Surgical Evaluation and Management of Symptomatic Lumbosacral Meningeal Cysts

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Abstract
Sacral meningeal cysts are a fairly common finding in the workup of sciatica. In most instances, a cyst causes no symptoms. Occasionally, a symptomatic sacral cyst may present with chronic low back pain (radiculopathy), sensory loss in sacral dermatomes, perineal pain, or bowel or bladder dysfunction. Compared with computed tomography, magnetic resonance imaging shows meningeal cysts more often and allows better localization of sacral cysts.

In this article, we present clinical guidelines that may be used to distinguish symptomatic cysts from asymptomatic cysts. We conclude that surgical treatment of a symptomatic cyst may include laminectomy with fenestration and imbrication of the cyst—or percutaneous treatment methods. Surgery for sacral meningeal cysts can lead to successful improvement of pain and function in activities of daily living in more than 80% of cases.

Sacral cysts are a fairly common finding in the workup of sciatica. On myelography for investigation of leg and back pain, the incidence of sacral cysts is 17%. On magnetic resonance imaging (MRI) of 500 asymptomatic patients, the incidence is 4.6%. These cysts are usually considered incidental findings on MRI investigations, but occasionally they may cause sciatica and other symptoms such as bowel and bladder problems and perineal pain. In this article, we describe the clinical presentation, the MRI and computed tomography (CT) findings, and the surgical treatment options for sacral meningeal cysts.

Types of Sacral Cysts
In 1988, Nabors and colleagues classified sacral cysts into 3 types—extradural cysts (type I); extradural cysts with nerve roots included within the cyst, including the Tarlov perineural cyst (type II); and intradural cysts (type III). Most sacral meningeal cysts are dural diverticula that are of congenital or acquired onset and that may develop a pedicle with an ostium that works in an all-valve fashion to collect cerebrospinal fluid (CSF). Normal fluctuations in CSF pressure may account for growth of the cyst and erosion of adjacent bone surfaces.

Type I extradural meningeal cysts are dural diverticula that may arise anywhere along the thecal sac. Type I sacral cysts often have a pedicle at the caudal tip that connects to the thecal sac adjacent to dorsal nerve roots.

Type II cysts are dilations of the nerve root sleeve. The dura may have tears, which can be microscopic to fairly large. The wall of type II cysts contains nerve root fibers. Bone erosion (eg, canal-widening pedicular erosion, foraminal enlargement, scalloping of vertebral bodies or sacrum) is usual in type II cysts. Figure 1 shows types of extradural cysts that may be surgically treated.

Figure 1. Variation of connection of extradural cyst to the dura. A narrow pedicle can be ligated if there is no nerve root involvement in the cyst wall of the pedicle. The large and small rents may be oversewn to seal the cyst from the dura.
Type III cysts are intradural and may occur anywhere along the posterior subarachnoid space. In compression, symptomatic type III cysts act as any intradural masses may. The Table lists the meningeal cyst cases found in the literature and classifies them by type.

### Clinical Presentation

Symptomatic sacral cysts may present in various forms. Typically, a patient complains of low back pain for several years. The patient has minimal neurologic deficits, absent deep tendon reflexes, and bowel and bladder abnormalities, including constipation, incontinence, or recurring urinary tract infections. Usually, the lower extremity sensation is spared. Radicular pain often is relieved or disappears when the patient is recumbent, and it is aggravated often by the Valsalva maneuver. Perineal pain may be present in approximately 50% of patients. Sacral meningeal cysts have been associated with childbirth, papilledema, sacral fracture, neurofibromatosis, and dysraphism of the caudal spine.

### MRI and CT Findings

MRI is the best single test. Compared with CT, MRI shows meningeal cysts more often and allows better localization of sacral cysts. MRI determines whether cysts are filled with fluid and thereby excludes solid tumors. When the signal intensity of the mass is the same as that of the thecal sac, a diagnosis of CSF-containing structure may be confidently made. MRI shows a higher intensity on T2 weighting compared with CSF, probably related to increased protein and solute content and absence of CSF motion effects. Tsuchiya and colleagues stated that MRI with myelography may be especially sensitive with postoperative patients because myelographic material may highlight cysts despite the bony changes related to surgery or the scalloping associated with the cyst itself. Figure 2 shows meningeal cyst changes in the lumbosacral area on MRI.

