

Lumbar Synovial Cysts of the Spine

An Evaluation of Surgical Outcome

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Objective: Our aim was to study the outcomes and results of surgically treated patients with synovial cysts of the lumbar spine in our institution.

Methods: Retrospective data from 39 consecutive patients, treated during the period of December 1996 to August 2004, were analyzed. Twenty-eight men (70%) and 11 women (30%) of mean age 63.3 years were studied. All pre- and postoperative signs, symptoms, extension/flexion radiographs, magnetic resonance imaging (MRI), and computed tomography (CT) with or without myelography were reviewed. All underwent surgery for synovial cysts with excision and decompression. Additional fusion in 26 patients was performed; 22 of them had degenerative spinal spondylolisthesis. Nine (23%) patients had prior decompression procedures, with three (8%) having had prior spinal instrumentation. Surgical outcomes were evaluated according to a questionnaire scoring system (scale of 1–4; 4 = excellent, 3 = good, 2 = fair, 1 = poor). Various preoperative attributes such as gender, age, weight, and height were analyzed to see if they had any effect on the outcome of surgery. Modified musculoskeletal outcomes data evaluation and management system (MODEM), questionnaire was provided to all; 24 (62%) responded. The following categories were determined: excellent (<20), very good (21–40), good (41–60), fair (61–80), and poor (81–100). Postoperative complications were also recorded.

Results: All patients had pain in their lower extremities, with 62% experiencing pain bilaterally. Ninety-five percent had pain in their back and 36% in the buttocks (36%). Eighteen (46%) patients had CT myelography. A total of 42 cysts were found. Two patients had bilateral cysts at L4–L5 level. Histology revealed two hemorrhagic cysts. The average duration of surgery was 231 minutes (range 92–391 minutes), and a mean blood loss of 930 mL (range 200–2500 mL) was recorded. Two operative dural tears and one postoperative wound dehiscence were observed. One patient had a recurrent synovial cyst at the site of original surgery. Eight patients (four each in the fusion and nonfusion group) had junctional degeneration and symptoms. A regression analysis performed on age, height, weight, and gender showed that they were not determining factors of surgical outcome. Surgery of spinal cysts at L4–L5 segment produced good and those at L5–S1 and

multilevel excellent results. Patients with spinal segment fusion had superior outcomes, with 80% having excellent or good outcomes versus approximately 70% without fusion. With the modified MODEM questionnaire, 22 of the 24 (92%) patients scored between excellent, very good, and good. Two patients scored in the fair range, and none of the 24 patients scored in the range of poor.

Conclusions: Spinal cysts are commonly found at the L4–L5 level, the site of maximum instability. MRI is the tool of choice for diagnosis. The etiology is still unclear, but underlying spinal instability has a strong association for formation of spinal cysts and worsening symptoms. Synovial cysts resistant to conservative therapy should be treated surgically. Resection and decompression with fusion remain an appropriate option. The optimal approach for patients with juxtafacet cysts remains unclear. The best surgical treatment approach for each particular individual appears to remain speculative.

Key Words: synovial cysts, lumbar, operative outcome, spondylolisthesis

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Since described first by Baker,^{1,2} synovial cysts are found throughout the body from adjacent joints. Synovial cysts of the spine may occur anywhere in the cervical,³ thoracic,^{4,5} and lumbar spine predominantly at L4–L5 level.^{5–16} In 1950, synovial cyst was for the first time described to cause symptoms of spinal nerve compression; Kao et al later confirmed this in 1968.^{17–19} To date the debate continues regarding the origin, cause, pathology, and best treatment of synovial cysts.

Improved imaging capabilities with computed tomography (CT) and magnetic resonance imaging (MRI) have increased the diagnostic yield and treatment options of spinal synovial cysts. Lumbar synovial cysts are known to cause various symptoms and signs such as painful radiculopathy, neurogenic claudication, and cauda equina syndrome.^{9,10,16,20,21}

To better understand the significance and treatment outcome of surgically treated lumbar synovial cysts, we report our experience with patients treated by open surgery in our spinal unit. Data from consecutive 39 patients were collected and analyzed with focus on their preoperative symptoms, radiologic/histologic findings, and postoperative surgical treatment outcomes.

