指标、57 项三级指标，指标的重要性评分为 4.25～5.00 分，变异系数小于 0.25。结：基于德尔菲法构建的医学影像学医学生临床教学质量双向评价体系指标科学、可靠，可有效评估临床教学效果，并制定针对性的培训方案，以提高专业综合水平。

PU-0046

双侧髂内动脉 Fogarty 球囊阻断术在剖宫产术后瘢痕妊娠辅助清宫手术中的疗效与安全性

石静
安徽省阜阳市人民医院

摘要　目的　探究双侧髂内动脉 Fogarty 球囊阻断术在剖宫产术后瘢痕妊娠（CSP）辅助清宫手术中的临床疗效与安全性。方法　回顾性分析本院 2021 年 1 月～2022 年 9 月收治疗的 80 例 CSP 患者的临床资料。其中观察组 40 例，给予双侧髂内动脉 Fogarty 球囊阻断术下行宫腔镜下清宫治疗，术中间断阻断髂内动脉，清除胚胎、电凝或缝合止血；对照组 40 例，给予子宫动脉栓塞术（UAE）后 1-2 天行宫腔镜下清宫手术。对比分析两组患者在数字减影血管造影（DSA）下透视时间、体表辐射剂量、清宫手术中出血量、清宫手术时间、住院时间及术后随访情况。结果　所有患者清宫手术顺利，成功保留子宫。观察组未发生球囊相关的并发症。对照组 40 例患者 UAE 后均发生不同程度发热、子宫区疼痛等栓塞后反应。观察组、对照组 DSA 下透视时间及体表辐射剂量分别为（9.2±1.1）s　vs（1273.6±141.1）s、（7.7±0.8）mGy　vs（1503.8±101.8）mGy，分别比较,差异均有统计学意义（P 均<0.05）；清宫时术中出血量分别为（30.3±14.7）、（27.5±13.2）ml，清宫手术时间分别为（41.6±16.2）、（42.8±15.0）min，分别比较，差异均无统计学意义（P 均>0.05）；住院时间分别为（6.0±0.7）、（7.3±0.8）d，两组比较，差异有统计学意义（P<0.05）。随访期均在 3 个月以上，观察组、对照组 β-hCG 转阴时间、阴道流血时间、月经恢复正常时间及患者满意率，分别比较，差异均有统计学意义（P 均<0.05）。结论　双侧髂内动脉 Fogarty 球囊阻断术及 UAE 辅助 CSP 清宫手术均可明显减少术中出血量，但双侧髂内动脉 Fogarty 球囊阻断术相比于 UAE，减少患者 X 线辐射剂量，缩短患者住院时间、β-hCG 转阴时间、阴道流血时间、月经恢复正常时间，增加患者满意度率。

PU-0047

神经介入放射医务人员外照射个人剂量监测现状及监测结果分析

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目的：了解神经介入放射医务人员外照射个人剂量监测现状，分析外照射个人剂量监测结果，为保障医务人员健康和医院放射防护管理提供依据。

方法：于 2022 年 1 月-2022 年 12 月，选取山西省太原市 5 家三级甲等医院从事神经介入放射的 120 名医务人员作为研究对象，收集工作类型、岗位、个人剂量监测结果等信息，用 SPSS 22.0 对个人剂量监测结果进行分析。

结果：2022 年每季度有效监测率分别为 78.82%、81.65%、88.33%和 96.85%，呈上升趋势；人均季度剂量当量分别为 0.156 mSv、0.169 mSv、0.213 mSv 和 0.265 mSv，人均季度有效剂量逐季递增；人均季度有效剂量介入临床医生组>介入护理人员>技师组(H=11.355、6.185,P <0.01)。

结论：各季度神经介入放射医务人员实际监测人数逐年增加，有效监测率不断上升，外照射个人剂量处于较低水平，需要进一步加强对神经介入放射医务人员的辐射防护培训，提高辐射防护意识。

PU-0048

医学影像学医学生放射安全防护认知现状及培训需求调查分析

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目的：了解医学影像学医学生放射安全防护认知现状及培训需求，为提高医学生个人安全防护水平，强化安全防控提供科学依据。

方法：采用便利抽样方法，选取 2021 年 7 月-2022 年 7 月山西省 5 家三级甲等医院医学影像学医学生 112 名作为研究对象，采用一般情况调查量表、职业安全防护现状量表、职业安全防护认知量表、职业安全防护培训需求量表进行问卷调查，采用多元线性回归分析方法对医学影像学医学生放射安全防护认知及培训需求现状进行分析。

结果：医学影像学医学生放射安全防护认知总得分（85.56±6.27）分，得分由高到低依次为标准预防（20.15±3.75）分、医用防护用品正确使用（18.32±2.09）分、射线防控相关知识（15.36±2.18）分。多元线性回归分析结果显示，性别、学历水平、工作年限、岗位类别、专业背景、是否参加过相关培训是影响医学影像学医学生放射安全防护认知的主要因素（P<0.05）。分析得出学历越高、工作年限越长、参加过相关培训的医学影像学医学生放射安全防护认知得分越高，对情景模拟、经验分享、线上交流的培训方法的需求率较高。

结论：医学影像学医学生放射安全防护认知水平有待提高，其受到性别、学历水平、工作年限、岗位类别、专业背景、是否参加过相关培训相关因素的影响，培训方法、内容需求明确，提高防护意识，需熟练掌握放射防护用品正确使用方法、学习放射防护相关知识，应针对医学影像学医学生放射安全防护认知现状和培训需求加强培训，确保医学生的职业安全。

PU-0049

肾包膜动脉栓塞联合超选择性肾动脉栓塞治疗损伤性肾出血

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摘要:目的　探讨肾包膜动脉栓塞联合超选择性肾动脉栓塞术治疗损伤性肾出血的有效性和安全性。方法　回顾性分析 2020 年 1 月一 2022 年 7 月收治 20 例损伤性肾出血患者的临床资料，使用肾包膜动脉栓塞术联合超选择性肾动脉栓塞术治疗，评价其对术后血红蛋白、肾功能及肾区疼痛视觉模拟评分的影响。结果　20 例均完成肾动脉造影，20 例行超选择性肾动脉栓塞联合肾包膜动脉栓塞，微弹簧圈栓塞肾动脉 15 例，其中 4 例明胶海绵颗粒补栓塞肾动脉；5 例明胶海绵栓塞肾动；20 例明胶海绵颗粒栓塞肾包膜动脉。患者术后 7 天血肌酐水平较术前差异无统计学意义（$p>0.05$）；术后血红蛋白、肾区疼痛视觉模拟评分较术前存在明显差异，有统计学意义（$p<0.05$）。结论　肾包膜动脉栓塞联合超选择性肾动脉栓塞术是治疗损伤性肾出血是一种安全、有效、微创的止血方法，值得推广。

PU-0050

基于 PACS 系统的案例教学法在医学影像学医学生实践教学中的应用

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目的：探讨基于图像存储及传输系统（picture archiving and communication systems,PACS）的案例教学法在医学影像学医学生实践教学中的应用效果。

方法：采用便利取样法，选取 2021 年 12 月—2022 年 12 月在在山西省某三级甲等医院放射科实习的 60 名临床医学本科生作为研究对象，将其分为观察组和对照组，每组各 30 名，观察组采用 PACS 系统的真实病例进行自主学习、分组讨论式教学，对照组采用传统 PPT 讲授式教学。对两组学习情况（理论知识、临床技能操作）、教学效果满意度以及自评评价（有无激发学习兴趣、有无提高自学能力、有无提高创新能力、有无提高学习效率、有无增强理论与实践结合的能力和临床思维能力）进行比较。

结果：观察组的理论成绩、临床技能操作成绩均高于对照组，差异有统计学意义（$P<0.05$）；观察组教学效果满意度高于对照组，差异有统计学意义（$P<0.05$）；观察组自评评价优于对照组，差异有统计学意义（$P<0.05$）。

结论：基于 PACS 的案例教学模式，有利于学生临床综合能力的培养，对提高医学生临床实践能力具有重要的教学和实用价值。

PU-0051

MDT 模式下 CBL 教学法在培养医学影像住院医师临床诊疗思维能力中的应用

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目的：探讨多学科诊疗(multidisciplinary treatment,MDT)结合以案例为导向的教学法(case-based learning,CBL)应用在培养医学影像住院医师临床诊疗思维能力中的效果。

方法：选取 2022 年 6—12 月在山西省某三级甲等医院放射科医学影像住院医师 36 名作为研究对象，随机分为观察组和对照组，每组各 18 名，对照组采用传统 CBL 教学方法，观察组采用 MDT 模式下 CBL 教学模式，通过对比两组住院医师理论知识和临床技能考核成绩和住院医师对各自教学模式的主观评价来评估教学效果。

结果：观察组理论考核成绩（88.25±2.18）分和临床操作技能考核成绩（86.59±2.05）分均高于对照组的（82.56±4.35）分和（83.36±1.85）分，差异有统计学意义(P<0.05)；观察组在教学评价上观察组各项教学满意度高于对照组，差异有统计学意义(P<0.05）尤其表现在自主学习能力、临床问题解决能力、临床思维能力、师生交流频率及教学满意度等方面，观察组均高于对照组，差异有统计学意义(P<0.05)。

结论：MDT 模式下 CBL 教学法有效提高了医学影像住院医师的临床诊疗思维能力，提高了医学影像住院医师的理论和临床实践成绩，提升了团队协作和解决问题的能力，且教学满意度高，值得进一步推广。

PU-0052

腔静脉滤器误放入肾静脉 1 例

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患者，女，55 岁。因右下肢肿胀、疼痛 3 天入院。门诊下肢静脉彩超：右下肢股静脉、腘静脉、肌间静脉血栓形成。D-二聚体：9.06ml/L。经多学科会诊讨论，先行下腔静脉滤器置入术预防肺栓塞。

术中经左侧股静脉穿刺置入 5F 鞘管，确定肾静脉开口位置，置换滤器输送鞘，推送滤器（先健科技）至肾静脉开口下方 2cm 处，释放滤器。滤器在下腔静脉内呈斜位，整体呈梭状（图 2）。考虑为滤器误入右侧肾静脉属支内。遂行滤器取出术,交换 11F 鞘管后，引入“鹅颈”抓捕器回收滤器过程中，滤器与下腔静脉明显贴壁。于右侧股静脉使用导丝成袢、圈套法牵拉滤器使回收钩离开下腔静脉壁（图 3）。使用“鹅颈”抓捕器将滤器取出至体外。检查滤器结构完整后经右侧鞘管行滤器置入术及下腔静脉造影（图 4）。术后给予抗凝、抬高患者肢体等对症治疗。术后 20 天来院行滤器取出术，术后继续华法林抗凝半年，维持 INR 控制在 2-2.5 左右。

2 讨论

下腔静脉滤器（inferior vena cava filter，IVCF）置入能明显地降低急性下肢深静脉血栓形成后血栓脱落引起肺栓塞的发生率。而早期 IVCF 置入并发症包括滤器张开不良、误放、倾斜等；晚期并发症包括滤器移位、断裂，继发血栓、肺栓塞复发、静脉穿孔等[2-3]。当滤器长轴与静脉长轴的成角>15。，则为滤器倾斜[4]。多为术者误放或缺乏经验或滤器内在的质量或患者的

解剖变异导致。滤器进入心内或肺内可发生威胁生命的心律失常[5]。目前滤器取出技术包括套圈装置抓取、钩型导丝将滤器拉入下腔静脉或拉入大的鞘内方式等[6]。

经左侧股静脉行 IVCF 置入术，以下方法可降低早期并发症发生率：根据下腔静脉造影走形塑形滤器释放鞘管；下腔静脉造影后正确辨识下腔静脉及肾静脉开口位置；释放 IVCF 过程中发现滤器未充分打开，则及时回收滤器于鞘管内；发生滤器移位，及时取出，以免滤器进入心脏造成严重的后果[7]。

PU-0053

Persistent Proatlantal Intersegmental Artery(PPIA): Are Consideration Based On MSCTA

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Abstract

Background: Persistent proatlantal intersegmental artery(PPIA) is a rare permanent carotid-basilar anastomosis. MSCTA has become the primary non-invasive imaging technique for evaluation of ephalic and cervical vascular anatomy.

Purpose: To investigate the MSCTA imaging characteristics of PPIA and its clinical values,so then to provide a new classification method based on posterior circulation blood supply.

Material and Methods: The imaging and clinical data of 11 patients with PPIA diagnosed by MSCTA through combined head and neck scanning were analyzed retrospectively.

Results: The incidence of PPIA was 0.01%. Used classification according to the starting position of PPIA, type I of PPIA were 2cases (18.2%), type II of PPIA were 9 cases (81.8%). Classification according to blood supply of posterior circulation,type 1 of PPIA were 4cases (36.4%), type 2 of PPIA were 4cases (36.4%), type 3 of PPIA were 1cases (9.1%), type 4 of PPIA were 2 cases (18.2%). Among the 11 PPIA patients, ipsilateral vertebral artery absence were 11 cases, contralateral vertebral artery dysplasia were 3 cases and absence was 1 case, persistent artery dysplasia were 2 cases, and basilar artery dysplasia were 2 cases.In addition, there were 2 patients with aneurysm, 1 patient with cerebral infarction, and 1 patient with PAVF.

Conclusion: The new classification method of PPIA is more conducive to the evaluation of the posterior circulation blood supply. In addition, using MSCTA to diagnose PPIA can reduce the missed diagnosis of other cephalic and cervical vascular diseases, and provide a more comprehensive imaging evaluation for interventional and surgical operations.

PU-0054

Applications of Transcriptomics and Magnetic Resonance Imaging in Major psychiatric Disorders

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Major psychiatric disorders create a significant public health burden, and mental disorders such as major depressive disorder, bipolar disorder, and schizophrenia are major contributors to the national disease burden. The search for biomarkers has been a leading endeavor in the field of biological psychiatry in recent decades. And the application of cross-scale and multi-omics approaches combining genes and imaging in major psychiatric studies has facilitated the elucidation of gene-related pathogenesis and the exploration of potential biomarkers. In this article, we summarize the results of using combined transcriptomics and magnetic resonance imaging to understand structural and functional brain changes associated with major psychiatric disorders in the last decade, demonstrating the neurobiological mechanisms of genetically related structural and functional brain alterations in multiple directions, and providing new avenues for the development of quantifiable objective biomarkers, as well as clinical diagnostic and prognostic indicators

PU-0055

基于信息化的医学影像住院医师培训带教模式实施评价指标的构建及运用

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目的：构建基于信息化的医学影像住院医师培训带教模式，为保证培训带教质量和效果，构建实施效果评价指标，为培训带教效果评估提供评判方法和改进方案。方法：根据学习任务、不同级别等细化考核内容、标准及评价指标，制定理论教学、模拟教学、临床实践训练和考试考核一体化的信息化培训带教模式。选取 2021 年 7 月至 2022 年 6 月山西省太原市某三级甲等医院放射科医学影像专业的住院医师 20 名作为调查对象，比较教学计划与实施的一致性，系统评估教学实施效果。

结果：基于信息化的医学影像住院医师培训带教模式实施后，理论教学培训、模拟教学训练、技能操作训练和结业考试考核进行展开评价，理论教学培训为(94.78+0.26)分、模拟教学训练为(91.01+0.73)分、技能操作训练(92.85+0.42)分、结业考试考核(93.19+0.23)分，实施前后差异有统计学意义(P<0.05)。

结论：基于信息化的医学影像住院医师培训带教模式的应用，进一步建立了规范的、高效的考核体制，促进了培训满意度和培训效果的提升，有利于医学影像住院医师更好的适应临床工作，效果显著。

PU-0056

医学影像学医学生对放射性粒子辐射认知度和防护行为的调查

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目的：调查医学影像学医学生对放射性粒子辐射的认知度和防护行为情况,为加强医学生的放射防护提供参考依据。

方法：选取 2021 年 6 月-2022 年 6 月于山西省太原市 5 家三级甲等医院放射介入科参加实习的医学影像学专业的医学生 165 名作为研究对象，采用研究者自行设计的放射性粒子辐射认知度和防护行为问卷进行调查。

结果:165 名医学影像学专业的医学生放射性粒子辐射认知度评分均为（68.25±6.18）分，防护行为评分均为（71.67±5.23）分。放射性粒子辐射的认知度与防护行为等级呈正相关，即防护行为等级评分越高，放射性粒子辐射的认知度越高(P<0.001, α=0.0157)。

结论：医学影像学专业的医学生对放射性粒子危害的认知度与其防护行为密切相关，为提高医学生对放射性粒子辐射危害的认知度，减少放射性粒子对其造成的职业危害，需加强和重视对其进行放射性粒子辐射的相关知识教育，并提供完善的放射防护装备。

PU-0057

Deposition of Gadolinium in Central and Peripheral Nervous System and Its Effects on Sensory, Cognition, and Athleticism After Multiple Injections of Gadolinium Contrast Agents in Rats

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Abstract

Background The association between the repeated administration of gadolinium-based contrast agents (GBCAs) and the gadolinium (Gd) retention in the central and peripheral nervous systems and its effects on sensory, cognition, and athleticism remain unclear.

Purpose To investigate the effects of the repeated administration of GBCAs on Gd retention in central and peripheral nervous systems and the sensory, cognition, and athletic implications

Study type Cross-sectional cohort toxicity study

Animal Model Wistar rats

Field Strength 9.4T and fast spin-echo sequence

Assessment Forty-eight male Wistar rats (4 weeks old) received tail vein injections of saline or (0.6 mmol Gd/kg) GBCAs, including gadodiamide, gadopentetate dimeglumine, and gadoterate meglumine, 4 times

a week for 28 days. The rats were divided into two subgroups according to the time of euthanasia, the 28 d subgroup and the 42 d subgroup. The brains of the rats were scanned using 9.4 Tesla magnetic resonance imaging (MRI). The effects of GBCAs on the sensory were evaluated. Gd retention in the brain, spinal cord, and peripheral nerves was determined by inductively coupled plasma mass spectrometry. Transmission electron microscopy (TEM) was used to observe the microscopic distribution of Gd after deposition in the spinal cord. The hstopathological features in the spinal cord were analyzed by hematoxylin-eosin staining, nissl staining, glial fibrillary acidic protein (GFAP) staining, and neuron specific enolase (NSE) staining after administrations of GBCAs.

Statistical Tests One-way, unpaired t-test, and mixed-design analysis of variance was used for statistical analyses.

Results All GBCAs resulted in Gd deposition in central and peripheral nerve tissue, with the highest deposition in the spinal cord tissue. Among the three different GBCAs groups, the gadodiamide group had the largest deposition. Decreased muscle power and pain hypersensitivity to thermal and mechanical stimuli were observed after exposure to gadodiamide. There were no histopathologic findings associated with the levels of Gd measured in the spinal cord tissue. At the spinal cord, TEM found that the region of Gd depositions had a spherical structure similar to "sea urchins", with a diameter of 200 - 300 nm, and was mainly located near the vascular basement membrane.

Conclusion Multiple injections of GBCAs caused Gd deposition in the brain, spinal cord, and peripheral nerves, especially in the spinal cords of the gadodiamide group. Gadodiamide led to pain hypersensitivity and decreased muscle power. No histological damages was detected in the spinal cords of rats treated with either linear or macrocyclic GBCAs.

