Tension Pneumocephalus: A Complication of Invasive Ossifying Fibroma of the Paranasal Sinuses

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Ossifying fibroma is a rare benign neoplasm most commonly affecting the mandible, where it is frequently slow-growing and asymptomatic [1]. Ossifying fibromas of the midface and paranasal sinuses are more aggressive than their mandibular counterparts [2]. We report a case of an ossifying fibroma of the paranasal sinuses with intracranial extension complicated by the development of tension pneumocephalus. To our knowledge, tension pneumocephalus as a complication of ossifying fibroma has not been previously reported.

Case Report

A 51-year-old man with a 5-year history of a slow-growing ossifying fibroma of the left ethmoid and maxillary sinuses was well until 1 month prior to admission, at which time his family noticed a change in his personality and memory impairment, including frequent trouble with word finding. Three days prior to the patient's admission, his mental status dramatically deteriorated. His behavior became inappropriate, he developed a flat affect, and he had a seizure that prompted hospital admission. He was diagnosed with complex partial seizures that were managed with carbamazepine. Physical examination revealed no focal neurologic abnormalities. CT scans (Fig. 1) showed an osseous mass filling part of the left maxillary sinus and most of the left ethmoid air cells. The tumor extended into the left orbit through the lamina papyracea, with erosion through the cribiform plate, ethmoid air cells, and planum sphenoidale into the anterior cranial fossa. We noted a large air collection in the left frontal region that we believed to be subdural and intraparenchymal in location. The gas collection caused mass effect upon the frontal lobe with mild left-to-right subfalcine herniation.

At surgery it was noted that the tumor disrupted the anterior portion of the roof of the ethmoid air cells and invaded the anterior cranial fossa. A small dural dehiscence was encountered, and tumor was seen above and below the dural plane. CSF was found draining along a thin vestige of dura just anterior to the posterior ethmoidal artery and into the nasal passageways. The skull base portion of the ossifying fibroma was resected, and the osseous defect was repaired using nasoseptal cartilage and mucoperichondrium. The final pathologic diagnosis was ossifying fibroma.

Postoperatively, serial CT scans documented progressive resolution of the pneumocephalus. The patient was discharged 6 days after surgery.

Discussion

Tension pneumocephalus resulting from the presence of intracranial air under pressure can lead to neurologic deterioration. The development of tension pneumocephalus is possible when there is communication between the extracranial and intracranial spaces (usually through a defect in the paranasal sinuses that typically is accompanied by a dural defect) and the pressure gradient between these two compartments favors the ingress of air (intracranial pressure is lower). The pathogenesis is ascribed to a ball-valve mechanism [3]. In the paranasal sinuses, pressure may be transiently increased by coughing or other forms of straining. In the presence of an

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osseous defect, air flows from the sinuses into the lower-pressure intracranial space allowing equilibration of pressures. Subsequently, intrasinus pressure decreases and the defect is tamponaded by adjacent intracranial contents. Alternatively, a negative intracranial pressure gradient, created for example by a large CSF leak, may draw air into the cranial cavity [4].

Tension pneumocephalus is a serious and potentially lifethreatening condition. Patients with intracranial air are not usually symptomatic; however, the designation of tension pneumocephalus implies the presence of neurologic deterioration secondary to increased intracranial pressure. The symptoms of tension pneumocephalus are similar to those of other intracranial, space-occupying lesions. Severe headache is common. Seizures, vomiting, cranial nerve deficits, sensorimotor dysfunction, and personality changes are also frequently found [4, 5]. Many patients will have a CSF leak so slight as to be subclinical, or so large as to significantly reduce intracranial pressure and contribute further to the development of intracranial air [4]. Patients with tension pneumocephalus may present with neurological deterioration over a few hours or, in patients who are better able to compensate for increased intracranial pressure, symptoms may progress slowly over weeks, months, or even years [4, 6].

The diagnosis of pneumocephalus is quickly established on CT scans that can detect volumes of air as small as 0.5 cc and that can differentiate between epidural, subdural, subarachnoid, and intraparenchymal gas in most cases [7]. CT establishes the presence and degree of mass effect and is useful in identifying cranial defects.

Most cases of tension pneumocephalus are related to trauma, often involving fractures of the frontal sinuses and ethmoid air cells. Iatrogenic causes also are common and include not only craniofacial surgery but also procedures that cause a reduction in intracranial pressure such as CSF shunting or evacuation of a subdural hematoma [5]. Tension pneumocephalus related to tumors of the paranasal sinuses is unusual and is most often described in association with frontal and ethmoid sinus osteomas [6]. Cases have also been reported of pneumocephalus secondary to an epidermoid tumor [4] and a squamous cell carcinoma [8] of the sinuses.

Here we report a case of tension pneumocephalus complicating an ossifying fibroma of the paranasal sinuses. In gen-

Fig. 1.—51-year-old man with ossifying fibroma of paranasal sinuses.
A. Enhanced CT scan of brain shows large left frontal gas collection resulting in mild mass effect on frontal horn of left lateral ventricle and mild subfalcine herniation.
B and C, Coronal CT scans taken for bone detail show osseous mass in left ethmoid air cells eroding through sinus roof into anterior cranial fossa. Marked expansion into left orbit is also seen.
D. Axial CT scan taken for bone detail shows communication between superior left ethmoid air cells and floor of left anterior cranial fossa. Intracranial component of lesion is seen posteriorly (*).
eral, ossifying fibromas are asymptomatic or cause benign symptoms such as pain and cheek swelling. However, ossifying fibromas involving the midface and paranasal sinuses are more aggressive and locally invasive than their more common mandibular counterparts. Risks attendant to the intracranial and orbital structures are significant. In addition to nasal obstruction and proptosis, these risks include blindness, orbital cellulitis, meningitis, and cerebritis [1, 2].

Management of mandibular ossifying fibromas has classically consisted of observation, with conservative surgery reserved for patients with symptoms or cosmetic deformities. Accepted treatment of ossifying fibromas involving the paranasal sinuses is less well defined. Tumors in this location are more likely to recur after conservative surgical treatment. Thus, whenever possible, early wide local excision may help delay or prevent potentially life-threatening complications.

REFERENCES