Intracranial metastases differential diagnosis

The main differential diagnosis of intracranial metastases includes primary brain tumors, abscesses, vascular and inflammatory lesions.

Even among the patients with known cancer, 11% of the single brain lesions represent something other than metastases, the majority of which turn out to be High-grade gliomas [1].

Differentiating a dural-based metastases from meningioma can be difficult. Both may be hyperdense on noncontrast CT and enhance avidly [2].

Known history of malignancy, presence of both dural-based and parenchymal lesions, and development of a new dural lesion compared with prior imaging may be helpful to suggest a diagnosis of dural metastases rather than meningioma.

General imaging differential considerations include:

Primary brain neoplasm

Especially glioblastoma

NAA present to a degree

epicentre on white matter

extends to ependymal surface.

Hemangioblastoma

Differentiation between hemangioblastoma and brain metastases remains a challenge in neuroradiology using conventional MRI. Amide proton transfer imaging can provide unique molecular information. A study by Kamimura et al. from Kagoshima aimed to evaluate the usefulness of APT imaging in differentiating hemangioblastomas from brain metastases and compare APT imaging with diffusion-weighted imaging and dynamic susceptibility contrast perfusion-weighted imaging.

This retrospective study included 11 patients with hemangioblastoma and 20 patients with brain metastases. Region-of-interest analyses were employed to obtain the mean, minimum, and maximum values of APT signal intensity, apparent diffusion coefficient (ADC), and relative cerebral blood volume (rCBV), and these indices were compared between hemangioblastomas and brain metastases using the unpaired t-test and Mann-Whitney U test. Their diagnostic performances were evaluated using receiver operating characteristic (ROC) analysis and area under the ROC curve (AUC). AUCs were compared using DeLong's method.

All MRI-derived indices were significantly higher in hemangioblastoma than in brain metastasis. ROC analysis revealed the best performance with APT-related indices (AUC = 1.000), although pairwise comparisons showed no significant difference between the mean ADC and mean rCBV.

APT imaging is a useful and robust imaging tool for differentiating hemangioblastoma from metastases [3)]

Cerebral abscess

central restricted diffusion

dual rim sign [4)]

smooth complete low-intensity rim on SWI [5)]

Subacute stroke

Gyriform enhancement typical

Vascular territory

Meningioma

Usually obviously extraxaial

Homogeneous enhancement

Dural tail

Post-treatment effects (post-surgical or post-radiation) hypermetabolic acutely progressing to hypometabolic over time [6)].

Magnetic resonance spectroscopy

A study of Wang et al., measured the diagnostic examination quality of magnetic resonance spectroscopy in differentiating High-grade gliomas from metastases. PubMed, Embase, and Chinese Biomedical databases were systematically searched for relevant studies published through 10 July 2016. Based on the data from eligible studies, heterogeneity and threshold effect tests were performed; pooled sensitivity, specificity, and areas under summary receiver-operating characteristic curve of magnetic resonance spectroscopy were calculated. Finally, seven studies with a total of 261 patients were included. Quantitative synthesis of studies showed that pooled sensitivity/specificity of Cho/NAA and Cho/Cr ratio in peritumoral region was 0.85 (95% confidence interval: 0.79-0.90)/0.93 (95% confidence interval: 0.80-0.99) and 0.86 (95% confidence interval: 0.76-0.92)/0.86 (95% confidence interval: 0.73-0.94). The area under the curve of the summary receiver-operating characteristic curve was 0.95 and 0.90. Pooled sensitivity, specificity, and area under the curve of magnetic resonance spectroscopy to identify high-grade gliomas from metastases were 0.85 (95% confidence interval: 0.79-0.90), 0.84 (95% confidence interval: 0.75-0.90), and 0.90, respectively.

They concluded that magnetic resonance spectroscopy demonstrated moderate diagnostic performance in distinguishing high-grade gliomas from metastases. Furthermore, Cho/NAA ratio showed higher specificity and higher value of area under the curve than Cho/Cr ratio in peritumoral region. They suggested that Cho/NAA ratio of peritumoral region should be used to improve diagnostic accuracy of magnetic resonance spectroscopy for differentiating high-grade gliomas from metastases [7].

References

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