PU-0058

透明细胞型脑膜瘤的 MRI 表现

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目的：总结透明细胞型脑膜瘤的 MRI 影像特征，以期提高对该肿瘤的认识。材料和方法：回顾性收集经病理证实的 9 例透明细胞型脑膜瘤患者的临床资料及 MRI 表现。结果：3 例男性，6 例女性，中位年龄 33.8 岁；7 例位于桥脑小脑角区，其中 5 例跨中后颅窝生长，均呈囊实性，T1WI 呈等-低信号，T2WI 呈等-稍低信号，实性成分呈石榴籽样改变，2 例肿块周边可见血管流空，增强扫描肿块实性成分 6 例明显强化，1 例轻度强化，3 例可见脑膜尾征；2 例位于左侧额部大脑凸面，为实性肿块，T1WI 呈等信号，T2WI 呈高信号，肿块周边可见血管流空，周围脑组织可见明显水肿，增强扫描肿块明显强化伴脑膜尾征。结论：透明细胞型脑膜瘤的临床及 MRI 表现具有一定特征性。

PU-0059

基于深度学习图像重建算法（DLIR）对颈动脉 CT 血管成像胸廓入口处图像质量的影响

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目的：通过与 FBP 及混合迭代重建算法的对比，探讨基于深度学习的图像重建算法对颈动脉 CT 血管成像胸廓入口处图像质量的影响。资料与方法：选择疑似头颈部血管疾病的患者 30 例，采用 Revolution APEX CT 进行头颈部 CTA 成像，管电压 100Kv，分别利用滤波反投影重建（A 组）、40%ASIR-V 重建（B 组）、深度学习重建算法重建（C 组）重建出三组图像，测量胸廓入口处颈总动脉管腔内及同层面肌肉内的 CT 值、SD，计算颈总动脉的 SNR 及 CNR,由两位有 5 年以上诊断经验的医师进行主观图像质量评价，比较三组图像胸廓入口处颈总动脉的 CT 值、SD、SNR、CNR 及主观图像质量的差异。

结果：三组图像胸廓入口处颈动脉内的 CT 值差异无明显统计学意义（P 值>0.05）。FBP、40%ASIR-V、TrueFidelity™-H 三组图像颈总动脉的噪声分别为 21.96±7.84、17.98±7.19、11.23±4.43，TrueFidelity™-H 重建算法下噪声较 FBP 降低 48.86%，较 40%ASIR-V 降低 37.54%，三组图像信噪比及对比噪声比差异均有统计学意义（P 值均<0.05），TrueFidelity™-H 信噪比及对比噪声比均较 FBP 及 40%ASIR-V 提高。FBP、40%ASIR-V、TrueFidelity™-H 三组图像的主观评分分别为 3.60±0.50、4.13±0.43、4.40±0.50，TrueFidelity™-H 主观图像质量评分较 FBP 及 40%ASIR-V 提高（P 值均<0.05）。

结论：TrueFidelity™-H 重建算法可以降低胸廓入口处颈动脉 CT 血管成像的图像噪声，提高 SNR、CNR 及主观图像图像质量。

PU-0060

Multivariate prognosis of supratentorial glioblastoma based on deep learning glioma and peritumoral segmentation images

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Objective：Using automaticsegmentation of glioblastoma by building a deep learning segmentation model, andconstruct multi-omics by combining with clinical and pathological information Apredictive model for the prognosis of patients with glioblastoma.

Methods： Using a retrospective cohort study method, a total of 1649 patients withglioblastoma were downloaded for this study, from UPENN-GBM database (n=630),UCSF-PDGM database (n=501), TCGA-GBM (n=262), Affiliated Hospital ofGuizhou Medical University (n=67). We collect clinical baseline data and imaging data, screen qualified cases through the inclusion and exclusion criteria, and performunified standardized preprocessing on the imaging data (including deskullization,resampling,

Z-SCORE normalization, registration), UCFS The database is used forthe training and verification of the deep model (3D-UNET); the UPENN-GBMdatabase is used as the radiomics training set and internally verified, and theTCGA-GBM data set and the Affiliated Hospital of Guizhou Medical University areused as the external verification set; The tumor and peritumoral edema imagesobtained by the deep learning segmentation model were automatically segmented forfeature analysis, and the radiomics score (Rad-score) of the respective methods wasintegrated with the clinical data to construct a cox hazard ratio nomogram. Ultimately,a good deep learning combined with clinical-pathological-imaging multi-omicsprognosis decision-making scheme is constructed to assist clinical work.

Results: wedeveloped a three-dimensional glioblastoma and peritumoral edema automaticsegmentation model. The model performs segmentation and manual repair onUPENN-GBM data set, TCGA-GBM data set and the data processed by the AffiliatedHospital of Guizhou Medical University, extracts and screens radiomics features, andcalculates the radiomics score (Rad-score) To quantify the imaging indicators, andthen divided into high-score group and low-score group according to the median andperform survival analysis, we found that the prognosis of patients in the low-scoregroup was better than that in the high-score group (p=0.0026), and the value ofRad-score and location in the prognosis of glioblastoma has a significant position oftumor (HR=0.884, 95% Cl[0.810;0.965], p<0.001), Rad-score (HR=2.150, 95 %Cl[1.392;3.323], p<0.001), we finally constructed a clinical-pathological-imagingmulti-omics prognostic model, and the model for 1-year (AUC=0.98), 3-year(AUC=0.70) prognosis The evaluation is valuable. In its internal verification, wefound that it has good performance within 1-5 years; after that, we conducted externalverification on the TCGA-GBM data set and the data of the Affiliated Hospital ofGuizhou Medical University. It also has a certain value in the evaluation of theprognosis of patients within 3 years (AUC>0.60).

Conclusions: Deep learning combined theimaging multi-omics model can better predict the prognosis of glioblastoma patients

PU-0061

联合多模式图像学习算法的缺血性脑卒中侧支循环定量评估与取栓预后的相关性分析

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目的：本研究基于 LP 图学习和 LSTM 深度学习的人工智能方法，对颅内大血管闭塞（LAO）所致急性缺血性脑卒中进行分析，探讨侧支循环与机械取栓预后的相关性，进一步分析影响机械取栓预后的高危因素。

方法：回顾性研究 2022 年 1 月至 2022 年 10 月因 LAO 所致急性缺血性脑卒中并行机械取栓的患者 92 例。所有患者术前均行脑 CT 灌注成像（CTP）检查，CTP 图像采用 LP 图学习和 LSTM 深度学习的人工智能方法，定量得出核心梗死体积、缺血半暗带体积及侧支血管密集度（血管密集度=低灌注区内血管的体积/低灌注区体积）。单因素分析中计量资料用 x±s 的形式表示并行两独立样本 t-检验，计数资料用行×列卡方检验。多因素分析采用 Logistic 回归模型，计算出优势比(OR)和 95%可信区间(95%CI)。

结果：通过纳入及排除标准，本研究共纳入 87 例 LAO 患者，其中男性 57 例，女性 30 例，年龄为 51.2±8.4 岁，预后较好的有 54 例，预后不良的为 33 例。通过该指标与传统量表评估、临床特征评估和 HIR 等影像指标评估进行比较，发现该定量值比传统的梗死核心和 NIHSS 评分等特征值诊断效能高（图 1-A），多因素 Logistic 回归分析表明，侧支血管密集度（P=0.008）（OR=13.296；95%CI，1.948-90.736）为影响机械取栓术预后的独立危险因素；当侧支血管密集度大于 0.155（cutoff 值）时，提示患者侧支循环较好，且行机械取栓的预后更佳。进一步，采用该指标进行缺血区侧支循环评估的模型也较常规基于 CTA 侧支循环评分量表的模型效能高（AUC：0.91 vs 0.76;图 1-B）。

结论：基于多模式图像学习算法的定量侧支血管密集度可反映 LAO 患者的侧支循环情况，该指标对缺血区侧支循环评估的效能较常规指标及基于 CTA 评分量表高，且该定量指标与取栓预后相关，为其独立的危险因素。

PU-0062

Subregional radiomics model in predicting progression free survival of glioblastoma with conventional magnetic resonance imaging

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Objectives: This study aims to identify intratumoral subregions with distinct heterogeneity based on conventional MRI images, and to assess their progression-free survival (PFS) stratification performance in Glioblastoma (GBM).

Methods: In this retrospectively study, 186 pretreatment GBM patients (99 vs. 87 for training vs. independent test cohorts) with pre-treatment 4 MRI sequences (T1-weighted, T2-weighted, fluid-attenuated inversion recovery, and contrast-enhanced T1-weighted images) from 3 different medical centers were enrolled. Each tumor was partitioned into several phenotypically consistent subregions via individual and population-level clustering. For each subregion, 974 radiomics features were extracted from 4 MRI sequences. After feature selection, the remain radiomic features obtained from each subregion in the training cohort were then concatenated to construct a radiomics risk score (RRS), on the basis of their ability to risk-stratify patients according to PFS. In addition, correlations ($P < 0.05$) between RRS features and clinical and genetic factors were assessed, using Spearman correlation analysis.

Results: Three subregions (denoted as S1, S2, and S3) were identified in the two cohorts. The prognostic performance of RRS-S1 outperformed RRS-whole tumor (C-index, 0.81 vs. 0.73; $p < 0.001$). Furthermore, the addition of subregional radiomics features to clinical, molecular and radiological features improved predictive performance and RRS-S1 showed the best performance (C-index, 0.8283, $p < 0.001$).

Conclusions: The stratification performance of subregional radiomics analysis was higher than the conventional whole tumor radiomics analysis.

PU-0063

Computed tomography reconstruction based on canny edge detection algorithm for acute expansion of epidural hematoma

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Background: and purpose: Acute enlargement of epidural hematoma often indicates a poor prognosis. This paper aims to explore the predictive value of computed tomography (CT) reconstruction based on the Canny seg_x0002_mentation algorithm for acute expansion of epidural hematoma. Methods: A retrospective analysis was made of 73 patients with epidural hematoma in our hospital. They were divided into two groups according to whether there was an acute expansion of hematoma during and after operation: the expansion group and the non-expansion group. Canny edge detection algorithm was used to segment the focus, and three-dimensional (3D) reconstruction was performed to predict the acute expansion of epidural hematoma. Evaluate the effect of 3D reconstruction of epidural hematoma and the application value of 3D CT reconstruction in acute hematoma enlargement. Results: The Dice value of the hematoma segmentation result based on Canny's edge detection algorithm was 0.919. The accuracy, sensitivity, and specificity of 3D CT reconstruction were 88.46%, 87.03, and 91.67%, respectively. Conclusion: The Canny edge detection algorithm has good accuracy in segmenting epidural hematoma, and CT reconstruction has an excellent predictive effect on the acute expansion of epidural hematoma.

PU-0064

基于对称双通道 UNet 网络的脑胶质瘤分割

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目的：
脑胶质瘤是一种高发病率、死亡率的中枢神经系统原发性恶性肿瘤，手术是其最有效的治疗方法，并且病变及手术切除范围评估与病人预后密切相关。目前，肿瘤浸润范围评估十分依赖影像学诊断，对于肿瘤边界的精准分割有助于病灶的完整切除。然而，脑胶质瘤手动分割存在耗时长、主观因素影响大等问题。因此，本研究采用人工智能技术自动分割脑胶质瘤，以获取更精准的肿瘤边界，并为临床提供更快捷的决策参考。

方法：
基于 UNet 网络引入了残差连接与多尺度特征提取模块并将它们整合作为一个新的网络单元（RM 模块，构成 RMUNet）。在此基础上把原残差连接以多尺度特征提取模块代替，构成双通道对称结构（SRM 模块，构成 SRMUNet），此时仍可将一个通道看作另一通道的残差连接。此外，引入 Focal Loss 代替交叉熵损失函数（SRMUNet_FL），均衡肿瘤与正常组织像素数量差异，并优化困难样本的分割效果。基于 BraTS19 数据集（T1、T2、T1ce 与 FLAIR 四种模态）随机选取 200 例图

像，以 4:1 的比例划分训练集与测试集。在测试集上评估各模态的分割效果，从 Dice 系数、召回率、精准率等方面综合评价网络性能。

结果：

结果显示，引入残差连接与多尺度特征提取模块后，T1ce 模态上 Dice 系数为 85. 59%，双通道对称结构进一步将 Dice 系数提升到 86.11%。在此基础上，使用 Focal Loss 代替交叉熵损失函数，获得了最佳分割结果，Dice 系数为 88.10%，对应召回率与准确率分别是 91.49%与 87.67%。在其余模态上，SRMUNet_FL 模型的 Dice 系数测试值也达到 86%以上。

结论：

针对 UNet 网络的改进策略整体上优化了网络性能，达到更好的多尺度特征提取效果，可以更客观精准地识别肿瘤边界。系列网络模型的测试集结果提示改进策略的有效性，以及最终网络模型在脑胶质瘤辅助诊断决策方面的应用潜力。

PU-0065

Multi-level Topological Analysis Framework for Multifocal Diseases

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Feature engineering and deep learning have been widely used to characterize imaging features in medical applications. However, the importance of geometric structure and spatial relationship of multiple lesions for multifocal diseases are often neglected by these methods. In this paper, we propose a Multi-level Topological Analysis (MTA) framework based on persistent homology, by capturing global-level topological invariants underlying geometric structure and local-level spatial adjacency relationship among lesions and local structure. In particular, a novel Filtration-based Community Discovery algorithm is designed to efficiently partition lesions to local clusters. Experimental results demonstrate that the proposed MTA framework outperforms five state-of-the-art persistent homology methods and achieved AUC 0.824±0.132 on a task of differentiating two multifocal diseases, Multiple Sclerosis and Neuromyelitis Optica.

PU-0066

对侧颈动脉狭窄对非急性前循环大血管闭塞的灌注影响:CTP 初步研究

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目的：探讨对侧颈动脉狭窄对非急性大血管闭塞（large vessel occlusion，LVO）脑部灌注和分水岭侧支状态的影响。

方法：回顾性分析 2020 年 1 月～2022 年 12 月我院连续 39 例非急性大血管闭塞患者 CT 脑灌注和 DSA 图像，根据对侧颈动脉狭窄（CAS）程度分为两组：狭窄≥50%和＜50%。CT 灌注成像采用 320 排 CT 扫描仪(Aquilion Vision，佳能医疗)。灌注分析采用人工智能处理工具（CTPDoc，数坤科技）。根据 Tmax 值，采用一种新的 10 分制分水岭区域侧支评分（WTCS）对侧支状态进行评分。比较两组双侧脑半球脑灌注参数及分水岭区 CBF、CBV、TTP、MTT、Tmax 比值以及 WTCS。

结果：39 例非急性前循环闭塞患者（对侧 CAS≥50%，n=19；对侧 CAS≤50%，n=20）均存在不同程度的灌注不良，闭塞侧前循环区侧支循环不完善，表现为 MTT、TTP 和 Tmax 延长，CBV 和 CBF 略有增加。与对侧非 CAS 患者相比，CAS≥50%患者的分水岭区 CBF 比值较低（0.959±0.146 vs 1.158±0.145，P=0.0039），而 CBV、MTT、TTP、Tmax 比值无统计学意义。与没有对侧 CAS≥50%的患者相比，对侧 CAS≥50%患者的 WTCS 较高[3.0（95%CI:2.0-5.0）vs 4.0（95%CI:3.0-6.2），P=0.049）]。两例（2/19，10.5%）对侧严重（WTCS:8）或轻度（WTCS:7）CAS 患者在 90 天的随访中分别出现不良事件。

结论：非急性 LVO 卒中患者中，对侧 CAS≥50%与不良侧支循环状态相关。WTCS≥7 可能是严重中风事件的潜在预测因素。然而，90 天的功能性预后独立于对侧 CAS，这表明同侧、对侧或双侧的血液供应复杂，不良事件发生率较高。

PU-0067

Application of deep learning reconstruction in oblique sagittal cervical spine MR assessing cervical neural foraminal stenosis with reduced scanning time

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Objectives: Due to the anatomical structural features of cervical neural foramina with angles of approximately 45° oblique position, the conventional orthogonal sagittal image can’t offer a clear view of cervical neural foramina and the oblique sagittal image is demonstrated to be the optimal orientation for the diagnosis of cervical neural foraminal stenosis (CNFS). However, the oblique sagittal image is not included in the routine cervical spine MR protocol because the relatively long additional scanning time is required. This study aims to investigate whether the

oblique sagittal cervical spine MR with deep learning reconstruction (DLR) using limited time cost provide improved inter-reader agreement in grade of CNFS and better clinical correlations.

Methods: For images with number of excitation (NEX) of 1 or 2, images of 78 participants (23 men, age 54.13 ± 7.66 years) were acquired 1NEX with DLR (hereafter, 1NEX MRI + DLR) and without DLR (hereafter, 1NEX MRI) and 2NEX without DLR (hereafter, 2NEX MRI). Two readers interpreted images independently for noise, artifacts, overall image quality and grade of CNFS at cervical level from C4－5 to C6－7. Inter-reader agreement in values were analyzed using kappa statistics and differences in values were compared using Wilcoxon signed-rank tests. Spearman correlation between grade and clinical manifestations were calculated using non-parametric correlation analysis.

Results: The analyses of noise and overall image quality showed significantly better results for 1NEX MRI + DLR compared with 1NEX MRI ($p<0.001$) and 2NEX MRI ($p<0.001$). Inter-reader agreements in grade of CNFS at bilateral C4-5/C5-6/C6-7 were perfect for 1NEX MRI + DLR, superior to those for 1NEX MRI and 2NEX MRI. Representative MR images of grade of CNFS at bilateral C4-5/C5-6/C6-7 rated by the two readers for 1NEX MRI + DLR/1NEX MRI/2NEX MRI were shown. Grade of CNFS at left C4-5 was positively associated with numbness, and correlation intensity for 1NEX MRI + DLR was stronger than 1NEX MRI and 2NEX MRI.

Conclusions: Without large expense of imaging time, DLR based T2 weighted oblique sagittal cervical spine MR provides images with reduced noise and better quality, which results superior inter-reader agreement in grade of CNFS and better clinical correlation. It could be considered to include into the routine cervical spine MR to approve more precise grading of CNFS and support neurosurgeons to determine appropriate treatment scheme.

PU-0068

基于 DTI 图像的 Transformer 模型预测耳鸣患者音乐掩蔽治疗效果

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目的:探究 DTI 图像与耳鸣患者之间的关联，运用基于 DTI 图像的 Transformer 模型预测耳鸣患者音乐掩蔽治疗效果。

方法: 对 60 例特发性耳鸣患者和 57 例健康对照人群进行了弥散张量成像（Diffusion Tensor Imaging，DTI）。应用了一种特殊的耳鸣治疗仪器 eMasker®（Micro-DSP 科技有限公司），这是一种根据耳鸣特征测试结果定制的个人声音治疗设备，可以对耳鸣患者进行音乐掩蔽治疗。每 17 周收集一次关于声音疗法应用的治疗反馈。所有患者被要求在治疗后再次完成耳鸣障碍量表评分，据此将患者分为治疗有效组与治疗无效组。基于迁移学习的方法构建基于 DTI 图像的 Transformer 模型，标签选择为治疗有效组与治疗无效组，探究模型预测能力。

结果:在 28 例患者中，音乐掩蔽治疗具有良好的治疗效果；32 名患者治疗无效。基于 DTI 图像的 Transformer 模型可以很好地将这两类患者进行区分（AUC 为 0.94，敏感性，82.86%;，特异性，97.14%），且在 10 折交叉验证中都保持较高的预测能力（所有 AUC＞0.85，平均 AUC＞0.9）。校准曲线显示模型拟合良好。且模型对于区分健康对照人群与耳鸣患者也有意义（P＜0.05）。

结论: 基于 DTI 图像的 Transformer 模型可以有效预测耳鸣患者的治疗效果，这对于耳鸣患者的治疗方案选择是具有积极意义的。

PU-0069

利用对比增强 MRI 的脑转移瘤计算机辅助检测和监测治疗反应

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目的：探讨基于特征金字塔网络（FPN）的机辅助检测在对比增强(CE) MRI 上非手术治疗前后检测脑转移瘤（BMs）的价值，并评价其在监测脑转移瘤治疗反应中的作用。

材料和方法：本研究回顾性纳入 2021 年 10 月至 2022 年 12 月期间在我院接受初次和非手术治疗后随访 3D CE MRI 的 85 名新诊断为脑转移的癌症患者。所有 MR 检查均在 3.0T MR 系统（Elition, Philips; Discovery 750w, GE）上进行。人工检测 (Manual detection，MD) 由医师 1 执行。计算机辅助检测（computer-aided detection，CAD）由医师 2 使用 uAI Discover 脑转移瘤检测软件执行。两位医师分别对每位患者的治疗反应进行了评估。分别针对初始、随访和总体数据计算 MD 和 CAD 的灵敏度、平均每次扫描的假阴性和假阳性 。 配对卡方检验用于比较 MD 和 CAD 在脑转移检测方面的差异。 通过 kappa 检验评估 MD 和 CAD 在监测治疗反应方面的一致性。

结果：MD 和 CAD 对初始 3D CE MRI 的敏感性分别为 78.65% 和 99.13%。 配对卡方检验表明，在初始 3D CE MRI 上，MD 和 CAD 的 BM 检测存在统计学差异。 MD 和 CAD 对随访 3D CE MRI 的敏感性分别为 76.32% 和 98.24%。 配对卡方检验显示，MD 和 CAD 在随访 3D CE MRI 上的 BM 检测存在统计学差异。医师 1 和医师 2 在评估脑转移瘤的治疗反应方面有很好的一致性（Kappa=0.941，P<0.05）。

