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Case Report

Intradiploic Meningiomas: A Comprehensive Review of Clinical Presentation, Surgical Management, and Radiological Findings. A Case Report and Review of Literature

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ABSTRACT:
This case report details the presentation, diagnosis, and surgical management of a 45-year-old female with a history of severe head trauma presenting with a persistent dull headache. Imaging revealed a left parietal intradiploic meningioma, leading to surgical exploration and resection of the lesion. Histopathological analysis confirmed the diagnosis, highlighting the importance of considering intradiploic meningiomas in patients with skull lesions, particularly following head trauma. Surgical resection remains the treatment of choice, emphasizing the need for meticulous surgical technique to prevent complications. This case underscores the challenges and nuances in diagnosing and managing rare intradiploic meningiomas, contributing to our understanding of their clinical presentation and optimal treatment strategies.

Keywords: Intradiploic meningioma ,Skull lesion ,Head trauma ,Surgical resection ,Histopathology ,Imaging studies

Case Report:

A 45-year-old woman with a history of severe head trauma 10 years ago presented to the hospital complaining of a persistent dull and throbbing headache for the past 2 months. Upon examination, a solid mass measuring 5.6 cm in diameter was palpable in the left parietal area, with no associated skin changes. Brain MRI revealed a left parietal lesion measuring 5.6 × 4 cm, located in the diploic space of the parietal bone herniated into the diploic space.(fig01)

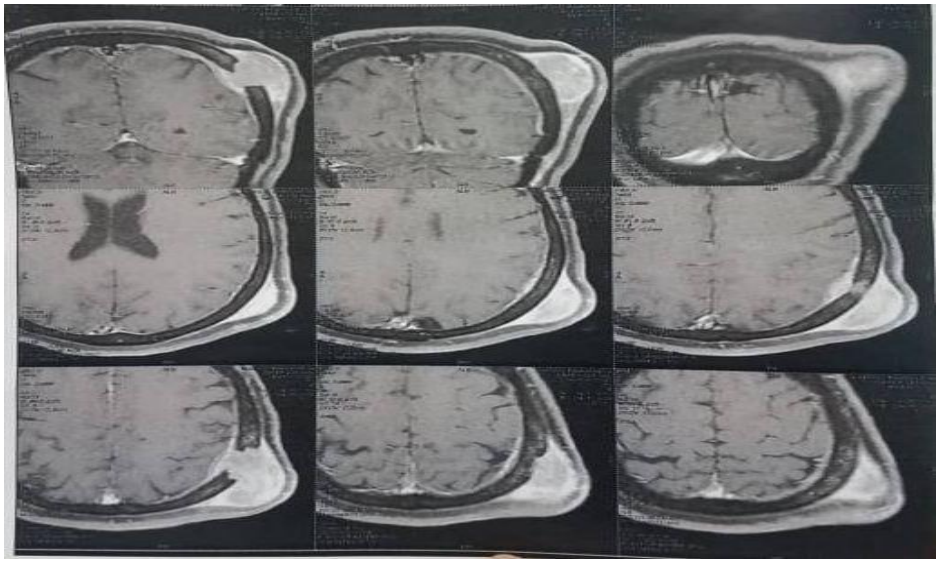

Fig 01 : MRI images revealed a left parietal lesion

The patient underwent surgical exploration of the lesion. The expanded skull bone, including the inner and outer plates, was excised, revealing thinned bone with a mass in the diploic layer, and the thin dura mater was repaired**(fig02)**. Following the surgery, the patient's headaches completely disappeared. Microscopic examination revealed bone fragments infiltrated by a meningothelial meningioma, characterized by uniform cells with round to ovoid nuclei and a lobulated arrangement. Some areas exhibited a myxoid intertrabecular stroma, while others showed increased osteoclastic and osteoblastic activity, indicating bone breakdown and new bone formation.

