people, drug treatment is highly effective, clearly worth the risk of toxicity, and the event precipitates aggressive follow-up by the public health system. As clinicians, we must take care that our eagerness to eliminate tuberculosis does no harm.

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An Unusual Case of Pneumorrhachis Following Resection of Lung Carcinoma*

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We report an unusual case of a patient with a bronchopleural-subcutaneous fistula that occurred 3 years following a lobectomy and en bloc chest wall resection for carcinoma. Following a sudden resolution of subcutaneous emphysema, an epidural air collection developed. Spontaneous pneumorrhachis is a previously unreported late complication after surgical or radiation therapy for lung carcinoma.

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Key words: bronchial fistula complications; CT; emphysema; emphysema complications; mediastinal emphysema; pneumocephalus; radiograph; spinal canal abnormalities; subcutaneous emphysema

Air very rarely enters the spinal canal (pneumorrhachis). Pneumorrhachis has been reported to occur following spontaneous pneumomediastinum,1–4 traumatic pneumothorax,5 skull fracture,6 epidural anesthesia,7 radiation therapy, and thoracic surgery.8 We report on a patient who suddenly developed pneumorrhachis several years after undergoing a thoracotomy and external beam radiation therapy for lung carcinoma.

CASE REPORT

A 60-year-old man received a diagnosis of left upper-lobe, large cell, undifferentiated carcinoma with chest wall invasion. He underwent a left upper-lobe lobectomy, en bloc chest wall resection, and resection of ribs 3 to 5 followed by 500-cGy external beam radiation therapy through anteroposterior and posterolateral ports.

Three years later, after protracted severe coughing, this patient developed sudden-onset extensive subcutaneous emphysema in the head, neck, and chest. A chest radiograph and CT scan of the chest identified no pneumothorax. We chose conservative management because a chest tube could not be placed strategically, and we wished to avoid surgical intervention in view of the presence of COPD and the patient’s limited underlying pulmonary reserve. Subcutaneous emphysema of the neck and chest persisted for the following 5 months and then resolved abruptly.

Several days later, the patients presented with excruciating pain in the back and left arm and leg. A spinal cord compression syndrome was suspected clinically, and an MRI scan revealed an epidural gas collection (5 to 10 mL) that extended from C3 through T4. A chest radiograph revealed a pneumomediastinum and subcutaneous emphysema (Fig 1). A CT scan of the chest revealed air in the epidural space, the mediastinum, and subcutaneous tissues (Fig 2). Air from the mediastinal and subcutaneous regions moved through the neural foramina into the epidural space. No definite pneumothorax was identified. The precise location of the presumed bronchopleural fistula could not be identified by MRI, CT scan, ventilation-perfusion scan, or fiberoptic bronchoscopy. The presence of an active infection at the time of presentation was not suspected.

The patient did not respond to 2 weeks of conservative management, and at that time he underwent a modification of his prior thoracoplasty with resection of ribs 2 and 6 and a combined serratus anterior and intercostal muscle flap closure of the bronchopleural fistula. Multiple small air leaks were found emanating from the inflated surfaces of the superior segment of the left lower lobe parenchyma. The bronchopleural fistula air leak returned 2 weeks after his muscle flap closure surgery. The failure of the surgery was not surprising since the muscle flap covered an area of the lung that was scarred and emphysematous.

A chest tube was placed in the area of the presumed air leak and was left to open-air drainage. Persistent drainage of air continued through the chest tube, without recurrence of pneumorrhachis, for the next 2 years until his death due to end-stage COPD.

DISCUSSION

In general, pneumorrhachis may enter the epidural space or may penetrate further into the subarachnoid space. Air that enters the epidural space usually does not migrate significantly, and complete resorption occurs spontaneously. Epidural space pneumorrhachis causes no symptoms or local pain. When pulmonary air enters the subarachnoid space, a bronchopleural-subarachnoid fistula is present, and air easily travels cephalad to the cranium (ie, pneumocephalus). These patients experience severe headaches, or less often, focal neurologic symptoms similar to a stroke.8 Pneumorrhachis is best demonstrated on CT scanning but may be seen on MRI scanning or...
cervical spine radiographs. Even with CT scanning, it may be difficult to distinguish whether the air is in the epidural space or subarachnoid space.