结论：与 MD 相比，基于 FPN 的 CAD 对检测 BM 具有更高的敏感性、更低的假阴性。 CAD 在 CE MRI 上检测和监测脑转移瘤的治疗反应方面具有较高性能。

PU-0070

基于深度学习的胶质母细胞瘤多模态磁共振图像分割方法研究

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目的： 通过构建深度学习分割模型来实现对于胶质母细胞瘤的自动分割并验证其在其他数据集的可用性。

方法： 采用回顾性方法，总共下载了 1649 例胶质母细胞瘤的患者进行本次研究，分别来自 UPENN-GBM 数据库（n=630）、UCSF-PDGM 数据库（n=501）、 TCGA-GBM(n=262)、贵州医科大学附属医院（n=67）数据临床基线数据及影像数据，通过纳入排出标准筛选出符合要求的病例后对

其影像数据进行统一的标准化预处理（包括去颅骨、重采样、Z-SCORE 归一化、配准），UCFS 数据库用于进行深度模型（3D-UNET）的训练及验证；UPENN-GBM 数据库作为内部验证集、TCGA-GBM 数据集及贵州医科大学附属医院数据作为外部验证集，并验证其性能。

结果：通过使用 UCSF-PDGM 数据库进行 3D-Unet 模型训练及验证，我们开发了一个 3D 胶质母细胞瘤及瘤周水肿自动分割模型，性能最好的模型 Dice 值为 0.909704， Val_dice 值为 0.856033，之后使用该模型对 UPENN-GBM 数据集、TCGA-GBM 数据 集及贵州医科大学附属医院数据处理好的图像进行分割并得到较好的性能。

结论：使用深度学习胶质母细胞瘤多模态磁共振图像分割模型可以提高图像分割的效率并加速向临床实践的转型。

PU-0071

基于 CT 平扫征象预测自发性脑出血早期血肿扩大的研究进展

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自发性脑出血是严重的急性脑血管疾病，大多数患者在发病早期可出现血肿扩大，这会进行性加重神经功能损伤和不良预后，因此能否客观准确地预测血肿扩大并尽早采取个体化针对性的治疗十分关键。CT 作为脑出血诊断的金标准，能够直观地显示脑出血情况，基于 CT 征象预测早期血肿扩大具有十分重要的临床价值。文章针对 CT 平扫征象预测血肿扩大的研究进展进行综述，旨在为临床医师快速准确地判断患者病情并积极采取干预治疗提供客观参考。

PU-0072

从肺癌脑转移瘤的 MRI 表现预测肺癌的组织学病理类型

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摘要：**目的**：研究不同病理类型肺癌的脑转移瘤的 MR 表现，从而预测肺癌脑转移瘤原发灶的组织学病理类型。**资料与方法**：回顾性分析病理或临床证实的 157 例不同病理类型的肺癌脑转移瘤的 MRI 影像，分析病灶周围水肿范围、病灶大小、数量、信号特点、部位、强化方式。**结果**：157 例病例中，共 347 个病灶，好发于皮层下转移瘤以肺腺癌多见，结节状强化的以肺腺癌、肺小细胞癌多见，病灶环形强化的神经内分泌癌及黏液性肺腺癌多见，斑片状强化以肺腺癌、EGFR19 基因突变型多见，囊性转移瘤以黏液性肺腺癌、神经内分泌癌多见，病灶较大的转移瘤以神经内分泌癌多见，出血多见肺腺癌，(P=0.004)。DWI 呈低信号多以神经内分泌癌多见(P＝0.015)。**结论**：肺癌脑转移瘤的 MRI 表现差异与肺癌的病理类型有关系，从肺癌脑转移瘤 MRI 表现可以一定程度预测原发灶肺癌的组织病理学类型。

PU-0073

Role of insula and its subregions in transition from acute to chronic idiopathic tinnitus

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PurposeTinnitus is an auditory hallucination, that is, the perception of sound without any internal or external stimulus. Tinnitus is a common condition, with an incidence of approximately 10%–15% in adults. Tinnitus and its negative consequences, for example, anxiety and depression, greatly diminish the quality of life of patients. A growing body of evidence shows that tinnitus is not a cochlear lesion but a neurological symptom closely related to abnormal brain remodeling. We determined the structural and functional alterations in the insula and its subregions in patients with idiopathic tinnitus in order to identify the neural changes involved in the progression from acute to chronic tinnitus.**Methods and materials**We recruited 24 acute tinnitus patients, 32 chronic tinnitus patients, and 36 healthy controls. We measured the gray-matter (GM) volume and fractional amplitude of low-frequency fluctuation (fALFF) of the insula and its subregions, and the functional connectivity (FC) within the insula and between the insula and the rest of the brain. Relationships between MRI and clinical characteristics were estimated using partial correlation analysis.**Results**According to the results of a connection-based parcellation study, we divided the insula was divided into a total of 6 subregions, 3 per hemisphere: posterior insula (PI), dorsal anterior insula (dAI), and ventral anterior insula (vAI) (Fig1). Both acute and chronic tinnitus patients showed significantly decreased fALFF across the insula and its subregions, but only chronic tinnitus patients showed bilateral GM atrophy in the ventral anterior insula (vAI) (Fig2). Abnormal FC was detected in acute and chronic tinnitus patients relative to the healthy controls, but FC differences between acute and chronic tinnitus patients were found in only the auditory-related cortex, frontal cortex, and limbic system (Fig3). Functional alterations (fALFF and FC of the left vAI), but not structural changes, were correlated with clinical severity (Fig4). Bilateral GM atrophy in the vAI, decreased regional activities in the left vAI and left posterior insula, and abnormal FC of the insula subregions with auditory and non-auditory areas were implicated in the progression from acute to chronic tinnitus. **Conclusion**In conclusion, as the tinnitus duration increased (from less than 1 year to more than 1 year), we found that structural alterations and changes in neural activity in the insula subregions, and the connectivity of the insula subregions with areas in the frontal cortex, limbic system, and temporal cortex changed continuously. Our findings indicate that tinnitus generation and development occur in a dynamic manner, and the structure, regional activities, and related connectivity changes of the insula and its subregions play a crucial role in this process. In particular, abnormal connectivity of the insula subregions with areas in the auditory cortex, frontal cortex, and limbic system, as a tinnitus circuit, may predict the progression from

acute tinnitus to chronic tinnitus. The above regions may serve as a major hub in the central mechanism of tinnitus.

PU-0074

MRI 在黏液乳头型室管膜瘤和脊髓室管膜瘤中的鉴别诊断价值

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目的　　比较并分析椎管内黏液乳头型室管膜瘤和脊髓室管膜瘤的临床资料及 MRI 表现，探讨 MRI 对两者的鉴别诊断价值。方法　　回顾分析本院 2010 年-2022 年发生于椎管内经手术病理证实且影像资料及手术记录完整的黏液乳头型室管膜瘤 16 例与脊髓室管膜瘤 18 例的临床资料及影像表现，比较两者在临床和影像学上的差异。结果　　椎管内黏液乳头型室管膜瘤与脊髓室管膜瘤在发病年龄、发生部位、形态、肿瘤长径、囊变及出血分布、T1WI 及 T2WI 信号强度、增强信号特点上的差异具有统计学意义（P＜0.05）。结论　　椎管内黏液乳头型室管膜瘤与脊髓室管膜瘤在临床特点及影像学表现上存在一定的差异，结合临床资料能提高两者术前诊断的准确性

PU-0075

全脑 CT 灌注成像在急性孤立性脑干梗死的诊断和预后预测价值

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目的：探讨全脑 CT 灌注（WB-CTP）影像参数在急性孤立性脑干梗死的早期诊断和预后预测的价值。

方法：回顾性分析 2018 年 1 月至 2022 年 3 月本院急诊卒中中心连续收治的的急性孤立性脑干梗死患者，所有患者入院时均接受全脑 CT 灌注检查并由 MRI 确诊。测量梗死灶的灌注缺损体积和最终梗死体积（FIV）。发病 90 天后改良 Rankin 评分 0-1 分为预后良好。统计方法包括单因素回归分析、多因素回归分析、二元逻辑分析和受试者工作特征分析（ROC）。

结果：CT 平扫阳性、CT 血管成像源图像阳性、基底动脉狭窄、入院时美国国立卫生研究院卒中量表（NIHSS）评分和 WB-CTP 图谱上的灌注缺损体积与 FIV 关系密切。多因素方差分析，在调整了年龄、性别、NIHSS 评分、发病-检查时间、CT 平扫阳性、CT 血管成像源图像阳性后，灌注缺损体积与 FIV 仍显著相关。在二元逻辑回归分析中，所有 CTP 图上的灌注缺损体积均是良好预后的独立预测因子。在 ROC 分析中，脑血流量对预后的鉴别价值略高，最大曲线下面积为 0.675。

结果：WB-CTP 图像的灌注缺损体积可以预测急性孤立性缺血性脑干梗死患者的预后情况。

PU-0076

Mixed brain perfusion pattern and its association with epilepsy duration: The application of arterial spin labeling in older people with epilepsy

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Purpose: We aimed to identify the brain perfusion pattern of older people with epilepsy by pseudo-continuous arterial spin labeling (pCASL), and find the association between cerebral blood flow (CBF) and duration of epilepsy.

Methods: A total of 80 older people with MRI-negative epilepsy and 40 healthy controls with matched age, gender and education were prospectively recruited. Epilepsy-related clinical features were collected, including epilepsy duration, age of onset, seizure frequency and number of anti-seizure medication types. The participants were administrated 3.0-T T1WI and pCASL scan. The perfusion patterns were compared between two groups on whole-brain voxel-based level. The brain regions with significant differences between the two groups were defined as regions of interest (ROI), from which CBF values were extracted. For EP group, demographic characters and clinical features were included in the multiple linear regression model, in order to analyze the association between ROI-based CBF and duration of epilepsy.

Results: Compared to healthy controls, older people with epilepsy exhibited decreased CBF in the bilateral middle temporal gyrus and inferior temporal gyrus, and increased CBF in the left supplementary motor area, right fusiform gyrus and left anterior cingulate and paracingulate gyri ($P < 0.05$, cluster-level, AlphaSim corrected). After adjustment for age of onset, gender, education, seizure frequency and number of anti-seizure medication types, CBF of the left middle temporal gyrus and inferior temporal gyrus negatively correlated with duration of epilepsy ($\beta = -0.430$, $P=0.024$). Similarly, CBF of the right middle temporal gyrus and inferior temporal gyrus also negatively correlated with duration of epilepsy ($\beta = -0.466$, $P=0.022$).

Conclusions: There was a mixed brain perfusion pattern in older people with MRI-negative epilepsy, and CBF of the brains regions with decreased perfusion negatively correlated with duration of epilepsy, indicating that pCASL may provide supplementary information in clinical evaluation of seizure activity and severity for older people with MRI-negative epilepsy.

PU-0077

DWI 序列对急性脑梗死诊断的价值探讨

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目的：探讨 DWI 序列对急性脑梗死诊断的价值分析。

方法：采集本院 2021 年 4 月至 2021 年 8 月期间接收的 88 例＜24 小时急性脑梗死患者，使用磁共振常规序列 T1WI、T2WI、液体抑制反转恢复（FLAIR）及弥散加权磁共振成像（DWI）序列对 88 例发病＜24 小时的脑梗死病例进行检查。

结果：其中 45 例病例在 FLAIR 序列中可见为稍高信号，88 例在 DWI 序列中均表现为高信号，随着 b 值得增大 DWI 序列中的信号强度也随之增高，在弥散系数（ADC）序列中表现为低信号。

结论：磁共振 DWI 序列对超急性及急性脑梗死有很高的敏感性和特异性，DWI 序列能快速、准确的诊断出超急性和急性脑梗死，且能判断出阻塞血管的部位，以便为临床提供最佳的治疗方案，诊断具有明显优势。

PU-0078

急性前循环大面积脑梗死恶性脑水肿早期评估体系的研究

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[摘要]：

目的　比较 EDEMA 评分、NEDEMA 评分、ASEDEMA 评分这三种评分对大面积脑梗死患者发生恶性脑水肿的临床预测价值。

方法 回顾性分析我院大面积脑梗死患者的影像及临床资料（包括 EDEMA 评分五个参数：入院血糖，中风病史，再灌注治疗，中线移位和基底池消失），并将入院时 NIHSS 及 ASPECTS 两个评分分开添加到原始 EDEMA 分数中，创建修改后的两个分数，利用受试者工作特征曲线比较 EDEMA 评分、NEDEMA 评分、ASEDEMA 评分这三种评分对大面积脑梗死患者发生恶性脑水肿的临床预测价值。

结果 单因素分析显示基底池消失、中线移位、EDEMA 评分、NEDEMA 评分、ASEDEMA 评分在两组间比较有统计学意义（P<0.05）。EDEMA 评分、NEDEMA 评分、ASEDEMA 评分预测大面积脑梗死发生恶性脑水肿的 ROC 曲线下面积（AUC）分别是 0.867（95%CI=0.778～0.956，P<0.001）、0.880（95%CI=0.792～0.969，P<0.0001）、0.860（95%CI=0.766～0.953，P<0.0001）。结果显示 NEDEMA 评分、ASEDEMA 评分对大面积脑梗死发生恶性脑水肿的最佳预测临界值均为 5.5 分。

结论　NEDEMA 评分比 EDEMA 评分、ASEDEMA 评分在预测大面积脑梗死患者发生恶性脑水肿方面的临床价值更高，更具备临床实用性。

PU-0079

强化药物治疗后对脑卒中神经功能预后评估的前瞻性研究

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目的：本章研究旨在基于三维高分辨率磁共振管壁成像（hr-VW-MRI）通过短期随访和长期随访两个时间维度，探讨经强化药物治疗后患者临床和影像特征的变化规律，并评估缺血性脑血管事件治疗后神经功能残障的独立危险因素。

材料与方法：本研究前瞻性分析因急性缺血性脑卒中或 TIA 入院治疗的患者，所有患者均在入院前行三维头颈联合 hr-VW-MRI 检查，并要求患者在强化药物治疗 3 个月后进行临床指标和影像特征的复查评估。随后在 2021 年 3 月 1 日前以电话采访形式进行患者症状和残障评估。通过改良兰金量表（modified rankin scale，mRS）来确定预后不佳和神经功能残障。统计分析采用单因素及多因素 Logistic 回归评估预后情况，并计算优势比（OR）和 95%置信区间（95%CI）。

结果：最终纳入研究的患者为 80 人（平均年龄：59.64±12.03），两次 MRI 扫描的平均时间间隔为 92.4±15.9 天，长期随访的平均天数为 583.4±130.8 天。在神经功能预后评估中，短期治疗后的预后优劣与患者高危因素控制不佳（OR=4.544；95%CI，1.238-24.761；P=0.045）、总运动代谢当量（OR=0.678；95%CI，0.465-0.990；P=0.044）和熵（OR=0.073；95%CI，0.011-0.473；P=0.006）显著相关，而斑块位于第二象限（图 1）（OR=9.617；95%，2.0159-44.911；P=0.004）、服药依从性（OR=0.135；95%，0.030-0.610；P=0.009）和高危因素控制不佳（OR=6.234；95%，1.723-22.553；P=0.005）则与其长期治疗后神经功能残障有关（图 2）。

结论：hr-VW-MRI 可评估强化药物治疗后斑块变化情况，并有助于缺血性脑卒中患者的功能残障评估。

PU-0080

青年急性脑梗死合并脑小血管病变及其危险因素分析

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目的：探讨青年性脑梗死患者是否存在脑小血管病变(cerebral small vessel disease，CSVD)，并分析其临床危险因素。材料与方法：回顾性收集 2019 年 1 月至 2021 年 12 月于本院住院治疗的临床确诊的新近发生青年性脑梗死患者 91 例 及 96 名年龄、性别与青年梗死组相匹配的健康人作为对照组。并收集所有受试者入院时的临床资料以及实验室检查指标。所有受试者接受常规 MRI 和 DWI 扫描，观察脑内各种 CSVD 的 MRI 表现进行评分，包括双侧基底节区及半卵圆中心区血管周围间隙扩大(enlarged perivacular space，EPVS)、侧脑室周围白质高信号(periventricular hyperintense，PVH)、深部白质高信号(deep white matter hyperintense，DWMH)、腔隙性梗死(lacunar infarction，LI)以及微出血(cerebral microbleeds，CMBs)，计算脑小血管病总体负担评分(total burden scores of CSVD，TBS)，并对各评分进行分级。计数资料比较采用卡方检验；CSVD 各影像表现评分采用非参数检验。应用多因素 Logistic 有序回归分析确认青年梗死组 CSVD 的影响因素。$P<0.05$ 为差异有统计学意义。

结果：青年性脑梗死患者 CSVD 发生率较对照组增高，其中 EPVS、LI、DWHM CMBs 及 TBS 之间差异具有统计学意义（$P<0.05$）。多因素 Logistic 有序回归分析结果显示：压力程度是青年性脑梗死患者 EPVS、DWMH、CMBs 及 TBS 的影响因素 ；睡眠质量是 DWMH 及 TBS 的影响因素；高血压

是 CMBs 的影响因素（$P<0.05$）。结论：青年性脑梗死患者常伴有脑小血管病变。高血压、压力程度及睡眠质量可能是青年性梗死患者脑小血管疾病的影响因素。

PU-0081

阿尔茨海默病谱系中局部血流灌注与脑功能解耦合

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目的：既往基础研究表明阿尔茨海默病（AD）的病理过程伴随着神经血管耦合（NVC）受损，但是它在阿尔茨海默病人群中的早期改变及其与 AD 病理（淀粉样蛋白 β ［Aβ］和 Tau 蛋白）的关系仍不确切。本研究旨在探究 AD 谱系中 NVC 的早期改变，以及它与 AD 病理及认知的关系。鉴于脑小血管病（CSVD）在老年人中十分常见，本研究同时评估了 CSVD 病理对 AD 人群 NVC 改变的贡献。

方法：从 ADNI 数据库纳入认知正常（CN）及轻度认知障碍（MCI）被试，所有人均有静息态功能磁共振、动脉自旋标记磁共振、正电子发射断层扫描（PET）数据，并根据 AT（N）病理分级系统分组：CN 且无 Aβ 沉积（A-CN）43 人、CN 伴 Aβ 沉积（A+CN）18 人、MCI 伴 Aβ 沉积（A+MCI）20 人,排除非 AD 病理（A-MCI）34 人。计算局部一致性（ReHo）以代表神经活动，灰质血流量（CBF）代表脑灌注；二者的比值（CBF/ReHo ratio）以评估脑活动与灌注的匹配情况，即神经血管耦合；另采用 PET 数据反映脑内 Aβ 和 Tau 病理负荷。采用方差分析探究 ratio 的差异脑区并进行了事后分析；为了探索神经血管耦合损伤的神经机制及其临床意义，将 ratio 与神经病理标志物以及认知功能进行相关分析，并额外进行了其与 CSVD 病理评分的相关性分析。

结果：与 A-对照组相比，A+组均在左侧颞中回/颞下回（MTG/ITG）存在 CBF/ReHo ratio 值下降，减低的 ratio 与更低的 MMSE 评分及更高的 Aβ 及 Tau 负荷相关，这一改变独立于 CSVD 病理。

结论：伴随着 AD 病理的进展，AD 谱系早期人群存在 NVC 受损，并与更差的总体认知相关。CBF/ReHo ratio 或许可以作为一个有效检测 AD 早期神经血管耦合改变的指标，这些发现有助于我们理解 AD 病理在 AD 神经血管解耦合中的作用，为 AD 临床诊疗提供依据。

PU-0082

椎管内黏液乳头型室管膜瘤的 MRI 征象分析

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目的：探讨椎管内黏液乳头型室管膜瘤的 MRI 征象，提高本病术前影像诊断水平。方法：回顾性分析本院经手术病理证实且影像资料及手术记录完整的 16 例黏液乳头型室管膜瘤的临床资料及影像表现。结果：16 例黏液乳头型室管膜瘤均为单发病灶，8 例位于腰 2 椎体附近，16 例肿瘤呈中心性纵向生长，平均长径为（4.93±2.94）cm，13 例表现为规则的长椭圆形，2 例为短椭圆形，1 例形态不规则，对椎管后方骨质压迫、吸收呈“扇贝样”改变，但未累及椎间孔。12 例肿瘤与脊髓圆锥或马尾终丝分界不清，4 例对脊髓圆锥或马尾终丝推移。T1WI 平扫 15 例呈等信号

（参照脊髓灰质），1 例低信号。T2WI 平扫 15 例为高信号，1 例为完全低信号，14 例肿瘤内掺杂点状、条状及斑片状低信号，有 9 例肿瘤头端或尾端表现为“帽征”，且全部为马尾终丝区的肿瘤。5 例肿瘤内部可见囊变，2 例尾端囊变。T1WI 增强 16 例肿瘤实体均明显强化，10 例肿瘤表现为蜂窝状强化，1 例肿瘤 T2WI 显示为完全低信号，增强后环形强化。结论：椎管内黏液乳头型室管膜瘤在 MRI 上具有一定的特征性，结合临床资料，能提高术前诊断的准确性。

PU-0083

3种颅内动脉钙化评价方法评估脑小血管病效能的对比研究

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目的 探讨颅内动脉钙化（IAC）在评估脑小血管病（CSVD）的最优方法。**方法** 回顾性分析 2018 年 12 月至 2020 年 7 月本院住院的 303 例研究对象的资料。根据 CSVD 总体负担评分，将实验组分为 4 组（1～4 分），无 CSVD（0 分）人群作为对照组，采用 Agatston、改良 Woodcock、Babiarz 这 3 种钙化评价方法，在头颅 CT 评价 IAC 情况，在头颅 MRI 计算 CSVD 总体负担评分；采用受试者工作特征曲线（ROC）比较 3 种方法评估 CSVD 的效能。**结果** Agatston、改良 Woodcock 及 Babiarz 这 3 种方法鉴别诊断有无 CSVD、CSVD1 分和 2 分、1 分和 3 分、1 分和 4 分、2 分和 3 分、3 分和 4 分的曲线下面积分别为：0.899 VS 0.911 VS 0.921、0.579 VS 0.629 VS 0.690、0.622 VS 0.701 VS 0.716、0.706 VS 0.763 VS 0.783、0.549 VS 0.625 VS 0.635、0.644 VS 0.687 VS 0.696、0.605 VS 0.577 VS 0.648，其中 Babiarz 方法曲线下面积最大。**结论** 在 3 种 IAC 评价方法比较中，Babiarz 方法评估 CSVD 的效能最好，该评价方法快速、实用，可用于脑血管病的大型流行病学研究。

PU-0084

CT perfusion deficit volume predicts the functional outcome of endovascular therapy for basilar artery occlusion

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Objectives To investigate the relationship between baseline computed tomography (CT) perfusion deficit volumes and functional outcomes in patients with basilar artery occlusion (BAO) undergoing endovascular therapy (EVT).

