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CASE REPORT

Frontal sinus osteoma associated with pneumocephalus

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ABSTRACT
The most common causes of intracranial air are head trauma and neurosurgical procedures. Less common etiologies include infection due to gas-forming organisms, mucoceles, tumours, congenital neuroenteric cysts, and dural defects. Here, we present a case of a frontal sinus osteoma associated with long-standing pneumocephalus.

Key words: • *osteoma* • *paranasal sinuses* • *pneumocephalus* • *imaging*

Osteomas are benign, slow-growing bone tumors, most commonly affecting the frontal and the ethmoidal sinuses, although the maxillary and sphenoid sinuses may also be involved (1). These tumors are often asymptomatic in their early stages. However, due to the peculiar anatomic relationships, patients having an osteoma within the frontal sinus can be exposed to serious orbital and intracranial complications (2). We report here a case of a frontal sinus osteoma presenting with long-standing pneumocephalus.

Case report

A 26-year-old man was admitted to the hospital with a persistent headache in the frontal area lasting approximately one year which was resistant to analgesics, and tinnitus in his left ear. His physical and neurological examination was normal. Plain radiographs taken to rule out a possible sinusitis showed intracranial air collection and a subtle osseous lesion in the left frontal sinus (Fig. 1). Paranasal and cranial computed tomography (CT) performed after plain radiographs revealed an osseous lesion in the left frontal sinus with lobulated contours that was extending into the anterior cranial fossa measuring approximately 2 cm in diameter, which was then diagnosed as an osteoma. There was also accompanying intracerebral air collection extending from the apex of the lesion to the vertex (Fig. 2).

At surgery, it was noted that the tumor had breached the frontobasal dura and extended towards the brain parenchyma. After complete removal of the ossifying tumoral tissue, frontobasal bony defect was repaired by bony allograft. Dural opening was primarily sutured and vascularized periostal graft was spread over the frontobasal region. Pathological examination confirmed the presence of an osteoma. The post-operative course was uneventful. Six month control CT scan documented progressive resolution of the pneumocephalus. In addition, cerebrospinal fluid (CSF) replaced the intracerebral air collection with the disappearance of parenchymal compression.

Discussion

Although paranasal sinus osteomas are common, intraorbital and intracranial complications including proptosis, diplopia, amourosis fugax, CSF fistula, meningitis, and pneumocephalus are rare (2, 3). Pneumocephalus usually occurs due to head trauma and neurosurgical procedures. Infection due to gas-forming organisms, mucoceles, congenital neuroenteric cycts, and dural defects may also cause pneumocephalus (1, 4).

Clinical onset of an uncomplicated osteoma is most often characterized by facial pain and headache (2) but pneumocephalus may be the first sign of a previously unrecognized osteoma, representing a sudden

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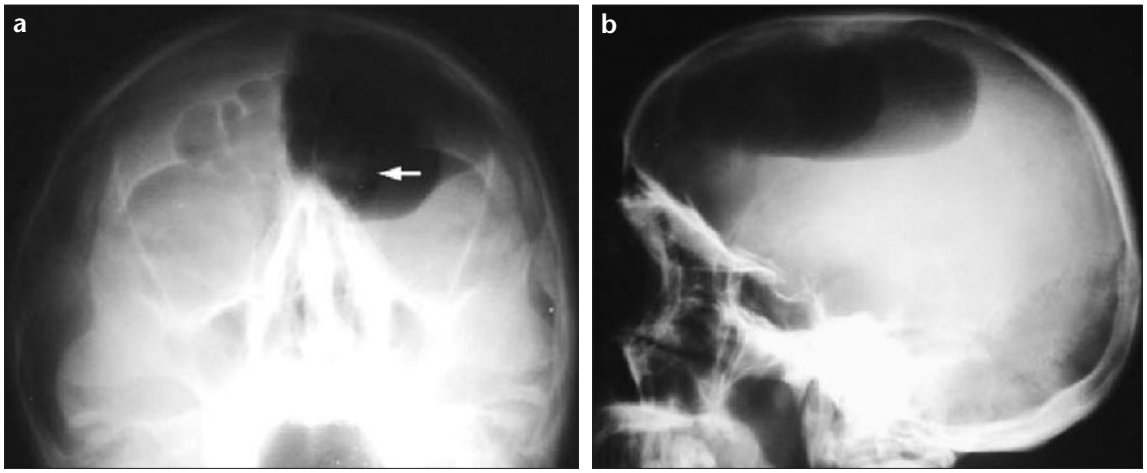

Figure 1. a, b. Occipitomental radiograph **(a)** shows intracranial air collection in the left frontal region and a subtle osseous lesion in the left frontal sinus *(arrow)*. Lateral radiograph of the skull **(b)** confirms that the air collection is located intracranially.

