Central neurocytoma. MRI and MRS
imaging findings

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Section: Neuroradiology
Area of Interest: Neuroradiology brain
Procedure: Imaging sequences
Procedure: Diagnostic procedure
Imaging Technique: MR
Imaging Technique: MR-Spectroscopy
Special Focus: Neoplasia Case Type: Clinical Cases
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Patient: 41 years, female

Clinical History:

A 41-year-old woman presented with persistent headaches during the past 2 months. On admission, brain computed tomography (CT) was performed, followed by magnetic resonance imaging (MRI).

Imaging Findings:

The CT revealed an intraventricular lesion and signs of hydrocephalus. The MRI showed a solid, well-circumscribed mass lesion confined to the right frontal horn of the lateral ventricle, attached to the septum pellucidum. The left lateral ventricle was displaced and dilated due to obstruction of the right foramen of Monro. The lesion appeared with low to isointense signal on T1-weighted images and hyperintense on T2-weighted images. Small tubular signal void areas, consistent with vessels, were observed in the lesion. Calcifications or cystic areas were not observed. A slight enhancement was seen after intravenous contrast administration (Fig. 1, 2). MR spectroscopy (MRS) with short time echo (23 ms) revealed a specific peak at 3.55 ppm representing elevated glycine in the lesion, along with other metabolites including elevated choline and decreased N-acetylaspartate (Fig. 3). The patient was operated and histology was compatible with a central neurocytoma (CNC) (Fig. 4).

Discussion:

Central neurocytoma is a rare brain tumour composed of uniform round cells with neuronal differentiation. It usually occurs in young adults with no sex predilection and constitutes approximately 0.1-0.5% of all intracranial tumours [1-2]. The majority of CNC are located entirely within the ventricles, close to the foramen of Monro [3-4]. Although CNC is believed to be benign tumour, it can present atypical features and aggressive behaviour such as disease recurrence, tumour progression, craniospinal dissemination and extraventricular extension [5-6]. Patients typically present with symptoms of obstructive hydrocephalus, headaches, dizziness, vomiting and diplopia [7]. Treatment of choice is surgical removal.

On conventional MRI, a CNC is usually a well-defined, lobulated mass, located in the anterior portion of the lateral ventricles. Attachment with a broad base to the septum pellucidum is almost always observed. On T1-weighted images the tumour appears hypointense and on T2-weighted images hyperintense. After contrast administration, a variable degree of heterogeneous enhancement from mild to strong is depicted. Intratumoral heterogeneity is due to the presence of cystic, haemorrhagic areas and calcifications [8-10]. Although structural imaging findings of CNC
are typical, they are not specific. Differential diagnosis includes many brain tumours such as choroid plexus papilloma, astrocytoma, meningioma, ependymoma, subependymoma, oligodendroglioma and lymphoma [10-11].

Yeh IB et al [9] reviewed eight patients with CNC and MRS. CNC had a typical appearance with a metabolite peak at 3.55 ppm due to increased Gly, and this feature may be helpful in the differential diagnosis. The reason for the increased Gly in CNC is unknown. Biologically, Gly is a simple amino acid that is mainly found in astrocytes and glycineric neurons and is acting as an inhibitory neurotransmitter [12, 13]. Most intracellular Gly is synthesized from glucose through serine by serine hydroxymethyltransferase (SHMT-1) in the mitochondria. Hence, elevated SHMT-1 activity in proliferative cells and neoplastic tissues may lead to oversynthesis of Gly [14]. Cytogenetic studies in CNC have found that loss of chromosome 17p may contribute to the neoplastic growth of CNC [15-16]. Further work in neurochemistry and cytogenetics is necessary to elucidate the causes of the observed metabolic disturbances in CNC.

In conclusion, the characteristic MRS appearance of CNC with high Gly peak at 3.55 ppm may be helpful for differentiating CNC from other intraventricular neoplasms and contribute to presurgical diagnosis and planning.

**Differential Diagnosis List:** Central neurocytoma, Oligodendroglioma, Ependymoma, Astrocytoma, Subependymoma, Meningioma, Lymphoma, Choroidal plexus papilloma

**Final Diagnosis:** Central neurocytoma

**References:**


Description: Axial T2-weighted image shows a hyperintense, well-circumscribed mass lesion in the right lateral ventricle. The lesion is attached to the septum pellucidum causing hydrocephalus (arrow).

Origin: Department of Clinical Radiology, Medical School of Ioannina, Greece.
Description: Axial contrast-enhanced T1-weighted image showed mild heterogeneous enhancement of the mass (arrow). Origin: Department of Clinical Radiology, Medical School of Ioannina, Greece.
Description: MR spectroscopy of the lesion at short echo time (TE: 23 ms) revealed a specific peak in 3.55 ppm representing elevated glycine (asterisk). Decreased NAA at 2.0 ppm and elevated Cho peak at 3.2 ppm are also present. Origin: Department of Clinical Radiology, Medical School of Ioannina, Greece.
**Figure 4**

Description: Histologically, the tumor is composed of round cells and nucleus-free areas of neuropil. (H/E X200). Origin: Department of Pathology, Medical School, University of Ioannina, Greece.