Chiropractic management of a patient with lumbar spine pain due to synovial cyst: a case report

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Abstract

Introduction: The purpose of this study is to report the findings resulting from chiropractic care using flexion distraction spinal manipulation for a patient with low back and radicular pain due to spinal stenosis caused by a synovial cyst.

Case Report: A 75-year-old man presented with low back pain radiating to the right anterior thigh and down the left posterior leg of 3 years' duration. Physical and imaging examinations showed a synovial cyst–induced spinal stenosis at the right L3-L4 level and bilateral L4-L5 spinal stenosis.

Intervention and Outcomes: Flexion distraction spinal manipulation and physiological therapeutics were applied at the levels of stenosis. After 4 visits, the patient noted total absence of the right and left lower extremity pain and no adverse reaction to treatment. After 3 months of treatment and 16 visits, his low back and buttock pain were minimal; and he had no leg pain.

Conclusion: Lumbar synovial cyst and stenosis–generated low back and radicular pain was 80% relieved in a 75-year-old man following Cox flexion distraction spinal manipulation.

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Introduction

Synovial cysts occur at the L4-L5 level in 75% of the patients and less frequently at the L3-L4 and L5-S1 levels.¹ Although found predominately in elderly patients, younger individuals have been shown to

have synovial cysts. Cases involving a 14-year-old adolescent girl with an intraspinal cyst that caused left radicular pain and a 17-year-old adolescent boy with left L5 radicular pain found to have a posterior longitudinal ligament ganglion cyst have been reported.^{2,3} This author reports a 17-year-old adolescent boy with right low back and pelvic pain diagnosed by magnetic resonance imaging (MRI) to have a right L3-L4 facet joint synovial cyst. The boy is relieved of pain with flexion distraction spinal manipulation applied at the level of the facet synovial cyst as shown in Fig 7.

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Synovial cysts may be asymptomatic or compress neural structures to cause radicular pain and neurological deficits. They can be unilateral or bilateral and at one or multiple levels.⁴ Cervical and thoracic spine occurrence is found far less than the lumbar spine. More than half of the patients present with radicular pain, neurogenic claudication, or neurological deficits, with a higher incidence than previously thought in patients older than 60 years.⁵ Degenerative spondylolisthesis has been reported in a third of synovial cyst patients and instability of the facet joints in 61%, supporting hypermobility in the pathogenesis of the cyst.^{6,7} Multiple-level synovial cysts can occur within a short period in certain patients, predominately women older than 40 years.⁸ Intraspinous synovial cysts are invariably associated with facet degeneration.⁹

Figs 1 and 2 illustrate the typical findings of synovial cyst and degenerative spondylolisthesis stenosis. The capsule of the facet joint, subchondral bone, and synovium are richly innervated and can be a potential source of the low back pain when disk and facet joint degeneration leads to joint cartilage erosion, joint space loss, and bone sclerosis.¹⁰ Synovial cysts occur when the synovial lining herniates through the joint capsule to form a cyst that becomes symptomatic by causing compression on the nerve structures. External herniation of synovium from a fluid-expanded joint space appears to be the most plausible pathologic mechanism.¹¹ Extraforaminal cysts are also cited.¹² The combined occurrence of degenera-

Fig 2. Fast spin echo weight sagittal view shows an L3-4 synovial cyst at the arrow. Also note the L4 degenerative spondylolisthesis of L4 on L5 and the advanced L4-L5 disk desiccation. Degenerative spondylolisthesis, facet arthropathy, and synovial cysts are common accompanying factors in synovial cyst etiology.

Fig 1. T2-weighted axial image demonstrating an L3-4 left synovial cyst (arrow) that produces spinal stenosis of the left lateral recess and osseoligamentous canal. The cauda equina is compressed by the cyst. The left third lumbar nerve complex is contacted and compared to the well-visualized L3 nerve on the right side.

tive spondylolisthesis and facet joint synovial cyst is reported in 54% of cases.¹³ Pigmented villonodular synovitis of the left L4-L5 facet joint on MRI causing left sciatica has been reported.¹⁴ Synovial cysts contain reactive fibrous connective tissue, dense fibrous connective tissue, hyperplastic synovial membrane, and fine calcifications.¹⁵ Synonyms for synovial cysts are hypertrophic synovitis, cysts of the ligamentum flavum, or ganglion cysts.¹⁶⁻¹⁸

Synovial cysts are treated surgically or nonsurgically, but the optimal approach remains unclear.⁴ The presence of a synovial cyst alone is not an indication for surgery, and conservative care is recommended in patients without progressive neurological deficits.^{19,20} Surgery with resection and decompression with or without fusion and instrumentation remains an appropriate option and has been reported to be better than conservative care, but synovial cysts may recur following surgery.²¹ Surgical relief is reported to be as high as 97% of cases with radicular pain or neurogenic claudication present.²²

