Dorsal arachnoid web with spinal cord compression: variant of an arachnoid cyst?

Report of two cases

CHRISTOPHER G. PARAMORE, M.D.

Department of Surgery (Neurosurgery), University of Alabama at Birmingham, Birmingham, Alabama

Arachnoid cysts are discrete pockets of CSF or CSF-like fluid found adjacent to normal CSF spaces; they may occur sporadically or result from intraspinal trauma or hemorrhage.2–4,14 These cysts may be intradural, extradural, or perineural, and they may or may not communicate freely with the subarachnoid space. They have been noted frequently on myelography in asymptomatic volunteers,13 and on rare occasions they may cause spinal cord compression and myelopathy.1–9 Although these lesions are found throughout the spine, they appear to have a predilection for the dorsal thoracic region. Radiographic analysis has consisted historically of plain radiography and myelography, and more recently of CT myelography and MR imaging. Surgical treatment of symptomatic thoracic arachnoid cysts has been described in the setting of progressive myelopathy.1–9 Treatment outcomes have been relatively good, although to date the series have been small.1,3,5,9

Two patients presented with focal thoracic spinal cord compression from lesions that on imaging studies appeared to be arachnoid cysts. Both patients had syringomyelia just below the level of the most severe compression. At operation both patients were found to have focal arachnoid “webs,” which blocked the dorsal subarachnoid space in the area in which the spinal cord was most compressed; however, no cyst was found. A search of the literature did not disclose reports of similar lesions. The radiographic appearance of this unusual lesion and a proposed mechanism for its pathophysiological characteristics are discussed.

Case Reports

Case 1

This 54-year-old man presented with a several-year history of back and left leg pain. Previously, he underwent a lumbar discectomy with no relief. He was noted to have atrophy of his left lower-extremity musculature and an upgoing left toe. His gait was spastic. Magnetic resonance imaging studies were obtained and were remarkable for revealing a distorted thoracic spinal cord associated with a small syrinx (Fig. 1). Computerized tomography myelography was performed, but the results were nondiagnostic. This patient underwent a T1–6 laminectomy and exploration. At surgery a discrete arachnoidal web between the dorsal dura mater and pia mater was noted, which appeared to block the flow of CSF. No cyst in the usual sense of the word was found. The spinal cord assumed a normal shape following resection of the web, and follow-up MR imaging demonstrated no residual compression and confirmed resolution of the syrinx. The patient’s weakness and muscle tone improved following surgery, although he continued to have significant left lower-extremity pain.

Abbreviations used in this paper: CSF = cerebrospinal fluid; CT = computerized tomography; MR = magnetic resonance.
Case 2

This 45-year-old man presented with a 2-year history of progressive midthoracic pain and left lower-extremity weakness. He experienced numbness in the flank at the level of his pain but no bowel or bladder difficulty. Neurological examination revealed increased muscle tone and mild iliopsoas weakness in the left lower extremity. Mild loss of pinprick sensation was noted in the midthoracic region. Magnetic resonance imaging revealed a small syrinx in the spinal cord at T-7 with the spinal cord indented from behind just above the syrinx (Fig. 2). A CT myelography study was performed, and the results were interpreted as consistent with anterior spinal cord herniation through a ventral dural defect. Thoracic laminectomies were performed, and a dense focal arachnoid web was encountered dorsally. This was resected completely. The spinal cord was explored and was not found to be herniated through the ventral dura. The patient tolerated the procedure well and was discharged home on postoperative Day 3. His left lower-extremity strength returned to normal, and his muscle tone improved following surgery.

Discussion

Arachnoid cysts of the thoracic spine are rarely reported in the spine literature.1–5,7–9,14 Two theories have been espoused regarding their cause. Perret, et al.,10 suggested that the cysts arise from “diverticula” of the arachnoidal membranes, particularly from the relatively well-developed arachnoidal septum between the posterior dura and dorsal spinal cord, or septum posticum. This theory successfully explains the majority of these lesions, which are dorsal; it does not, however, explain the occasional presence of a ventral thoracic or cervical cyst or the relatively common perineural sacral or Tarlov cyst.12 Subsequently, a unified theory of arachnoid cyst development has been espoused by Fortuna, et al.,4 who attempt to explain the occurrence of arachnoid cysts at all locations. They suggest that arachnoid granulations become trapped in various locations, that is, in intradural, extradural, or perineural regions, and that cyst formation results from CSF production and sequestration along the path of least resistance. Because none of these theories has been proven, it is probably best to consider the causes of idiopathic arachnoid cysts to be multifactorial.

The two patients described here appeared to suffer from a variant of arachnoid cyst formation. In both cases, dense focal webs of arachnoid were found to be adherent to the pia of the dorsal spinal cord and the posterior dura, thus interfering with the free flow of spinal fluid along the dorsal subarachnoid space. The webs resembled normal arachnoid in appearance and were situated in the axial plane perpendicular to the spinal cord and dura. In both cases the webs were adherent to the dura and dentate ligaments, and the normally free plane between the arachnoid and the dura was not found at the time of surgery. Presumably, this type of lesion would arise by means of a mechanism similar to that for other idiopathic arachnoid cysts; neither patient had any history of trauma, hemorrhage, or inflammation.1 Interestingly, the webs were not visible on either the preoperative MR images or the CT myelograms. Both patients were treated by wide resection of the arachnoidal web, and the spinal cord assumed a normal shape immediately.

The pathophysiological mechanism of the disorder appeared to be blockage of CSF flow by the web, with enlargement of the dorsal subarachnoid space and spinal...
cord compression. One could hypothesize that the constant pulsation of CSF pressure waves along the dorsal subarachnoid space causes alterations in perivascular spinal cord fluid dynamics. This imbalance in the hydrostatic pressures exerted on the spinal cord on its ventral and dorsal surfaces could lead to cord deformation at the site of the web and syringomyelia below the lesion. Such a mechanism has been proposed for the syringomyelia that frequently accompanies Chiari I malformations and chronic spinal cord trauma.11

Conclusions

The presentation of two patients with such strikingly similar clinical, radiographic and operative findings suggests that thoracic arachnoid webs may be a rare variant of arachnoid cyst malformations. Prompt diagnosis and surgical treatment can be expected to provide excellent relief of neurological symptoms and signs. As has been true in other series of patients with arachnoid cyst, pain relief may be unpredictable following surgical treatment.8–10
References


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Address reprint requests to: Christopher G. Paramore, M.D., 511 MEB, 1813 6th Avenue South, Birmingham, Alabama 35294.
email: paramore@uab.edu.