

Detection of Bronchopleural-Subarachnoid Fistula by Radionuclide Myelography: Case Report

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Radionuclide myeloscintigraphy has previously been used to demonstrate subarachnoid fistulae. In the present case a patient with bronchogenic carcinoma developed spontaneous pneumocephalus postoperatively. Chest radiographs showed an air-fluid level in the postoperative area. Various diagnostic tests were used, but only a radionuclide myeloscintigram showed the presence of a bronchopleural-subarachnoid fistula.

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Although the concept of radionuclide myeloscintigraphy was investigated as early as 1953 (1), the study has never been used widely because of its poor resolution and anatomic detail compared to that of contrast myelography. For physiologic and dynamic evaluation of cerebrospinal fluid (CSF) distribution, however, the value of radionuclide studies has long been recognized.

Radionuclide studies have been particularly successful in localizing sites of abnormal communication of CSF in cases of traumatic or spontaneous CSF rhinorrhea and otorrhea (2,3). Other sites of CSF leakage have also been demonstrated by radionuclide imaging (4-8). We recently observed a case of CSF leak into the right hemithorax 2 mo following right upper lobectomy for bronchogenic carcinoma in a 43-year-old man in which radionuclide myeloscintigraphy demonstrated a bronchopleural-subarachnoid fistula.

CASE REPORT

A 43-year-old man presented with recent onset of headache. Past history included pulmonary parenchymal disease in the right upper lobe, and a cavitory nodule 3 yr before this visit. The patient had been placed on antituberculous therapy with apparent partial resolution of the parenchymal densities, and was then temporarily lost to followup. Four months before admission, chest radiographs showed progression of the apical density in the right upper lobe,

and a diagnosis of bronchogenic squamous carcinoma was made by bronchoscopic biopsy.

The patient received a midplane tumor dose of 3,000 rads, given in ten fractions over 11 days. One month later a right upper lobectomy was performed. Tumor was found to be adherent to the second and third thoracic (T-2 and T-3) vertebral bodies and transverse processes. The adherent portion of the tumor was removed with a curved orthopedic osteotome, and a portion of the third rib and transverse process of T-3 were also removed. Pathologic diagnosis of the tumor was non-keratinizing squamous-cell carcinoma.

Two months postoperatively, the patient began having headaches. Spontaneous pneumocephaly was noted on plain skull radiographs (Fig. 1). The first possibility considered was that of paranasal sinus or basilar skull disease. The question arose, however, whether this might represent bronchopleuro-subarachnoid communication at the right apical tumor site. Chest radiographs showed a loculated air-fluid level at the T-2 to T-4 level (Fig. 2). A cervicothoracic contrast myelogram failed to demonstrate a communication at this level.

A radionuclide myelogram was performed (Fig.

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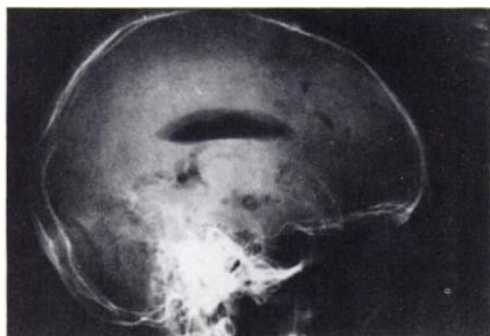


FIG. 1. Lateral projection of skull showing pneumocephalus.

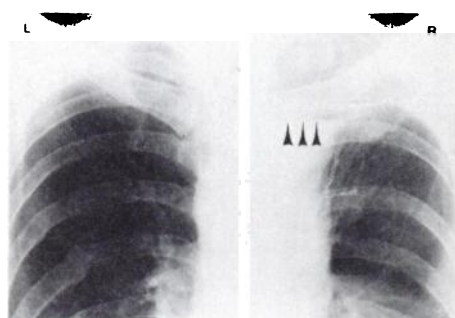


FIG. 2. PA chest radiograph, status post right upper lobectomy, showing air-fluid level (arrows). Note: Right and left are reversed for correlation with the posterior myeloscintigram.

3) with a cisternal injection of 0.5 mCi Yb-169 DTPA in 1 ml of hyperbaric dextrose (10%) while the patient remained in the sitting position (9,10). Static camera images at 1 hr post-injection in both sitting and prone positions showed a well-circumscribed area of activity in the right upper medial chest corresponding to the air-fluid level on chest radiographs. The finding was interpreted as a CSF leak at T-2 or T-3.

Surgical repair included thoracoplasty with removal of the first four right ribs. The patient's head-

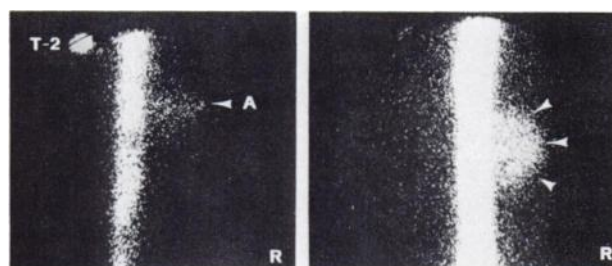


FIG. 3. Posterior Yb-169 DTPA myeloscintigrams with patient in erect (left) and prone (right) positions. Note CSF collection in right hemithorax at T-4 level (arrows). Air-fluid level simulated on erect view (A).

aches resolved and plain skull radiographs showed no pneumocephalus.

DISCUSSION

Although the surgeon removed tumor adherent to the transverse process of T-3 with an osteotome, it is unlikely that a direct communication with the anatomically remote subarachnoid space could have been created surgically. Other possibilities include fistulization following local inflammatory changes, or tumor invasion and erosion of bony spinal elements at this level. Conventional tomograms of the dorsal spine showed no bony erosion at the upper thoracic level.

Failure to demonstrate a communication radiographically using positive contrast (iodinated agents) or negative contrast (air) does not exclude the diagnosis. The more physiologic distribution of radionuclide in CSF allows demonstration of CSF leaks and porencephalic cysts, even when contrast agents fail to negotiate these communications (3,11). The spontaneous appearance of air in the subarachnoid and ventricular system in this case directed initial attention to the possibility of an unusual communication. Contrast myelography failed to demonstrate the site of the communication. The radionuclide cisternogram was the only study that localized the source of the pneumocephaly. Resolution with this technique gave excellent anatomic correlation, such that on the posterior erect image, even the appearance of the air-fluid level was reproduced as in the chest radiograph (Fig. 3, left).

A criticism of the use of chelated radionuclides for demonstration of CSF leaks has been that chelates may be more rapidly absorbed from the subdural and epidural spaces than the larger albumin tracers (6). In our patient, the abnormal extradural activity (Fig. 3) remained well circumscribed even on the 24-hr delayed images.

This case demonstrates the value of intrathecal radionuclide studies for confirmation and localization of CSF leaks at clinically suspected, unusual sites of subarachnoid communication.

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