Methods This was a single-center study in which 64 patients with BAO who underwent EVT were retrospectively analyzed. All the patients underwent multi-model CT on admission. The posterior-circulation Acute Stroke Prognosis Early Computed Tomography Score (pc-ASPECTS) was applied to assess the ischemic changes. Perfusion deficit volumes were obtained using Syngo.via software. The primary outcome of the analysis was a good functional outcome (90-day modified Rankin Scale [mRS] score ≤ 3). Logistic regression and correlation analyses were further used to explore predictors of the functional outcome.

Results A total of 64 patients were recruited (median age 68, 71.9% male patients), of whom 26 patients (40.6%) achieved good functional outcomes, while 38 (59.4%) had poor functional outcomes. Tmax > 10 s, Tmax > 6 s, and rCBF < 30% volume were independent predictors of good functional outcomes (odds ratio range, 1.025–1.167; 95% confidence interval [CI]: 1.003–1.357]) and performed well in the receiver operating characteristic analyses exhibiting positive prognostic value; the areas under the curves were 0.845 (95% CI, 0.751–0.939), 0.806 (95% CI, 0.698–0.914), and 0.781 (95% CI, 0.670–0.892).

Conclusion CT perfusion deficit volume represents a valuable tool in predicting higher risk of disability and mortality in patients with BAO after basilar endovascular treatment.

PU-0085

伴缺血性脑血管病颈动脉蹼的 CTA 影像与临床特征分析

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目的 探讨无症状、短暂性脑缺血（transient ischaemic attack，TIA）及同侧急性缺血性脑卒中（acute ischemic stroke，AIS）颈动脉蹼患者的临床及影像学特征。方法 回顾性选择经 CT 血管造影（CTA）诊断为颈动脉蹼的患者，按照颈动脉蹼与 TIA、AIS 发生分为无症状性颈动脉蹼组、TIA 颈动脉蹼组、AIS 颈动脉蹼组，比较三组患者的临床及 CTA 颈动脉蹼影像学特征。结果 76 例颈动脉蹼患者，共发现颈动脉蹼 85 个，其中无症状性颈动脉蹼组 26 例，TIA 颈动脉蹼组 22 例、AIS 19 例、合并其他脑血管病 9 例。男性 59 例，女性 17 例。在临床特征卡方及方差分析比较，其中伴有糖尿病、高血压、吸烟、高密度脂蛋白，三组间差异均有统计学意义（P ＜0.05）。在高血压、吸烟组间分析中，无症状与 TIA 颈动脉蹼组、AIS 颈动脉蹼之间有统计学意义（P ＜0.05），在糖尿病组间分析中，TIA 颈动脉蹼组与无症状、AIS 颈动脉蹼组之间有统计学意义（P ＜0.05）。在高密度脂蛋白组间方差分析中，无症状组与 TIA 颈动脉蹼组、AIS 颈动脉蹼之间有统计学意义（P ＜0.05）。在颈动脉蹼影像特征包括轴位长度、斜矢状位长度、角度、狭窄程度单因素方差分析三组比较，仅狭窄程度有统计学意义（F =3.43，P ＜0.05）,其中无症状组与 AIS 颈动脉蹼组之间有统计学意义（P ＜0.05）。年龄、性别、收缩压、舒张压、总胆固醇水平、甘油三脂水平、低密度脂蛋白水平、颈动脉蹼（轴位长度、斜矢状位长度、角度）均无统计学意义（P ＞0.05）。结论 颈动脉蹼以男性多见，在存在相关危险因素高血压、糖尿病、吸烟及高密度脂蛋白水平改变的颈动脉蹼患者，其更易于发生 TIA 或者缺血性卒中事件。颈动脉蹼形态结构所致的管腔狭窄亦与缺血性脑卒中有着密切关系。

PU-0086

A predictive nomogram for intracerebral hematoma expansion based on non-contrast computed tomography and clinical features

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Purpose To develop and validate a new nomogram utilizing non-contrast computed tomography (NCCT) signs and clinicalfactors for predicting hematoma expansion (HE) in patients with spontaneous intracerebral hemorrhage (ICH).Methods HE was defined as> 6 mL or 33% increase in baseline hematoma volume. Multivariable logistic regression analysis was performed to identify the predictors of HE. The discriminatory performance of the proposed model was evaluatedvia receiver operation characteristic (ROC) analysis, and the predictive accuracy was assessed by a calibration curve. Thenomogram was established by R programming language. The decision curve analysis and clinical impact curve were drawnaccording to the related risk factors.Results A total of 506 patients with spontaneous ICH were recruited in the development cohort, and 103 patients wereregistered as the external validation cohort. Among the development cohort, 132 (26.09%) experienced HE. Glasgow comascale (GCS) (P < 0.001), neutrophil to lymphocyte ratio (NLR) (P < 0.001), blend sign (P < 0.001), swirl sign (P < 0.001),and hypodensities (P = 0.003) were significant predictors of HE, by which were used to establish the nomogram. The modeldemonstrated good performance with high area under the curve both in the development (AUC = 0.908; 95% confidenceinterval, 0.880 - 0.936) and the external validation (AUC=0.844; 95% confidence interval, 0.760 - 0.908) cohort. The calibration curve illustrated a high accuracy for HE prediction.Conclusion The nomogram derived from NCCT markers and clinical factors outperformed the NCCT signs-only model inpredicting HE for patients with ICH, thus providing an effective and noninvasive tool for the risk stratification of HE.

PU-0087

颅内动脉钙化定量评价与脑小血管病总体负担评分的相关性研究

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目的　旨在探讨 3 种颅内动脉钙化（IAC）评价方法结果与脑小血管病（CSVD）的相关性。方法　回顾性分析 303 例观察对象的资料。CSVD 患者为实验组，无 CSVD 人群为对照组。在头颅 CT 采用 Agaston、改良 Woodcock、Babiarz 这 3 种方法评价 IAC，在头颅 MRI 评价腔隙性脑梗死、脑白质高信号、脑微出血、血管周围间隙 4 个征象并计算 CSVD 总体负担评分，采用 Spearman 秩相关分析评价 CSVD 与 IAC 的相关性；采用 Kruskal－Wallis 检验比较 5 组观察对象的 IAC。结果　Agaston 钙化分级、改良 Woodcock 钙化积分、Babiarz 钙化分级与 CSVD 总体负担评分（r 分别为 0.643、0.666、0.681）、深部白质高信号（r 分别为 0.503、0.536、0.539）、脑室旁白质

高信号（r 分别为 0.535、0.578、0.570）、脑微出血（r 分别为 0.452、0.480、0.479）、腔隙性脑梗死（r 分别为 0.466、0.518、0.541）、血管周围间隙（r 分别为 0.585、0.577、0.554）均呈正相关，P 值均＜0.001。结论　3 种 IAC 评价结果均与 CSVD 呈正相关，IAC 可能是 CSVD 的危险因素。

PU-0088

基底动脉闭塞患者经血管内治疗后枕骨大孔疝发生的影像学预测因素分析

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目的：探讨基底动脉闭塞（BAO）患者经血管内治疗（EVT）后枕骨大孔疝（TH）发生的早期影像学预测因素。方法：回顾性分析 2018 年 3 月~2022 年 9 月于丽水市中心医院神经内科住院行 EVT 的 BAO 患者 59 例，均进行多模式 CT 检查，使用 Siemens 后处理工作站 Syngo.via 进行图像后处理，生成脑血流量（CBF）、脑血容量（CBV）、平均通过时间（MTT）及达峰时间（Tmax）图像，并基于不同的阈值得到定量灌注参数：Tmax>6s、10s 体积（VTmax>6s、VTmax>10s），rCBF<20%、30%体积（VrCBF<20%、VrCBF<30%）和缺血半暗带体积（VTmax>6s - VrCBF<30%）。对 TH 组和非 TH 组患者的一般资料和影像学参数进行组间比较，以 ROC 曲线评价预测效果，约登指数确定最佳截断值。结果：①相较于非 TH 组，TH 组男性更多（P=0.014），90d mRS 评分更高（P=0.001）。②TH 组与非 TH 组相比，VTmax>10s（P=0.012）、VrCBF<20%（P=0.004）和 VrCBF<30%（P=0.003）更大。TH 组较非 TH 组更易发生基底动脉近段闭塞（P=0.009）、单侧或双侧椎动脉闭塞（P=0.022）、小脑后下动脉区梗塞（P<0.001）、小脑前下动脉区梗塞（P<0.001）和小脑上动脉区梗塞（P=0.014）。③VTmax>10s、VrCBF<20%、VrCBF<30%预测 TH 形成曲线下面积分别为 0.727、0.744、0.768，当 VrCBF<30%为 14.35ml 时为最佳截断值，敏感度性为 61.54%，特异性为 89.96%。结论：本研究表表明，低灌注体积可以为 BAO 患者 EVT 后 TH 的发生提供影像学依据，在临床治疗决策中使用这些参数可能降低 BAO 患者的死亡率与致残率。

PU-0089

多发脑胶质瘤病灶间白质纤维分布特征的 MRI 研究

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目的 观察分析多发胶质瘤病灶间白质纤维分布的空间频次，定量评价病灶间白质纤维影像指标改变的空间模式

方法 回顾性分析 2010 年至 2019 年国内三家医院以及 TCGA 共 165 例多发胶质瘤数据，使用 MRIcron 软件在 T1WI 增强像上勾画 165 例肿瘤的所有瘤灶，以及 T2-FLAIR 像上病灶间的高信号，再采用 SPM 软件把 ROI 配准到 MNI 标准空间，获取位置分布以及瘤灶间白质纤维分布的频次热图。把 62 例 DTI 数据配准到 MNI 标准空间，采用 PANDA 软件，观察病灶间的白质纤维束分布情况，获取所有肿瘤病灶间白质纤维的频次热图。在 JHU 模板下观察每个白质脑区中白质纤维连接出现的频次。分别提取两种尺度的频次热图中每个 ROI 的平均频次数，进行空间相关性分析。

结果 多发脑胶质瘤频繁出现在侧脑室旁、胼胝体及右侧岛叶。T2-FLAIR 及 DTI 两种模态观察发现，病灶间白质纤维频繁出现在胼胝体，特别是胼胝体体部及压部，与肿瘤位置分布具有较好的相关性。基于 JHU ICBM-DTI-81 白质模板，病灶间白质纤维更多累及连合纤维(胼胝体体部、压部)和投射纤维(内囊前/后肢、上/后放射冠)。不同模态间的白质纤维改变在空间上均具有较好的相关性(DTI vs. T2-FLAIR, r=0.555，P＜0.001)。胼胝体压部是多发脑胶质瘤的白质纤维连接最高频次脑区。

结论 我们从不同维度和层次构建了一个参与多发胶质瘤形成的病灶间白质纤维的空间特征模型，并与肿瘤位置分布存在空间对应关系。这些结果为多发胶质瘤的白质纤维束理论提供支持及影像学依据

PU-0090

MRI 对椎管内黏液乳头型室管膜瘤与神经鞘瘤的鉴别诊断价值

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目的　　比较并分析椎管内黏液乳头型室管膜瘤(Myxopapillary ependymoma，MPE)与神经鞘瘤（Schwannoma，SCH）的临床资料及 MRI 表现，探讨 MRI 对椎管内 MPE 与 SCH 的鉴别诊断价值，为临床手术方式的选择及预后评估提供更有价值的信息。方法　　回顾分析本院 2010 年-2022 年发生于椎管内经手术病理证实且影像资料及手术记录完整的黏液乳头型室管膜瘤 16 例与神经鞘瘤 20 例的临床资料及影像表现，比较 MPE 和 SCH 的临床和影像学差异。结果　MPE 与 SCH 在发病年龄、发生部位、轴向位置、形态、肿瘤长径、囊变及出血分布、T1WI 及 T2WI 信号强度、增强信号特点上的差异具有统计学意义（P＜0.05）。结论　　椎管内黏液乳头型室管膜瘤与神经鞘瘤在临床特点及影像学表现上存在一定的差异，结合临床资料能提高两者术前诊断的准确性。

PU-0091

颅内动脉粥样硬化斑块药物治疗及介入治疗疗效的 HR-MRI 评估研究

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目的：应用高分辨磁共振成像（High resolution magnetic resonance imaging, HR-MRI）技术探讨药物治疗及介入治疗后颅内动脉斑块影像学特征的变化，并进行疗效对比研究。

材料与方法：　2017 年 12 月至 2019 年 12 月期间，对具有症状性颅内动脉粥样硬化性病变、接受药物治疗或球囊扩张治疗的患者进行 HR-MRI 随访。根据临床治疗方案分为药物治疗组和介入治疗组，于基线期及治疗后第 3、6 和 12 个月进行颅内动脉 MR-MRI 检查，于基线期测量颅内动脉斑块长度、厚度、管腔狭窄程度、增强前后斑块信号强度与胼胝体信号强度的比值，并定量评估斑块的强化程度。分别比较药物治疗组和介入治疗组各随访时间点相对于基线期斑块负荷及强化程度的变化，比较同一随访时间点两组之间斑块负荷及强化程度相对变化的差异，并比较两组患者随访过程中脑缺血事件发生率的差异。

结果：共有 63 例患者（44 例男性；平均年龄 61.1±10.0 岁）纳入本研究中，其中药物治疗组 41 例（65.1%）。与基线期相比，药物治疗组 12 个月时颅内动脉斑块的强化程度明显降低（P　=0.004）。与基线期相比，介入治疗组 6 个月时颅内动斑块的长度（P　=0.018）、厚度

（P =0.006）及管腔狭窄程度（P =0.001）显著缩小、降低。介入治疗组 6 个月时颅内动脉斑块厚度的相对变化率（P=0.010）及管腔狭窄程度相对变化率（P=0.002）明显大于药物治疗组。随访过程中两组患者之间脑缺血事件的发生无明显差异（P=0.575）。

结论：颅内动脉粥样硬化斑块药物治疗后一年斑块强化程度降低、趋于稳定，而颅内动脉球囊扩张术后半年时斑块负荷会明显降低；在缩小斑块厚度及改善管腔狭窄程度的方面，球囊扩张较药物治疗的显效时间短；单纯药物治疗较球囊扩张可以更好地减轻斑块内的炎症性反应。

PU-0092

Amygdala may serve an important role in Parkinson's Disease with Anxiety: A Seed-Based Functional Connectivity study

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Objectives: Aimed to investigate whether there are abnormal changes in the functional connectivity (FC) between the amygdala with other brain areas, in Parkinson's disease (PD) patients with anxiety.

Methods: Participants were enrolled prospectively, and the Hamilton Anxiety Rating (HAMA) Scale was used to quantify anxiety disorder. Rest-state functional MRI (rs-fMRI) was applied to analyze the amygdala FC patterns among anxious PD patients, non-anxious PD patients, and healthy controls.

Results: Thirty-three PD patients were recruited, 13 with anxiety, 20 without anxiety, and 19 non-anxious healthy controls. In anxious PD patients, FC between the amygdala with the hippocampus, putamen, intraparietal sulcus, and precuneus showed abnormal alterations compared with non-anxious PD patients and healthy controls. In particular, FC between the amygdala and hippocampus negatively correlated with the HAMA score ($r = -0.459$, $p = 0.007$).

Conclusion: Our results support the role of the fear circuit in emotional regulation in PD with anxiety. Also, the abnormal FC patterns of the amygdala could preliminarily explain the neural mechanisms of anxiety in PD.

