

# Role of intraoperative squash smear cytology as a diagnostic modality in lipoma of quadrigeminal cistern

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### ABSTRACT

Quadrigeminal lipoma is a rare tumor that has been categorized as developmental malformation rather than a hamartoma or true neoplasm, due to its origin from abnormal persistence and mal-differentiation of meninx primitiva during the development of the subarachnoid cisterns. Reported admixture of adipose tissue with heterotopic elements also supports a developmental origin. Quadrigeminal lipomas are frequently asymptomatic and detected incidentally. Though a favorable clinical course is usually expected, recurrences may occur due to partial removal of lesions in close relation to vital structure. We describe the role of intraoperative squash smear cytology as a diagnostic aid in quadrigeminal cistern lipoma and an alternative to frozen sections that are technically difficult to obtain due to presence of lobules of fibro-adipose tissue. With radiological correlation, squash cytology can be an economical method for intraoperative diagnosis, pending subsequent histopathological confirmation.

**Key words:** Cytology, lipoma, quadrigeminal, squash

### Introduction

Intracranial lipomas are rare brain tumors with an incidence of 0.06-0.3%.<sup>[1]</sup> These tumors tend to occur in characteristic locations like interhemispheric (approximately 50%), quadrigeminal or superior cerebellar cistern (10-25%), suprasellar or interpeduncular cistern, cerebellopontine angle, and sylvian fissure.<sup>[2,3]</sup> Almost half of the intracranial lipomas are asymptomatic, and frequently manifest in young adult age group.<sup>[1]</sup>

Quadrigeminal cistern, also known as superior cistern or cistern of the great cerebral vein is one of the subarachnoid cisterns located between the splenium of the corpus callosum and the superior surface of the cerebellum. It extends from the third ventricle to the great cerebral vein. We describe a rare case of quadrigeminal

cistern lipoma in a 10 years male child and discuss the role of squash preparation as an alternative to frozen sections for intraoperative diagnosis.

### Case Report

A 10 years male child presented with headache since 2 years of age along with recurrent vomiting and drooping of left eyelid during the attack. There was no history of seizures, fever, bladder or bowel disturbances and an unremarkable physical examination. Electroencephalogram (EEG) showed a slow wave pattern. Cranial Computed tomography (CT) scan revealed a mass lesion in the quadrigeminal cistern with homogeneously low attenuation, lacking calcification or contrast enhancement. T1 weighted magnetic resonance imaging (MRI) showed a 33 × 22 × 26 mm hyperintense lesion in the quadrigeminal cistern, displacing the midbrain anteriorly [Figure 1a and b]. The lesion revealed suppression on fat saturation sequences [Figure 1c and d], suggesting the presence of adipose tissue. No associated intracranial developmental anomaly was detected. A midline suboccipital craniotomy through supracerebellar approach was undertaken for near total

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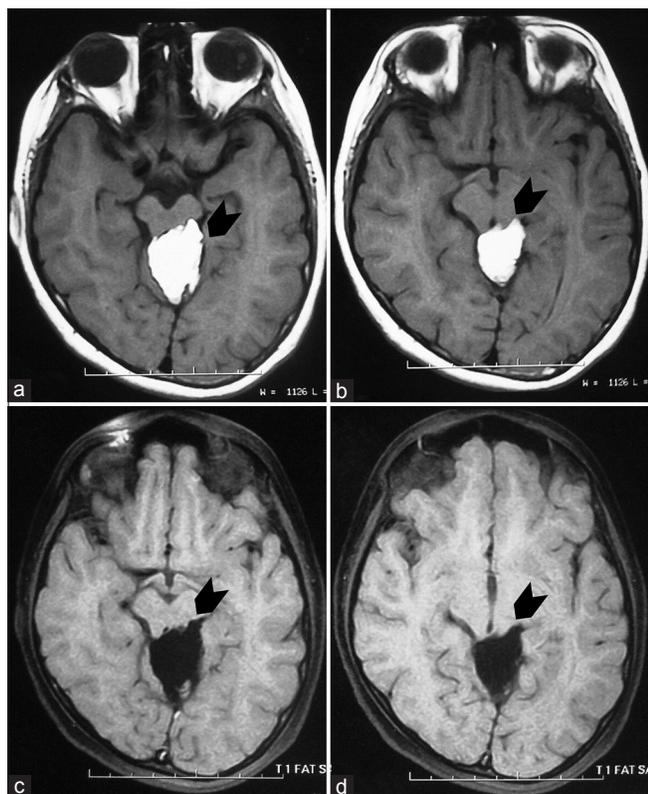
removal of the lesion. Intraoperatively the mass was firm, non-suckable, moderately vascular and partially adherent to the midbrain on the left side. The pressure on the midbrain was relieved, and a tiny residual tumor mass [Figure 2a and b] in close proximity to the superior cerebellar artery was left behind. The excised tissue measured  $2.5 \times 2 \times 1.5$  cm with a firm, pinkish white fibrofatty texture. Cryostat sections were technically

difficult, and few poor quality sections obtained were not adequate for interpretation. Squash smears were also prepared with difficulty due to cohesiveness. Smears stained by Toluidine blue and rapid Hematoxylin and Eosin (H and E) revealed lobules of fibroadipose tissue admixed with few blood vessels [Figures 3 and 4]. With radiological correlation, a diagnosis of lipoma of the quadrigeminal cistern was suggested. The histology sections corroborated with the squash smears, bearing similar lobules of adipose tissue intimately admixed with fibrocollagenous tissue, blood vessels and gliotic white matter [Figure 5].

