Lumbar Intraspinal Synovial and Ganglion Cysts (Facet Cysts)
Ten-Year Experience in Evaluation and Treatment

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Study Design. This study analyzed the clinical history, physical examination, diagnostic studies, and operative and histologic findings in 19 patients with lumbar intraspinal synovial and ganglion facet cysts evaluated and treated over a 10-year period.

Objectives. The results were correlated to provide a greater understanding of the nature of lumbar facet cysts and rationale for conservative or surgical treatments.

Summary of Background Data. The 19 patients included 13 women and 6 men ranging in age from 38 to 70 years. 84.4% of the patients presented with radicular pain. 26.3% had significant motor deficit. 68.4% of the facet cysts were found at L4-L5, 21.1% at L5-S1, 5.2% at L1-L2, and 5.2% at L2-L3. Their clinical pictures, imaging studies, and surgical and histologic findings were correlated in a retrospective fashion.

Methods. The clinical history and findings on physical examination, standard radiography, myelography, computed tomography-myelography, facet arthrography, post-facet arthrography, magnetic resonance imaging with and without contrast, and computed tomography scans were reviewed.

Results. Bilobed cysts were found on both dorsal and ventral aspects of the involved facet joints within and outside of the spinal canal on facet arthrography, computed tomography, magnetic resonance imaging, and at the time of surgery in more than 60% of the patients. Significant facet degeneration was found in 75% of standard radiographs, and in all of the magnetic resonance imaging and computed tomography scans. In six patients, symptoms improved with rest, medication, and bracing. Epidural corticosteroid injections provided short-term relief in three out of four patients. Facet corticosteroid injections provided good relief in one, partial relief in one, and no relief in one patient. Surgical decompression in eight patients resulted in three excellent, four good, and one fair outcome.

Conclusions. Most of the lumbar intraspinal facet cysts were associated with significantly degenerated facet joints. Patients with intraspinal facet cysts may respond to conservative treatments if there is no significant neurologic deficit. Surgical decompression and removal of large facet cysts usually are successful in relieving symptoms. [Key words: facet degeneration, ganglion cysts, intraspinal facet cysts, lumbar spine, synovial cysts] Spine 1995;20:000-000

Synovial and ganglion cysts may arise from periarticular tissues, most commonly in the extremities at the wrist, knee, ankle, and foot. Juxta-articular cysts in the spine are less common. Intraspinal “synovial cysts” and “ganglion cysts” have been defined, although it is not clear whether they are two completely separate entities. Histologically, a true synovial cyst has a surrounding lining of synovial-like epithelial cells. A ganglion cyst does not have synovial lining. It has a collagenous capsule or fibrous wall surrounding myxoid material. Some authors have suggested that a synovial cyst may evolve into a ganglion cyst, and others have proposed that a ganglion cyst may develop a synovial lining over time. Histologic studies have demonstrated the presence of both synovial and ganglion cysts within the spine, although the term “intraspinal synovial cyst” is more frequently used in the literature. Because our patients had both synovial and ganglion cysts that were associated with the facet joints, the term “intraspinal facet cysts” will be used in the present report.

In general, the literature, which consists of mostly case reports, has emphasized the rarity of this condition in the spine, although we were able to find more than 65 articles, representing at least 120 cases. The largest reported series of lumbar intraspinal cysts described 10 patients.

Over the years, various diagnostic studies have been used to identify intraspinal facet cysts. These include myelography, computed tomography (CT), CT myelography, facet arthrography, post-facet CT arthrography, and magnetic resonance imaging (MRI) with and without contrast agent. Treatment methods have ranged from bed rest, bracing, percutaneous needle aspiration, and facet corticosteroid injection to surgical removal of the cysts.

In this report, we present our experience with 19 documented lumbar intraspinal facet cysts evaluated
and treated over a 10-year period. Our methods have evolved with the development of new technologies.

### Materials and Methods

Nineteen patients were evaluated and treated for lumbar intraspinal facet cysts between January 1982 and June 1992 at St. Mary's Hospital and Medical Center, San Francisco, California. The clinical history, physical examination, diagnostic studies, and operative and histologic findings were reviewed. There were 13 women and 6 men in the study group. Their ages ranged from 38 to 79 years, with an average age of 58. Follow-up with physical examination and diagnostic studies were performed in 14 patients, with a range of follow-up of 1.5 to 8 years. In five patients, follow-up ranged from 2 to 11 months. Fifteen patients were studied with standard radiography of the lumbar spine, including oblique projections. (Figures 1A, 2A)

Three of these patients underwent lumbar myelography followed by CT myelography of the involved areas. (Figures 1A; 3C; 4A, B; 5A, B) Twelve patients had routine CT scans of the lumbar spine. (Figures 1B; 2B, D, E; 3B; 6A; 7A; 8A, B; 9D, E)

Nine patients had magnetic resonance examinations of the lumbar spine. (Figures 1C, D; 5C; 6B, C; 7B, C; 9A, B, C) and two patients were injected with gadolinium diethylenetriamine penta-acetic acid (Magnevist; Berlex Laboratories, Cedar Knolls, New Jersey) (Figures 1D, B).

