Chronic myelopathy due to a giant spinal arachnoid cyst: a complication of the intrathecal injection of phenol

Case report

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Acquired intradural arachnoid cystic lesions of the spine have been associated with trauma, hemorrhage, parasitic infections, and other insults that cause inflammation and subarachnoid adhesions. The authors describe the case of a previously healthy 36-year-old woman who presented with a chronic myelopathy due to the progressive development of a giant spinal arachnoid cyst that resulted after the intrathecal injection of phenol for the management of chronic upper extremity pain. Neurological examination, spinal computed tomography, and magnetic resonance imaging were used for diagnostic and follow-up purposes. Even after the initial excision of the cyst, the patient remained symptomatic with minimal functional recovery. (DOI: 10.3171/SPI/2008/8/4/390)

KEY WORDS • neurolysis • spine • subarachnoid space

The intrathecal injection of alcohol or phenol for spinal neurolysis has been an effective but invasive alternative to treat chronic pain syndromes. It was first introduced in 1931 by Dogliotti for the treatment of sciatic pain and has gained popularity among anesthesiologists and pain management specialists as a useful technique to treat recalcitrant chronic pain states in patients with cancer and acquired spasticity. The procedure is designed to irreversibly ablate sensory axons of posterior roots, thereby damaging the afferent pain pathways and potentially providing pain relief for several months. When done appropriately, 0.5–1.0 ml of a 5–6% solution of phenol or alcohol in glycerin is injected in the intrathecal space. Subarachnoid neurolytic block can provide adequate pain relief in up to 60% of patients. Epidural space injection of neurolytic agents is often preferred as an alternative to intrathecal injections because of the less frequent side effects.

To date, all of the reported complications of this technique have been associated with the sudden onset of symptoms, but subacute or delayed complications are rare. We present the case of a patient with permanent spinal cord injury due to the development of a giant spinal arachnoid cyst after the intrathecal injection of phenol.

Abbreviations used in this paper: CSF = cerebrospinal fluid; MR = magnetic resonance; MRC = Medical Research Council.

Case Report

History and Examination. After a fall during which was sustained a minor injury to the right hand, this previously healthy 36-year-old right-handed woman reported pain involving the ipsilateral thumb and arm. A chronic pain syndrome developed, and reflex sympathetic dystrophy was later diagnosed. The patient was treated unsuccessfully with analgesics and spinal and stellate ganglion blocks. Four years after the initial trauma and based on the persistence of symptoms, an epidural injection of phenol was administered in the upper thoracic region in an attempt to relieve her chronic suffering. Immediately after the injection, she reported left arm and leg weakness and respiratory distress that required close monitoring in the intensive care unit. Later that day she experienced respiratory failure, and endotracheal intubation with assisted mechanical ventilation was needed. Twenty-four hours after the procedure, a cervical and thoracic spine MR image revealed no mass effect or cord abnormalities (Fig. 1). Nevertheless, free air was seen in the subarachnoid space, which was confirmed on computed tomography scanning of the spine (Fig. 2A) and brain (Fig. 2B). Her left side remained weak, and she had a prolonged hospital stay requiring a tracheostomy and percutaneous gastrostomy for respiratory and nutritional support. After a 3-month period of intense rehabilitation, she was able to return home, and over time she was able to walk short distances with the assistance of a cane and to
climb a flight of stairs. Although she experienced numbness in both legs, she was able to resume her normal activities of daily living.

Two months later she was readmitted to the hospital because of medical complications including malnourishment and pressure ulcers. Moreover, she had progressive weakness and numbness in both lower extremities, difficulty walking, and urinary and fecal incontinence. At this time she was transferred to our institution for evaluation. On our initial physical examination, her vital signs were normal and her mental capacity was intact. Her cranial nerves were significant for fasciculations and wasting of the right side of the tongue and ipsilateral tongue deviation. A motor examination revealed pronounced wasting of the muscles of the left upper extremity with a strength grading of MRC 2/5 on shoulder abduction, MRC 3/5 on elbow flexion and extension, and MRC 4/5 on finger flexion; the remainder of the muscle groups were very weak with a strength rating of MRC 0–1/5. In the lower extremities, the strength was rated 4/5 except for left foot dorsiflexion, which was MRC 3/5. Reflexes according to the National Institute of Neurological Disorders and Stroke Myotatic Reflex Scale were 2 in the right upper extremity, 1 in the left upper extremity, 2 at both knees, and 3 at the ankle level bilaterally. She had bilateral upgoing plantar responses. Sensory examination showed a patchy loss of pinprick sensation in the lower trunk and bilateral lower extremities. Vibration and joint position sense were absent in the toes but present at the ankle level. At this point an MR image demonstrated a large septated and loculated CSF collection from T2–8 compressing and displacing the cord anteriorly (Fig. 3). The most severe compression was seen at T5–6 with accompanying myelomalacia. A diagnosis of myelopathy due to an arachnoid cyst was made, and a surgical intervention was planned to relieve the spinal cord of the mass effect seen on the MR image.