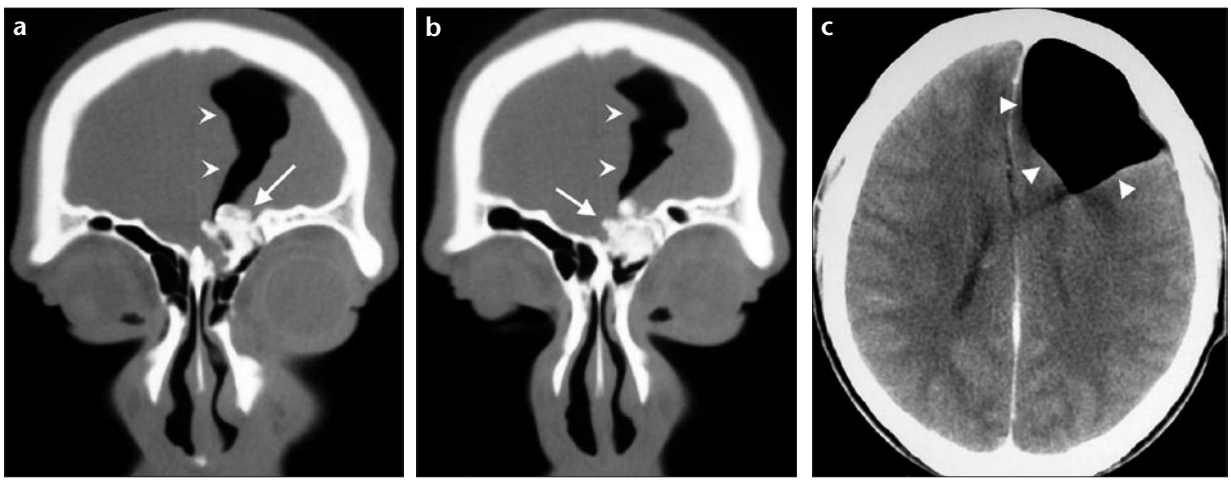

Figure 2. a-c. Coronal paranasal CT images **(a, b)** demonstrate an osseous lesion with well-defined lobulated contours extending into the left anterior cranial fossa *(arrows)* with accompanying intracerebral air collection *(arrowheads)*. Axial cranial CT **(c)** shows intracerebral extention of the air collection causing parenchymal compression in the left frontal lobe *(arrowheads)*.

and unexpected complication (1). Growing osteoma erodes the sinus wall, duramater and arachnoid membrane, allowing air into the cranial cavity. Intracranial air collection can be subdural, subarachnoidal, intracerebral or even intraventricular. Mucocele formation may be associated with it. Meningitis and brain abcess may also occur (1). The mechanism of spontaneous pneumocephalus is related with the meningeal anatomy in the anterior cranial fossa. With the dura being thin and close to bone and the arachnoid adherent to the frontal lobe, fronto-ethmoidal meningeal lacerations frequently result in subdural air or occasionally intracerebral air due to adhesions directly to the frontal lobe (5). If the air accumulation is intracerebral, it is more prominent in plain radiographs and cranial CT, which is the case in the present patient. When the intracranial air is under tension, it can act like a mass causing severe neurological complications and known as "tension pneumocephalus" (5). Severe headache, vomiting, cranial nerve deficits, sensorymotor dysfunction, and personality changes may develop. Neurological deterioration may develop in a few hours or, in patients who are able to compansate for increased intracranial pressure, symptoms may progress slowly over weeks, months, or even years (6, 7). From the clinical point of view, severe headache was frequently present in the previously reported cases, sometimes associated with vomiting and signs of raised intracranial pressure (1). In the present case, the pneumocephalus showed the typical symptom and presented with severe headache lasting approximately one year and no acute neurological deterioration developed.

Although the diagnosis of intracranial air is not difficult on routine radiographs, CT is of fundamental importance in detecting the primary lesion and defining the extent of intracranial air collection (1). CT can also differantiate between epidural, subdural, subarachnoid, and intraparenchymal air in most cases (8).

Clinical behaviour in the presence of a small osteoma of the air sinuses is still a matter of debate and different approaches are recommended. Follow-up may be suitable for very small lesions, however, resection should be considered if they show the signs of progression. Close follow-up by imaging may avoid life-threatening complications.

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