CLINICAL MATERIAL AND METHODS

Data were retrospectively collected from 39 consecutive patients treated during the period of December 1996 to August

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2004. All underwent excision of synovial cysts at the Hospital of Special Surgery in New York.

Of these, 28 men (70%) and 11 women (30%) with a mean age of 63.3 years (range 43–81 years) were studied. Review of the computerized database was the main source of our study.

Presenting Signs and Symptoms

All pre- and postoperative signs and symptoms were reviewed. Patient preoperative symptoms included pain in the back, buttocks, and lower limb on one side or bilaterally. All preoperative and postoperative examinations were recorded. Patients were evaluated at the end of the first postoperative month; then, depending on their symptoms, further follow-up visits were arranged. These follow-up visits ranged from 18 to 92 months with an average of 26 months.

Diagnostic Imaging and Histology

All patients had dynamic flexion/extension radiographs (to assess the degree of spondylolisthesis), MRI, and CT with or without myelography of the lumbosacral spine. Radiologic imaging helped in the final diagnosis, preoperative planning, characterization, and marking of the level and number of synovial cysts. All possible samples retrieved during surgery were sent for histologic examination.

Surgical Evaluation and Outcome

All patients underwent surgery for cyst excision and decompression laminectomies to relieve symptoms. Additional lateral fusion procedure at or surrounding levels of the cyst was performed if the spine was deemed unstable before or after decompression.

All patients were reviewed according to a questionnaire scoring system (scale from 1 to 4) to evaluate the final success of surgery.

Excellent (score 4): complete resolution of symptoms

Good (score 3): minor, occasional pain

Fair (score 2): had improvement but still experienced a constant, lower degree of preoperative symptoms, had surgical complications or infections

Poor (score 1): continued to experience all preoperative symptoms

Various preoperative attributes such as gender, age, weight, and height were analyzed to see if they had any effect on the outcome of surgery. Other operative (type of procedure: decompression alone versus decompression/spinal fusion, duration of surgery, and cyst level) parameters were also reviewed to see the qualitative effect on outcomes. A statistical and regression analysis was performed to compare different parameters.

To assess functional outcomes and success of surgery, an 18-part comprehensive modified MODEM questionnaire was requested to be completed by all 39 patients. All efforts were made in this regard to contact all 39 patients. Contact was made during their follow-up visits, via mail, and, if required, by phone to ensure completeness. Individual responses were recorded, scored, and then summed to obtain an aggregate score. The following categories were determined by standard

MODEM guidelines: excellent (<20), very good (21–40), good (41–60), fair (61–80), and poor (81–100).

RESULTS

Presenting Signs and Symptoms

The 39 patients presented with varying symptoms including pain in the lower extremities (100%), back (95%), and buttocks (36%). Sixty-two percent of the patients experienced pain bilaterally in their extremities (Fig. 1). Other signs and symptoms included neurogenic claudication (82%), radiculopathy (79%), weakness of the lower extremity (87%), and paresthesia (23.1%). Fifteen percent of patients had increased pain with the Valsalva maneuver (Fig. 2). One patient experienced bladder dysfunction (increased urination).

Diagnostic Imaging and Histology

All patients had radiographs and MRI scans, 18 (46%) patients had CT myelography, and 21 (54%) had CT without myelography (Figs. 3 and 4). A total of 42 cysts were identified at various levels in the lumbar spine of 39 patients. Two patients presented with bilateral cysts at the same spinal level (L4–L5), and one patient had two cysts at consecutive levels (L4–L5 and L5–S1). Twenty-two were found on the left side and 20 on the right side. The cysts were most commonly found at L4–L5 (28/39 = 63%), with the L3–L4 segment having the next highest incidence (8/39 = 18%). Three and two cysts were found at L2–L3 and L5–S1, respectively. Thirty-two (82%) patients had associated degenerative spondylolisthesis.

Of the possible tissues retrieved during surgery, synovial tissue was found in 16 (41%) patients on histologic examination (Fig. 5). Two hemorrhagic cysts were found. Other tissues found were irregular calcification (7/39), hemosiderin deposition (6/39), degenerative enthesopathy (3/39), chondriod degeneration (2/39), myxoid degeneration (1/39), and metaplastic cartilage (1/39).

