Pneumocele vs. Pneumosinus Dilatans: Review of the Literature with a Case of Frontal Sinus Pneumocele

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Pneumoceles of the frontal sinus are very rare conditions, characterized by abnormal expansion of the frontal sinus. The expansion may involve either all, or a part of, the sinus (Walker et al. 2002). The etiology and pathogenesis of pneumoceles remains unclear. Here, a case of pneumocele of the frontal sinus is presented, and the differentiated features of the disease are discussed.

CASE REPORT

A 23-year-old man who noticed a mass over his left eyebrow presented. He was otherwise asymptomatic. On routine physical examination he had on the left bossing of his forehead (Fig. 1). Neurologic and ophthalmologic examinations were normal. A computed tomography (CT) scan demonstrated diffuse enlargement of the left frontal sinus with localized thinning of the superior wall. There was no evidence of bone erosion (Fig. 2). Right frontal sinus and the other sinuses were normal. Written permission was obtained from the patient for the use of his photograph.

DISCUSSION

Frontal pneumocele is a rare condition with either focal or generalized thinning of the bony sinus walls. The abnormally expanded, aerated frontal sinus has been addressed in the literature by confusing, overlapping and sometimes poorly
defined terms which include hypersinus, pneumocele and pneumosinus dilatans. Hypersinus represents a contraction of the term hyperpneumatized sinus. The sinus is aerated, and its walls are normal. Although the sinus is larger than the usual frontal sinus, it does not extend beyond the normal boundaries of the frontal bone. There is no frontal bossing, intracranial extension, or ethmoid, nasal, or orbital encroachment (Urken et al. 1987). The feature that differentiates pneumosinus dilatans from the pneumocele is the loss of integrity of part, or all, of the bony sinus wall. Pneumosinus dilatans refers to an aerated sinus which is abnormally expanded, but the sinus walls are of normal thickness. Pneumocele refers to an aerated sinus with either focal or generalized thinning of the bony sinus wall (Urken et al. 1987; Eskandary and Kermani 1999). The entire sinus may be abnormally expended, or only a focal portion of the sinus may be enlarged (Urken et al. 1987). Most writers use the term pneumosinus dilatans and pneumocele interchangeably as the conditions are difficult to differentiate radiographically (Walker et al. 2002).

Pneumocele lacks a proven cause, although several etiologies have been postulated. Proposed causes of pneumocele include developmental, inflammatory, neoplastic, and posttraumatic causes. It has been suggested that increased sinus pressure caused by a one-way valve obstruction of the nasofrontal duct could result in this condition (Lichtenberg and Russel 1995; Appelt et al. 1999).

Our patient had no history of infection, or

Fig. 1. Note the left frontal sinus bossing.

Fig. 2. CT shows enlargement of the left frontal sinus and localized thinning of the superior wall (arrows).
neoplasm. He presented with frontal bossing. Clinically, the patient was totally asymptomatic. Most pneumoceles are diagnosed when a deformity can be seen or when displacement of adjacent structures lead to symptoms. In the frontal sinus, the most common finding is a bulge in the supraorbital region. In the other paranasal sinuses, the signs and symptoms present are related to the mass effect of an expanded sinus encroaching upon areas outside of the normal osseous boundaries (Urken et al. 1987; Wolfensberger and Herrmann 1987; Canadan et al. 1990; Eskandary and Russel 1999).

The roentgenographic differential diagnosis includes a pneumocele and pneumosinus dilatans. CT scanning is required to absolutely rule out any thinning or erosion of the bone margins. In our patient, CT scan demonstrated diffuse enlargement of the left frontal sinus with localized thinning of the superior wall.

Many different treatment modalities have been proposed, based on the presumed etiology of occlusion of the maxillary sinus ostium by one-way valve. These include direct sinus needle puncture, creation of a naso antral window through a Caldwell-luc operation or endoscopic sinus surgery. In majority of the cases this treatment was shown to arrest the expansion of the sinus (Walker et al. 2002). For the treatment of the cosmetic defect numerous methods of repair have been described. Appelt et al described a bicoronal approach in which the deformed anterior frontal sinus wall was reconstructed with a split calvarial bone graft harvested from the inner table of the frontal cranial bone flap (Appelt et al. 1999). Pospisil and Balmer outlined removal of anterior wall of the frontal sinus followed by slicing off the anterior portion of the removed anterior wall bone and rewiring the bone in place (Pospisil and Balmer 1988). Surgery with a bicoronal approach was offered to our patient for repairing the deformity however the patient rejected the treatment.

References