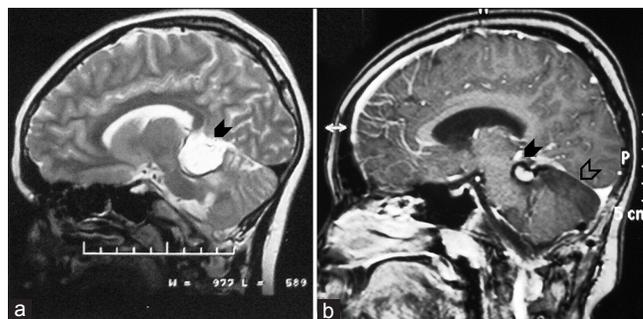
Follow up MRI scans did not show any increase in size of the residual lesion, and the patient remains symptom free at 1 year of follow up.

## Discussion

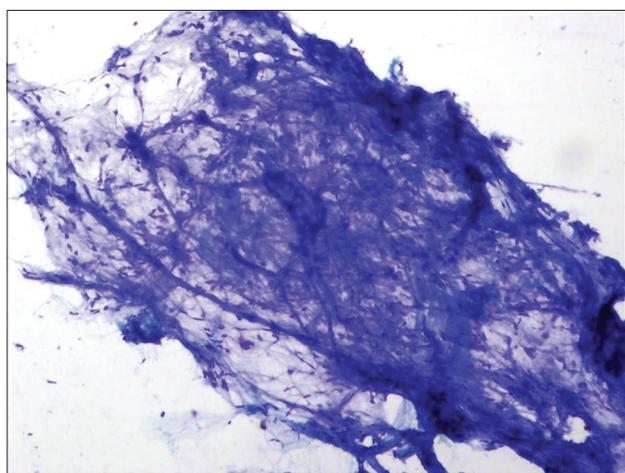
Intracranial lipomas comprise 0.1 to 0.5% of all primary brain tumors, and quadrigeminal lipomas form 10-25%



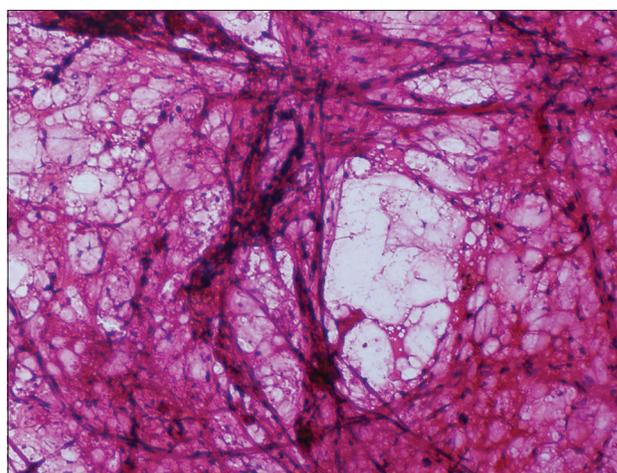
**Figure 1:** (a and b) T1 weighted MRI scans reveals homogenous intensely hyperintense lesion in the quadrigeminal cistern (arrow), pushing the midbrain anteriorly; (c and d) suppression of the lesion (arrow) on fat saturation sequence, suggesting presence of adipose tissue



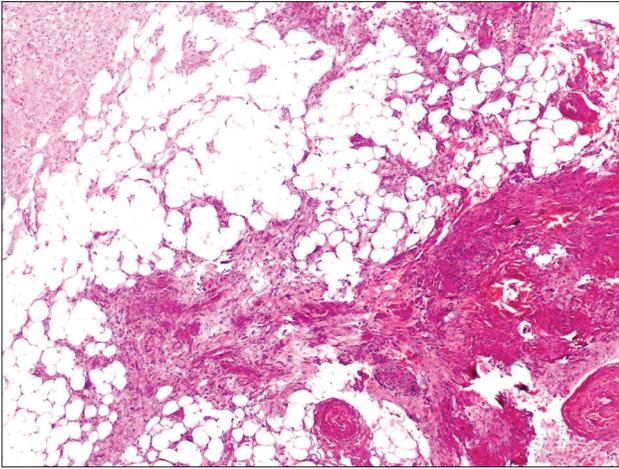
**Figure 2:** (a) T2 weighted sagittal MRI reveals homogenous hyperintense lesion occupying the quadrigeminal cistern (arrow); (b) Post operative T1 weighted MRI showing a small residual lesion (arrow); path of the surgical approach is visible as hyperintensity (vacant arrow), representing reactive gliosis



