Horner syndrome was observed to be associated with lesions at the lower cervical level. In general, motor weakness predominates over sensory abnormalities. Although symptoms manifest in a progressive manner, remission and fluctuation have been reported in 30% of cases. Also, exacerbation of symptoms due to the Valsalva maneuver and the head-up position has been observed.

We have encountered an unusual presentation of an extradural arachnoid cyst located in the retroperitoneal space. The patient complained of abdominal discomfort without any evidence of neurological compromise. The lesion was placed in retroperitoneal space without compression of neither spinal thecal sac nor nerve root.

**CASE REPORT**

A 26-year-old man presented with abdominal discomfort mainly over the right lower quadrant for 4 months. Although the patient did not have any significant medical or surgical past history, L4 hemivertebra had been incidentally found during a retroperitoneal Spinal Extradural Arachnoid Cyst Combined with Congenital Hemivertebrae

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Spinal extradural arachnoid cysts usually cause symptoms related to spinal cord or nerve root compression. Here, we report an atypical presentation of a spinal extradural arachnoid cyst combined with congenital hemivertebra which was presented as a retroperitoneal mass that exerted mass effects to the abdominal organs. On image studies, the communication between the cystic pedicle and the spinal arachnoid space was indistinct. Based on our experience and the literature of the pathogenesis, we planned anterior approach for removal of the arachnoid cyst in order to focus on mass removal rather than ligation of the fistulous channel. In our estimation this was feasible considering radiologic findings and also essential for the symptom relief. The cyst was totally removed with the clogged ‘thecal sac-side’ end of the cystic pedicle. The patient was free of abdominal discomfort by one month after the surgery.

Key Words: Abdominal discomfort · Cystic pedicle ligation · Extradural arachnoid cyst · Retroperitoneal mass.
the cystic pedicle was cone-shaped and appeared to be clogged (Fig. 3).

Although in usual circumstances removal of a spinal extradural arachnoid cyst focuses on exploration and ligation of the fistulous channel\(^1\), a direct anterior retroperitoneal approach to the cyst was planned in this case, considering that removal of the main mass in the retroperitoneal space was essential for symptom relief, and that the communication between the cyst and the spinal subarachnoid space was unlikely. This decision was based on our experience with spinal extradural arachnoid cysts without identifiable communication points on imaging, in which detachment from the spinal cord was feasible and did not require ligation of the cystic origin. The literature also supported this concept of noncommunicating spinal extradural arachnoid cysts\(^5,12\).

The patient was placed in a “three-quarter lateral” position, and an incision was made along the lateral margin of the rectus abdominis muscle. After retraction of peritoneum and dissec-
tion through the retroperitoneal fat, the right kidney was noted. The cyst was identified below the right kidney and was placed on the surface of psoas major muscle (Fig. 4). The cyst was displacing the inferior vena cava ventrally. For convenient dissection, internal decompression was performed; the cyst contained a clear liquid. The pedicle of the cyst originated from the intervertebral foramen, and the remaining cystic pedicle could be removed en bloc by undermining into the intervertebral foramen and gently drawing it. After the removal was completed we explored the cystic pedicle of the specimen with a blunt probe and observed that the 'thecal sac-side' end was clogged (Fig. 5). The final tissue pathology diagnosis was reported to be consistent with an arachnoid cyst (Fig. 6).

During the postoperative period, the patient did not complain of any symptoms other than postoperative pain. Flatus was passed on the first postoperative day, and the patient was discharged on the sixth postoperative day without any problem. A postoperative lumbar MRI was obtained one month after surgery and demonstrated no residual cyst and intact thecal sac without evidence of cerebrospinal fluid (CSF) leakage (Fig. 7). After the subsidence of postoperative pain, the patient was free of any abdominal discomfort.

**DISCUSSION**

Although the pathogenesis of spinal extradural arachnoid cysts has not yet been clarified, extradural arachnoid cysts are thought to be diverticula of the arachnoid membrane due to a dural defect which can be either congenital or acquired following events such as spinal surgery, trauma, infection, or percutaneous procedure. The location of diverticula is known to be most commonly occurring at the junction of the theca and the nerve root sleeve followed by dorsal midline and the nerve root sleeve itself.

