Paraparesis induced by inflammatory contents of a pneumonectomy cavity

Case report

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We present a report on a patient who developed paraparesis as a result of epidural compression from the contents of an old pneumonectomy cavity. We discuss the case and review the literature regarding similar cases.

Case Report

History. This 61-year-old man presented with progressive paraparesis of 2 days' duration. He had been admitted to a local hospital after a fall resulted in severe epigastric pain. No neurological abnormalities were observed on admission, but over the next 2 days he developed paraparesis and urinary retention. A regimen of intravenously administered dexamethasone was initiated, and he was transferred for neurosurgical evaluation. At interview, he denied prior exposure to or treatment for tuberculosis. He had undergone a total right pneumonectomy in 1957 for a histopathologically diagnosed carcinoid-type adenoma.

Examination. On physical examination, his temperature was 37.6°C. His systemic examination was remarkable only for a right thoracotomy scar and absence of right lung field sounds on auscultation. Neurologically, he had full strength and sensation in his upper extremities. His right leg strength was 2/5 and his left was 3/5. He exhibited gradual sensory loss over the midthoracic dermatomes. Dense hypesthesia, hypalgesia, and absence of proprioception were noted in his legs. He had absent lower extremity reflexes and downgoing plantar reflexes. His rectal tone was markedly diminished. His white blood cell count was 9000 cells/mm³ and his hemoglobin was 17.8 g/dl.

A chest x-ray film demonstrated the old opacified and calcified right lung field (Fig. 1). On MR imaging of the cervical (Fig. 2) and thoracic spine (Fig. 3) a right-sided intrathoracic mass with erosion into the pedicles and laminae of T-4 and T-5 was demonstrated. There was an epidural compressive mass extending from T3–L2.

Operation. The patient was taken to the operating room for emergency decompressive laminectomy. At operation, a high-speed air drill was used to begin a laminectomy of T-5. Two millimeters deep to the dorsal laminar cortex, a fluid collection was entered from which 400 to 500 ml of moderately thick, rust-colored fluid was removed. During subsequent mechanically assisted inspirations, fluid continued to express through a tract that began at the right T-5 lamina–pedicle junction and travelled ventrolaterally past the pedicle and toward the right thoracic cavity. After this decompression, intact normal-appearing dura was identified through the laminotomy. A biopsy sample of the T-5 lamina was obtained. A laminotomy performed on a lamina within the rostrocaudal extent of the mass (approximately T-9) revealed only normal-appearing dura. This confirmed that the fluid represented the compressive mass and that it had been evacuated. The wound was closed and the patient was moved to the intensive care unit for postoperative recovery.

Radiological and Infectious Disease Evaluation. Cultures of the epidural fluid used to test for aerobic, anaerobic, fungal, and mycobacterial pathogens yielded negative results. Pathological examination of the lamina biopsy material revealed fibrous tissue with macrophages. Cytological examination of the fluid revealed macrophages and material consistent with old blood. Atypical cells, tumor cells, fungal forms, and acid-fast forms were not seen.

Further evaluation included an erythrocyte sedimentation rate (6 mm/hour) and C-reactive protein (1.5 postop-

Abbreviations used in this paper: CT = computerized tomography; MR = magnetic resonance.
eratively and 0.8 at discharge, upper limit of normal = 0.5). Tests for purified protein derivative intradermal skin reaction, venereal disease, prostate-specific antigen, and Histoplasma capsulatum antigen in urine yielded negative results. A bone scan yielded no metastatic lesions. Findings on abdominal and pelvic CT scans were normal. A chest CT scan revealed a right-sided pneumonectomy cavity containing a small amount of air (Fig. 4). This air was considered indirect evidence that the epidural surgical site communicated with this cavity through the laterally oriented tract observed at surgery. A CT scan of the chest obtained 3 years earlier was located and no difference was found between it and the current chest CT scan other than the erosion of the bony spinal canal.

Postoperative Course. By the 6th postoperative day, the patient’s leg strength was 4 on the right and 5 on the left, with normal sensation. He still required intermittent urinary catheterization. On the 20th postoperative day, he reported a “puffy” sensation at his incision site. Results of physical examination were unremarkable at the time, but 2 days later, a small amount of subcutaneous fluid was palpable beneath the incision. Observational management was instituted and he was discharged.