Surgical Evaluation and Outcome

All patients underwent decompression with excision of the synovial cysts, with a further 67% of the patients having lateral spinal fusion at or surrounding levels of the cyst along with decompression procedure. The mean duration of surgery was 231 minutes (range 92–391 minutes) with a mean blood loss of 930 mL (range of 200–2500 mL). Nine (23%) patients had prior decompression procedures, with three (8%) patients

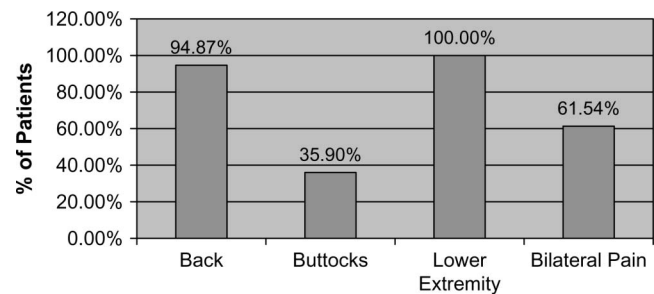


FIGURE 1. Showing distribution of pain.

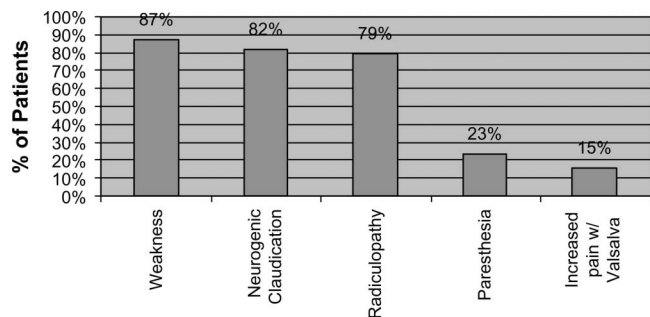


FIGURE 2. Showing different signs and symptoms.

having had prior spinal instrumentation. Two operative dural tears and one postoperative wound dehiscence were observed.

One patient had a recurrent synovial cyst at the site of surgery approximately 5 years after its removal. Eight patients (four each in the fusion and nonfusion group) had junctional degeneration and symptoms. Of the four in the fusion group, two underwent revision surgery with fusion above the level of the original surgery. Two of the nonfusion group await surgery (fusion), while all others are treated conservatively.

The following are results of different parameters studied to see if they were determining factors of surgical outcome: A regression analysis performed on age ($R^2 = 0.014$) showed it was not a determining factor of the outcome. Regression analyses showed no correlation between height and weight and surgical outcome ($R^2 = 0.0465$ and 0.00266 , respectively). With use of the assigned value scores, the mean outcomes of genders were also compared (female = 3.17 and male = 3.11). The final parameter examined was the duration of surgery. No significant relationship could be found for any of the variables or measured outcomes in either the MODEM or the value-based measurements.



FIGURE 3. A pre-operative sagittal MRI of the spine demonstrating a right synovial cyst at L4-5 level.

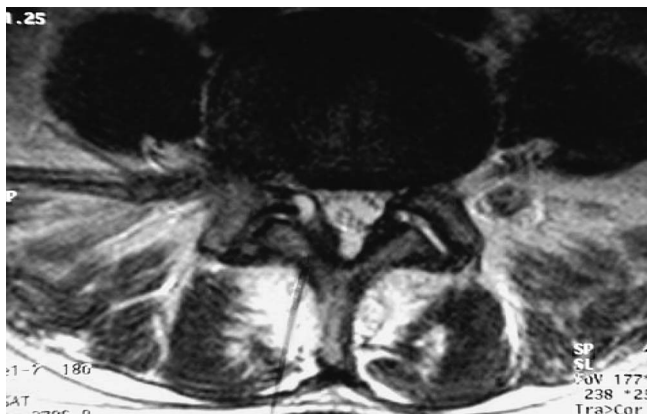


FIGURE 4. A pre-operative axial MRI scan showing a right synovial cyst at L4-5 level.