PU-0093

基于流入血管空间灌注成像（inflow-based vascular-space-occupancy，iVASO）直方图特征预测高级别脑胶质瘤复发

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背景 高级别脑胶质瘤术后高复发率是影响患者预后的主要因素。及早地预测肿瘤复发，并实施针对性治疗，是提高疗效的关键。小动脉血容量（CBVa）能较好地反映胶质瘤血流灌注信

息，相对变化比毛细血管和静脉血容量更明显、更敏感。利用 iVASO MRI 技术能够完全无创地获得小动脉血容量绝对值。目前，尚无研究将 iVASO MRI 用于预测胶质瘤的复发。

目的

探究基于 iVASO MRI 技术，获取高级别脑胶质瘤术后不可测量病灶的小动脉血容量，并通过提取直方图相关特征，用于预测高级别脑胶质瘤术后复发。

方法

收集病理确诊的高级别脑胶质瘤术后患者 50 例，根据是否复发分为非复发组（n=27）及复发组（n=23）。使用 Matlab 软件处理 iVASO 数据后计算获得小动脉血容量（CBVa）图，然后利用 Image J 软件提取 CBVa 直方图参数，包括：平均值、中位数 、最大值 、最小值、偏度、峰度、第 10、第 20、第 25、第 30、第 40、第 50、第 60、第 70、第 75、第 80 及第 95 百分位数。使用独立样本 t 检验（正态分布）或 Mann-Whitney U 检验（偏态分布）比较复发组及非复发组之间各参数的差异，绘制 ROC 曲线评估其预测效能，并计算出最佳截断值。

结果

非复发组于平均值、中位数 、最大值 、第 20、第 25、第 30、第 40、第 50、第 60、第 70、第 75、第 80 及第 95 百分位数均显著低于复发组（P<0.05），两组间年龄、最小值、偏度、峰度及第 10 百分位数均无统计学差异（P>0.05）。ROC 曲线分析显示 CBVa 中位数在鉴别非复发组与复发组中的诊断效能最高，曲线下面积为 0.853。当以 1.0925 为截断值时，灵敏度为 91.3%，特异度为 63.0%。

结论

通过 iVASO MRI 技术获取 CBVa 值，并通过提取直方图特征，可以作为一个预测高级别脑胶质瘤术后复发的工具，其中 CBVa 中位数具有良好预测价值。

PU-0094

非侵入性评估特发性正常压力脑积水脑类淋巴系统功能障碍的探索性研究

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目的：应用“沿血管周围空间扩散张量成像”（DTI-ALPS）研究特发性正常压力脑积水（iNPH）患者脑类淋巴系统的损伤，并评估其诊断效能。

方法：研究纳入 8 例 iNPH 患者及 8 例性别、年龄匹配的健康对照者（HC）行 MR 扫描，序列包括 3D-T1、T2WI 及 DTI。采用髓静脉周围空间扩散率指数（即 ALPS 指数）间接评估脑内类淋巴系统液体流速，分析组间 ALPS 指数差异。收集患者的临床指标(认知评分、颅内压力值)及影像学指标[埃文指数（EI）、胼胝体角（CA）、颞角宽度（THW）、不对称性蛛网膜下腔积水(DESH)、脑室周围白质高信号（PVH）、胼胝体后角(SA)、中脑直径（AP）]，分析 ALPS 指数与 iNPH 传统影像学以及临床指标的相关性。使用线性多元回归模型分析 ALPS 指数的独立预测因素。使用受试者操作特征曲线（ROC）评价 ALPS 指数的诊断价值。

结果：iNPH 组左侧及平均 ALPS 指数低于 HC 组（p=0.01；p=0.02，性别及年龄为协变量）。在 iNPH 组中，左侧及平均 ALPS 指数与 EI 呈负相关（r=-0.791，p=0.019；r=-0.739，p = 0.036）。去除年龄及性别影响后，平均 ALPS 指数与 AP 呈正相关（r=0.998，p=0.039）,平均 ALPS 指数与 MMSE 评分呈负相关（r=-1.00，p=0.001）。多元线性回归分析显示，EI 是左侧 ALPS 指数的独立影响因子（β=-4.192，p=0.017）；DESH 征是平均 ALPS 指数的独立影响因子（β=-0.06，p=0.021）。ROC 曲线分析显示，平均 ALPS 指数显示出较高的特异度（p=0.002），曲线下面积(AUC)为 0.969。

结论：iNPH 中存在脑类淋巴系统功能损害，淋巴引流功能障碍或参与 iNPH 疾病生理过程。ALPS 指数在 iNPH 诊断中具有较高的应用前景。

PU-0095

CTP 指导下超时间窗大血管闭塞缺血性脑卒中患者机械取栓研究

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目的　探讨 CT　灌注成像(CTP)对超时间窗大血管闭塞急性缺血性脑卒中患者机械取栓进行指导的可行性。

方法　回顾性分析 2021 年 1 月至 2022　年 3 月邯郸市中心医院收治的超时间窗大血管闭塞急性脑梗死患者的临床资料，所有患者进行美国国立卫生研究院卒中量表（NIHSS）评分，术前发病时间＞6h，均行一站式 CTP 检查，14 例患者同时行 MRI 检查。根据治疗方式回顾性将 54 例患者分为二组：第一组 21 例均进行机械取栓治疗，另一组 33 例采用常规保守治疗，并于治疗前、治疗后 6h、24 h、7 天及 30 天分别进行 NIHSS 评分及 CT 平扫检查。

结果 在 CTP 指导下进行超时间窗机械取栓术的大血管闭塞急性脑卒中者在治疗后 6h、24 h、7 天及 30 天与常规治疗组 NIHSS 评分比较，机械取栓组 NIHSS　评分显著性更好差异均具有统计学意义（P＜0.05）；两组患者预后良好率、梗死核心体积扩大率比较，械取栓组具有更好的预后效果，差异均具有统计学意义（P＜0.05）；人工智能辅助 CTP 诊断能够完成自动化评估，快速做出独立于影像科医师的判断结果，但对梗死核心体积评估存在过大或过低问题。

结论 使用 CTP 指导超时间窗大血管闭塞急性脑卒中患者机械取栓有重要意义。

PU-0096

颅内动脉闭塞磁共振高分辨血管壁成像研究

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颅内动脉闭塞磁共振高分辨血管壁成像研究

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【摘要】

目的　探讨高分辨率磁共振血管壁成像（High resolution vessel　wall imaging，HR-VWI）与时间飞跃法磁共振血管成像（Time of flight magnetic resonance angiography，TOF-MRA）对颅内动脉闭塞诊断及评估的优势。

方法　前瞻性纳入解放军总医院第一医学中心 2020 年 6 月至 2022 年 8 月由 TOF-MRA 确诊的颅内动脉闭塞患者。两位放射诊断医生独立分析其 HR-VWI 图像，以评估是否存在真正的闭塞，并将所有病例按不同的闭塞节段分组，并比较 TOF-MRA 及 HR-VWI 描述闭塞病变特点上的差异。

结果　　共 255 例 TOF-MRA 确诊为颅内动脉闭塞性脑血管病患者纳入本研究，其中，同时采集了 HR-VWI 的患者共 125 例。两种方法在诊断颅内动脉血管是否闭塞具有一般-较好的一致性（Kappa=0.453-0.811），闭塞病变长度测量上，HR-VWI 闭塞病变长度在不同颅内动脉测量中均显著短于 TOF-MRA（p＜0.001）。此外，HR-VWI 可以准确区分不同的闭塞类型。

结论　　与 TOF-MRA 相似，HR-VWI 可以准确诊断颅内动脉闭塞及其闭塞节段，HR-VWI 能够直接观察闭塞病变结构特点、更加准确的反映闭塞的范围、描述闭塞病变类型，能够为临床治疗提供关键信息。

PU-0097

MR 高信号血管征的临床意义和影响因素的研究

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目的　　探讨 MR 高信号血管征的临床意义和影响因素。

方法　　分析 2017 年 4 月-2019 年 8 月我院收治的 109 例急性前循环闭塞性脑梗死患者的临床资料及影像参数，发病 24h 内完成头部 FLAIR、DWI 及 3D TOF MRA 检查。根据 FLAIR 序列 HVS 的分布范围分为四级，进一步分为 HVS 低级组(0 和 1 级)与高级组(2 和 3 级)，单因素和多因素回归分析影响 HVS 分布的相关因素。选取发病 6h 内先于 MRI 完成基线 CT 扫描的 52 例患者，行 Alberta 卒中项目早期 CT 评分(CT-ASEPCTS、DWI-ASPECTS)半定量评估脑梗死体积，计算 CT-ASPECTS 与 DWI-ASPECTS 的差值，以 ASPECTS 的差值≤1 分为 ASPECTS 未变化组(AN)，ASPECTS 的差值＞1 分为 ASPECTS 变化组(AY)，比较 HVS 的级别在两组间是否存在差异，并将 HVS 分级与 ASPECTS 的差值进行 Spearman 相关性分析。

结果　　高脂血症、TOAST 分型、Willis 环分型在 HVS 组间比较差异显著(P=0.026，P=0.004，P=0.004)，其他临床因素与血管闭塞位置均无显著差异(P＞0.05)；TOAST 分型中 LAA 型(OR=3.054，95%CI：1.257～7.422，P=0.014)及 Willis 环 I 型(OR=5.494，95%CI：1.074～28.091，P=0.041)、Ⅱ型(OR=5.571，95%CI：1.895～16.372，P=0.002)是促进 HVS 广泛分布的独立影响因素。HVS 的分级在 AN 与 AY 组间比较差异显著(P=0.002)，HVS 分级与 ASPECTS 的差值呈负相关(r=-0.573，P=0.000)。

结论　　TOSAT 分型、Willis 环分型是影响 HVS 分布的重要因素。HVS 分级反映侧支代偿状态，认识 HVS 可能有助于评估脑梗死早期体积进展情况。

PU-0098

铁沉积对帕金森病伴发焦虑患者大脑恐惧回路的影响

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目的：焦虑是帕金森病最常见的精神症状之一，脑铁沉积被认为是帕金森病的病理机制之一。本研究的目的是探讨有焦虑的帕金森病患者与没有焦虑的帕金森病患者相比，尤其是恐惧回路中脑铁沉积的变化。

方法：前瞻性纳入16例伴有焦虑症的帕金森病患者、23例无焦虑症的PD患者和26名健康老年对照。所有受试者均接受了神经心理学评估和脑磁共振成像（MRI）检查。使用基于体素的形态计量学（VBM）来研究两组之间的脑形态学差异。定量磁化率成像（QSM）是一种能够量化脑组织磁化率变化的MRI技术，用于比较三组患者整个大脑的磁化率变化，分析了使用汉密尔顿焦虑评定量表（HAMA）量化的焦虑评分与大脑磁化率变化之间的相关性。

结果：患有焦虑症的帕金森病患者的帕金森病持续时间更长，HAMA评分也高于没有焦虑症的患者。两组之间未观察到大脑形态学差异。基于体素和基于ROI的QSM分析显示，伴发有焦虑症的PD患者在内侧前额叶皮层、前扣带皮层、海马体、楔前叶和角回的QSM值显著增加。此外，其中一些大脑区域的QSM值与HAMA评分呈正相关（内侧前额叶皮层：r=0.255，P=0.04；前扣带皮层：r=0.381，P<0.01；海马：r=0.496，P<0.01）。

结论：我们的研究结果支持了帕金森病患者的焦虑与大脑恐惧回路中的铁沉积有关的观点，为解释帕金森病患者焦虑的潜在神经机制提供了一种可能的新方法。

PU-0099

Altered power spectrum slope in patients with alcohol use disorders: a metric for measuring activity of single voxels

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Background: Earlier neuroimaging investigations showed that abnormal brain activity in patients with alcohol use disorder (AUD) was frequency dependent. However, there is lacking of a comprehensive method to capture the amplitude of multi-frequency bands directly. Here, we used a new method, the power spectrum slope (PSS) to explore abnormal spontaneous activity of brain in AUD patients.

Methods: Thirty-three AUD patients and 29 healthy controls (HC) enrolled in this study. The coefficient b and the power-law slope b' were calculated and compared between two groups. We also used the receiver operating characteristic (ROC) curve to examine the ability of the PSS analysis to distinguish between AUD and HC. We next examined the correlation between changes in network nodes and the severity of alcohol dependence.

Results: Thirty AUD patients and 26 HC were enrolled after head motion correction. The two metrics of PSS values increased in the left precentral gyrus in AUD patients. PSS differences in the specific brain area showed good area under the curve values (range: 0.836-0.844), as well as good sensitivities (range: 83.3%-86.7%) and specificities (range: 73.1%-76.9%). The MAST or ADS scores were not significantly correlated with the PSS values in the specific brain area.

Conclusions: As a novel method, the PSS can well detect abnormal local activity in the brain of AUD patients and may become a new alternative power spectrum analysis method applied in future fMRI studies.

PU-0100

多发性硬化共患阿尔茨海默病的脑灰质体积荟萃分析研究

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目的：本研究旨在以脑灰质体积（GMV）作为多发性硬化（MS）和阿尔茨海默病（AD）的跨诊断标志物，探索两类神经退行性疾病的脑结构异同。

方法：我们对 PubMed 数据库中截止到 2022 年 10 月，所有基于体素形态学分析（VBM）的方法对 MS 和 AD 患者全脑 GMV 改变的病例对照研究进行系统性搜索。经过严格文献筛选，本研究最终纳入 33 篇 MS 病例对照研究，包括 1964 例 MS 和 1606 例健康（HC）被试；51 篇 AD 病例对照研究，包括 1508 例 AD 和 1903 例 HC 被试。使用 Seed-based d Mapping（SDM）v6.22 软件分别对 MS 和 AD 患者的 GMV 改变进行荟萃分析，利用联合分析确定两类疾病 GMV 改变的共同脑区（未校正 P < 0.005）。

结果：MS 和 AD 患者均表现为全脑 GMV 萎缩，于 MS 组主要分布在：双侧丘脑、尾状核、壳核、感觉运动、扣带、颞叶和岛叶皮层等，萎缩最严重的脑区是丘脑（Z = -11.221）；于 AD 组主要分布在双侧海马旁回、尾状核、壳核、默认网络、扣带、颞叶和岛叶皮层等，萎缩最严重的脑区是海马旁回（Z = -14.431）。上述结果均可通过敏感性检验和发表偏倚测试。

结论：MS 共患 AD 存在广泛脑 GMV 减少，联合分析发现其共同萎缩的脑区主要分布在：双侧岛叶、颞叶、扣带等，贡献最突出的脑区是岛叶。证实了两类疾病存在共患病的解剖学基础，进一步深刻理解了 MS 和 AD 的神经退行性改变机制。

PU-0101

CADASIL 病的磁共振诊断价值探讨

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目的　探讨 CADASIL 病的 MR 征象，提高对本病的认识。方法　回顾性分析 7 例经基因检测确诊的 CADASIL 病颅脑 MRI 影像表现，分析其病灶分布、信号特点及特异性征象。结果　7 例 CADASIL 病的脑白质病变好发于桥脑、两侧额顶叶皮层下、半卵圆区、颞叶前部、外囊、侧脑室室管膜下，呈对称性斑片、斑点状 T1WI 等或稍低信号、T2WI、T2-FLAIR 高信号、DWI 等信号，以颞叶前部、外囊、侧脑室室管膜下为特异性发病部位。6 例显示两侧丘脑、基底节、外囊、侧脑室旁、半卵圆区腔隙性梗塞、软化灶。2 例显示侧脑室旁新近梗塞灶，1 例左侧丘脑血肿，6 例 SWI 显示脑内多发、散在微出血灶，2 例 MRA 未见异常。结论　CADASIL 病的 MR 表现具有一定特征性；MR 检查能够提高对该病的认识，为临床提供影像学诊断价值。

PU-0102

大脑中动脉狭窄与脑小血管病影像标志物的相关性研究

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目的 探讨单侧大脑中动脉（MCA）狭窄程度与脑小血管病（CSVD）总负荷及其影像标志物之间的相关性。 方法 回顾性分析2015年至2019年就诊于解放军总医院第一医学中心并接受了多模态MRI检查的慢性单侧大脑中动脉狭窄患者。根据MCA狭窄程度将患者分为重度狭窄-闭塞（狭窄程度≥70%）和轻中度狭窄（狭窄程度＜70%）两组，比较两组间CSVD总负荷评分以及CSVD影像标志物之间的差异。 结果 共纳入患者261例，其中轻中度狭窄有159例，男性117(73.6%)例，平均年龄58.5±12.5岁；重度狭窄-闭塞患者102例，男性70例(68.6%)，平均年龄55.2±11.9岁。轻中度狭窄患者CSVD总负荷评分为1（0，2），重度狭窄-闭塞CSVD总负荷评分为1（1，3），两者之间比较后存在统计学差异（P=0.043）；两组各影像标志物评分后相比较，半卵圆中心血管周围间隙（P＜0.001）、腔隙（P=0.001）在两组之间存在统计学差异；二元logistics回归分析显示，CSVD总负荷评分（OR=1.3, 95%CI 1.047－1.613, P=0.017）、半卵圆中心血管周围间隙评分（OR=2.099, 95%C 1.54－2.86, P＜0.001）和腔隙（OR=2.609，95%CI 1.294－5.261，P=0.007）与重度狭窄-闭塞相关。结论 大脑中动脉狭窄程度与CSVD总负荷相关，重度狭窄-闭塞的患者可能会有较高CSVD总负荷、更多的半卵圆中心血管周围间隙和腔梗。

PU-0103

动态脑连接梯度模式偏心率在失神癫痫发放全过程中的评估研究

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背景：失神癫痫是常见儿童癫痫，以意识丧失和再获取为主要临床特征。基于磁共振的动态功能连接技术在刻画失神癫痫发作状态的切换中起着重要作用。脑连接的梯度分析为脑连接提供了更深入和高阶的信息。本研究采用EEG-fMRI技术，结合动态功能连接技术和功能连接梯度，开发功能连接梯度指标，应用于研究失神癫痫患者整体发作过程中脑改变模式，提高对意识改变的病理生理机制的认知。

材料与方法：纳入了12例失神癫痫患者，所有的患者都是本院和南京儿童医院门诊患者。本研究通过了本院伦理委员会的批准，同时所有被试都签署了纸质的知情同意书。所有的被试都在3.0T Siemens TrioTim磁共振（Erlangen，Germany）扫描了磁共振数据，并采用32通道的磁共振兼容的EEG脑电采集设备（Brain Product， Munich, Germany）采集了同步EEG-fMRI序列，通过Brain Vision Analyzer 2.0软件离线预处理，由神经内科医师判读，获得了29段包含发放前、中、后的时间段用于后续分析。采用fmriprep进行数据预处理，并采用DynamicBC构建动态连接矩阵，随后采用BrainSpace构建了所有时间点的功能连接梯度，并采用自编译的代码计算了梯度离散偏心率。随后采用两两配对T检验研究了不同发作状态间梯度偏心率的切换模式差异。

结果：在整体离散度上，发作前中后的离散度呈现倒V型模式。发作前中后的躯体运动，注意网络出现了倒V型改变模式，并且在梯度2中发现了默认网络的V型模式，以及梯度3中的倒V型改变模式。

结论：在本研究中，我们评价了失神癫痫患者 GSWDs 发作前中后三状态间的脑状态切换的模式。我们发现，DMN 和注意网络的抑制可能是失神癫痫发作中的重要影像学发现，其可能与失神癫痫患者的意识丧失有关；此外，GSWDs 影响了丘脑-皮层间的信息交流。

PU-0104

不同 IDH1 基因表达脑胶质瘤的 MRI 表现及 ASL 的应用研究

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摘要：**目的** 研究不同异柠檬酸脱氢酶 1(IDH1)基因表达脑胶质瘤的 MRI 及动脉自旋标志成像(ASL)表现。**方法** 回顾性分析 48 例病理证实的脑胶质瘤患者（其中 IDH1（+）20 例，IDH1（—）28 例）的 MRI 及 ASL，分析 IDH1（+）与 IDH1（—）脑胶质瘤的 MRI，分析病灶水肿，出血、囊变、钙化，强化情况，及 ASL。**结果** IDH1（+）的非胶质母细胞瘤中：病灶水肿 7 例，出血 5 例，囊变 9 例，钙化 2 例，明显不均匀强化 6 例，轻度强化 4 例，ASL 高灌注 8 例，其中 10 例胶质母细胞瘤中：病灶水肿:3 例，出血 1 例，囊变 3 例，钙化 0 例，明显强化 10 例，ASL 高灌注 13 例。IDH1（—）的非胶质母细胞瘤中：病灶水肿 2 例，出血 1 例，囊变 3 例，钙化 8 例，轻度强化 7 例，无强化 3 例，ASL 高灌注 3 例，其中 13 例胶质母细胞瘤中：病灶水肿:9 例，出血 5 例，囊变 10 例，钙化 0 例，明显强化 13 例，ASL 高灌注 13 例。**结论** 不同 IDH1 基因表达脑胶质瘤的 MRI 及 ASL 表现不同，IDH1（+）的非胶质母细胞瘤中，病灶周围水肿、囊变、出血、钙化、强化的比例明显高于 IDH1（—）的非胶质母细胞瘤（P＜0.05），而在 IDH1（+）的胶质母细胞瘤中，其结果恰好相反，病灶周围水肿、囊变、出血、钙化的比例明显低于 IDH1（—）的胶质母细胞瘤（P＜0.05）。病灶强化程度在胶质母细胞瘤中，与 IDH1 基因表达没有相关性，均呈明显强化，ASL 在 IDH1（+）的非胶质母细胞瘤中大多数呈高灌注，在 IDH1（—）的非胶质母细胞瘤中大多数呈低灌注，而在胶质母细胞瘤中与 IDH1 基因无相关性，绝大多数均呈高灌注（P＜0.05）。因此，在一定程度上，从胶质瘤的 MRI 表现可以预测 IDH1 基因突变情况。

PU-0105

基于入院时全脑 CTP 参数预测动脉瘤性蛛网膜下腔出血后分流依赖性脑积水的发生

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目的 探讨基于入院 24h 内全脑 CT 灌注（CTP）及临床数据预测动脉瘤性蛛网膜下腔出血（aSAH）患者发生分流依赖性脑积水（SDHC）的价值。方法 回顾性搜集 2018 年 3 月至 2022 年 8 月在本院接受介入栓塞治疗的 414 例 aSAH 患者入院时的临床和影像学数据。所有患者均在症状发生后 24h 内完成一站式全脑 CTP 检查，并经后处理得到 CTP 的定性和定量参数。根据是否发生 SDHC，将患者分为 SDHC 组及非 SDHC 组，比较两组间的差异，采用 Logistic 回归分析确定 SDHC

发生的独立影响因素，通过绘制 ROC 曲线评估预测效能。结果 17.6%（73/414）患者发生分流依赖性脑积水。是否发生急性脑积水、世界神经外科联盟分级、Hunt-Hess 分级、mFS、CTP 定性及定量参数在两组间的差异有统计学意义（p 均<0.001）。aSAH 患者合并急性脑积水、高龄、较高 mFS 及 Hunt-Hess 分级、较低 mCBF 是发生 SDHC 的独立影响因素。结论 aSAH 患者入院 24 小时内的全脑 CTP 和临床数据可用于预测 SDHC 的发生。