In three patients, facet arthrograms were performed (Figures 1E, 5D) and then CT scans were obtained. All CT scans were performed on either a General Electric 9800 (General Electric, Milwaukee, WI) or a Technicare 2060 (Solon, OH) scanner. The magnetic resonance examinations were obtained using a General Electric 1.5 Tesla superconducting unit, a .03 Tesla Fonar (Melville, New York) 500 permanent magnet, or a Resonex (Sunnyvale, California) R4000. All magnetic resonance examinations included T1-weighted axial scans (TR 600–800, TE 20) and T2-weighted (TR 2000, TE 80–100) sagittal sequences. The slice thickness varied from 3 to 5 mm, depending on machine and technique used. Additional T2-weighted axial scans were obtained in three (flip angle, 10°–15°). All patients initially were treated with conservative measures. Eight patients required surgical intervention. Epidural corticosteroid injections were performed in four patients.

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**Figure 1.** (A) Oblique projection of plain film series demonstrates severe degenerative changes at the right L4-L5 facet of a 57-year-old woman. (B) Computed tomography axial view demonstrates partially calcified cyst. Note the presence of cystic masses ventral and dorsal to the degenerated facet joint. (C) Magnetic resonance imaging axial T1-weighted image (TR 800/TE 30) reveals increased signal intensity of inner rim with low signal emanating from the center of the cyst. (D) Sagittal T2-weighted image (TR 2000/TE 60) shows uniform decrease in signal intensity in this lesion. (E) Post-facet arthrogram CT scan demonstrates contiguity of the bilobed ventral and dorsal facet cyst. **Figure 2.** (A) Lateral radiograph of a 46-year-old woman in September 1984 reveals mild degenerative changes at L4-L5. (B) Computed tomography axial image in October 1986 demonstrates noncalcified cyst off right L4-L5. Patient was treated with corticosteroid injection of facet joint and conservative management. (C) Lateral radiograph in February 1991 reveals degenerative spondylolisthesis of L4 on L5. Computed tomography scan with (D) axial and (E) sagittal reconstructed images demonstrate severe facet degeneration and bony erosive changes. The cyst disappeared spontaneously.
Figure 3. (A) Myelogram localizing posterolateral extradural defect at L5-S1 on the right side in a 72-year-old woman. (B) Computed tomography axial scan demonstrates large cyst occupying approximately 50% of the spinal canal. (C) Post-myelogram CT scan—axial view of same patient.

Injections of corticosteroid into the involved facet joints were performed in three patients (Figure 9). Findings were incidental in three patients. Seven surgical specimens were histologically examined. Patients' clinical history, physical examination, imaging modalities, and operative and histologic findings were correlated in a retrospective fashion.

Figure 4. (A) Computed tomography myelogram of a 72-year-old-man in November 1983 demonstrates mild degenerative changes at L1-L2. (B) Computed tomography myelogram in May 1990 at the same level demonstrates development of a cyst with air in the central cavity that is contiguous with facet vacuum.
Results

Nineteen intraspinal facet cysts were identified in 19 patients. Thirteen of the involved facet cysts were identified at L4—L5, four at L5—S1, and one each at L1—L2 and L2—L3. Seven patients reported only radicular pain, lasting 6 weeks to 29 months and averaging 8 months. Nine patients complained of back and lower extremity pain. Three patients had only back pain. In the above 12 patients, the duration of back pain was 3 months to 20 years, with an average of 7 years.
Physical examination revealed tenderness over the involved facet joints in 12 patients. Facet maneuvers with lumbar extension and lateral bending to the side of the lesion increased the back pain or radicular pain in five patients. In one patient, manual compression of the involved facet joint caused reproduction of radicular pain. The straight leg raising test was positive in seven. Femoral nerve stretch test was positive in five. Significant motor deficits were noted in five patients. Sensory changes were found in eight patients.

In 10 of the 15 patients, standard radiographs demonstrated degenerative changes at the involved facet joints manifested by joint space narrowing and bony overgrowth (Figure 1A). Facet subluxation and degenerative spondylolisthesis were identified in three. Three myelograms demonstrated posterolateral extradural filling defects in three patients (Figure 3A).

