Posterior fossa tumor differential diagnosis

Atypical teratoid rhabdoid tumor.

Diffuse midline glioma

Ependymoma

Hemangioblastoma: HB is a highly vascular benign tumor with characteristic findings of a cerebral cystic region and a peripherally enhanced nodule. Its FDG uptake is relatively low [1] whereas Tl uptake is increased at early phase [2] [3].

Lymphoma: ML is characterized by high cellular density and accelerated glycolytic metabolism and results in higher FDG uptake than Glioblastoma or Mets [4] [5] [6].

Pilocytic astrocytoma.

Glioblastoma:Mostly found in relatively aged subjects.

Medulloblastoma: MB is found mostly in children, which is highly different from others [7].

Rosette forming glioneuronal tumor.

Atypical choroid plexus papilloma.

Pilomyxoid astrocytoma.

Metastases: In about 80% of patients with metastatic tumor, primary lesions were detected using whole-body FDG-PET [8].

Adults

Posterior fossa tumor has a very different differential in an adult as opposed to a child:

Cerebellar metastases (most common): especially lung cancer and breast cancer also melanoma, thyroid malignancies, and renal cell cancer gastrointestinal stromal tumor (very rare)

Hemangioblastoma: most common primary brain tumor.

Cerebellar astrocytomas, cerebellar medulloblastomas, and posterior fossa ependymomas are encountered in younger adults but are rare in older adults, accounting for <1% all tumors

Fourth ventricle lymphoma

Lipoma

An important space occupying lesion (the most common in fact) to remember is that of a stroke, which when subacute can mimic a tumor.

Child

Posterior fossa astrocytoma

Pilocytic astrocytoma: most common

Brainstem glioma

Medulloblastoma

Ependymoma atypical teratoid/rhabdoid tumor (AT/RT)

Hemangioblastoma (uncommon except in patients with vHL) teratoma (in infants) A quick and handy mnemonic for posterior fossa tumors in children is BEAM.

Although it is true that posterior fossa tumors are much more common in children than in adults the distribution does vary with age 2:

0 to 3 years of age: supratentorial > infratentorial 4 to 10 years of age: infratentorial > supratentorial 10 to early adulthood: infratentorial = supratentorial adults: supratentorial > infratentorial Overall 50-55% of all brain tumors in children are found in the posterior fossa 3.

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15 paediatric patients with brain tumours were scanned prospectively using pseudo-continuous arterial spin labelling (ASL) and dynamic susceptibility contrast (DSC-) MRI with a pre-bolus to minimise contrast agent leakage. Cerebral blood flow (CBF) maps were produced using ASL. Cerebral blood volume (CBV) maps with and without contrast agent leakage correction using the Boxerman technique and the leakage parameter, K2, were produced from the DSC data. Correlations between the metrics produced were investigated.

RESULTS:: Histology resulted in the following diagnoses: pilocytic astrocytoma (n = 7), glioblastoma (n = 1), medulloblastoma (n = 1), rosette-forming glioneuronal tumour of fourth ventricle (n = 1), atypical choroid plexus papilloma (n = 1) and pilomyxoid astrocytoma (n = 1). Three patients had a non-invasive diagnosis of low-grade glioma. DSC CBV maps of T1-enhancing tumours were difficult to interpret without the leakage correction. CBV values obtained with and without leakage correction were significantly different ($p < 0.01$). A significant positive correlation was observed between ASL CBF and DSC CBV ($r = 0.516$, $p = 0.049$) which became stronger when leakage correction was applied ($r = 0.728$, $p = 0.002$). K2 values were variable across the group (mean = 0.35, range = -0.49 to 0.64).

CONCLUSION:: CBV values from DSC obtained with and without leakage correction were significantly different. Large increases in CBV were observed following leakage correction in highly T1-enhancing tumours. DSC and ASL perfusion metrics were found to correlate significantly in a range of paediatric brain tumours. A stronger relationship between DSC and ASL was seen when leakage correction was applied to the DSC data. Leakage correction should be applied when analysing DSC data in enhancing paediatric brain tumours.

ADVANCES IN KNOWLEDGE:: We have shown that leakage correction should be applied when investigating enhancing paediatric brain tumours using DSC-MRI. A stronger correlation was found between CBF derived from ASL and CBV derived from DSC when a leakage correction was employed [9].

A study investigated the combined capability of Thallium 201 SPECT and 18F positron emission tomography for differential diagnosis of posterior fossa tumors using multiple discriminant analysis.

This retrospective study was conducted under approval of the institutional review board. In the hospital information system, 27 patients with posterior fossa intra-axial tumor between January 2009 and June 2015 were enrolled and grouped as the following 7 entities: Low-grade glioma (LGG) 6, anaplastic astrocytoma (AA) 2, glioblastoma (Glioblastoma) 3, medulloblastoma (MB) 3, hemangioblastoma (HB) 6, metastatic tumor (Mets) 3, and malignant lymphoma (ML) 4. Tl and FDG uptakes were measured at the tumors and control areas, and several indexes were derived. Using indexes selected by the stepwise method, discriminant analysis was conducted with leave-one-out cross-validation.The predicted accuracy for tumor classification was 70.4% at initial analysis and 55.6% at cross-validation to differentiate 7 tumor entities. HB, LGG, and ML were well-discriminated, but AA was located next to LGG. Glioblastoma, MB, and Mets largely overlapped and could not be well distinguished even applying multiple discriminant analysis. Correct classification in the original and cross-validation analyses was 44.4% and 33.3% for Tl-SPECT and 55.6% and 48.1% for FDG-PET [10].

1)

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7)

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8)

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9)

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10)

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