The effect of the cyst's spinal level was examined to determine if it affected the outcome. Patients with cysts at level L2–L3 had uniform response to surgery, with no single patient having complete resolution of symptoms. Cysts excised from the L3–L4 level had good or excellent results, except for one patient. Surgery of cysts at the L4–L5 region produced good outcome. Of note, the patient with L5–S1 synovial cysts and multilevel cysts (L4–L5 and L5–S1) had excellent results without any postoperative symptoms (Table 1).

The two surgical procedures used, namely, decompression laminectomies alone or with fusion, were analyzed to see if the type of procedure performed had any effect on outcomes. All 39 patients underwent decompression, with 26 (67%) having at least two spinal segments fused at or around the level of cysts. Patients with spinal segment fusion tended to have better outcomes, with 80% having excellent or good outcomes versus approximately 70% without fusion (Fig. 6).

Twenty-four (62%) of the 39 patients were enrolled for the MODEM questionnaire assessment. Twenty-two of 24 (92%) scored between excellent, very good, and good. Two

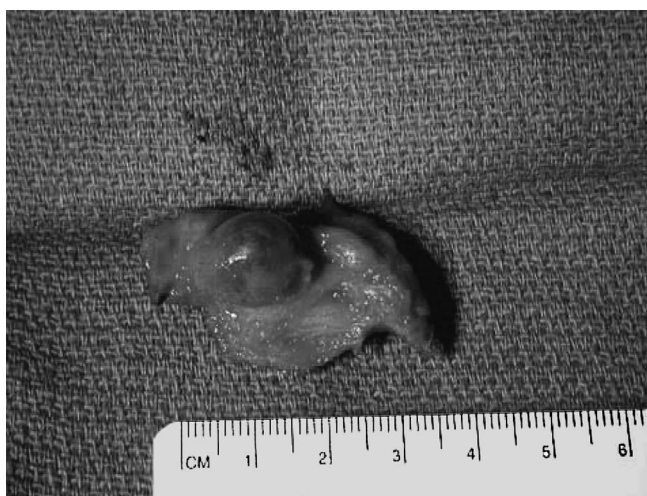


FIGURE 5. A synovial lumbar cyst retrieved from surgery.

TABLE 1. Effect of Level of Spinal Cyst Versus Outcome

	Poor	Fair	Good	Excellent	Total
L2–L3	1	1	1	0	3
L3–L4	1	0	3	4	8
L4–L5	2	4	8	12	26
L5–S1	0	0	0	1	1
L4–L5/L5–S1	0	0	0	1	1

patients scored in the fair range, and none of the 24 patients scored in the range of poor.

DISCUSSION

Presenting Signs and Symptoms

The clinical presentation of a cyst depends on its volume, site, and relationship to the surrounding bony and neural structures. Cysts may be asymptomatic and found incidentally.^{16,34} Most of the symptomatic patients present with radicular pain and neurologic deficits. A history of low back pain invariably precedes the radicular pain. In addition, clinical syndromes such as cauda equina,^{28,35} lateral recess,³⁶ and spinal stenosis syndromes^{8,21} have been described.

In our series, all patients had lower extremity pain, with 61% having pain bilaterally in the lower limbs and almost all (95%) with associated back pain. The demonstration of lower extremity weakness (87%) was also a consistent finding. Only 15% had pain on Valsalva maneuver. Our findings were consistent with reports found in other surgically treated cases in the literature.^{9,13,16,24,27}

Diagnostic Imaging and Pathology

CT scanning and MRI are the two neurodiagnostic imaging modalities recommended for characterization of synovial cysts and preoperative planning. The typical appearance of a cyst on a CT scan can be altered by its content, for example, gas,^{8,33} calcification,²⁵ blood,³ inflammation, and osseous structure involvement. On MRI, synovial cysts appear as well circumscribed, smooth, extradural in location, and adjacent to facet joints. The proteinaceous content of the cyst can demonstrate greater signal intensity than the surrounding

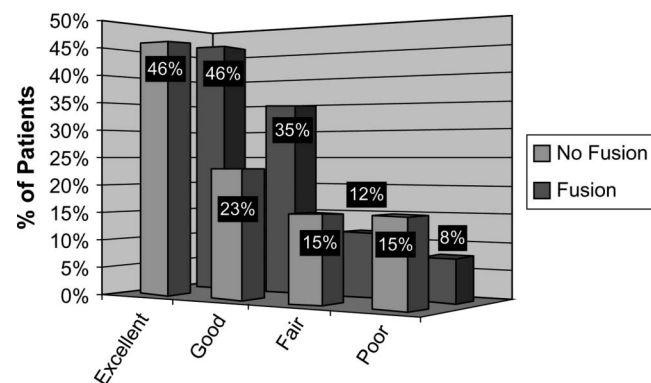


FIGURE 6. Effect of two different type of procedures (with or without fusion) vs. outcomes.