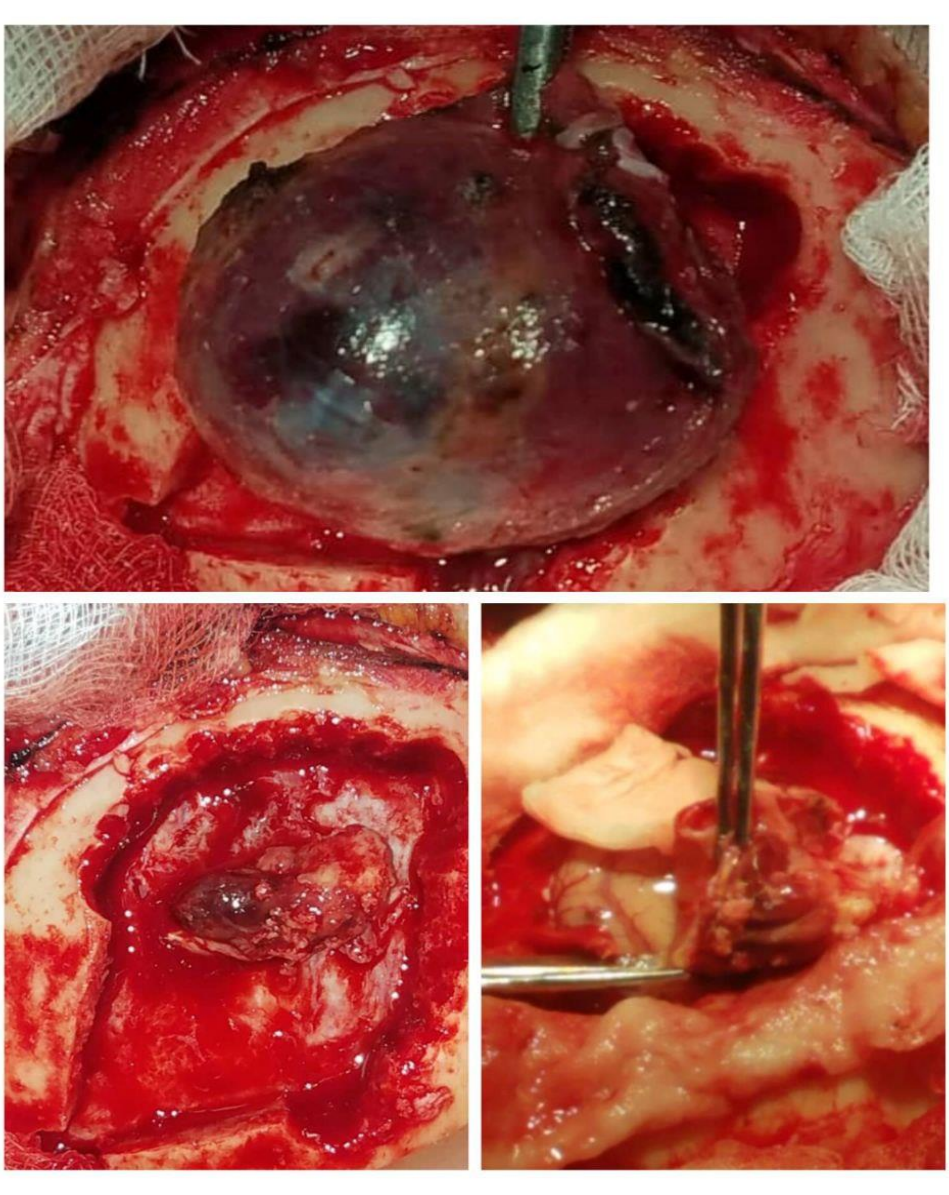

Fig 02 : Images obtained intraoperatively showing the lesion

INTRODUCTION:

Meningiomas are typically benign tumors that arise from the meninges, the protective membranes surrounding the brain and spinal cord. Among intracranial tumors, meningiomas are one of the most common types, accounting for approximately 15 to 20% of cases. While they often occur along the parasagittal and convexity regions of the brain, they can also develop within the bone, a rare subtype known as intradiploic meningiomas. These tumors originate within the diploic space of the skull, presenting unique diagnostic and treatment challenges. In this case report, we present the clinical findings, diagnostic imaging features, surgical management, and histopathological characteristics of an intradiploic meningioma in a 45-year-old woman with a history of head trauma. Through this case, we aim to highlight the clinical significance and management considerations of this rare type of meningioma.

DISCUSSION:

Meningiomas are one of the most common benign brain/intracranial tumors, with an incidence rate of 15 to 20%. The parasagittal and convex locations are the most frequent, representing nearly 45% of cases. Primary intraosseous lesions are rare, accounting for less than 1% of intracranial meningiomas. Although the diploic layer can be affected by various pathologies, intradiploic meningioma has been rarely reported. Intradiploic meningioma is an extremely rare

type of extradural meningioma and is usually localized in the frontoparietal and orbital regions.(05)

These tumors are primarily observed during the first two decades of life, but there is a second peak between the 5th and 7th decades of life with a noted male predominance. Winkler, in 1904, first described a meningioma developing in an extradural location. (03)

Primary intraosseous meningiomas are rare tumors. They have also been referred to as ectopic meningiomas or primary extradural meningiomas. Hoye classified ectopic meningiomas into four groups: (i) primary intracranial tumors with direct extracranial extension; (ii) tumors originating from arachnoidal cell rests within the sheaths of cranial nerves; (iii) tumors occurring extracranially without apparent connection with the foramina of cranial nerves; and (iv) benign-appearing intracranial meningiomas with extracranial metastases. Intradiploic meningiomas are generally solitary. Intradiploic meningiomas of the convexity most often present as slow-growing scalp masses, with a possible association with the cranial suture. Common locations include the periorbital and frontotemporal-parietal regions.(02)

