Pneumocephalus Secondary to Acute Sinusitis

—Case Report—

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Abstract

We encountered a male patient with a pneumocephalus secondary to acute sinusitis. A fistula between the sphenoid sinus and the intracranial cavity, probably the subarachnoid space, was detected during puncture and irrigation of the sphenoid sinus. This fistula might have been quite small and might have closed spontaneously. Sellar tomograms and metrizamide computed tomographic cisternography had failed to disclose the fistula.

Key words: pneumocephalus, acute sinusitis

Introduction

Spontaneous pneumocephalus occurs in association with neoplasms, infections, or unknown causes, and its incidence is much lower than that of traumatic pneumocephalus.⁹⁾ We treated a case of pneumocephalus secondary to acute sinusitis, in which a communication between the sphenoid sinus and the intracranial cavity was identified.

Case Report

On July 31, 1981 an 18-year-old male developed headache and a temperature of about 38°C. These symptoms persisted and he was admitted to a local hospital on August 5, under suspicion of meningitis. A lumbar puncture disclosed an opening pressure of 180 mmH₂O. The cerebrospinal fluid (CSF) contained 21 lymphocytes, 2 polymorphonuclear leukocytes, and 41 mg/dl of protein. Antibiotics were administered, but his headache continued and he was transferred to our hospital on August 9. He had no history of CSF rhinorrhea or meningitis.

On admission, the patient was alert and had no neurological deficits or nuchal stiffness. His temperature was 37.5°C. A computed tomographic (CT) scan showed small air bubbles in the subarachnoid

space (Fig. 1). Skull x-rays clearly demonstrated an air-fluid level in the sphenoid sinus (Fig. 2). When he was in an upright or face-down position, no fluid drained from his nostrils. A second lumbar puncture revealed an opening pressure of 200 mmH₂O, and CSF contained 413 lymphocytes, 70 polymorphonuclear leukocytes, 128 mg/dl of protein, and 26 mg/dl of glucose. A CSF culture was negative. Sellar tomograms revealed a collection of fluid in the left side of the sphenoid sinus and no bony erosion, thinning, or asymmetry of the sellar floor.

We administered antibiotics, but severe headache continued. On August 14, a CT scan showed a collection of fluid in the sphenoid sinus and no air in the intracranial cavity (Fig. 3). The density of the fluid was higher than that of CSF. On that day, he had a generalized convulsion. On August 16, we performed a metrizamide CT cisternography *via* lumbar puncture to determine if any CSF had leaked into the sphenoid sinus. However, the CT number of the fluid in the sphenoid sinus was the same before and after metrizamide injection. To identify the nature of the fluid in the sphenoid sinus, on August 17 we punctured the sphenoid sinus through the right nostril, using a 21-gauge needle under a fluoroscope. Pale yellowish pus was aspirated and the sphenoid sinus was irrigated with physiological saline contain-

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Fig. 1 CT scan on admission. Small air bubbles (arrows) are seen in the left sylvian fissure.

Fig. 2 Skull x-ray on admission. An air-fluid level is clearly seen in the sphenoid sinus.

ing gentamicin. Aerobic and anaerobic cultures of the pus revealed *Klebsiella oxytoca*, which is sensitive to gentamicin. He was kept in a recumbent posi-

Fig. 3 CT scan 5 days after admission. The fluid collection in the sphenoid sinus has a higher density than that of CSF.

tion after the procedure. A CT scan obtained 2 hours after the procedure showed a pocket of air in the left frontal base, probably in the subarachnoid space (Fig. 4). Further CSF analyses revealed a gradual decrease in the cell count. His clinical course was satisfactory after irrigation of the sphenoid sinus, and antibiotics were discontinued on September 4. A CT scan taken on September 20 showed no fluid collection in the sphenoid sinus and no air in the intracranial cavity. He was discharged on September 27, and there has been no recurrence of sinusitis or pneumocephalus.

Discussion

Spontaneous pneumocephalus has been traced to various etiologies.^{1,3,9-11,14} Pneumocephalus secondary to sinusitis is rare, although sinusitis is a common disorder. Markham⁹ stated that infection was the cause of pneumocephalus in 26 (8.8%) of the 295 cases reported. In the group comprising pneumocephalus secondary to infection, three cases were due to sinusitis and nine were associated with chronic otitis media.

Pneumocephalus can be easily diagnosed by CT scans. Before the advent of CT scans, pneumocephalus might have been overlooked in a patient such as ours because of the small amount of air.

Fig. 4 CT scan 2 hours after irrigation of the sphenoid sinus. Air is visible in the left frontal base, probably in the subarachnoid space.

Metrizamide CT cisternography may have a role in diagnosing empty sella or CSF rhinorrhea.^{5,6)} In our patient, however, metrizamide CT cisternography did not reveal the empty sella and CSF leak into the sphenoid sinus, and failed to localize the fistula. The fistula was incidentally discovered in the sphenoidal roof when the sphenoid sinus was punctured and irrigated.

Spontaneous pneumocephalus may be related to the presence of congenital abnormalities, such as remnants of the craniopharyngeal canal,⁸⁾ or to bone abnormalities,⁷⁾ mainly of the "focal atrophy" type.¹³⁾ Hooper⁷⁾ reported 27 sphenoidal defects in 21 skulls, with diameters ranging from less than 0.1 mm to 2.5 mm. O'Connell¹²⁾ described CSF rhinorrhea as a result of a fistula of 1 mm in diameter. In our patient such abnormalities were not detectable by sellar tomograms or CT scans. Because of its extremely small size, the defect in the sphenoidal bone might not have been recognized.

Frankel *et al.*³⁾ reported a case of pneumocephalus secondary to chronic otitis media in which cholesteatoma caused bony erosion, and an active CSF leak through a small hole in the dura mater was discovered. This suggests that the hole was newly formed secondary to the chronic otitis media. In our case, the question of whether the fistula, which was probably a sphenoidal defect, existed prior to infec-

tion or was formed during the infectious process is unanswerable. Acute infection of the sphenoid sinus is unlikely to cause both a very small bony defect and perforation of the dura mater and the arachnoid membrane. Therefore, it is probable that the sphenoidal defect existed prior to the sphenoid sinus infection.

The acute sinusitis subsided in our patient after irrigation of the sphenoid sinus, and the fistula might have closed spontaneously. If pneumocephalus recurs, surgical repair may be necessary.^{2,4,13,15)}

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