PU-0106

多时相 CTA 成像对急性缺血性脑卒中患者预后评价及再发卒中的预测价值

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目的 探讨多时相 CTA 血管造影成像对颅内动脉闭塞或重度狭窄急性缺血性脑卒中患者的侧枝循环状况评估与预后及再发卒中的预测作用。方法 研究对象选择 2019 年 5 月-2020 年 5 月期间中国科学技术大学附属第一医院神经内科门诊及住院治疗的前循环动脉狭窄/闭塞患者 35 例。所有患者均 进行 CT 一站式检查，记录患者经过治疗后的预后评分情况并对其进行随访观察，终点为 1 年内再发缺血性卒中事件。将患者分为再发缺血性卒中组和未再发组。根据 Alberta 卒中项目早期 CT 评分（ASPECTS）对病灶侧枝循环血管状况进行量化分级评估，评分越高则代表侧枝循环建立越好。同时对比单时相 CTA，收集患者临床资料。采用卡方检验、两独立样本 t 检验进行组间比较，同时进行 Logistic 回归分析，判断临床指标、多时相 CTA 评分与患者预后的关系。结果 1.多时相 CTA ASPECTS 侧枝循环量化评分预测临床预后优于单时相 CTA ASPECTS 评分（P=0.000）。2.经过一年随访，10 例患者发生了再发卒中事件，通过组间比较发现单时相 CTA ASPECTS 评分无显著统计学差异（t=1.548 P=0.176）；未再发组多时相 CTA ASPECTS 评分显著高于再发卒中组（t=-5.982 P＜0.001）。采用 Logistic 多因素回归分析，多时相 CTA ASPECTS 侧枝循环量化评分是再发卒中事件的独立预测因子（OR,3.245;95%CI,1.285-6.782;P=0.004 ）。

结论 多时相 CTA 造影成像 ASPECTS 侧枝循环量化评分对前循环大血管闭塞/重度狭窄的患者半定量评分，能够预测治疗预后及筛选再发卒中的高危患者。

PU-0107

视神经脊髓炎前视路扩散张量成像研究

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目的：使用基于 fixel 的分析（FBA）评估视神经脊髓炎谱系疾病（NMOSD）的视神经至外侧膝状体的前视路损伤特点，并探究 NMOSD 视神经炎急性发作期扩散张量成像能否预测患者视力预后。

方法：研究纳入了视神经炎发作≥6 个月的稳定期 NMOSD 患者（NMOSD-ON），同时纳入性别、年龄匹配的健康对照和无视神经炎发作史的 NMOSD 对照组（NMOSD-NON 组）。后依据稳定期结果，继续招募视神经炎发作急性期的 NMOSD 确诊患者（NMOSD-AON 组）。最终纳入 NMOSD-ON 组 20 例，NMOSD-NON 组 19 例，健康对照组 20 例，NMOSD-AON 组 20 例。分别将视神经、视束均分为 10 段，

每段从前至后分别编号 1-10，视交叉单独为 1 段，使用 FBA 分析每段的 FD 值、FC 值和 FDC 值。使用一般线性模型比较各组之间前视路各子段的 FBA 测量值，校正年龄和性别。使用偏相关分析评估 FBA 测量值和 OCT 检查结果及临床参数的相关性。使用 Spearman 相关性分析探究视神经炎急性发作期 FBA 参数与基线数据及 6 个月视力的关系。

结果：与健康对照组相比，NMOSD-ON 组视束的第 4-8 子段 FD 值、FDC 值显著降低（P＜0.05），视神经各子段 FD、FC、FDC 值均较健康对照低，但无统计性差异。NMOSD-NON 组与健康对照组相比，FBA 测量值未见显著差异。相关性分析显示 NMOSD 患者视交叉和视束的平均 FD 值、视神经的 FC 值、视交叉的 FDC 值和平均 GCIPL 厚度呈正相关。视交叉的 FD 值和平均 RNFL 厚度存在相关性。NMOSD-AON 组急性期视束的 FD、FC 和 FDC 值与恢复期视力显著相关。

结论：NMOSD 前视路损伤主要位于视束后部，FD 值减低提示纤维密度的减低。FBA 参数与 OCT 检查结果可建立相关性，提示 FBA 分析可作为潜在的前视路损伤评估标记物。视束的急性期 FBA 参数可能对患者 6 个月视力预后有提示作用。

PU-0108

探究脑白质高信号与年龄的因果关联：一项来自孟德尔随机化的证据

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目的:探究脑白质高信号与年龄之间的因果关联，探索脑白质高信号体积与年龄之间的回归关系。

方法: 我们的大脑成像数据来自一项全基因组关联研究，该研究基于英国生物银行的 39691 个头部多模式成像样本，这其中就包括我们所需要的脑影像学特征即脑白质高信号体积。我们的目的是探索脑白质高信号体积与年龄之间的因果与回归关系。而关于年龄的全基因组关联研究（Genome-Wide Association Studies，GWAS）数据则来源于基于 11856 的欧洲人群，有关年龄的单核苷酸多态性（Single Nucleotide Polymorphism）为 9851867 个。我们应用双向孟德尔随机化研究方法来分析二者的因果关联。并采用主效应回归法建立脑白质高信号体积与年龄之间的回归关系。同时，对于孟德尔随机化的结果我们进行水平多效性与异质性分析，来保证结果的稳定与可靠。

结果: 在双向的孟德尔随机化分析中，脑白质高信号与年龄之间存在因果关联（P=0.02），而且大于 35 岁后二者呈现正向相关（相关系数＞1）。孟德尔随机化的结果进行水平多效性与异质性分析均表示结果稳定可靠（P＞0.05）。

结论:脑白质高信号体积与年龄高度相关，且存在回归关系，应注意白质的高信号体积与人体衰老密切相关，且在一定年龄范围存在较强的回归关系。

PU-0109

临床 5.0 T 超高场 MRI 磁敏感加权成像评估脑深髓静脉及其分支的价值

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目的:探讨 5.0 T 超高场 MR SWI 技术评估健康人群深髓静脉及其分支的价值。

方法:本研究为前瞻性研究。收集 2023 年 3 月至 5 月招募的健康成年人 50 名，采用完全随机设计将其分为 3.0 T MR 组和 5.0 T MR 组，每组 25 名。对所有受检者进行 SWI，采用主观 Likert5 分量表评分和 SNR、CNR 对图像质量进行评估，采用 3 分量表法对脑深髓静脉显示质量［大脑大静脉（VofG）、大脑内静脉（ICV）、透明隔前静脉（ASV）、流入透明隔前静脉的深髓静脉（DV of ASV）、流入尾状核横静脉的深髓静脉（DV of TCV）、流入侧脑室内侧静脉的深髓静脉（DV of TLV）］进行评估。2 组间定量指标的比较采用独立样本 t 检验和 Mann-Whitney U 检验。

结果:50 名受检者中男 27 名、女 23 名，年龄 21~73（43±11）岁。5.0 T MR 组图像的 SNR 值和 CNR 值高于 3.0 T MR 组，差异有统计学意义（t 分别为 23.62、21.45，P<0.001），但 5.0 T MR 组、3.0 T MR 组图像质量主观评分差异无统计学意义［分别为 5.0（5.0，5.0）、5.0（4.0，5.0）分，Z=-1.46，P=0.113］。对脑深髓静脉的评估上，3.0 T MR 组与 5.0 T MR 组 SWI 在 VofG 和 ICV 的显示均较好，评分差异无统计学意义（P>0.05），而在 ASV 的显示上 5.0 T MR 组图像均明显优于 3.0 T MR 组图像（P<0.05）。在 DV of ASV、DV of TCV、DV of TLV 的评估中发现 5.0 T MR 组对深髓静脉的显示均显著高于 3.0 T MR 组图像（P<0.001）

结论:5.0 T 超高场强 MR SWI 技术扫描对脑静脉及深髓静脉显示优良，这为构建脑髓质静脉网络提供了可能，可用于脑静脉疾病的诊断和鉴别诊断。

PU-0110

脑出血预后影像学标记物血肿周围水肿的研究及临床应用

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目的：

联合应用临床数据和半自动分割技术测量非对比剂增强计算机断层扫描（non-contrast computed tomography，CT）图像上急性脑出血发病早期血肿周围水肿（PHE)的体积，探讨影响急性脑出血患者早期临床功能预后的危险因素，明确 PHE 相关影像学参数及临床相关指标与急性脑出血患者的早期功能预后的相关性。

方法：

收集 2018 年 1 月-2022 年 6 月于我院就诊的的 206 名急性脑出血患者，将患者按照出院 mRS 评分（改良 Rankin 量表）分成预后良好组和预后不良组，其中 mRS≤2 分为预后良好，＞2 分为预

后不良；利用单因素和二元 logistic 回归探讨影响急性脑出血患者早期预后功能的独立危险因素，评估急性脑出血发病早期 PHE 相关影像学参数与患者早期预后的关系。

结果：

206 名患者中预后良好组 53 人，其中男 42 人，女 11 人；预后不良组 153 人，其中男 106 人，女 47 人。两组患者的人口统计学、实验室指标、影像学数据、临床评分资料对比，年龄、卒中病史、基线 GCS、基线 NIHSS、白细胞计数、绝对 PHE 体积、rPHE 体积差异有统计学意义（P <0 .05）。入院 NIHSS 评分（OR=1.272，95% CI = 1.12-1.499）、绝对 PHE 体积（OR=1.102，95% CI = 0.99-1.223），rPHE 体积（OR=0.006，95% CI = 0.00-0.108）是影响急性脑出血患者早期不良预后独立危险因素（P <0 .05）。其中入院 NIHSS 评分越高，患者的预后越差；发病 24±12 小时内的绝对 PHE 体积越大，患者预后越差，相对 PHE 体积越大，患者预后功能越好。

结论：

急性脑出血患者早期绝对 PHE 体积和相对 PHE 体积、入院 NIHSS 评分是影响脑出血早期临床预后的独立危险因素，可作为预后因素的重要指标，PHE 可能对于急性脑出血预后具有相应的临床应用价值。

PU-0111

多发脑胶质瘤的空间位置特征的 MRI 研究

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目的 探究多发脑胶质瘤的位置分布与基因表型及细胞富集的空间相关性

方法 回顾性分析 2010 年至 2020 年国内三家医院以及癌症基因组图谱(TCGA)共 211 例多发胶质瘤的影像学数据，使用 MRIcron 软件在 T1WI 增强像上勾画肿瘤的所有瘤灶，再采用 SPM 软件把图像及肿瘤 ROI 配准到 MNI 标准空间，叠加所有瘤灶 ROI，得到位置分布空间频次热图。通过文献检索 27 个临床常见的脑胶质瘤相关基因，采用配对样本 t 检验比较多发和单发胶质瘤相关基因关联强度 t 的区别，使用 NeuroVault 工具分别评估多发和单发脑胶质瘤空间分布模式与基因表达的空间相似性。使用 BrainSpan 数据集，通过细胞类型特异性表达分析 CSEA 发育表达工具进行发育富集分析

结果 相比单发，多发脑胶质瘤频繁出现在双侧脑室旁、胼胝体及右侧岛叶（P ＜ 0.05），分布差异脑区位于双侧脑室旁及胼胝体。14 种胶质瘤风险基因中有 5 种与多发脑胶质瘤空间位置存在正相关，非风险(保护)基因中有 3 种与多发胶质瘤的空间位置存在负相关。小胶质细胞和内皮细胞富集表达的脑区，多发胶质瘤发生率更高

结论 多发脑胶质瘤具有较特异的空间分布模式，这个空间分布模式可以部分解释为神经干细胞分布、空间基因表达以及细胞富集等因素影响。本研究为理解多发胶质瘤的空间位置形成模式以及病生机制提供影像学依据。

PU-0112

Delineation of Target Volume for Radiotherapy of High-Grade Gliomas through Registration of Preoperative MR on Postoperative MR Images

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Background: Accurate delineation of gross tumor volume (GTV) in high-grade glioma (HGG) radiotherapy is challenging. We proposed a novel nonlinear registration method for registering preoperative MR images onto postoperative MR images.

Methods: The preoperative and postoperative MR images of 96 HGG patients were included in this retrospective study. Three commonly used registration methods and our proposed method were used to register preoperative MR images on postoperative MR images. Target registration error and Dice score were calculated to select the optimal registration method. Three radiation oncologists outlined the GTV on the registered (with optimal registration method only) and unregistered images, respectively. The concordance index (CI) and coefficient of variance (COV) were calculated. The number of cases and number of slices of GTV including surgical complication lesions were calculated.

Results: Among these four registration approaches, our proposed method had the lowest target registration error (2.22 ± 0.47 mm) ($P<0.01$) and the highest Dice score (69.89 ±5.47 %) ($P<0.05$). The COV for the registered images (12.03 ± 6.11%) was smaller than that on the unregistered images (17.07 ± 15.54 %) ($P<0.05$); the CI on the registered images (66.69 ± 8.64 %) was larger than that on the unregistered images (59.70 ± 13.81%) ($P<0.05$). The GTV delineated on registered images included less surgical complication lesions ($P<0.05$).

Conclusions: Our proposed nonlinear registration method could improve the interobserver consistency and accuracy of GTV delineation for radiotherapy in HGG.

PU-0113

Transcriptomics and Magnetic Resonance Imaging in Schizophrenia

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Schizophrenia affects about 1% of people and causes a huge burden of health care worldwide. Although schizophrenia results from changes in brain, the underlying biological mechanisms are unknown. There is a lack of specific molecular markers that can be used for diagnosis or treatment. Transcriptomic studies quantitative expression changes or qualitative changes of all genes and isoforms, providing a more meaningful biology insight. MRI techniques play roles in revealing brain structure and function. We discuss the current transcriptome combined with MRI studies related to schizophrenia, in an attempt to provide insights into the mechanism, clinical diagnosis and treatments of schizophrenia.

PU-0114

不同扫描序列对颅脑平扫及增强 MRI 图像采集及质量的对比研究

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【目的】 探讨 2D 常规扫描方式与 3D 容积扫描技术对颅脑平扫及增强 MRI 图像成像质量的影响。

【方法】 回顾性分析 125 例行颅脑平扫及增强 MRI 检查的患者病例，根据不同的检查方式将患者分为两组：常规的 2D 扫描，包含有：T1WI 横断位、矢状位及冠状位、C+T1WI 横断位图像，共计 90 例；3D 容积扫描，包含：T1WI、C+T1WI 图像，共计 35 例。主观质量评价采用 Likert-type 量表 5 级评分法，对两组平扫、增强后图像质量进行评价，包含有伪影评价，即图像伪影严重程度；解剖结构识别评分，即图像对颅脑解剖结构和病灶解剖结构显示的清晰程度评分。客观图像质量评价包括图像的信噪比（signal to noise ratio, SNR）与对比噪声比（contrast to noise ratio, CNR）。分类变量表示为病例数和百分比，X2 检验处理分类变量；计量资料用均数±标准差（x-±s）表示，采用单因素方差分析比较各组间差异；非参数 Kruskal-Wallis 检验比较两组序列增强后图像质量的差异及两组序列图像 SNR 与 CNR 的差异。

【结果】 3D 容积扫描序列的 SNR（P=0.001）、CNR（P=0.008）、伪影评分（P=0.000）、解剖结构识别评分（P=0.000）均高于 2D 常规序列。

【结论】 在颅脑平扫及增强图像分析中，同 2D 常规序列相比，3D 容积扫描序列可减少颅脑图像伪影，且 SNR 和 CNR 显著提高，扫描时间稍长于常规序列，但是更加利于图像识别，并且 3D 容积扫描序列图像可以进行多角度重建，均为颅脑疾病的诊断提供新方法，可作为 2D 常规序列替代选择。

PU-0115

3D-MATRIX 在脑转移瘤检出的临床应用

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目的 探讨压缩感知（CS）技术加速的三维快速自旋回波序列调制反转角成像技术(MATRIX)的脑转移瘤检出能力。方法 收集疑似有脑转移瘤的 59 例患者，用 3.0T-MRI 行增强 5mm-

T1FLAIR、增强 1mm-T1FLAIR 与 1mm-MATRIX 序列扫描。经手术或临床随访 3-6 个月证实为脑转移瘤 28 例患者。按照病灶直径分为 3 组（≤3mm、3-10mm、≥10mm），比较三个序列诊断脑转移瘤的检出数目与按病灶直径分组的检出率。结果 （1）28 例患者共 752 个脑转移瘤病灶，增强 5mm-T1FLAIR、增强 1mm-T1FLAIR 和增强 1mm-MATRIX 脑转移瘤的总检出数分别为 604 个、656 个和 752 个，其中直径≤3mm、3-10mm、≥10mm 分别为 258 个、263 个、347 个，291 个、337 个、349 个，55 个、56 个、56 个。（2）增强 5

mm-T1FLAIR、增强 1mm-T1FLAIR 和增强 1mm-MATRIX 的检出数目两两比较，p <0.05，差异有统计学意义。（3）三种序列病灶直径≤3mm、3-10mm、≥10mm 的检出率做卡方检验，p >0.05，差异无统计学意义；病灶直径≤3mm、3-10mm、≥10mm 检出率的线性趋势比较，p <0.05，差异有统计学意义。结论 增强 1mm-MATRIX 对序列脑转移瘤检出率高于增强 5mm-T1FLAIR、1mm-T1FLAIR，特别是对直径≤3mm 的脑转移瘤的检出更有优势，推荐临床常规应用。

PU-0116

高分辨磁共振血管壁成像评价前交通动脉瘤稳定性的作用

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目的 探讨高分辨磁共振血管壁成像（magnetic resonance vascular wall imaging，HR-VWI）对评价前交通动脉瘤稳定性的作用。

方法 连续收集 2019-01—2022-9 深圳市宝安区人民医院就诊的前交通动脉动脉瘤患者 60 例，其中女 35 例，男 25 例，年龄 37～78 岁（57.78±9.77）岁，经过 HR-VWI 成像，将所得图像全部载入西门子磁共振后处理工作站，对图像进行多平面重组（multiplanar reformation，MPR），得出不同方位的图像，由两名高年资影像诊断医师进行图像分析，对同一方法两位医师的测量结果进行分析，包括动脉瘤直径、AR 值（动脉瘤高度与瘤颈宽度之比）、SR 值（动脉瘤瘤体高度与载瘤动脉平均直径之比）、SI（动脉瘤壁增强前后的信号强度）变化的测量，存在不同意见时进一步商议达成一致意见。采用 SPSS 19.0 软件分析数据，计量资料以均数±标准差（x±s）表示，计数资料以率（%）表示。以 P＜0.05 为差异有统计学意义。

结果 依据动脉瘤破裂与否将其分为 A 组（破裂，12 个瘤体）及 B 组（未破裂，48 个瘤体），所有入组患者均经 HR-VWI 进行检查，对比观察两组间 MR 检查结果。60 个动脉瘤中，病灶大小 2～38（6±5.17）mm；27 例存在动脉瘤壁强化的现象，33 例瘤壁未见强化。B 组瘤体大小、AR 值、SR 值及 SI 均明显低于 A 组患者，差异有统计学意义（P ＜ 0.05）。

结论 使用高分辨 MR 血管壁成像可有效评估前交通动脉瘤破裂风险，具有无创，高效的优势，能够提供一定的诊治依据，已成为常规检查。

PU-0117

Quantitative Study of Clinical Application of Spin-Singlet Targeted Glutamate Proton Magnetic Resonance Radiofrequency Pulse Sequence

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Background Conventional single voxel spectroscopy (SVS) proton magnetic resonance spectroscopy(^{1}H-MRS) is a non-invasive method for measuring cellular metabolism in tissues and organs. ^{1}H-MRS imaging combined with LCModel analysis software can be used to non-invasively detect changes in brain metabolites and quantitatively analyze the concentration of these metabolites. By continuously optimizing the scanning and post-processing techniques, we can also quantify metabolites with similar molecular structure and spectral characteristics, such as acetylaspartic acid (NAA), Glu/Gln, etc. However, there are many other post-processing analytical methods that can change the accuracy of ^{1}H-MRS metabolite quantification, and it is not clear to what extent the differences in analytical methods used to quantify ^{1}H-MRS data affect the quantitative results.

Objective The brain tissue and glioma of normal volunteers (Healthy controls, HCs) were detected by conventional voxel MRS, ^{1}H-MRS Glu targeted pulse sequence and LCModel, MATLAB and other post-processing software. The method of in vivo quantitative detection of Glu, quantitative detection of Glu in different lobes of normal brain and quantitative detection of Glu in glioma were investigated. To explore the feasibility of Glu quantification detected based on Glu-targeted 1H-MRS pulse sequence as a biomarker for Glu metabolic imaging in human brain in vivo.

