A Rare Case of Spontaneous Frontal Sinus Pneumocele Associated with Pneumocephalus Presenting with Severe Headache

ABSTRACT
A rare case of severe headache presenting with spontaneous pneumocephalus secondary to frontal sinus pneumocele is described. To the best of our knowledge this is the second case presented in the English literature. Clinical presentation, management, and outcome are discussed.

KEYWORDS: spontaneous pneumocephalus, pneumocele, frontal sinus, osteoma, headache.

Case Presentation
A 37-year-old female presented with severe headache after a severe cold. She had no head injury but gave a history of back injury from a past motor vehicle accident. She was on synthroid for hypothyroidism. She was allergic to cats and there was an element of allergic rhinitis. Ear examination showed normal tympanic membrane on the right side and the left tympanic membrane was scarred. Nasal examination showed a mild deviation of the septum to the left side and there was allergic nasal mucosa. Throat examination was clear and her vision and neurological examination did not show any abnormality.

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The patient had a computed tomography (CT) scan of the brain (Figure 1 and Figure 2) which confirmed pneumocephalus and she received a conservative line of treatment with bed rest, intravenous antibiotics, and instruction to avoid strained nose blowing, sneezing, or coughing. As the patient was not getting better, she had to undergo repair of the frontal sinus with a bicornal, osteoplastic approach using titanium mesh and plate (Figures 3, 4, and 5).

Post-operatively the patient felt much better and had no severe headache, but she did have a dull pain over the bicornal incision and tenderness over the right frontal sinus. She also had left maxillary sinus block due to allergic sinusitis (Figure 6). She was advised to use a corticosteroid nasal spray and saline nasal rinse.
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Introduction

Pneumoceles of the paranasal sinuses are very rare \(^1,2\) where distended air-filled paranasal sinus extend beyond the margin of paranasal sinuses. \(^3\) Spontaneous pneumocephalus is extremely rare and represents only 0.6% of largely reported cases. \(^4\) Although pneumocephalus is caused by sinogenic origins such as osteoma, \(^5,6\) spontaneous pneumocephalus has not been reported as a complication associated with pneumocele of the frontal sinus. \(^1\) In this article we report a case of spontaneous pneumocephalus with pneumocele of the frontal sinus presenting with severe headache. Review of the literature showed this was the second case reported. The first case reported was treated conservatively \(^1\); however, our patient had to undergo surgical intervention as the patient did not respond to the conservative line of treatment.

Discussion

Pneumoceles of the paranasal sinuses is a rare condition characterized by distended, air-filled sinus beyond the margin. \(^3\) This condition most commonly affects the frontal sinus, followed by the sphenoid sinus, ethmoid sinus, and maxillary sinus. \(^7\) Mostly pneumocele are asymptomatic and can present with changing facial contour or facial pain, diplopia, or headache. \(^3,8\) Here we are presenting a rare case of spontaneous pneumocephalus secondary to frontal pneumocele.

Most cases of pneumocephalus are due to surgical or accidental trauma. \(^9\) There have been some cases reported of delayed spontaneous traumatic pneumocephalus. \(^2\) Spontaneous pneumocephalus is rare and has only been reported in 0.6% of the largest reports in the pneumocephalus series. \(^4\)

Pathophysiology

The pathophysiologic mechanism of the pneumocele of the frontal
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-times osteoma of the sinuses can cause pneumocephalus likely due to one-way valve entry of air in the sinuses due to partial blocking. Barotrauma can be due to a Valsalva manoeuvre or excessive sneezing can lead to pneumocele in the sinus and also to the inverted bottle effect when there is loss of cerebrospinal fluid due to dural tear and then air escapes from the sinuses into the intracranial compartment. Anatomical defect during development or post-trauma can lead to the development of pneumocephalus.

Clinical Features

Spontaneous pneumocephalus can be asymptomatic or symptomatic, depending on its size at the onset. Most of the time spontaneous pneumocephalus is presented with

CT scan showing frontal pneumocele and encephalocele.
headache. Additional symptoms can include aural fullness, tinnitus, loss of balance, and scotoma.\textsuperscript{16,17}

**There is no standard treatment for pneumocele due to the rarity of cases. Very small pneumocephalus are treated conservatively and complete resolution is seen in post-treatment MRI.**

After a complete eye, ear, nose, and throat examination, a neurological examination should be done.

**Investigation**

CT scan of the brain and sinuses is needed to confirm a diagnosis and to establish a preoperative plan.\textsuperscript{15,18}

**Treatment**

There is no standard treatment for pneumocele due to the rarity of cases. Very small pneumocephalus are treated conservatively\textsuperscript{10} and complete resolution is seen in post-treatment magnetic resonance imaging (MRI).\textsuperscript{1} Conservative treatment is with bed rest with intravenous antibiotics and to avoid blowing the nose, straining, sneezing, and coughing. MRI is taken after two weeks of treatment where small pneumocephalus should completely disappear.

Those patients who have a large pneumocephalus and have failed conservative treatment are treated surgically to close the defect endoscopically or by the craniotomy approach depending on the size of pneumocephalus.\textsuperscript{19,20} Presumed risk of meningitis is an argument for closing bony defects.

**Conclusion**

Although frontal sinus pneumocele is a very rare condition, it can develop into spontaneous pneumocephalus, hence it should be included as a differential diagnosis in the severe headache.\textsuperscript{1}

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References

SUMMARY OF KEY POINTS

Spontaneous frontal pneumocele is a very rare entity.

Frontal pneumocele can lead to pneumocephalus.

The patient can present with severe headache.

CT scan of the brain and sinuses confirms the diagnosis.

Appropriate treatment will relieve the patient’s symptoms.

The patients with a severe headache should undergo CT scan of brain and sinuses if all the other diagnostic tests are negative.