**Figure 3:** Squash smears showing fibroadipose tissue fragments (Toluidine blue  $\times 100$ )



**Figure 4:** Squash smears showing fibroadipose tissue fragments (H and E,  $\times 100$ )



**Figure 5:** Histological section showing lobules of adipose tissue, fibrocollagenous tissue, blood vessels and gliotic white matter (H and E, x40)

of these intracranial lipomas.<sup>[2-4]</sup> Quadrigeminal lipomas are common in young adults, though can occur in any age group without any gender predilection.<sup>[2,5]</sup> These lesions usually present as varying sized nodular mass protruding into the aqueduct. Most are asymptomatic and detected incidentally. Occasionally they can produce signs of mass effect, raised intracranial pressure and hydrocephalus. Patients may present with headache, dizziness, psychomotor retardation, epilepsy, sometimes with complex partial seizures, and visual disturbances.<sup>[3,5]</sup> This 10 year old male child had a 33 × 22 × 26 mm lipoma in the quadrigeminal cistern at the time of detection. He presented with episodes of headache, recurrent vomiting and drooping of left eyelid of long duration, from 2 years of age, indicating that it was a slowly growing lesion.

Hamartomas are rare congenital malformations, characterized by benign proliferation of components unique to the tissue of origin. Intracranial lipomas may be included within the spectrum of developmental malformations rather than a hamartoma or true neoplasm.<sup>[1,2]</sup> These lesions originate from mesodermal germ plaque beneath the leptomeninges,<sup>[1]</sup> or may be a result of abnormal persistence and mal-differentiation of meninx primitiva during the development of the subarachnoid cisterns.<sup>[2]</sup> Heterotopic components like cartilage, bone described in these lipomas,<sup>[6]</sup> along with its association with other brain anomalies in almost half of the cases lends support to a developmental malformation.<sup>[2]</sup>

Midline anomalies like mal-development of corpus callosum, partial absence of the septum pellucidum, microgyria, hemispheric atrophy and other malformations such as aneurysms has been found to be associated with these lipomas.<sup>[2,3]</sup> Quadrigeminal lipomas may be associated with agenesis of corpus callosum or

hypoplasia of inferior colliculus.<sup>[2,3]</sup> However, imaging studies in this child did not reveal any associated intracranial developmental malformation.

On CT scan, intracranial lipomas appear as well demarcated mass lesions with homogeneous attenuation and usually not enhancing on contrast. Peripheral linear streaks of calcification may be evident. Intense signal on T1 weighted MRI and fluid attenuated inversion recovery (FLAIR), and a relatively low intensity signal on T2-weighted images, supplemented by fat suppression sequences suggests the possibility of a lipoma.<sup>[2,5,7-9]</sup> The lesion in this child also on imaging showed features suggesting the possibility of a quadrigeminal lipoma. Differential diagnoses of such lesions include subacute hematomas, thrombosed berry aneurysm, epidermoid or dermoid tumors, or lipomatous transformation of neoplasms like primitive neuroectodermal tumors (PNETs), gliomas or ependymomas. These differentials demonstrate negative to heterogeneous attenuation values on CT.

Intracranial lipomas are generally surrounded by a fibrous capsule. Sometimes the lesions may be vascular, have specks of calcification, and traversed by vital structures like cranial nerves and cerebral vessels. Quadrigeminal lipomas may occur in close relation to the superior cerebellar arteries, similar to the case reported here.<sup>[5]</sup> Shunt surgery is offered as a treatment option for relieving hydrocephalus. Although surgical excision is seldom required, it is useful in situations causing mass effect. Complete excision is usually attempted, though at times close proximity to or dense adhesions with vital structures allow only partial removal.<sup>[1,4,5]</sup> This child required surgery as the lesion was causing pressure effect on the midbrain. Intraoperatively, a tiny residual tumor mass in close proximity to the superior cerebellar artery was left behind. Follow up MRI scans one year later did not reveal any increase in size of this lesion.

## Conclusion

Intracranial lipomas are not true neoplasms, and should be categorized under developmental malformations. Lipomas in the quadrigeminal cistern have are rare. Although known to have a favorable outcome, complete removal on occasion is not possible due to proximity to vital structures, and recurrences are known. Intraoperative squash smear cytology is an economical and convenient diagnostic modality for quadrigeminal cistern lipoma compared to frozen sections with subsequent histopathological confirmation to exclude other differentials. Additionally, careful radiological

evaluation is necessary to detect associated CNS malformations in the CNS, common in these lesions.

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