Intracranial subdural osteoma

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Abstract

Subdural osteomas are extremely rare benign neoplasms. Here, we report the case of a 35-year-old female patient with a right frontal and parietal subdural osteoma. The patient presented with a 2-year history of intermittent headache and fatigue. Computerized tomography (CT) scan showed a high-density lesion attached to the inner surface of the right frontal and parietal skull. Magnetic resonance imaging (MRI) demonstrated T1 hyperintensity and T2 hypointensity of the lesion. Intraoperatively, the hard mass was located in subdural space and attached to the dura mater. Histopathological examination revealed lamellated bony trabeculae lined by osteoblasts and the intertrabecular marrow spaces occupied by adipose tissue. The patient underwent neurosurgical resection and recovered without complication. Surgical excision is recommended to extract the symptomatic lesions with overlying dura mater.

Keywords

CT 3D reconstruction examination, intracranial, subdural osteoma

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Introduction

Osteomas are slow-growing benign tumors that can affect the skull, and arise in the craniofacial region in bones formed by intramembranous ossification. Intracranial subdural osteomas are very rare benign tumors. To the best of our knowledge, about 15 cases of subdural osteoma have been reported to date,1–11 most of which are located in the frontal region.1,3–11 They usually have attachment to the dura mater without relation to skull and grow along the cerebral cortex with pressure symptoms or epilepsy. Computed tomography (CT) scans reveal a high-density lesion isolated from the inner table of the skull, but magnetic resonance imaging (MRI) can demonstrate different signal intensity. In the present case report, we describe the clinical, radiological, and pathological findings of subdural osteoma in a 35-year-old female, and furthermore carry out a thorough literature review.

Case report

A 35-year-old female with a history of 2 years’ intermittent headache over the whole head and fatigue was admitted in November 2018. She had no history of systemic disease, head trauma, or infection. No physical abnormalities or any neurological deficits were found in the physical examination. A non-contrast CT and three-dimensional (3D) reconstruction CT showed a high-density calcified lesion in the right frontal and parietal region (Figure 1(a)–(c)). There was a curvilinear lucent line between the inner table of the skull and the calcified mass (Figure 1(b)). Preoperative MRI revealed that the mass was hyperintense on T1-weighted images and hypointense on T2-weighted images (Figures 1(d)–(f)). However, enhanced MRI examination was not available. At first, the surgical tumor resection was not considered as the patient was young woman with mild
symptom of the mass. However, the mass was growing and headache had aggravated for 2 years. After signing the informed consent, the patient received frontoparietal craniotomy under general anesthesia. Intraoperatively, the mass was noted to be attached to the inner layer of the meninges (Figure 2(a)). After making an incision to expose the dura, the mass was found to be bony, hard, and demarcated from the brain parenchyma (Figures 2(a)–(c)). It could be easily removed from the arachnoid membrane. The inner side of the mass was smooth, and an impression was observed owing to the compression of the underlying brain parenchyma (Figure 2(c)). An artificial dura substitute was used to repair the dural defect. Histologically, the lesion was a 6.5 × 4 × 0.5 cm irregular bony mass (Figure 2(b)–(c)). Pathological examination revealed lamellated bony trabeculae
lined with osteoblasts, with marrow spaces occupied by abundant adipose tissue (Figure 3(a)–(b)). Postoperatively, the pain was resolved and the patient recovered uneventfully.

Discussion

Intracranial subdural osteomas are generally attached to the inner layer of the dura mater, which start with a wide base and grow inward as an expanding mass with a well-defined border. As a result, the symptoms of the tumors might be caused by irritation or compression of the adjacent dural membrane and the underlying brain parenchyma. Headache was the most common complaint in these reported cases of subdural osteomas; other symptoms include seizure,2 vertigo, dizziness,8,10,11 or even mental deficiency.7 According to the literature review, all cases except one have single lesion. Most subdural osteomas except one are located in the frontal area,2 and they were more frequently located on the right side. It is interesting that most of the cases were reported in Asia, and most patients were female (Table 1).

The mechanism of the origin of intracranial subdural osteomas remains unclear. The etiologies of subdural osteomas are postulated into two types: primary and secondary. Given that intracranial subdural osteomas are very slow-growing neoplasms, the age distribution of the reported patients suggests a congenital malformation rather than acquired origin of the lesions. The periosteum of the frontal bones and cells from the nasal septum, which contribute to the falx cerebri and the adjacent dura,12 are derived from the embryological neural crest cells. It is quite possible that the meninges act as periosteum when the osteomas grow from dura and falx.8 There is also the view that primitive mesenchymal cells from connective tissue might migrate into the subarachnoid space along the intracerebral blood vessels.6 Subdural osteomas may occur secondary to trauma, infection, or systemic diseases. It was found that only one case had clear history of trauma through our literature review.10 This new bone might not represent a true neoplasm, but possibly a reactive change in the potentially osteogenic tissue of the cerebral meninges, which in some instances may stem from the altered mineral metabolism that accompanies chronic renal failure.

The pathogenesis of osteomas without bone involvement is still unknown. A dural osteoma can be confused with “meningeal ossification or calcification” originating from the dura or the falx because of the similarities in CT and MRI examinations and microscopic appearance. The new bone might not represent a true neoplasm but possibly an osteogenic change in the cerebral meningeal tissue. However, meningeal ossifications are commonly multicentric and located on the dural–falx junction along the both sides of the superior sagittal sinus. CT examination, especially the CT 3D reconstruction examination, is a very useful tool to diagnose the lesions. The lucent dural line between the skull and the osteoma can be used to differentiate subdural osteoma from meningeal ossification or epidural osteoma. The MRI appearances of these tumors were consistent with that of tumors. Usually, the mass with abundant adipose tissue exhibited high signal change in T1-weighted images just like the present case, the mass that predominantly consisted of thickened mature lamellar

Figure 3. Pathological findings. (a–b) Microscopically lamellated bony trabeculae and the intertrabecular spaces are occupied by abundant adipose cells and loose fibrovascular tissues (H&E, hematoxylin and eosin staining, a, ×20, b, ×100).
bone exhibited signal loss on T1-weighted and T2-weighted images, and the mass with context of intertrabecular bone marrow exhibited the enhancement on MRI in some cases.\textsuperscript{3,5,9,10}

Surgical excision is the treatment of choice for symptomatic lesions. It is recommended to extract the lesions with overlying dura mater since most tumors were attached to dura mater.

**Conclusion**

Subdural osteoma is a rare benign lesion and shows characteristic findings of lucent dural line on CT that can help distinguish from other diagnostic considerations. Surgical excision is the treatment of choice for symptomatic lesions. Most cases usually have good prognosis after resection.

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