Methods From June 2022 to January 2023, 10 glioma patients (over 18 years old) were enrolled as the patient group and 28 healthy volunteers were recruited as the volunteer group. All subjects were scanned by SIEMENS 3.0T MRI (Prisma) system, including 3D-MRI axial scan, single voxel 1H-MRS (PRESS) scan, and Glu-targeted ^{1}H-MRS scan. In normal subjects, frontal lobe, occipital lobe and basal ganglia were selected as voxel regions of interest (VOI). In the patient group, the VOI was located in the solid part of tumor. The spectral lines obtained by conventional voxel MRS detection were post-processed and semi-quantitatively determined by LCModel (SVS-LCModel method), and the spectral lines obtained by targeted Glu sequence were manually measured and semi-quantitatively determined by MATLAB (SSO-MATLAB method). The reliability of the two quantitative detection methods was evaluated by Bland-Altman (B-A) method and coefficient of variation (CV) analysis, respectively. Pearson product-moment correlation coefficient (R) was used to calculate the correlation between Glu and total creatine (tCr) quantified by different detection methods, i.e. creatine (Cr) + creatine phosphate (Pcr). The quantitative values of Glu in the tumor area detected by two methods were compared with those in the normal frontal lobe area by two-sample t-test.

Results The quantitative results of SVS-LCModel in frontal lobe, occipital lobe and basal ganglia of volunteers were (1.275 ±0.0987; 1.227 ±0.1696; 1.040 ±0.1335), the quantitative results of SSO-MATLAB were (0. 690 ±0.0742; 0.529 ±0.1304, 0.552 ±0.1990), and the quantitative results of SVS-LCModel and SSO-MATLAB in the glioma area were (3.407 ±0.6149) and (0.644 ±0.3002), respectively. The semi-quantitative Glu values of the two methods in the frontal lobe, occipital lobe and basal ganglia region and glioma group were in good agreement with each other, among which the frontal lobe and occipital lobe had the best consistency. CV analysis also showed that the variation of frontal lobe and occipital lobe was the lowest, among which SVS-LCModel (frontal lobe: 7.74%, occipital lobe: 13.82%) was better than

SSO-MATLAB (frontal lobe: 10.75%, occipital lobe: 24.65%). The results of correlation analysis of the two methods showed that there was a good correlation between frontal lobe and occipital lobe, but there was no correlation between basal ganglia and tumor area, and SVS-LCModel showed that the content of Glu in glioma area was significantly higher than that in normal frontal lobe (SVS-LCModel), and there was no significant difference in Glu content between glioma area and frontal lobe by SSO-MATLAB method.

Conclusion The quantitative detection of Glu of SSO-MATLAB in frontal lobe and occipital lobe of normal subjects has a better correlation with SVS-LCModel, and the reliability of semi-quantitative detection of Glu is better, but the reliability of quantitative detection of Glu in basal ganglia and glioma is not ideal, so it still needs to be improved.

PU-0118

Diffusion tensor imaging combined with nerve fiber bundle tracing in acute cerebral infarction

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Objective: The early diagnosis and judgment of clinical prognosis directly affect the treatment effect and reha_x0002_bilitation of cerebral infarction. This study aims to observe the corticospinal tract (CST) condition and its relationship with motor function in patients with acute cerebral infarction. Methods: A total of 21 patients with unilateral acute cerebral infarction diagnosed by conventional magnetic resonance imaging (MRI) and diffusion tensor imaging (DTI) were included in this study. The fractional anisotropy (FA) and diffusion tensor tractography (DTT) maps were reconstructed to determine the specific FA and DCavg values. The correlation between the FA and DCavg value and the modified Edinburgh Scandinavian scale score (MESSS) was analyzed. Results: The FA and DCag values in the cerebral infarction area were (0.18 ± 0.09) and (5.16 ± 1.06) 10- 3 mm2 / s, respectively. These values were significantly lower than that of corresponding parts on the healthy side ($P < 0.05$). The FA and DCavg values in bilateral cerebral peduncles have no statistical significance ($P > 0.05$). The CST on the lesion side shows compression, displacement, deformation, and interruption. The degree of injury of the CST is related to clinical neurological symptoms. The FA ($r = 0.772$) and DCag values ($r = 0.827$) in the cerebral infarction area had a high positive correlation with the MESSS. Conclusion: The DTI can noninvasively display the injury degree of the CST in cerebral infarction, which helps judge the impairment of motor function and predict the prognosis.

PU-0119

Accurate surgical guidance for glioblastoma: visualization of infiltration boundaries using MR-contrast-enhanced ultrasound

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Objective: Glioma is the most common primary neuroepithelial malignancy, and maximizing the resection of the tumor and infiltrating area is beneficial for the long-term survival of patients. Affected by the heterogeneity of cancer cells, the identification of infiltrating areas has become a key and difficult point in treatment. This study utilizes preoperative ultrasound MR enhanced fusion and intraoperative ultrasound contrast to effectively visualize the macroscopic and infiltrating boundaries of the tumor.

Method: A total of 16 glioma patients (1 in WHO grade I, 1 in grade II, 4 in grade III, and 10 in grade IV) were included. The general situation and laboratory indicators of the patients were analyzed, and the proportion of tumor cells stained with H&E was used to distinguish the tumor, infiltrating area, and normal tissue. Before surgery, ultrasound MR enhanced fusion imaging was used to locate the macroscopic boundaries of the tumor. Considering that the blood-brain barrier in the infiltrating area was not damaged, gadolinium enhancement was unable to develop. Intraoperative contrast-enhanced ultrasound was performed and dynamic images were stored. The tumor edges, infiltrating areas, and corresponding normal tissues were analyzed by avoiding surrounding blood vessels, ventricles, and superficial areas. The differences in parameters PI, RT, TTP, and TIC-AUC were compared. Standardization related parameters: Calculate the ratio of tumor edge to infiltrating area r1 and the ratio of infiltrating area to normal tissue r2, analyze the value of r1 and r2 in identifying infiltrating areas, and delineate infiltrating boundaries based on parameter thresholds. Finally, a logistic regression diagnostic model was constructed with $p<0.05$ as the effective factor and its performance was analyzed.

Result: There were no significant differences in age, gender composition, blood glucose, neutrophil percentage, and solid lesion volume among different grades of gliomas. The most common site of onset was the frontal and temporal lobes (13/16, 81.25%). The lymphocyte percentage and neutrophil lymphocyte ratio in high-grade gliomas (HGG) were significantly higher than those in low-grade gliomas (LGG) ($p<0.05$), HGG is mainly characterized by mixed echoes (9/14,64.3%), with low (1/2,50%) or high echoes (1/2,50%) being more common in LGG. From the edge of the tumor to normal tissue, PI and TIC-AUC showed a significant decrease trend ($p<0.05$), while RT and TTP gradually increased, but the difference was not statistically significant ($p>0.05$). From LGG to HGG, TTP, TIC-AUC, r1RT, r1TIC-AUC, r2RT in the infiltrated area showed a significant increase ($p<0.05$), while r2TIC-AUC showed a significant decrease ($p<0.05$). PI, RT, r1PI, r1TTP, r2PI, and r2TTP did not increase significantly ($p>0.05$). The heterogeneity of gliomas can be seen by delineating their

infiltrating boundaries, and the consistency with H&E staining is good. RTTP and rPI have high sensitivity (0.846) and negative predictive value (0.718) in distinguishing infiltrated areas from normal tissues. PI has high specificity (0.919) and positive predictive value (0.838). The ROC curve shows that PI has the highest diagnostic efficacy (0.703, $p<0.05$), and the combined diagnostic efficacy is 0.802 ($p<0.05$), The expression of the infiltration zone regression equation constructed with $p<0.05$ as an independent impact indicator is Y=-0.211+0.081 * PI-0.997 * rPI-1.341 * rTTP+0.020 * TIC-AUC. The accuracy of predicting non infiltration and infiltration is 72.8% and 72.1%, respectively, with an overall prediction accuracy of 72.4%.

Conclusion: Drawing the boundary of glioma infiltration area through contrast-enhanced ultrasound can guide surgical resection, and the constructed linear regression model has good predictive performance for invasion, which is expected to be further promoted and applied in surgery.

PU-0120

自旋单态靶向谷氨酸氢质子磁共振波谱射频脉冲序列的开发及临床初步应用

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背景 氢质子磁共振波谱成像（^{1}H-MRS）能在活体组织内无创地测量所选定体素的区域的特定化合物浓度，从而推测出相应脑区的代谢状态；大量研究表明，氨基酸代谢异常是许多中枢神经系统疾病如胶质瘤等的关键因素，因此及时、准确的在体氨基酸定量分析能够为中枢神经系统疾病的早期诊断提供帮助。谷氨酸 (Glutamate, Glu) 和谷氨酰胺 (Glutamine, Gln)的波谱信号在 ^{1}H-MRS 所获的曲线中有明显的重叠，这使得分离 Glu 的信号十分困难。因此，选择性地分离出体内 Glu 的信号对于研究 Glu 参与的正常人体内的代谢过程及确定其在胶质瘤进展中的作用非常重要。

目的 验证 Glu 靶向 ^{1}H -MRS 射频脉冲序列应用于不同浓度 Glu 水溶液及临床实践的可行性。

方法 1）基于 3.0T 临床核磁共振扫描仪，开发并测试 Glu 靶向 ^{1}H-MRS 脉冲序列，以选择性探测 Glu 信号。通过在不同浓度下的 Glu 水模溶液中进行测试，同时，进行常规单体素 PRESS 序列进行扫描，以确定在水模溶液中分离出 Glu 信号的可靠性。2）分别应用常规单体素 PRESS 序列及 Glu 靶向 ^{1}H-MRS 射频脉冲序列对健康人脑和胶质瘤患者进行检测，以确定 Glu 靶向 1H-MRS 射频脉冲序列在临床应用中的可靠性。将上述单体素 PRESS 序列测量所得的 Glu 谱线与 LCModel 软件拟合出的 Glu 谱线进行定性分析比较。

结果 将开发出的 Glu 靶向 ^{1}H-MRS 的脉冲序列应用于不同浓度下的 Glu 水模溶液、正常人脑不同部位及胶质瘤患者，均可以选择性地探测分离出 Glu 的信号。所获得谱线的化学位移、波峰及波形均与利用 LCModel 拟合出的 Glu 谱线趋于一致。

结论 新开发的 Glu 靶向 ^{1}H-MRS 射频脉冲序列在不同浓度下探测到水模溶液中的 Glu 信号。并可以应用于正常人脑及胶质瘤患者的选择性 Glu 靶向检测。

PU-0121

ASL 动脉自旋标记磁共振灌注序列介绍及临床应用

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ASL 的工作原理是利用射频脉冲标记动脉血内水质子，带标记的动脉血流入成像平面后对组织进行灌注成像，此时采集图像称为“标记像”，标记像信号包括了流入标记血流信号和原组织静态信号；另单独采集未标记的静态信号称为“控制像”，将标记像与控制像减影便得到灌注像，由于灌注像信号强度小、信噪比低，常需多次采集，最终才得到较理想的灌注像。

ASL 的分类：

1、连续动脉自旋标记（CASL）：

2、脉冲式动脉自旋标记（PASL）：

3、假连续脉冲动脉自旋标记 （PCASL）

PU-0122

基于 4D-CTA 改良 ASITN/SIR 侧支循环评分与 急性缺血性脑卒中预后的相关性

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【摘要】 目的 探讨基于 4D-CTA 改良 ASITN/SIR 侧支循环评分与急性缺血性脑卒中患者预后的相关性。方法 收集 2021 年 1 月至 2021 年 12 月我院收治的单侧大脑中动脉重度狭窄或闭塞的急性缺血性脑卒中患者 41 例，入院后行脑部 4D-CTA 和 DSA 检查，以 DSA 的 ASITN/SIR 评分作为金标准，评价 4D-CTA 改良 ASITN/SIR 侧支循环评分方法的效能，并分析该评分与急性缺血性脑卒中患者预后的相关性。结果 依据随访 3 个月的 mRS 评分分为两组，预后良好组（n=27）与预后不良组（n=14）之间患者糖尿病史、卒中史以及入院时 NIHSS 评分的差异有统计学意义（P＜0.05）。采用 ROC 曲线分析，4D-CTA 改良 ASITN/SIR 侧支循环评分的 AUC 值为 0.959（95%置信区间：0.855～0.998，P＜0.001）。改良 ASITN/SIR 评分对急性缺血性脑卒中患者预后的阳性预测值为 80.0%、阴性预测值为 92.3%，该评分与随访三个月后 mRS 评分呈负相关（r=-0.899，P＜0.001）。结论 4D-CTA 改良 ASITN/SIR 评分能准确评估急性缺血性脑卒中患者侧支循环和预测预后，为治疗方案提供重要依据。

PU-0123

320 排 CT 全脑灌注扫描定量参数和侧支循环评分与急性缺血性脑卒中患者预后的相关性

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【摘 要】 目的 探讨 320 排 CT 全脑灌注扫描定量参数和侧支循环评分与急性缺血性脑卒中患者预后的相关性。方法 收集 2020 年 1 月至 2022 年 1 月我院收治的急性缺血性脑卒中患者 60 例，对患者随访 3 个月，并进行改良 Rankin 量表评分，0～2 分归为预后良好组，3～5 分归为预后不良组，比较两组间患者临床特征、CT 全脑灌注扫描定量参数及侧支循环改良 ASITN/SIR 评分的差异。结果 与预后良好组（n=39）比较，预后不良组（n=21）患者 CT 脑灌注脑血流量（CBF）明显降低（46.75±4.83 vs.50.85±4.72）ml/100ml/min，脑血容量（CBV）亦明显降低（3.12±0.50 vs.3.54±0.45）ml/100ml，平均通过时间（MTT）延长（5.82±0.72 vs.5.05±0.68）s，达峰时间（TTP）延长（14.64±1.82 vs.12.58±1.74）s，两组间差异均有统计学意义（P＜0.05）。预后不良组患者改良 ASITN/SIR 评分≤2 分的比例为 100%，明显高于预后良好组 35.9%，两组差异有显著统计学意义（P＜0.05）。结论 320 排 CT 全脑灌注扫描定量参数和改良 ASITN/SIR 评分与急性缺血性脑卒中患者预后有明显相关性，能为治疗方案的选择提供重要依据。

PU-0124

探讨联合应用高分辨率血管壁磁共振成像（HR VW-MRI）及血流动力学（4D Flow MRI）在评估颅内动脉瘤子瘤破裂风险的价值

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目前探讨联合应用高分辨率血管壁磁共振成像（HR VW-MRI）及血流动力学（4D Flow MRI）在评估颅内动脉瘤子瘤破裂风险的价值。方法回顾遂宁市中心医院 2020 年 03 月~2022 年 12 月间 DSA 或手术确诊为颅内动脉瘤子瘤患者 89 例，分别采用 HR VW-MRI 及 4D Flow MRI 技术扫描，将所得数据传输到工作站，进行图像后处理，得到 HR VW-MRI 对动脉瘤壁的炎症反应；4D Flow MRI 对感兴趣的血流区域提供三维层面的血流动力学重要指标，其可视化及测量上具有一定的优势。结果 4D Flow MRI 能够对动脉瘤进行血流动力学参数的测量，HR VW-MRI 能够观测动脉瘤瘤壁状况，两者对评估动脉瘤子瘤破裂风险具有重要价值。结论血流动力学、瘤壁炎症之间的关联揭示了动脉瘤形成和破裂的潜在过程及机制，HR VW-MRI 联合 4D Flow MRI 对评估颅内动脉瘤子瘤破裂风险具有明显的优势及价值。

PU-0125

多层螺旋 CT 薄层重建图像显示尘肺病变的价值

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目的　探讨多层螺旋 CT（MSCT）薄层重建图像显示尘肺病变的价值，为规范尘肺病 CT 检查技术提供依据。方法　回顾性收集 104 例尘肺及接尘病例，在行胸部 MSCT 薄层扫描的同时，于主动脉弓上、气管隆突下、膈上平面（代表上、中、下肺区）分别进行一次轴位高分辨率 CT（HRCT）扫描。在 HRCT 代表左右肺上、中、下共 6 个肺区图像中分别选出病变最多的一个层面进行标记，再在 MSCT 薄层重建图像标记相对应层面。对所标记的两种图像分别阅片，主要观察图像质量、小阴影形态和大小、小阴影密集度、大阴影、肺气肿等。结果 104 例的 6 个肺区中，标记的 MSCT 薄层重建图像与 HRCT 图像分别为 624 幅图像。两者图像质量分级符合率在 68.27%~95.19%，Kappa 值在 0.409~0.534 之间，具有中度一致性；两者对小阴影形态和大小的判定未发现有统计学差异；两者对小阴影密集度判定的符合率在 96.16%-98.08%，Kappa 值在 0.888~0.934 之间，具有高度一致性；两者显示大阴影类型及频数分布的符合率在 6 个肺区均为 100%；两者对肺气肿分级的判定 6 个肺区完全相同，符合率均为 100%。结论　多层螺旋 CT 薄层重建图像能够清晰显示尘肺病变，尘肺病胸部 CT 检查不需加做 HRCT。

PU-0126

帕金森病神经影像生物标记物：一项基于低频振幅的区域影像组学相似性网络研究

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目的：构建基于低频振幅（ALFF）的影像组学相似性网络（R2SN）并探讨其在分类帕金森（PD）患者和健康对照（HC）的可行性，开发基于 ALFF R2SN 的 PD 潜在神经影像生物标记物。

方法： 两个独立中心的数据用于本研究。磁共振数据分别常规处理得到平均 ALFF（mALFF）图，利用自动解剖标记（AAL）116 图谱分割 mALFF 并构建 R2SN。采用 t 检验和最小绝对收缩和选择算子(LASSO)进行特征选择，使用嵌套 10 折交叉验证（重复 100 次）进行超参数优化和模型评估，使用高斯径向基函数支持向量机(RBF-SVM)构建分类模型。我们采用采用独立外部验证集测试我们模型性能及采用脑连接组（BN）246 脑图谱重复上述操作进一步验证我们的结果。我们选择 1000 次迭代中平均权重绝对值大于最大绝对权 20%的特征为“区分特征”并计算其与 PD 患者临床症状评分相关性。

结果： 使用 AAL116 和 BN246 脑图谱构建的 R2SN 都具有良好的可重复性和稳定性。我们构建的模型在训练集平均 AUC 和准确率分别为 0.85±0.02 和 0.81±0.03（P 均＜0.001），在外部独立测试集分别为 0.77 和 0.70(P 均＜0.05)。使用 BN246 脑图谱时模型在训练集平均 AUC 和准确率分别为 0.83±0.03 和 0.76±0.03（P 均＜0.001）。我们识别了 35 个“区分特征”，主要位于默认网络、感觉运动网络、执行控制网络、视觉网络、额顶网络和小脑网络。Spearman 偏相关分析示“区分特征（即 R2SN 连接强度）”与 PD 症状评分呈中等度相关（P 均＜0.05）。

结论： 基于 ALFF 构建的 R2SN 具有良好的可重复性及生物学意义，是 PD 新的且鲁棒的神经影像生物标记物。PD 与多个网络内及网络间的功能异常相关，我们的方法为 PD 的异常网络组织提供新视角。

PU-0127

高分辨磁共振血管成像技术对高血压患者豆纹动的应用价值

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目的 探讨高分辨磁共振血管壁成像技术对高血压患者豆纹动脉（LSAs）的应用价值。

方法 以２０１９年1月－２０23年1月我院收治的７６名高血压患者为研究对象，其中男性３８例，女性３８例，年龄４０～６８岁。对所有受试者行高分辨磁共振血管壁成像，DSA 颅内血管造影检查。以 DSA 检查结果为金标准，HR-VW 成像数据传至西门子后处理工作站自带软件,由 2 名高年资主治医师进行多 平面重建，以最小密度投影法 （ＭｉｎＩＰ）重建血管图像,对受试者 LSAs 的血管数量及深度进行分析，测得双侧 LSAs 分支深度及数量，然后对测得数据进行评估，若出现意见分歧时， 2 人共同阅片，以统一意见为最终诊断结果。使用 SPSS 25. 0 统计软件进行数据分析，计量资料经 ShaPiro － Wilk 检验，符合正态性分布的计量资料以（ x ± s）表示；采用 Kappa 一致性检验分析 HR-VW 诊断结果与 DSA 结果的一致性； 0. 80 ＜ Kappa ＜ 1，提示两者具有强一致性; P ＜ 0. 05 为差异有统计学意义。