The origin of calvarial meningiomas is controversial. Some authors believe that these tumors originate from ectopic meningocytes. Another hypothesis is that calvarial meningiomas arise from capillary arachnoid cells that are trapped in cranial sutures. This entrapment may occur during head molding at birth (8-50% of these tumors are related to skull vault sutures) or as a result of blunt trauma, when the dura mater and arachnoid are caught in the fracture line. Their origin may also be attributed to cellular dedifferentiation within the diploic space or to sheath cells of cranial nerves as they course through the diploic layer.(04)

Typiquement, ils sont de type psammomateux. L'histologie de routine révèle une prolifération néoplasique de cellules tumorales fusiformes de taille moyenne sans atypie, formant des faisceaux dans le tissu osseux métaplasique et se propageant dans l'os trabéculaire normal, ainsi que des cellules néoplasiques présentant une immunoréactivité à l'antigène membranaire épithélial (Epithelial Membrane Antigen).(01)

Radiographically, intradiploic meningiomas are typically either osteoblastic or osteolytic. Mixed variants have also been reported. The majority of these tumors cause hyperostosis, which can mimic fibrous dysplasia. Most of these tumors are benign, but malignant transformation is also described. The osteolytic subtype of intradiploic meningiomas is more likely to be malignant than the osteoblastic subtype.

Osteolytic lesions typically cause thinning, expansion, and disruption of the internal or external tables of the skull, and these lesions also enhance homogeneously after contrast administration. In the present case, the lesion appeared as an osteolytic variety, with disruption of the outer table and intact inner table. On radiography, opacification with irregular patches of osteosclerosis and osteoclasis may be present.

Computed tomography appearances in these cases are not typical of meningioma, which usually enhances strongly after intravenous contrast medium injection. CT allowed delineation of the mainly soft tissue nature of the tumor and its extent (the degree of involvement of the skull base and secondary effects on the brain). MRI characteristics of intradiploic meningiomas are not specific; in fact, there is only one reported MRI study regarding intradiploic meningioma.

Due to their low incidence and lack of adequate preoperative diagnostic imaging, intradiploic meningiomas are often confused with primary calvarial bone tumors, plaque meningiomas, and fibrous dysplasia. Intradiploic meningiomas should be considered in the differential diagnosis of patients with osteoblastic or osteolytic skull lesions.(09)

The differential diagnosis of a solitary osteolytic lesion of the skull includes hemangioma, chondroma, chondrosarcoma, dermoid, myeloma, plasmacytoma, giant cell tumor, aneurysmal bone cyst, eosinophilic granuloma, metastatic deposit, and intradiploic meningioma. Biopsy and histopathological examination are necessary to confirm the diagnosis. In the pediatric group, fibrous dysplasia and dermoid cysts should be considered.(07)

From a surgical standpoint, these meningiomas pose no difficulty: they are contained within a bony shell. Treatment involves complete resection of the lesion through the bone covering; sometimes, if the bony shell is not intact, intradural exploration and biopsy of the dura mater can aid in total resection.(07 /08)

If the bone covering the tumor is infiltrated or destroyed by the tumor, resection of the bony shell and skull reconstruction in a second session may be necessary. If the tumor shell facing the dura mater is not intact, the most important thing is to prevent postoperative cerebrospinal fluid leaks and careful exploration of the periosteum. (08)

Wide surgical resection of intradiploic meningioma is the treatment of choice and can be curative if complete surgery is possible. However, patients with tumors that cannot be completely resected and are histologically benign and neurologically asymptomatic may be followed up with serial CT/MRI. From a surgical perspective, when located on the convexity, surgical excision is feasible. Often, complex reconstruction of the anterior skull base may be a limitation in cases of total resection (Rt) of large meningiomas involving also the ethmoid and sphenoidal bones.(05)

CONCLUSION:

In conclusion, intradiploic meningiomas are uncommon tumors that present unique challenges in diagnosis and management. This case report underscores the importance of considering intradiploic meningioma in the differential diagnosis of patients presenting with osteoblastic or osteolytic skull lesions,

especially in those with a history of head trauma. While imaging studies such as CT and MRI can aid in the diagnosis, histopathological examination remains the gold standard for confirming the diagnosis and assessing tumor characteristics. Surgical resection is often the preferred treatment approach, aiming for complete tumor removal while minimizing neurological deficits and complications. However, achieving total resection may be hindered by factors such as tumor size, location, and involvement of critical structures. Close postoperative monitoring is essential to detect and manage complications promptly, ensuring optimal patient outcomes. Further research is warranted to elucidate the underlying pathogenesis of intradiploic meningiomas and to refine treatment strategies for improved patient care. Overall, this case highlights the importance of a multidisciplinary approach involving neurosurgery, radiology, and pathology in the management of intradiploic meningiomas.

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