Routine radiographs of the sacrum and lumbar spine may show bone erosions, but this result is uncommon. CT myelogram is important in determining whether a cyst communicates with the subarachnoid space. If intrathecal dye does not fill the cyst even with some delay, then simple oversewing of the posterior cyst wall is all that is required. If the cyst communicates with the subarachnoid space, the pedicle or communication must be found and ligated to prevent recurrence of the cyst. CT myelogram may show the presence or absence of the free communication of the cyst with the spinal subarachnoid space. Delayed myelographic images are important and may show an extradural arachnoid cyst that fills slowly through a small pedicle connecting the cyst with the thecal sac. Myelography may produce a false-negative result if the pedicle of the cyst is too narrow to allow entry of intrathecal contrast material. Another problem is that CT seldom shows sacral roots, except S1, because CT is limited to pedicle-to-pedicle scanning in most cases, and lumbar CT seldom is ordered below L5-S1. CT of the lumbar and sacrum, sacral tomography, and epidurography and intraoperative ultrasound may be helpful but remain unproved in any large number of cases.

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**Figure 2.** Sagittal magnetic resonance imaging views of 2 lumbosacral meningeal cysts. The L4-L5 cyst, which extends into the left foramina, was causing radicular pain in the left leg.

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**Table. Literature Review for Meningeal Cysts**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Extradural Type I</th>
<th>Extradural Type II</th>
<th>Intradural Type III</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. patients</td>
<td>67</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>Cyst location</td>
<td>Throughout spine</td>
<td>Lumbosacral</td>
<td>Throughout spine</td>
</tr>
<tr>
<td>Cyst size</td>
<td>2–5 cm</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>Surgery</td>
<td>Laminectomy cyst excision</td>
<td>Cyst wall excision, oversewing</td>
<td>Cyst excision</td>
</tr>
</tbody>
</table>

**Authors' Clinical Guidelines**

Clinical guidelines for distinguishing a symptomatic cyst from an asymptomatic cyst are useful.

First, it is important to rule out any other possible causes of back and leg pain. It is absolutely necessary not to ascribe complaints of back and leg pain to a cyst unless it is reasonably certain that the cyst is causing the pain. Unfortunately, this is not always possible, and there is not a reliable test for determining the clinical relevance of a sacral cyst. It is important to rule out disc herniation, spinal stenosis, and spondylolisthesis as causing the patient's pain.

Second, it is important to determine that the cyst corresponds anatomically to the patient's complaints. A symptom-producing sacral cyst should cause sacral radiculopathic symptoms, with radiculopathy to the buttock and S1 distribution in the leg associated perhaps with bowel or bladder symptoms. The symptoms should correspond anatomically with the cyst; they should correspond to the same side as the cyst and to symptoms affecting the same level of nerve roots as the cyst location suggests.

Third, it is useful to see whether pulsatile changes in CSF pressure increase symptoms. Postural changes in CSF pressure may affect complaints. Radicular pain often is relieved or disappears when the patient is lying down. Increased pain with Valsalva maneuver, cough, or sneeze tends toward a diagnosis of symptomatic cyst.

Fourth, aspiration of the meningeal cyst may be diagnostic of a symptomatic cyst if the symptoms decrease at least temporarily. This may be done with CT or fluoroscopic guidance. Aspiration may be repeated if initially successful and symptoms recur. If all 4 criteria are met, then it is reasonable to suggest that a cyst is symptomatic (Figure 3).

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**Evaluation and Treatment Algorithm: Symptomatic Sacral Cyst**

**Consider Diagnoses**
- Low back sprain
- Osteoarthritis
- Herniated disc
- Spinal stenosis
- Spondylolisthesis
- Instability

**Consider Diagnoses**

Patient with a sacral cyst and
- Chronic low back pain
- Normal lower extremity sensation
- Absent deep tendon reflexes
- Bowel and bladder abnormalities

**Yes**

Does the cyst cause back and leg pain?

Rule out non-sacral etiology of pain

MRI, CT-myelography

Electromyography

Postural changes: recumbent and Valsalva

**No Pain Relief**

Diagnostic aspiration relieves pain?

**Yes**

Repeat aspiration

Percutaneous drainage of the cyst

Closure of the cyst with fibrin glue

**Failure of treatment may require additional testing and treatment consistent with greater level of severity**

**Surgical treatment—Considerations**

1. Delay of 2-6 months to allow conservative treatment
2. Documented failure to respond to treatment; physical signs and radiographic findings of a surgically treatable lesion
3. Goal is correction of pathological condition, to attain functional recovery.

