Unusual primary intraosseous meningioma, mimicking cranial osteoid osteoma: A radiological clue to the differential diagnosis

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ABSTRACT

Primary intraosseous meningioma of the skull is rare. We report a patient who presented with a history of an enlarging scalp mass over 30 years. Noncontrast computed tomography demonstrated a densely calcified right frontal extra-axial mass lesion. Magnetic resonance imaging of the lesion demonstrated heterogeneous hypointensity on T1-and T2-wieghted images and without evidence of gadolinium contrast enhancement. And the mass showed heterogeneous isointensity on diffusion weighted image. Preoperative diagnosis for the lesion was osteoid osteoma of the right frontoparietal bone, and total excision of the tumor was carried out. Histological examination showed intraosseous meningothelial meningioma. We should be aware of the primary intraosseous meningioma showing the classical radiological findings of cranial osteoid osteoma. The radiological clue for the accurate diagnosis is discussed.

Key words: Cranial osteoid osteoma, diffusion weighted image, primary intraosseous meniongioma, radiographic findings

INTRODUCTION

Intraosseous meningiomas are rare tumors, constituting fewer than 2% of all meningiomas.[1] The radiographic appearances of primary intraosseous meningiomas are typically enhanced homogenously after gadolinium (Gd) contrast administration on magnetic resonance imaging (MRI) scan, and low intensity on T1-weighted and high intensity on T2-weighted images, similarly to intradural meningiomas.[2-5] We report a patient with a rare primary intraosseous meningioma without Gd enhancement, mimicking the classical findings of cranial osteoma.

CASE REPORT

An 87-year-old woman presented with 30-year history of gradually enlarging mass in her left frontal. There was no history of head trauma. Physical examination revealed a solid mass on her right frontal about 7 cm in maximum diameter, which is not adhering the overlying pigmented skin. The mass was not mobile or tender. The patient had no neurological deficit. Radiographs of the skull demonstrated a large, well-defined, homogenous bony density that extends outward from the skull in the right frontoparietal region [Figure 1a]. Nonenhanced computed tomography (CT) with bone window revealed a right-sided frontoparietal hyperostotic lesion, expanding markedly outward and slightly inward [Figure 1b and c]. MRI showed a solitary calvarial mass of the frontoparietal region that was heterogeneous hypointense on T1- and T2-weighted images [Figure 2a and b]. The T1-weighted imaging following Gd injection demonstrated no enhancement of the lesion [Figure 2c]. The underlying dura was enhanced by Gd injection. And the mass showed heterogeneous isointensity on diffusion weighted image (DWI) [Figure 2d]. Preoperative diagnosis was made as a cranial osteoma with reactive dural thickening.

The patient underwent wide surgical excision and cranioplasty due to cosmetic matter. At surgery, the scalp was easily elevated from the tumor. The tumor was bony hard mass without elasticity. The tumor and the surrounding skull were removed in a single block. The mass was firmly adhered to the underlying thickened dura mater. A small piece of the yellowish and thickened dura was incised for biopsy and was repaired with periostium. The bone defect was replaced by a

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heat-cured methyl methacrylate. The postoperative course was uneventful.

Macroscopic examination of the resected specimen showed bony hard mass without elasticity [Figure 3]. Histological examination showed benign primary intraosseous meningothelial meningioma, which had island-like clusters of meningothelial cells with eosinophilic cytoplasm, clearly round nuclei and nucleoli, in a thick trabecular bony structure [Figure 4a and b]. Furthermore, the clusters of meningotherial cells were also observed on the surface of the incised small piece of the dura mater [Figure 4c]. An additional salvage surgery for the underlying dura mater was rejected by the patient, and close observation by imaging studies was decided.

Although the surgery remained Simpson's Grade 3 resection, a favorable course without recurrence during 5-year postoperative follow-up has been observed.

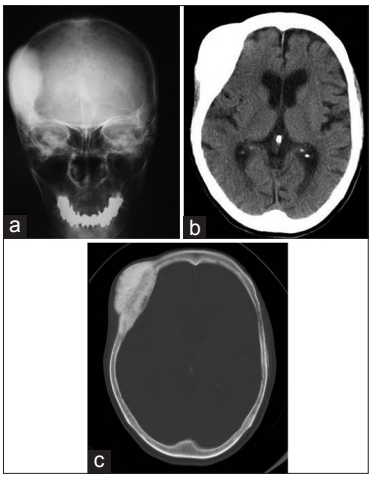

Figure 1: Plain skull radiograph (a) Showing a 7 × 7 cm area of hyperostosis in the right frontal. Plain computed tomography (CT) (b) and bone window CT scan (c) Showing thickening and hyperostosis of the right frontoparietal bone

