

Pneumosinus dilatans: A discussion of four cases and the possible aetiology*†

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SUMMARY

Pneumosinus dilatans is an abnormal dilatation of the paranasal sinuses, which contains only air and is lined by normal mucosa. It is a rare condition, the aetiology of which is unclear. We describe four patients who presented to our department with pneumosinus dilatans. The aetiology was either developmental hydrocephalus (n=1), post-traumatic (n=1) or idiopathic (n=2). Two patients underwent surgery, and follow-up is at least 12 months to date. The radiological aspects of this rare condition and the possible aetiologies are discussed.

Key words: paranasal sinuses, pneumosinus dilatans, paranasal anatomy, sinus dilatation

INTRODUCTION

Pneumosinus dilatans is an abnormal dilatation of the paranasal sinuses, which contains only air and is lined by normal mucosa (Smith et al., 1987). It is a rare condition, the aetiology of which is unclear. We describe four patients who presented to our department with pneumosinus dilatans.

CASE REPORTS

Patient 1

This patient was a 21-year-old man with a long and complex history who initially presented as a child with hydrocephalus. He was born with a large por-encephalic cyst with subdural fluid collections and required repeated insertion of ventriculo-peritoneal shunts for hydrocephalus. He had a long-standing history of walking difficulties and epilepsy. The finding of pneumosinus dilatans affecting the frontal and sphenoid sinus was an incidental finding and asymptomatic (Figure 1).

Patient 2

A 29-year-old man was referred with intermittent swelling of the right frontal region occurring over eight years, which started after fracturing his nose. The swelling could increase in size overnight and then subside over a similar period. It was associated with blurred vision and headaches but no diplopia. He was employed as a metal polisher. High-resolution coronal CT-scans through the paranasal sinuses showed a hypoplastic and acellular left frontal sinus and a relatively large right frontal sinus. There was no definite evidence of fracture involving the

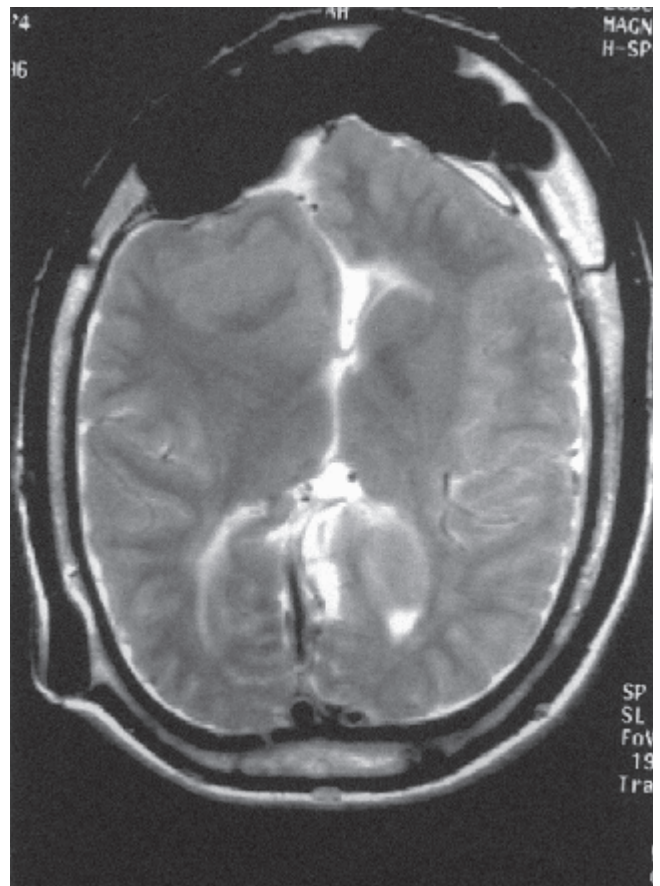


Figure 1. Axial T₂-weighted MR. There is pneumosinus dilatans of the frontal sinuses with encephalomalacia of the frontal lobes.

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origin of the right nasal frontal duct. The nasal septum was straight. There was evidence of minor chronic sinusitis involving the ethmoid air cells and the maxillary antra.