**Surgical treatment**

Decompression laminectomy with

Oversewing of cyst neck and partial or total excision of the cyst

Shunting of cerebrospinal fluid from the cyst to the subarachnoid space

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**Figure 3.** Evaluation and treatment algorithm for symptomatic sacral cysts.
Surgical Treatment

Surgical management usually includes extensive bony decompression with laminectomy alone or combined with either partial resection and oversewing of the cyst or total cyst excision, which may include sacrifice of the involved sacrococcygeal nerve roots. Additional treatments may include cyst drainage (percutaneous aspiration or external drain placement); incision, drainage, and plication of the cyst wall; CSF shunting to the peritoneum or the subarachnoid space; and closure of the connection between the cyst and the thecal sac. Type I meningeal cysts are treated by closing the pedicle between the cyst and the subarachnoid space. With type II meningeal cysts, because there is no pedicle to block off, the aim of surgery is to obliterate the cyst by partial resection and oversewing of the cyst wall. One must move or protect the nerve roots if they are within the wall of the cyst, as in the Tarlov variety of type II cysts. Type III intradural cysts should be excised by marsupialization, opening to the surrounding intradural fluid. These cysts are likely to recur. Recently, cyst drainage, either percutaneous or open, has been recommended to decrease symptoms, but cysts treated this way are likely to recur. In 2001, Morio and colleagues reported on a case successfully managed with cyst subarachnoid shunting (as a variation). In a preliminary report, Patel and colleagues suggested that fibrin glue may be definitive therapy for sacral meningeal cysts. They extended their method for sealing dural tears to a CT-guided percutaneous procedure for delivering fibrin glue to sacral cysts. Aseptic arachnoiditis has been a worrisome complication of this percutaneous glue technique.

The most popular treatment may be a combination of laminectomy, fenestration, and drainage of the cyst; blockage repair of the communication with the arachnoid space; and suture use, perhaps supplemented with as-needed placement of fibrin glue to seal drainage. Figure 4 (A–C) shows a symptomatic extradural cyst that was ligated at its base and aspirated. The surgical outcome was good, but the patient reported having mild radiculopathy-type pain without weakness intermittently at the 6-month interval; at the time of his report, this pain was improving.

Summary

Sacral meningeal cysts have fascinated spine surgeons for decades. In most instances, these cysts are asymptomatic. It is necessary to relate complaints of back and leg pain to a cyst only when it is reasonably certain that the cyst is causing the pain. Unfortunately, although MRI and CT can be used to determine the presence of a meningeal cyst, there is no reliable test for determining the clinical relevance of this cyst. Clinical guidelines are used to distinguish a symptomatic cyst from an asymptomatic cyst. Treatment options for a symptomatic sacral meningeal cyst range from aspiration and shunting of the cyst to laminectomy and closure of the communication of the cyst with the thecal sac. Percutaneous treatment with fibrin glue is interesting but may have residual aseptic arachnoiditis as a complication.
References


Editorial

this is what all patients perceive and dread. It seemed so long and I never really slept. Each time a medication was due or a nursing procedure needed, the nurse would say that she’d be there as soon as she could, but it seemed forever before she returned with the medication or whatever. There was something about inefficiency in the pharmacy; that the nurses couldn’t just get the ordered medications themselves when they are due. I loved the old days when I was a resident. The nurse and I would round with a cart with bottles of pills and the charts. If the patient wanted or needed something, it was dispensed and charted on the spot. Efficient patient care, but “someone’s” concern about potential drug abuse by doctors and nurses, the possibility of dosage mistakes, and, obviously more important, the failure to properly bill the patient, have led to the computerized infallible, but possibly less efficient system.

Finally, the day came, and, eager to take the first train out of Dodge, I thanked my surgeon, felt immensely better than before the surgery, and received my discharge diploma. I don’t know whether I learned anything new, but I certainly experienced the ebb and flow of emotions that many of my more perceptive patients feel. Certainly the inpatient medical care has improved over the years. The respiratory therapist and his instructions and equipment have improved. The OTs and PTs were there and efficiently rendered their instructions and advice. The preoperative, operative, and recovery room processes are professionally rendered and appropriate, although the recent well-intended JCAHO requirements result in a three-stooges comedy routine, with everyone indiscriminately going through the same questions over and over again. Possible nursing shortages and perhaps inpatient pharmacy issues may exist, but perception and reality may not coincide. Nonetheless, I now know what my patients can expect and can respond with some level of understanding. My fellow surgeons, if you have to have surgery, you will appreciate the "education."