On CT scan, the density of the facet cysts varied significantly. In five of the patients, the scan appeared to be completely cystic. In two of the patients, a rim of calcification was identified, suggesting ossification within the capsule (Figure 6A). Diffuse calcification was scattered throughout the cyst in three patients (Figures 1B, 9D, E). In two patients, a focal globular area of calcification was identified within the contents of the cyst itself. The cysts varied in size from 5 to 16 mm. Erosion of the cortical bone in the adjacent articulating facets was identified in one patient, and in another, air was identified within the cyst and communicated with air within the facet joint. All of the facet cysts were identified as extradural masses adjacent to the facet ligamentum flavum within the spinal canal. Compression of the dural sac or nerve roots was identified in all patients. In eight patients, the soft tissue mass appeared to involve both the dorsal inferolateral and the ventral superior-medial aspects of the involved facet joints. These lobed or dumbbell shaped lesions were otherwise similar in their CT appearance (Figure 1B).

The magnetic resonance appearance of the facet cysts on T1-weighted axial scans was characteristic. In all instances, independent of CT density, the facet cysts were of increased signal intensity compared with the cerebral spinal fluid on T1-weighted axial scans (Figure 6B). Signal intensity was nearly the same or slightly increased when compared with the adjacent ligamentum flavum. The cysts were of variable signal intensity on all T2-weighted sequences (Figures 9B, 10C). At times, the facet cysts were extremely difficult to identify on sagittal T2-weighted sequences because of partial volume averaging and their variable signal intensity (Figures 6C, 7C). The capsule of the cyst had a well-defined, low signal intensity on T1- and T2-weighted sequences in only two patients. These patients had densely calcified rims on CT scans.

Injection of contrast material in the facet joints of three patients followed by CT scanning confirmed the continuity of the cysts with the involved facet joints (Figures 1E, 5D). In these three patients, similar findings were noted at the time of surgery. They were found to have dorsal involvement of the cyst at the facet joint (Figure 7F). As the paraspinal musculature was elevated, cystic material was found emerging from the facet joint before the spinal canal was exposed. Indigo carmine solution injected into the dorsal component of the cystic mass subsequently was found within the ventral component in the spinal canal. In our experience, indigo carmine localization of the synovial cyst facilitated complete surgical resection (Figure 7D).

Significant calcification noted within the cystic mass on CT was confirmed intraoperatively in two patients. A
chalk-like substance was found along with gelatinous or mucinous material within the mass at the time of surgery. In the others, no apparent calcification was visualized during surgery. Degenerated mucinous material was found to be enclosed in the fibrous cyst wall. The cystic mass compressed the dural sac or the nerve root in all cases. The dural sac had adhered to the cyst wall in three cases.

Histologic examination of the surgical specimens in four patients revealed that the cyst wall contained fibrous connective tissue without synovial lining. In one cyst, most of its wall was fibrous and devoid of synovial lining cells, except at the base adjacent to the facet joint where the synovial cells were evident (Figures 7E, F). In the others, the internal surface of the fibrous wall was lined with a layer of synovial-type cells. Amorphous proteinaceous substance was found in the cyst interior. Occasionally, hemosiderin deposits, small fragments of calcified structure, bone, or cartilage were found.

Other significant spinal pathologies were found in the lumbar spine of eight patients. These included severe spinal stenosis in two, stenosis and disc herniation in two, multilevel disc degeneration and herniations in three, and tumor metastasis in one.

Of the 19 patients, 11 received nonsurgical treatments. Because the facet cysts were incidental findings in three, no treatment was directed to this condition in these patients. In six patients, symptoms improved with conservative treatment, including rest, medication, and bracing. Two patients were not included in follow-up. Epidural corticosteroid injections in four patients provided significant but short-term relief lasting 3 weeks to 2 months. One patient had no relief of symptoms. Facet corticosteroid injections were performed in three patients, with one having good relief, one partial relief, and one no relief. A 48-year-old woman received a facet injection for an L4–L5 facet cyst documented on CT scan (Figure 2B). After the injection, her symptoms improved for 5 months. However, more back pain subsequently developed. Repeat CT scan 4.3 years later revealed the disappearance of the cyst and development of progressive degenerative changes with erosion of subchondral bone and formation of cavities (Figures 2D, E). Serial radiographs over 6 years demonstrated a gradual development of degenerative spondylolisthesis at L4–L5 (Figure 2C).

Surgical decompression with removal of the facet cysts was performed in eight patients. We rated the results as follows.

Excellent: complete resolution of symptoms.
Good: marked improvement, occasional pain, occasional use of pain medication.
Fair: some improvement, need for pain medications, significant functional restrictions.
Poor: no change in symptoms, or worse.