In the English language medical literature, several causes of pneumorrhachis involving air in the epidural and subarachnoid spaces have been defined (Table 1). Most often, pneumorrhachis occurs following trauma, barotraumas, or an invasive procedure.

Epidural space pneumorrhachis usually occurs by the two following mechanisms: atmospheric air passes through a spinal needle into the epidural space; or air moves through the posterior mediastinum into the epidural space. Air may unintentionally enter the epidural space during a lumbar puncture or may enter intentionally during lumbar epidural anesthesia to locate the epidural level. These conditions are self-limited. If air is present in the posterior mediastinum, it may dissect along fascial planes from the posterior mediastinum (or retropharyngeal space), through the neural foramina, and into the epidural space. No true fascial envelope protects the epidural space. Mediastinal air moves into the epidural space behind the driving pressure of a tension pneumothorax or pneumomediastinum. In case reports, there are associated causative factors such as trauma, strenuous exercise, asthma, and violent coughing.

On the other hand, subarachnoid space pneumorrhachis occurs by mechanisms of trauma or extensive surgical exposure of the spinal nerve root. It is usually seen during the first 30 days after the resection of lung carcinoma. This very rare postoperative thoracotomy complication is associated with upper lobectomies with posterior chest wall resections and multilevel rhizotomies, such as with superior sulcus tumor resections. In lung cancer patients who have not undergone thoracic surgery, subarachnoid space pneumorrhachis with pneumocephalus has been observed 2 to 3 months after diagnosis without therapy and after external beam radiation therapy.

The management of pneumorrhachis must be individualized. Spontaneous resolution occurs in most cases of epidural space pneumorrhachis, which permits conservative management in this benign occurrence. Spontaneous resolution occurs less frequently with subarachnoid space pneumorrhachis. Surgical management involving muscle...
flap obliteration of the bronchopleural fistula or laminctomy are likely to be more frequently utilized for cases of subarachnoid space pneumorrhachis than for cases of epidural space pneumorrhachis.

Our patient developed epidural space pneumorrhachis secondary to bronchopleural-cutaneous fistula. Unlike prior clinical descriptions, our patient’s symptoms were quite severe, as he exhibited excruciating back pain. A history of upper lobectomy with posterior chest wall resection was present, similar to reported cases of bronchopleural-subarachnoid fistula with pneumocephalus. However, our patient did not exhibit subarachnoid space pneumorrhachis or pneumocephalus during the immediate postoperative period. His delayed presentation of pneumorrhachis 3 years after undergoing the thoracotomy is well beyond the longest duration of 96 days among reported cases of postoperative bronchopleural-subarachnoid fistula.

In our patient, the delayed appearance of a bronchopleural fistula after the resection of lung carcinoma raised suspicion for recurrent carcinoma or active infection with empyema. No recurrence of lung carcinoma or empyema was observed during the 2.5 years after he presented with pneumorrhachis. The etiology of this patient’s bronchopleural fistula may have been related to chronic lung inflammation at the site of the bronchopleural fistula, external beam radiation therapy, violent coughing, and COPD. We suspect the source of air that entered the epidural and from the bronchopleural fistula and from mediastinal and subcutaneous emphysema. The occurrence of pneumorrhachis in this patient 3 years after he had undergone a thoracotomy and external beam radiation therapy is distinctive and has not been previously reported.

Unlike previous reports, our patient’s epidural space pneumorrhachis did not resolve with conservative measures or with thoracic surgery. Instead, a long-term chest tube was maintained to drain and divert his persistent bronchopleural fistula.

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Scedosporium apiospermum Fungemia in a Lung Transplant Recipient*

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Scedosporium apiospermum, the asexual anamorph of the cosmopolitan fungus Pseudallescheria boydii, is emerging as an important cause of disseminated infection in immunocompromised patients. We present our experience with the first reported case of S apiospermum fungemia in a lung transplant patient. Disseminated infection resulted in sepsis, multiorgan failure, and death. Review of the literature highlights the diagnostic difficulties related to the similarities between S apiospermum and Aspergillus sp. This superficial resemblance has a significant impact on clinical outcomes considering the inherent resistance of Scedosporium to amphotericin B, the traditional antifungal of choice for disseminated hyalohyphomycoses.

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Key words: fungal infection; lung transplantation; Pseudallescheria boydii; Scedosporium apiospermum

Abbreviation: GMS = Gomori methenamine silver