At first the cysts must be merely small diverticula of arachnoid space and should get enlarged to cause any symptom. Several mechanisms have been postulated in order to explain the progressive nature of spinal extradural arachnoid cysts. Active fluid secretion from the lining cells of the cyst was proposed. But this could not explain observation that secretory cells were frequently absent in the lining. Osmosis of water was also proposed considering xanthochromia of the cystic contents. The osmotic pressure of xanthochromic fluid is higher than that of tissue fluid. More feasible explanation comes from the pulsatile nature of CSF. Intrathecal CSF dynamics change greatly by elevation of intra-abdominal pressure and this is far more influential than pressure change during the respiratory cycle. The change in intra-abdominal pressure result in enlargement of the cystic sac and persistent CSF pulsation cause continuous growth of the cyst under the law of Laplace. One-way valvular mechanism was followed in order to complement the relationship between imposed hydrostatic pressure and continuous cystic growth. Folds of meninges at the ostium of the cyst can act as a flap-like one-way valve, or rather slit-like communication with the subarachnoid space results in one-way valve. More recently, a ‘ball-valve’ theory was proposed to explain the valvular mechanism. When intrathecal pressure surges, the spinal arachnoid space is communicated with the cystic space and fluid flows...
into the cyst. As intrathecal pressure goes down, the cyst body exerts a force to impede the cystic pedicle following the law of Laplace as the cyst has the larger radius and therefore has the greater wall tension than the cystic pedicle. This is actually a two-way system of unequal flow, however, CSF is trapped in the cystic space.

Various imaging modalities have been used to identify tissue communication points; however, CT myelography using water-soluble contrast media has been the study of choice for illustrating the location of communication points between the cyst and the spinal thecal sac. More recently, there has been a report using cinematic MRI for detecting dural defects. There have been cases in which the cyst was not filtrated by contrast media, or the pedicle was unidentifiable. In our case, the patient has brought MR myelography from the referring hospital and refused additional CT myelography. The cystic pedicle and its communication with the spinal arachnoid space can be determined using MRI and MR myelography.

To date, removal of extradural arachnoid cyst has focused on obliterating the fistulous channel, that is, the pedicle. Choi et al. reported a case of spinal extradural arachnoid cyst which was removed following ligation of the fistulous channel, and reviewed 17 additional cases of spinal extradural arachnoid cyst which was either excised or ligated in a similar manner. Kulkarni et al. reported that, in their 7 cases of spinal extradural arachnoid cysts, they could not identify any connection between the cyst and the spinal arachnoid space in the operative field. In contrast, Cloward reported that communication was verified in 43 of 92 cases of congenital spinal extradural arachnoid cysts. Although there was no identifiable communication with the spinal arachnoid space, the characteristics of the cyst contents match that of CSF in the majority of cases. McCrum and Williams explained the formation of these cysts without communication using osmosis or an active secretion mechanism previously mentioned.

It has been proposed that the communication between extradural arachnoid cysts and the subarachnoid space gradually decreases as the pressure gradient fades and eventually becomes nonexistent. In other words, spinal extradural arachnoid cysts may or may not communicate with the spinal subarachnoid space depending on the stage of evolution. What can be deduced from this theory is that, if the communication is not detectable on imaging studies, the probability of communication disruption is high, so that, when deciding on the surgical plan, it is possible to disregard ligation of a fistulous channel in the cystic pedicle. In the current case, communication of the cyst pedicle with the spinal subarachnoid space was not detected on MR myelography, and the cystic pedicle was confirmed to be clogged.

CONCLUSION

This is an atypical presentation of a spinal extradural arachnoid cyst which extended into the retroperitoneal space, and was combined with a congenital vertebral malformation. The cystic pedicle was not communicating with the spinal arachnoid space on image study and the cyst was removed in en bloc manner with clogged ‘thecal sac-side’ end of the cystic pedicle by an anterior approach. This case supports the hypothesis that, when the cystic pedicle is not identified on image study, removal of the cyst without ligating the fistulous channel can be possibly done.

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