There were three excellent results, four good results, and one fair result. The patients with excellent results had predominantly lower extremity pain of less than 1 year duration. The patient with a fair result had an 8-year history of low back pain and a 16-month history of lower extremity pain with associated severe degenerative disc disease and spinal stenosis.

Discussion

A literature review showed that most intraspinal synovial or ganglion cysts in the lumbar spine occur at L4–L5 and occasionally at L5–S1 and L3–L4. In the present study, 68.4% were at L4–L5, 21.1% at L5–S1, 5.2% at L1–L2, and 5.2% at L2–L3. Increased joint motion may predispose to facet joint osteoarthritis, degenerative spondylolisthesis, and cyst formation at the L4–L5 level, which generally has the most motion within the lumbar spine.

Degenerative arthritic changes and increased joint motion may lead to proliferation or herniation of articular tissue through a joint capsule defect, resulting in cyst formation. Although the term “intraspinal synovial cyst” is commonly used in the literature, previous studies have demonstrated the presence of lumbar juxta-
articular cysts with and without synovial lining cells. The series included both types of cysts. Notably, one cyst showed both features with most of its wall purely fibrous, except for the base of the cyst, which contained synovial lining cells. It was not clear whether these cells represented the advancing front or the retreating residual synovium. Yet, the finding of both features in one cyst supports the concept that the synovial cyst and nonsynovial cyst (ganglion or fibrous cyst) are not entirely separate entities.

Physical examination in 63% of our patients revealed palpable tenderness over the involved facet joints. With manual compression, radicular pain could be reproduced in one patient with CT scan, and MRI documented a bilobed, dumbbell configuration to the synovial cyst. Compression of the dorsal aspect of the cyst probably caused transmission of fluid pressure to the ventral portion of the cyst, resulting in nerve root irritation. In eight patients, the bilobed configuration of the cysts was documented on MRI, CT, post-facet CT arthrography, or at the time of surgery. Cystic masses were found on the dorsal and ventral aspects of severely degenerated and hypertrophied facet joints. Even conventional radiographs showed marked degenerative facet arthritis in 75% of those who had standard radiographs. Serial radiographs in one patient over a 6-year period also documented the gradual development of degenerative spondylolisthesis in the involved level. These findings suggest that cysts may be one manifestation in the progression and spectrum of facet degenerative changes.

There are various ways of making a diagnosis of intraspinhal facet cyst, including myelography, CT scan, facet arthrogram-CT scan, and MRI. Magnetic resonance imaging appears to offer the best means of visualizing the cyst, especially with the use of contrast agent.
Yuh et al. reported five cases of intraspinal synovial cysts evaluated with noncontrast MRI and MRI using gadolinium diethylenetriamine penta-acetic acid. They demonstrated early enhancement of the solid component and cyst periphery, delayed enhancement of the cyst, persistent enhancement of the solid component and cyst capsule, enhancement of the facet joint, and recognition of possible connection between the cyst and the joint space. Yuh et al speculated that the MRI solid component represented the isolated dense hypervascular fibrous connective tissue, which showed immediate and persistent enhancement.

Although synovial cysts are fairly characteristic, appearance of similar soft tissue mass in the epidural space requires consideration in the differential diagnosis of extruded or sequestered disc fragment, metastatic tumor, meningioma, schwannoma, neurofibroma with cystic degeneration, arachnoid cyst, perineural cyst, and dermoid cyst. Kao et al. classified extradural intraspinal cysts into the following three groups.

1. Perineural cysts (arising from dorsal root ganglion).
2. Arachnoid cysts (pedicle attachment to spinal dura near nerve root).
3. Juxta-facet cysts (ganglion and synovial cysts attached to periarticular connective tissue of facet joints).

Not all intraspinal synovial cysts are symptomatic, as shown by incidental findings in three of our patients. Spontaneous reduction or resolution of the cyst may occur with rest or bracing. Facet injection or aspiration may be attempted if the cyst is not calcified. Administration of corticosteroids with or without local anesthetics into the adjacent facet joint may improve or resolve the problem. Computed tomography scans pre- and post-facet injection in one patient in our series demonstrated the disappearance of the cyst after the intra-articular corticosteroid injection. Epidural corticoste-
roid injections provided symptomatic relief of up to 2 months in three of four patients in our study.

Such response to epidural injections may lead the physician astray regarding the actual diagnosis. When the cyst is partially or completely calcified, there is less likelihood of spontaneous shrinkage with aspiration or corticosteroid injection. Surgical decompression is indicated in the face of intractable pain and especially with significant neurologic deficit or cauda equina syndrome. Surgical decompression generally produces good relief from the radicular pain. If there also is significant instability with spondylolisthesis, fusion in addition to decompression may be necessary.

References