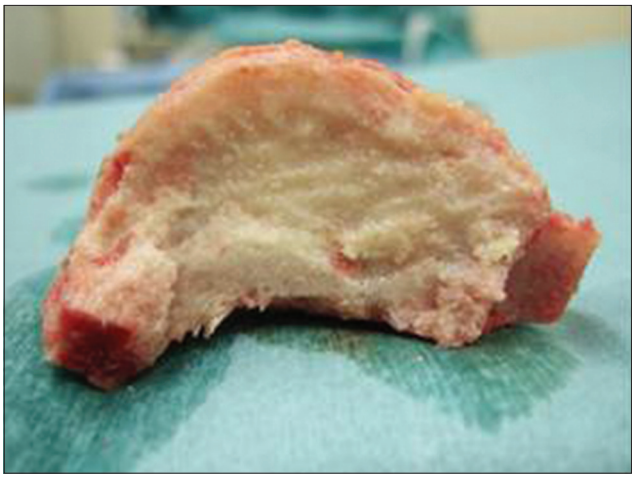

Figure 3: Macroscopic findings of the sectioned specimen showing a bony hard mass without elasticity

DISCUSSION

We have described a rare non-Gd enhanced primary intraosseous meningioma, which had been misdiagnosed as an osteoid osteoma preoperatively.

Intraosseous meningiomas are relatively rare cranial lesions, account for two-thirds of extradural meningiomas, which constitute 1-2% of all meningiomas.[1,2] The tumors are typically either the osteoblastic or osteolytic subtype, the majority of primary intraosseous meningiomas are of osteoblastic type.[6,7] Radiological differential diagnosis of the osteoblastic subtype includes fibrous dysplasia, osteoma, osteosarcoma, and Paget's disease. Fibrous dysplasia usually stops growing after puberty, whereas primary intraosseous meningiomas typically appear

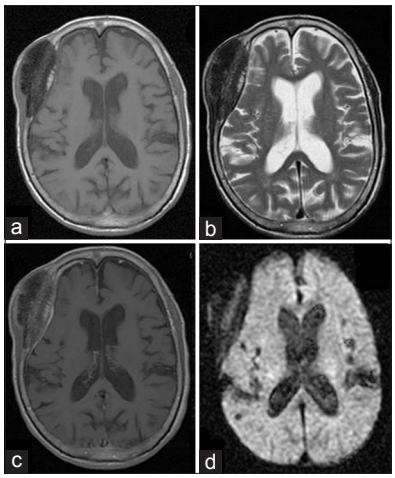

Figure 2: Axial T1- (a) and T2-weighted (b) Magnetic resonance imaging (MRI) showing heterogeneous iso - to hypointense lesion of the right frontoparietal bone. Gadolinium-enhanced MRI (c) Showing no enhancement of the lesion. Diffusion weighted image (d) Showing heterogeneous isointense of the lesion

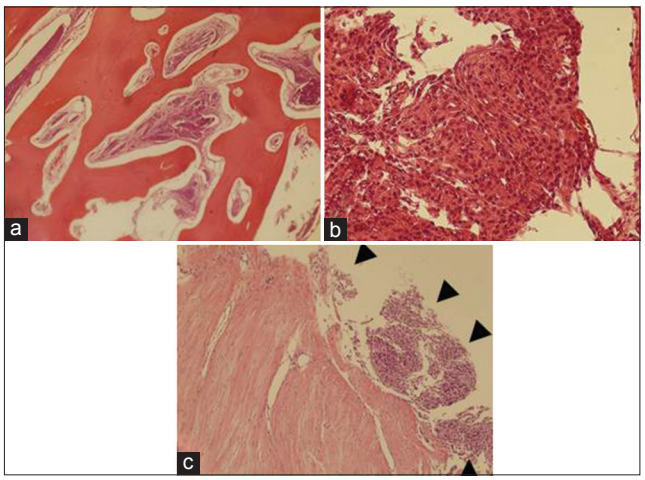

Figure 4: Photomicrographs showing clusters of meningothelial cells in trabecular bony structure (H and E, ×100). (a) The cells have eosinophilic cytoplasm, clearly round nuclei (H and E, ×200). (b) Clusters of meningothelial cells (black arrowheads) are observed on surface of dura (H and E, ×100) (c)

on later life stage and continue to grow slowly.[6] The characteristic MRI appearance of the usual intraosseous meningioma, demonstrating homogenously dense Gd enhancement of the tumor, may help distinguish this lesion from osteoma (nonenhancing), osteosarcoma (irregular contours, heterogeneous signal and enhancement) and Paget disease (heterogeneous signal, nonenhancing).[2,4] In the present case, the lesion was showed well-defined, homogenous bony mass on skull X-ray and CT, hypointensity on T1- and T2-weighted images and was not enhanced after Gd contrast administration on MRI, as like a typical cranial osteoid osteoma. These findings made us difficult to make accurate preoperative diagnosis.

Meanwhile, Barajas *et al.* have reported that cranial osteoid osteoma exhibited markedly decreased signal intensity on DWI.[8] Conversely, meningiomas showed iso to high signal intensity on diffusion weighted MRI depending upon the cellularity of tumors.[9,10] In our patient, the tumor showed heterogeneous isointensity on DWI implying the tumor to be primary intraosseous meningioma. The difference of signal intensity between two lesions on DWI can be an important clue to differentiate them.

CONCLUSION

This report highlights that primary intraosseous meningiomas must be kept in mind in the differential diagnosis of non-Gd enhanced hyperostotic skull lesions.

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