He underwent fibre-optic nasendoscopy. There was evidence of metal dust in the nose; both sides of the nasal septum (in particular Little's area) demonstrated signs of generalised congestion. The nasal septum deviated to the right with a bulge on the right side extending to the anterior part of area III. A submucosal resection was performed to try to open up the fronto-nasal duct without relief of symptoms, but he declined more definitive surgery.

Patient 3

A 15-year-old girl was first seen regarding sinus problems on 16th May 1995 with a history of post-nasal discharge (especially during colds), yellowish in colour. She complained of daily headaches and pain above and behind the left eye. This was first diagnosed as migraine and she received anti-migraine treatment. The pain had occasionally made her feel as if the left eye was about to "pop out." CT scan of the sinuses showed pneumosinus dilatans of the left sphenoid sinus.

On 29th August 1995, the left sphenoid sinus was explored through a posterior septal approach. The septum between the left and right sinuses was divided. Post-operatively, the pain related to the left eye had disappeared completely. She was last reviewed on 10th October 1995. There were no further pains related to her left eye, but she still complained of tension headaches. Pre-operatively, she used to have puffiness over the eyes, but this disappeared following the operation.

Patient 4

A 54-year-old lady was referred with a 6-month history of nasal obstruction and headaches (Figure 2). Clinical examination showed evidence of frontal bossing. High-resolution coronal CT scans showed pneumosinus dilatans affecting the frontal sinuses. Via FESS and an external approach (through an Eagle incision of the frontal sinuses) the fronto-nasal duct was enlarged bilaterally. Some of the fronto-ethmoidal cells were removed, the septum between the two frontal sinuses was divided, and a muscle plug obtained from the thigh was inserted. This achieved resolution of her symptoms.



Figure 2. Plain X-ray of the skull showing bilateral pneumosinus dilatans of the frontal sinuses.

DISCUSSION

The term "*pneumosinus dilatans*" was first coined by Benjamins in 1918, who described a rare case of abnormal dilatation of the frontal sinus containing only air. Lombardi in 1967 reported 51 cases and described its predilection for certain sites: It occurs most frequently in the frontal sinuses followed by the sphenoid, maxillary and ethmoidal sinuses, respectively. Som et al. (1987) proposed the following classification: *Hypersinus*: A frontal sinus that has developed beyond the upper limits of a normal frontal sinus. The sinus is aerated and its walls are normal. It does not extend beyond the normal boundaries of the frontal bone.

Pneumosinus dilatans: An aerated sinus that is abnormally expanded. The sinus walls, although intact and of normal thickness, have been displaced outwardly to cause frontal bossing, intracranial extension or ethmoid, nasal or orbital encroachment. *Pneumocoele*: An aerated sinus with either focal or generalised thinning of the bony sinus walls. However, Reicher et al. (1986) prefer to use the term pneumosinus dilatans for all cases of dilated, air-filled sinuses of uncertain origin with outwardly bulging walls, because differentiating pneumosinus dilatans from pneumocoele radiographically is impossible, and both present with identical clinical symptoms.

In normal subjects, there is a wide variation in the degree of pneumatisation of the sinuses. Overgrowth may occur in acromegalic subjects or in cases of agenesis of a cerebral hemisphere. The aetiology of pneumosinus dilatans is poorly understood as may be evident from the many mechanisms that have been proposed by various authors. Most authors attribute it to a ball-valve action secondary to either redundant mucosa or a minor inflammatory process with consequent rise in pressure within the sinus (Dhillon and Williams, 1987). Benedikt et al. (1991) have suggested that spontaneous drainage of a mucocoele is the causative agent in a case of air-filled expansion of the ethmoid sinus, whereas others think that hormonal influence of osteoblastic activity allows ingrowth and expansion of the sinus (Smith et al., 1987). Still other authors think it is due to a congenital abnormality leading to unchecked development and growth of the sinus cavity (Som et al., 1987). It has been associated – particularly in the sphenoid sinus – with pathological factors, such as optic meningioma and fibro-osseous disease (Lloyd, 1985), which are thought to produce a stimulating effect on osteoblastic activity.

The fact that some of our patients responded to surgery would suggest some form of ball-valve mechanism, which is relieved by widening of the ostium to allow adequate aeration. Surgery should be considered for cosmetic reasons and is mandatory if ocular problems supervene. The association with meningioma and fibro-osseous disease means that other forms of imaging such as CT or MR may be required.


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ANNOUNCEMENT



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