He returned 1 month later for follow-up evaluation, by which time he had developed a 25 × 13-cm fluctuant fluid collection beneath his thoracic scar. There was no evidence of inflammation; he was afebrile. His strength was 5/5 in his legs with the exception of right ankle dorsiflexion and extensor hallucis longus extension, both rated 4+/5. His sensation was intact and his deep tendon reflexes were normoactive with downgoing plantar reflexes. Magnetic resonance images of the thoracic and lumbar regions (Fig. 5) were repeated and showed minimal reaccumulation of an epidural fluid collection contiguous with a subcutaneous collection that was hyperintense on both T₁- and T₂-weighted MR images. The collection was not consistent with a pseudomeningocele by T₁- and T₂-weighted MR imaging characteristics. Observation was continued.

He returned to the Cardiothoracic Surgery clinic 2 days after discharge and continued to do well. The subcutaneous collection was noted to have resolved. Physical examination was normal. The patient was discharged home on an outpatient regimen and scheduled for a follow-up appointment 1 month later.
weeks later with continued expansion of this subcutaneous fluid collection. His urologists discontinued his intermittent urinary catheterization; otherwise results of his neurological examination were unchanged. It was thought that a pleural–epidural–subcutaneous communication existed. Treatment options considered by the cardiothoracic and neurosurgical teams included intermittent percutaneous drainage of the collection, placement of a subcutaneous drain, placement of a chest tube into the right pneumonectomy cavity, and interposition flap placement. It was elected to tap the collection percutaneously once, followed by wrapping of the thorax with Ace bandages to prevent reaccumulation. If this failed, invasive surgical obliteration of the tract from the thoracic side would be contemplated. During the tap, 300 ml of thin black-brown liquid was removed from the collection. This fluid was negative for β2 transferrin; results of cytological examination and all cultures were negative. Five intact rolls of gauze were placed along the incision to provide pressure to it, followed by wrapping of the entire thorax by three 4-in-wide Ace wraps. A small collection recurred; however, it resolved by the 5th month postoperatively with continued thoracic wrapping. Results of his neurological examination remained unchanged.

Discussion

Our patient presented with acute-onset paraparesis. Common reasons for acute paraparesis include primary thoracic bone tumors; metastatic tumors (epidural, vertebral body, and drop metastasis); compression fractures (traumatic and pathological); infections (tubercular, discitis, osteomyelitis, epidural abscess); and traumatic thoracic spinal fractures and dislocations. Rarer causes include extramedullary hematopoiesis,1 rheumatoid nodules,6 spinal aneurysmal bone cysts,3 and ossification of the posterior longitudinal ligament and ligamentum flavum.4,7 Operations involving the aorta, especially for aortic dissection, are well known to cause paraplegia secondary to vascular compromise.3 Thoracotomy can also result in acute lower extremity weakness.2 In our case, we found no evidence of any of the aforementioned pathological mechanisms.

Strong consideration was given to recurrence of his tumor as the cause of his paraparesis. Carcinoids are an invasive tumor type that can recur, but no pathological evidence of adenoma was found at operation. It may be argued that the patient experienced a spinal epidural hematoma that was discovered during surgery, and that perhaps during drilling an incidental communication was created with the pneumonectomy cavity. We are certain that this is not the case for several reasons. First, in our drilling, we were careful not to veer laterally. Further, the fluid was encountered short of the expected depth of drilling required to reach the epidural space, indicating that a chronic process had deformed the laminae. Third, no elements suggestive of acute hemorrhage were discovered on cytological examination. Last, the volume of material removed was significantly greater than the volume of the spinal canal. A diagnosis of spinal tuberculosis is unlikely given the fact that tissue and fluid cultures were negative on two occasions, results of his purified protein derivative test were negative, and his chest CT findings were relatively stable.
From the data and clinical course in this patient we infer that the pneumonectomy cavity contents eroded into the spinal canal, resulting in spinal cord compression. The material repeatedly contained macrophages, which was suggestive of a chronic inflammatory component. This chronic inflammatory condition could have brought about invasion of the spinal canal. Although this explains how the invasion may have occurred, it is unclear why the cavity's contents transgressed the cavity wall posteriorly. We propose two hypotheses: 1) that chronic inflammation–induced fibrosis and contracture of its lining forced the cavity to decompress into nearby paravertebral tissues; and 2) that the posterior pneumonectomy cavity wall and subjacent tissues may be more susceptible to inflammatory erosion, leading to invasion and decompression in this direction.

No Medline search consisting of an intersection of pneumonectomy or thoracotomy with paraparesis or paraplegia yielded a similar case. To our knowledge, this is the first report describing the erosion of pneumonectomy cavity material into the spinal canal with resultant paraparesis. This case raises the possibility that this may occur when individuals live several decades after complete pneumonectomy.

References