Brainstem glioma diagnosis

47 patients were included in the study of whom 15 had confirmed glioma and seven had confirmed alternative diagnosis. 18F FET PET shows significantly higher uptake in high grade glioma than in non-glioma. Lesions with TBRmax >2.5 should be considered suspicious for glioma and biopsy considered. Threshold TBRmax > 3.0 is useful for differentiating high grade glioma from low-grade glioma . This may be a particularly useful tool for directing management in eloquent areas, such as brainstem glioma [1].

While histological examination is required for definitive diagnosis, due to the difficult nature of obtaining tissue from the brainstem, radiographic imaging is often the preferred method of diagnosis and classification [2]. Computed tomography (CT) of high-grade pontine gliomas typically shows a hypodense or isodense lesion; MRI shows a hypointense lesion on T1-weighted images and a hyperintense lesion on T2-weighted images. Rapid diffusion MRI, thallium single photon emission computed tomography (SPECT) [3] and positron emission tomography (PET) [4] are emerging as potentially superior imaging techniques for brainstem lesions. The differential diagnosis of a suspected high-grade glioma visualized radiographically is broad and includes vascular malformation, encephalitis, parasitic infection, demyelinating disorder, and hamartomas.

Magnetic resonance spectroscopy (MRS) is a complementary tool used in the differential diagnosis of a brainstem lesion [5] [6] [7].

However, compared to its application in supratentorial lesions, the use of MRS is more limited in the brainstem because of the technical difficulties related to the small size of the anatomical structures and the proximity of bone and fatty tissue of the skull base. Currently, single-voxel MRS is the technique used to study diffuse brainstem lesions, particularly in pontine lesions greater than 2 cm. More recently, the application of the 3T multivoxel MRS has improved the spatial resolution of this technique when acquisition times of 12–15 minutes are used [8].

In one retrospective study, nine adult patients suffering from brainstem gliomas (histologically confirmed in four cases) were evaluated with single-voxel MRS before treatment. All patients showed an elevation in the choline/N-acetyl aspartate ratio (Cho/NAA ratio) from 1.08 to 3.32 (normal is 0.6–0.8), an elevation in the Cho/creatine (Cr) ratio (range 1.89–1.01) in eight patients, and an elevation in the lactate signal in three patients. The creatine/NAA ratio was abnormal in all patients because of the loss of the NAA signal. Thus, the changes observed using MRS appear similar to those observed in supratentorial gliomas [9].

In the pediatric population, MRS has been shown to detect progression (decrease in NAA, elevation of Cho, and decrease in the NAA/Cho and Cr/Cho ratios) before radiological or clinical deterioration [10].

Experience in children also suggests that MRS may contribute to differential diagnoses with infectious

and demyelinating diseases [11].

Diffusion tensor imaging and white matter fiber tractography could also help to differentiate diffuse brainstem gliomas (deflected fibers) from demyelinating disease (lack of distortion) [12].

MRI in NF1 patients should be carefully interpreted because T2 hyperintensities in the brainstem, so-called “unidentified bright objects”, are frequent and must be differentiated from neoplastic lesions [13].

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