Operation. The patient underwent excision of the arachnoid cyst after a laminectomy from T3–6. Intraoperatively, we found thickened arachnoid along with loculations and septations. On cyst decompression, CSF was noted to be under elevated pressure. The arachnoid and its thickened septations from the dorsal subarachnoid space were dissected. Large amounts of arachnoid were excised, and the cysts were fenestrated. The patient also had thickened arachnoid on the epipidal aspect of the spinal cord, which was carefully dissected off and excised. Somatosensory evoked potentials were unchanged during the operation. Hemostasis was meticulously achieved, and a water-tight dural closure was ensured. Histopathological analysis revealed dense connective tissue with thin epithelial lining consistent with a cyst. No unusual features were seen at the microscopic level.
Postoperative Course. Despite surgical intervention the patient remained symptomatic with urinary and fecal incontinence, and her motor function did not improve. She has undergone several additional surgeries for recurrence of the cyst but without improvement. Follow-up MR imaging revealed extensive myelomalacia and severe atrophy of the spinal cord. She remains severely disabled.

Discussion

Complications of phenol and alcohol injections into the subarachnoid space are well known and can include aseptic meningitis, spread of the neurolytic agent into other structures including the spinal cord, involvement of anterior roots with muscle paralysis, and spinal cord ischemia with infarction due to vasospasm and thrombosis. Pathological findings have demonstrated that this technique causes demyelination, degeneration of dorsal roots, and sometimes damage to the spinal cord itself. In a series of subarachnoid spinal blocks using ethanol, a complication rate of 14.3% has been reported, with 2.2% resulting in irreversible injury. Our patient experienced the sudden onset of left arm and bilateral leg paralysis with respiratory failure. These symptoms localized to the spinal cord at or below the C-3 level and may have been explained by direct damage to the spinal cord either by chemical irritation or direct alcohol injection. Similarly, several authors have attributed this complication to anterior root injury during or after neurolysis. Spinal cord ischemia caused by arterial vasospasm and venous thrombosis have been proposed as a potential cause of spinal cord damage and extremity weakness in patients receiving ethanol injections for neurolysis. Animal studies have shown that concentrations of 3–6% ethanol can induce transient vasospasm of the spinal arteries and that intrathecal phenol injections have been associated with transient paralysis due to spinal thrombosis. Recently, McGarvey et al. have reported direct injury to the spinal cord based on MR imaging after intrathecal injection of ethanol in a patient with intractable pain due to cancer. In our patient, the initial MR image (Fig. 1) showed no evidence of spinal cord damage, and eventual recovery of strength and residual lower motor neuron syndrome in the left upper extremity favored a ventral root lesion. Similarly, the isolated hypoglossal nerve injury evidenced during our clinical examination supported the possibility of direct phenol toxicity over more cephalic ventral roots as well. It is feasible, however, that after the initial insult, we missed any evidence of spinal cord damage as no follow-up MR imaging was done.

Our patient improved after extensive rehabilitation but later experienced progressive neurological worsening. On transferring to our care, her physical examination was remarkable for flaccid weakness with hyporeflexia of the left upper extremity as well as weakness, hyperreflexia, and patchy sensory loss of the lower extremities. These symptoms were also accompanied by fecal and urinary incontinence. The gradual onset of these symptoms is characteristic of a cervicothoracic myelopathy due to mass effect or demyelination. An MR image obtained at our institution revealed a CSF collection from T2–8 compressing and displacing the cord anteriorly (Fig. 3). The most severe compression was seen at T5–6, which was accompanied by myelomalacia, but no intraspinal cord signal abnormality was seen. Acquired intradural arachnoid cystic lesions of the spine have been reported due to trauma, hemorrhage, parasitic infections, and other insults that cause inflammation and subarachnoid adhesions. These lesions are commonly located in the posterolateral aspect of the thoracic or sacral spine displacing the cord anteriorly, and they become symptomatic due to pressure and compression of the spinal cord and nerve roots. Myelomalacia seen on MR imaging (as in our case, Fig. 3) is an indicator of a poor functional outcome. Currently, there is no standard of care for this condition. Therapeutic options include complete excision, fenestration, and percutaneous drainage or shunting to the perito-
neum, atrium, or pleura. The literature supports complete excision of the cyst wall as the best treatment leading to a reversal of neurological deficits in most cases.\textsuperscript{7} Despite excision of the cyst in the present case, the patient remained symptomatic with only mild improvement in motor function.

We describe a clinical scenario in which subarachnoid phenol neurolysis for the management of chronic pain led to permanent spinal cord injury due to the development of a giant spinal arachnoid cyst. It is our hope that this report will alert other physicians to this rare but potentially devastating complication.

References


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