结果 HR-VW 和 DSA 显示 LSAs 左侧分支总数分别为 287 支和 217 支，右侧分支总数分别为 294 支和 276 支。HR-VW 显示左侧豆纹动脉平均数目为 5.18（1）支，平均长度是１６．８８±２．０mm；显示右侧豆纹动脉平均数目为 5.4（1）支，平均长度是１６． ９７±２． １mm。DSA 显示左侧豆纹动脉平均数目为 5.57（1）支，平均长度是１８． ７９±２． ２０mm；显示右侧豆纹动脉平均数目为 5.57（1）支，平均长度是１９． ２６±２． １mm。HR-VW 诊断结果与 DSA 诊断结果具有强一致性（ Kappa = 0. 858，P ＜ 0. 001)。

结论 高分辨磁共振血管壁成像对高血压患者豆纹动脉血管特征分析具有临床价值。

PU-0128

PET/CT 在结直肠恶性肿瘤患者中的诊断价值

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目的：探讨 PET/CT 在结直肠恶性肿瘤患者中的诊断价值，为疾病的确诊提供更确切的诊断依据。方法：观察临床上结直肠恶性肿瘤患者常用的几种医学影像学技术，发现 CT、MRI、PET/CT 等三种影像学技术使用频率最多，其中又以 PET/CT 的应用诊断价值最高，继而深度剖析 PET/CT 所擅长的领域与其优缺点。结果：发现 PET/CT 对于诊断结直肠恶性肿瘤的定位与定性、是否发生转移具有重要的临床意义，PET/CT 同时具有 PET 功能成像的优势和 CT 高空间的分辨率，而 CT 对于微小病灶的发现存在一定的局限性，MRI 只是对机体软组织分辨率比较高。结论：PET/CT 在诊断结直肠恶性肿瘤患者中的价值较高，效果得到了医学界的肯定，具有一定的临床应用价值。

PU-0129

三维动脉自旋标记灌注成像显示多动症儿童脑部血流灌注量降低

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目的：探讨三维动脉自旋标记(3D- ASL)灌注成像在多动症儿童脑部的应用可行性。

方法：前瞻性选取 5-13 岁多动症儿童 78 名为研究组，选取年龄、性别相匹配健康儿童 89 名为对照组，所有儿童均行磁共振常规序列、3D-ASL、3D-T1 序列扫描。通过软件后处理获得脑部各区脑灰白质体积和脑血流量(CBF)灌注值，比较分析两组儿童脑部各区脑灰白质体积和脑血流灌注量 CBF 值，找出多动症儿童脑部各区脑灰白质体积和脑血流灌注量特点。

结果：多动症儿童脑部总体积和脑部总血流量值低于健康儿童（P＜0.05）；多动症儿童额叶、颞叶、海马、尾状核、壳核、苍白球等脑区灰白质体积低于健康儿童（P＜0.05）；多动症儿童额叶、颞叶、海马、尾状核、壳核、苍白球等脑区灰质 CBF 值低于健康儿童（P＜0.05）；多动症儿童额叶、颞叶、海马、尾状核、壳核、苍白球等脑区白质与健康儿童相对应脑区白质 CBF 值差异无统计学意义（P＞0.05）；额叶、尾状核等脑区 CBF 值能区分多动症儿童（AUC＞0.05，P＜0.05）。

结论：3D-ASL 技术显示多动症儿童部分脑区脑血流灌注量降低,额叶、尾状核等脑区 CBF 值能区分多动症儿童。

PU-0130

周围神经系统成像 MR 扫描技术

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目前磁共振神经成像主要以下基于两点原理成像：

1、以 T2 加权为基础的神经成像，其主要利用神经内膜内的低蛋白水分子与周围组织水分子之间横向磁豫的差别成像。

2、以 DWI 为基础的神经成像，其主要是利用水分子之间神经髓鞘束膜的限制弥散呈高信号成像。

周围神经系统 MR 成像方法：

1.3D-STIR-SPACE，

2.DWIBS

3.DTI

4.T1-VIBE

5.T2-ME3D

PU-0131

影像组学模型对基底节区自发性脑出血早期血肿扩大的预测研究

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目的：探究基于 CT 影像组学特征对基底节区自发性脑出血患者发生早期血肿扩大(HE)的预测价值。

方法：回顾性收集自 2019 年 10 月至 2022 年 11 月于通江县人民医院收治的发病 6 小时内的 132 例基底节区自发性脑出血患者，于入院后半小时内行头颅 CT 检查,并于入院后 24 小时内行头颅 CT 复查,依据血肿体积差异判断有无血肿扩大。将患者分为 HE 组(23 例)和非 HE 组(109 例)。收集在首次 CT 头颅平扫图像，按 4:1 随机将患者分入训练集与测试集，由两名高年资放射科医师对血肿区域进行三维容积感兴趣区(volume of interest,VOI)勾画，并使用 python 软件中的 Pyradiomics 包提取影像特征，使用采用组内相关性系数(ICC)评价 2 名医师提取参数的一致性，纳入 ICC＞0.80 的参数，并计算均值。对影像组学特征数据行归一化处理，以最小绝对收缩和选择算法(LASSO)筛选出预测效果最强的影像组学特征。应用 Logistic 回归、支持向量机、决策树、随机森林四种不同学习算法，联合十折交叉验证进行模型构建，并绘制受试者工作特征(ROC)曲线，计算曲线下面积(AUC)评价预测模型诊断效能。

结果：通过 LASSO 回归模型筛选出 11 个最具相关性的影像组学特征作为影像组学标签构建模型，Logistic 回归模型诊断效能最好。预测模型的 AUC 为 0.810,敏感性和特异性分别为 89.5%、70.1%。

结论：基于 CT 图像构建的影像组学模型可对基底节区自发性脑出血患者早期血肿扩大进行预测。

PU-0132

基于 T1CE 和 DWI 的影像组学预测胶质瘤的 IDH 突变状态

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背景和目的： 胶质瘤是最常见的原发性恶性中枢神经系统肿瘤，约占恶性脑肿瘤的 80%，死亡率和发病率极高。其中，异柠檬酸盐脱氢酶（IDH）是定义不同胶质瘤种类的最关键分子。一些研究已经证实，与 IDH 野生型的胶质瘤相比，具有 IDH 突变的胶质瘤具有更好的预后、总体生存率，对化疗反应性好、敏感性强。因此，我们旨在利用基于磁共振成像（MRI）的影像组学来无创地预测 IDH 突变状态。

方法： 在这项研究中，我们共收集了 168 名胶质瘤患者（IDH 突变型，49 人；IDH 野生型，119 人）。所有患者按照 7：3 的比例被随机分为训练集（n = 118）和验证集（n = 50）。T1 加权对比增强图像（T1-weighted contrast-enhanced images ，T1CE）和扩散加权成像（diffusion-weighted imaging ，DWI）被用来提取特征。为预测 IDH 状态建立了五个机器学习模型，包括随机森林（RF）模型、支持向量机（SVM）模型、逻辑回归（LR）模型、隐含狄利克雷分布（LDA）模型和 K-近邻（KNN）模型。每个模型的性能通过受试者工作特征曲线下的面积（AUC）来评估的。

结果： 从每个序列的ROI中提取了885个特征，通过相关系数分析和套索算法（LASSO），从T1CE图像中选出20个特征，从DWI中选出16个特征。然后结合这两个序列，从1770个特征中选出14个特征。基于从T1CE或DWI单独提取的影像组学特征，SVM模型和RF模型分别是T1CE和DWI的最佳模型，AUC为0.67和0.73。来自两个序列的SVM模型达到了0.87的AUC。

结论： T1CE和DWI的组合在预测胶质瘤患者的IDH突变状态方面取得最佳预测性能，明显高于单序列成像模式结果。因此，基于MRI的影像组学可能有助于无创检测IDH突变状态，这有利于临床医生设计个性化的治疗策略。

PU-0133

Machine learning models based on multi-parameter MRI radiomics for prediction of molecular glioblastoma:a new study based on 2021 WHO classification

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Objective: Diffuse glioma is a common brain tumor that can be classified into low-grade glioma and glioblastoma histologically. However, WHO grade II or III histological IDH-wild-type diffuse astrocytomas with EGFR amplification, +7/-10, or TERT promoter mutations are classified as glioblastomas in the 5th central nervous system tumor classification guideline issued in 2021. An accurate diagnosis of the molecular glioblastoma is essential for personalized healthcare and will help improve clinical outcomes. This study aims to predict the newly defined molecular glioblastoma using machine learning models based on radiomics features of multi-parameter magnetic resonance imaging preoperatively.

Methods: This study retrospectively recruited 145 patients histologically diagnosed with low-grade glioma from January 2020 to February 2022. Fifty-four patients were reclassified as molecular glioblastoma by pyro-sequencing. All patients were randomly assigned to the training group and the test group in a ratio of 7:3. N4-ITK bias field correction was performed on all images, and the voxels were resampled to 1×1×1mm. The flair sequences were delineated manually by a neuro-radiologist with more than five years of experience. Subsequently, the masks obtained from the flair sequence were registered to the T1WI, T2WI and CET1 sequences. To evaluate the accuracy of segmentation, 30 patients were randomly selected and delineated by a neuro-radiologist with more than 10 years of experience, and the intra-class correlation coefficient (ICC) between the two radiologists was calculated. All features were normalized by z-score to eliminate the dimensionality of features. Four algorithms including distance correlation (DC), gradient boosting decision tree (GBDT), max-relevance and min-redundancy (MRMR) and recursive feature elimination (RFE) were used to select the optimal radiomics signatures in the training group. The features with significant collinearity were eliminated by the spearman correlation coefficient. Five machine learning algorithms including support vector machine (SVM), linear discriminant analysis (LDA), artificial neural network (ANN), k-nearest neighbor (KNN) and decision tree (DT) were used to build the predictive models. The parameters were adjusted and optimized by 10-fold cross-

validation in the training group, and the independent test group were used to evaluate the performances of the models.

Results: The median ICC between the two radiologists was 0.985 and the mean ICC was 0.933, which showed good consistency, suggesting that the delineation was reliable and the radiomics features were stable. The ANN+GBDT model was defined as the optimal model in view of its best performance in the test group. The AUC value of the model was 0.913 in the training group and 0.881 in the test group. The sensitivity, specificity, and accuracy of the ANN+GBDT model in the training group were 0.775, 0.937 and 0.874, and in the test group were 0.714, 0.833 and 0.796 respectively.

Conclusion: Machine learning models based on the multi-parameter MRI radiomics can provide a reliable non-invasive technique for predicting molecular glioblastoma, and provide useful information for personalized treatment evaluation.

PU-0134

Coordinatized lesion location analysis empowering ROI-based radiomics diagnosis on brain gliomas

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Objectives: To assess the value of Coordinatized lesion location analysis (CLLA), in empowering ROI-based imaging diagnosis of gliomas by improving accuracy and generalization performances.

Methods: In this retrospective study, pre-operative contrasted T1-weighted and T2-weighted MR images were obtained from patients with gliomas from three centers: Jinling Hospital, Tiantan Hospital, and The Cancer Genome Atlas Program. Based on CLLA and ROI-based radiomic analyses, a fusion location-radiomics model was constructed to predict tumor grades, isocitrate dehydrogenase (IDH) status, and overall survival (OS). An inter-site cross-validation strategy was used for assessing performances of the fusion model on accuracy and generalization with the value of area under curve (AUC) and delta accuracy (ACC) (ACCtesting—ACCtraining). Comparisons of diagnostic performances were performed between the fusion model and the other two models constructed with location and radiomics analysis using Delong’s test and Wilcoxon signed ranks test.

Results: A total of 679 patients (mean age, 50 years ± 14 [standard deviation]; 388 men) were enrolled. Based on tumor location probabilistic maps, fusion location-radiomics models (averaged AUC values of grade/IDH/OS: 0.756/0.748/0.768) showed the highest accuracy in contrast to radiomics models (0.731/0.686/0.716) and location models (0.706/0.712/0.740). Notably, fusion models ([median Delta ACC: -0.125, interquartile range: 0.130]) demonstrated improved generalization than that of radiomics model ([-0.200, 0.195], P=0.018).

Conclusions: CLLA could empower ROI-based radiomics diagnosis of gliomas by improving accuracy and generalization of the models.

PU-0135

功能磁共振成像机器学习检测帕金森病患者：一项多中心影像组学分析

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目的：使用两个中心数据和基于低频振幅（ALFF）的多阶影像组学来识别帕金森（PD）潜在神经影像标记物并探讨 PD 潜在的神经机制。

方法：两个中心的数据用于本研究，磁共振数据常规处理得到平均 ALFF（mALFF）图。使用脑连接组 246 脑图谱提取多阶影像组学特征。训练集用于超参数优化、特征选择、模型的训练和模型的内部测试，独立外部测试集验证模型性能。特征选择采用 t 检验和最小绝对收缩和选择算子(LASSO)，使用嵌套 10 折交叉验证（重复 20 次）进行模型评估和参数优化，使用支持向量机构建分类模型。选择在 200 次迭代中被选择频率最高的 10 个脑区的特征定义为“区分特征”并计算平均权重。计算“区分特征”与 PD 患者临床症状评分相关性。

结果：在训练集，模型的平均 AUC 和准确率分别为 0.850 和 81.45%（P 均＜0.001），在独立外部测试集 AUC 和准确率为 0.667 和 67.44%。我们识别的与 PD 相关特征共包括 17 个特征，这些特征绝大多数（15/17）为高阶影像组学特征，被一阶影像组学特征识别的脑区也被高阶影像组学特征识别。区分特征脑区位于双侧额上回、中央前回、右侧中央旁小叶、楔前叶、左侧颞下回、顶上小叶。SFG_R_7_5-GLN-HHL 与汉密尔顿 17 项抑郁评分（HDRS-17）呈负相关（ r = -0.31，P = 0.015），SFG_R_7_4-SRE-LHL 与标准化帕金森病等级量表评分（UPDRS）（用药）（r = 0.43，P = 0.024）和 UPDRS（未用药）（r = 0.39，P = 0.043）呈正相关。

结论：我们的方法可以有效分类 PD 患者和 HC，基于 ALFF 的影像组学特征可能是 PD 潜在的生物标记物，高阶影像组学特征可能能更好地表征图像特征且可能更适合作为 PD 潜在生物标记物。PD 可能与感觉运动网络和外侧顶叶皮层的功能异常相关。

PU-0136

MRI 技师快速预测急性脑卒中发病时间的影像组学模型建立与临床应用

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目的　探讨基于 DWI 的影像组学模型辅助 MRI 技师预测急性脑卒中发病时间的应用价值。

方法　回顾性分析于 2022 年 1 月至 2023 年 1 月在邵阳市中心医院就诊且发病时间明确的急性脑卒中患者 317 例。通过完全随机的方法根据 7：3 的比例将所有患者分为训练集(221 例)和内部测试集(96 例)；再根据发病时间将患者分为≤4.5h 和＞4.5h 两组。由主任医师对 DWI 图像上急性梗死区的高信号区进行轮廓勾勒标注。利用 3D SLICER 软件提取 107 个影像特征，特征筛选采用 F 检验、相关性分析及 lasso 回归方法，预测模型的构建采用随机森林分类器，并在测试组中进行验证。利用受试者工作特征曲线及曲线下面积（Area under the curve，AUC）评估预测模型

的效能。比较人工识别和 DWI 模型预测急性卒中发病时间的 ROC 曲线下面积(AUC)、准确度等性能。

结果 ROC 分析显示人工识别预测急性卒中发病时间的 AUC 为 0.554（95%置信区间 CI：0.44-0.67),影像组学模型的 AUC 值为 0.848（CI：0.74-0.95)，准确性、敏感性、特异性分别为 83%、78% 、84%。

结论　基于 DWI 的机器学习模型预测急性卒中发病时间明显优于人工识别，在临床实践中发现预测可在 MRI 扫描结束前由影像技师完成，可及时为未知发病时间的脑卒中患者疾病诊断及治疗提供更多信息。

PU-0137

T1CE And DWI Based Radiomics Predict IDH Mutation in Gliomas

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Background and purposes: Gliomas are the most common primary malignant central nervous system cancer, which accounts for almost 80% of malignant brain tumors, with the highest mortality and morbidity. They can be classified into four grades (grade Ⅰ, grade II, grade III, and grade IV) based on World Health Organization (WHO) molecular diagnostics criteria. Among them, isocitrate dehydrogenase (IDH) is the most crucial molecular to define a distinct family of gliomas that range from grade Ⅰ to grade IV. Several studies have confirmed that gliomas with IDH mutation show a better prognosis, overall survival, and response to chemotherapy than IDH wild-type gliomas. Thus, we aimed to use magnetic resonance imaging (MRI)-based radiomics to noninvasively predict the IDH mutation status.

Methods: In this study, a total of 168 patients with glioma (IDH-mutant, 49; IDH-wild-type, 119) were collected. All patients were randomly divided into a training set (n = 118) and a validation set (n = 50). T1-weighted contrast-enhanced images (T1CE), and diffusion-weighted imaging (DWI) were used to extract feature. Five machine learning models were built for predicting IDH status, including a Random Forest (RF) model, a Support Vector Machine (SVM) model, a Logistic Regression (LR) model, a Latent Dirichlet Allocation (LDA) MODEL, and a K-Nearest Neighbor (KNN) model. The performance of each model was evaluated by accuracy and the area under the receiver operating characteristic curve (AUC).

Result: Eight hundred and eighty-five features were extracted from ROIs of every sequence, and through correlation coefficient analysis and LASSO regression 20 features were selected from the T1CE images, sixteen features from the DWI. Then combined these two sequences and selected 14 features from 1770 features. Based on the radiomics features derived from either T1CE, or DWI alone, the SVM model and the RF model was the optimal model for T1CE and DWI respectively, with an AUC of 0.67 and 0.73. The SVM model derived from two sequences achieved an AUC of 0.87.

Conclusion: The combination of both the T1CE and DWI achieved significantly higher performance in predicting the mutation status of IDH in patients with glioma than did the single sequence imaging mode. Accordingly, MRI-based radiomics may be useful for noninvasively detecting IDH mutation status, that may help clinicians design personalized treatment strategies.

PU-0138

“影”永无止境，“像”亦知未来 影像组学无创性预测成人胶质瘤 IDH 基因型突变的应用研究

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脑胶质瘤源于神经胶质细胞，是最常见的原发性恶性中枢神经系统肿瘤，也是分类最复杂的颅内肿瘤。传统分类方法依据组织学起源和形态病理学标准，但会出现相同级别肿瘤有着不同生物学行为、临床特点、治疗反应以及不同预后的现象，这证明传统分类方法不足以指导临床。随着世界卫生组织中枢神经系统胶质瘤分类分级从 1979 年到 2021 年经过 5 版 6 次的升级，从组织起源与形态病理之争再到免疫组化和分子病理之论，从而发现其本质就是基因谱系的差别。并且在 2021 版中，年龄也作为一个重点的参数维度，将成人与儿童进行区分，这证明二者肿瘤类型虽然在形态学上很相近，但是在基因分子病理改变层面有截然不同的区别。针对传统病理穿刺获取基因信息有限制，本着术前优于术后、无创优于有创的新理念，即使用影像组学高通量无创量化功能 MRI 和核医学分子功能代谢 PET/CT 、PET/MRI 影像从结构和功能双维度预测成人胶质瘤 IDH 基因学信息。IDH 基因是目前临床公认预测胶质瘤预后及生物学行为的指标，知晓其是否发生突变对胶质瘤患者的术前诊断和制定个体化最佳治疗方案至关重要。影像组学与 PET/MRI 或 PET/CT 强强联合，由结果出发不但可以高通量提取常规解剖结构 MRI 或 CT 图像特征还能量化其结构与功能代谢整合图像。随着磁共振技术的不断更新发展，利用功能 MRI 进行影像组学预测 IDH 基因表达亦成为科研人员热点研究对象。多种成像技术优势互补，组学模型预测准确率显著提高。

影像组学本着源于临床、高于临床、回归临床的发展理念，还可量化患者更多维度信息，形成基于基因-生化-病理-影像-患者个人信息（年龄、性别、家族史等）精准预测肿瘤的新组学模式。本文就影像组学基于核医学正电子发射体层成像和功能磁共振成像预测成人胶质瘤 IDH 基因突变研究进展进行综述。