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## **Spontaneous Bronchial-Subarachnoid Fistula: An Unusual Cause of Pneumocephalus**

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## Spontaneous Bronchial-Subarachnoid Fistula: An Unusual Cause of Pneumocephalus

Whenever pneumocephalus is encountered without an obvious cause, it behooves the radiologist to find the source of an air leak. This site occasionally may be extracranial, especially in patients with malignancy. We report a case in which spontaneous bronchial-subarachnoid fistula developed after irradiation for locally invasive epidermoid lung carcinoma.

### Case Report

A 63-year-old former longshoreman was admitted to the hospital after the sudden onset of confusion, agitation, and hallucinations. One year before, the patient, who had a history of exposure to asbestos, cigarette smoking, and alcohol abuse, had presented with back pain. At that time he had a pulmonary infiltrate in the right upper lobe. He apparently was lost to follow-up until 5 months later when he presented with pain in the right shoulder. CT showed a right paraspinal mass with invasion of the spinal canal at the T4 level. The results of needle-aspiration biopsy were consistent with moderately differentiated squamous cell carcinoma. Contrast-enhanced cranial CT was normal.

Two months later, a thoracic CT scan showed progressive tumor invasion with air in the epidural space (Fig. 1A). The patient received 3000 rads (30 Gy) to the right upper lung field and mediastinum over a period of 3 weeks. Three months later he was admitted because of acute confusional state. Physical examination was remarkable for the absence of focal neurologic findings.

Head CT showed no evidence of a mass lesion but revealed prominent pneumocephalus (Fig. 1B). No evidence of metastasis; infection; or fracture of the calvarium, skull base, or sinuses on bone detail films was seen. The patient died several days later. The family refused permission for an autopsy.

### Discussion

A 1967 literature review by Markham [1] described the following causes in 295 cases of pneumocephalus: 73.9% trauma; 12.9% neoplasm; 8.8% infection; 3.7% postsurgical causes; and 0.6% source not found. Pleural-subarachnoid and bronchial-subarachnoid fistulas have been reported infrequently as causes of pneumocephalus. Previous thoracic surgery, usually for malignancy, generally is implicated in the development of such fistulas [2-6]. To our knowledge, only one reported case of bronchial-subarachnoid fistula was not associated with previous surgery [7]. Both in that case and in ours, the fistula occurred after irradiation for epidermoid lung carcinoma. The pneumocephalus could be explained only by a bronchial-subarachnoid fistula at the tumor site caused by tumor progression with invasion of the subarachnoid space and necrosis after radiotherapy.

The optimal imaging study is usually CT because it permits detailed visualization of soft tissues, air, and bone in the head as well as in the spine. Once cranial changes (sinus or skull fracture, metastasis, or infection) have been excluded as a cause for the patient's signs and symptoms and pneumocephalus, then the spinal site of the fistula may be identified precisely, as in our case. Myelography with water-

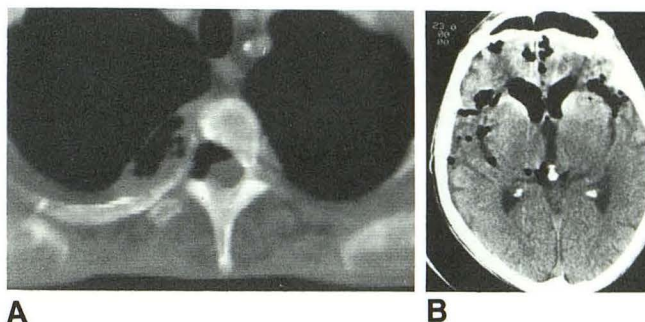


Fig. 1.—Pneumocephalus caused by a spontaneous bronchial-subarachnoid fistula.

A, Transverse CT scan of chest performed 4 months before occurrence of pneumocephalus shows a destructive necrotic paraspinal mass. Air is present within mass and at site of bony vertebral destruction and caps contents of spinal canal.

B, Axial CT scan shows prominent pneumocephalus involving ventricles, fissures, sulci, and cisterns.

soluble contrast material and radionuclide cisternography also may be useful if the source of the air leak is not otherwise apparent. Successful surgical closure of the fistula by means of thoracoplasty or by packing the cavitory chest lesion with muscle and fat [7] has been limited.

The possibility of bronchial-subarachnoid fistula should be considered in patients who have thoracic malignancy and pneumocephalus unexplained by trauma or other cranial disorders.

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