CSF on both T1- and T2-weighted images.^{14,23} MRI is considered to be the diagnostic imaging of choice in the workup of suspected synovial cysts.^{34,37}

The majority of synovial cysts in this study occurred at the L4–L5 level, which corresponds with data from other studies. The predilection for cysts to occur adjacent to this facet joint level has been attributed to the amount of degenerative spondylosis and spinal instability.^{4,9,10,16,20,24,26,30,31,38–43}

We were able to retrieve and confirm synovial tissue from 16 patients. The distinction between synovial cysts (with a synovial lining) and ganglion cysts (with out a lining) is a histologic one. As other authors have discussed, there is no clinical relevance to differentiating between ganglion and synovial cysts, as their presentations, treatments, and prognoses are identical.^{9,14,29} These cysts can, on rare occasion, hemorrhage and bleed into surrounding soft tissues and/or the spinal canal, causing acute compression of the spinal cord.^{22,24,32,35,44} A hemorrhagic cyst was clinically and histologically confirmed in 2 of our 39 patients.

Surgical Evaluation and Outcome

Conservative treatment modalities include bed rest, orthopedic corsets, CT-guided needle aspiration, and intra-articular injection of corticosteroid drugs.^{6,11,15,24,38} Few series have found that steroid injections provide acceptable long-term results.^{6,15,38} However, these treatments often show short-term or no improvement at all.¹⁰ Surgical treatment is largely recommended in all cases of intractable pain or neurologic deficit. The surgical technique will depend on the site, size, and associated other factors of the cysts, for example, duration of symptoms and involvement of surrounding structures, etc. Current therapy for synovial cysts includes excision of the mass and lumbar decompression.^{9,10,13,16,24,29,43}

In our series, an analysis of patient variables such as weight, height, or gender did not have any correlations with preoperative presentation and postoperative outcomes of surgery. Hence, we can conclude that none of the patients' variables were an indicator of surgical success and outcome.

Onforio and Mih¹⁴ reported 8 of 12 patients with spondylolisthesis, and Kurz et al²¹ reported 3 of 4 with spondylolisthesis, with none undergoing spinal fusion. Fifteen patients with spondylolisthesis appeared in the series of Sabo et al,²⁹ with six having spinal fusion. No difference in outcome was found between their patients having fusion and those who did not. Fifty percent of patients had spondylolisthesis in the series reported by Lyons et al,²⁴ in which 22 patients with spinal instability had fusion. Howington et al⁹ reported a similar finding: Thirteen patients deemed to have spinal instability underwent spinal fusion; no separate outcome of spinal fusion results was mentioned in either of the above two series. Others have mentioned an association between spinal cysts and spondylolisthesis/instability and better surgical outcomes without any mention of the results of the different type of procedures.^{13,27,43}

A total of 32 patients had degenerative spondylolisthesis of the 39 patients in our series. Twenty-two of the 26 patients who had spinal fusion also had degenerative spondylolisthesis, including 9 patients who had had prior operations and now had delayed spondylolisthesis. Ten of the 26 patients with

spinal fusion were women. Only four patients had no signs of spondylolisthesis but still underwent a spinal fusion. Analogously, six patients with spondylolisthesis did not have fusion. In our series, spinal fusion of the vertebral bodies seems to improve the postoperative success.

CONCLUSION

Spinal cysts are commonly found at the L4–L5 level, the site of maximum instability. MRI is the tool of choice for diagnosis. The etiology is still unclear, but underlying spinal instability has a strong association for formation of spinal cysts and worsening symptoms. Synovial cysts resistant to conservative therapy should be treated surgically. Resection and decompression with fusion remain an appropriate option. It appears that the optimal approach for patients with juxtafacet cysts remains unclear. The best surgical treatment approach for each particular individual would appear to remain speculative.

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