Successful pain relief outcome of a confirmed left L4-L5 synovial cyst with ligamentum flavum hypertrophy in a 76-year-old woman causing left L5 nerve root compression has been reported.²³ Two cases of synovial cyst successfully treated by Cox flexion distraction spinal manipulation and ancillary physiological therapeutics including electrical stimulation and cryotherapy were published. Postmanipulation repeated MRI examination did show marked reduction in size of the synovial cyst in 1 of the 2 cases, with total relief of pain for the patient.²⁴ Recurrence of bilateral low back and leg pain following surgical removal of a lumbar spine synovial cyst was successfully relieved by flexion distraction therapy and progressive rehabilitation exercises. The constant pain was relieved without another surgical intervention, and relief of neurological deficits was afforded.²⁵

The purpose of this case report is to define the success of flexion distraction spinal manipulation in treating patients with painful lumbar spine facet synovial cysts. This presents an option of care in the treatment of synovial cysts. First-line care for synovial cyst in patients without neurological deficits can include Cox flexion distraction decompression spinal manipulation, while retaining surgery for cases unresponsive to this form of spinal manipulation.

Case report

A 75-year-old white retired man presented with a chief complaint of low back pain that radiated to the right anterior thigh and down the left posterior leg. He stated that the quality of the leg pain was sharp. He could not sleep unless he rolled onto his right side. The pain started approximately 3 years previously following left hip replacement, and the pain was described as 8 to 9 out of a maximum of 10 in a numeric pain scale (NPS). Following the left hip replacement, the right hip pain started. The pain was aggravated by standing and walking and relieved by sitting. Further history shows that, in 1987, he was involved in a work accident in which he had a pelvic fracture, urethral damage, a broken left leg, and a right knee replacement in 2000.

A neurologist had seen him in the last 2 years and told him he had spinal stenosis of the lumbar spine and gave him 4 epidural steroid injections, which gave him 2 to 4 days of relief from pain. He had been told that he would eventually need spinal surgery to reduce his stenosis and to relieve his pain. He underwent radio-frequency denervation of the right S1-S4 dorsal rami in February 2010. At that time, his right hip pain was at an NPS 10; the procedure yielded approximately 20%

initial relief that decreased, and the patient had the original pain in a matter of days. The patient had to discontinue his narcotic medication secondary to increased constipation and decreased efficacy. He also underwent caudal adhesiolysis that gave him an initial 50% pain relief, which was not sustained. He was also given McKenzie extension exercises and core strengthening. Consideration for facet blocks at the L2-3 and L3-4 levels was made for the relief of buttock pain. Spinal decompression surgery was the last option.

When initially seen in our clinic, the NPS was a 9 for the low back, left leg, and right anterior thigh at its worst, and typically was 7 to 9. Physical examination revealed that the Minor, Bechterew, and Valsalva tests reproduced the low back and left lower extremity pain. The deep tendon reflexes were normal bilaterally. The Kemp sign was bilaterally positive for low back pain. The patient could walk on his toes, but weakness was noted on heel walking bilaterally. There was an abnormal right spinal tilt with the patient standing upright with marked loss of lumbar lordosis. The L4-S1 levels were bilaterally very tender to touch, and the ranges of motion of the thoracolumbar spine were 50° flexion and 5° extension with increased back and extremity pain. The straight leg raise sign only revealed bilaterally short hamstring muscles. Result of the Patrick flexion, abduction, external rotation, and extension (FABERE) test was negative on the left, which was the side of his hip replacement, and stiff and discomforting on the right side. Discerning muscle strength examination revealed that dorsi and plantar flexion, great toe flexion and extension, foot eversion, gluteus maximus strength, and quadriceps muscles strengths were all grade 4 of 5. No prone extension testing was done because of the aggravation of the patient's pain. Also noted was decreased vibratory sense bilaterally at the knee, ankle, and great toe.

Magnetic resonance imaging views of this patient's spine (Figs 3, 4, and 5) were taken before visiting our clinic.

Based upon these findings, the patient was diagnosed with a right L3-L4 facet joint synovial cyst causing stenosis as described in Figs 3 and 4 and spinal stenosis at the L4-5 level as described in Fig 5.

Chiropractic management

The standardized treatment plan and goals were set as follows:

Protocol I Cox flexion distraction and decompression spinal manipulation administered at the L1, L2, and L3 spinous process levels with manual spine

Fig 3. T2-weighted axial view shows the L3-L4 right-sided synovial cyst (arrow) displacing the cauda equina and producing marked stenosis of the vertebral canal. Facet arthrosis is noted bilaterally.

contact and applied distraction and decompression force was the first line of applied manipulation (Fig 6). Protocol I initiates the spinous process contact above

Fig 4. T2-weighted sagittal image shows the L3-L4 synovial cyst shown at the yellow arrow. The ligamentum flavum is hypertrophied and creates stenosis of the vertebral canal (green arrow). Facet arthrosis is present.

Fig 5. Axial L4-L5 level slice is shown to explain the stenosis at this level and its potential contribution of the patient's symptoms and signs. Note the bilateral spinal stenosis due to intervertebral disk bulging and endplate hypertrophy, ligamentum flavum hypertrophy most marked on the left side, and left-sided facet arthrosis causing lateral recess and osseoligamentous canal stenosis. The cauda equina is compressed within the vertebral canal.

the stenosis or disk herniation level, as this prevents exacerbation of nerve root compression as distraction decompression is applied by forcing a disk herniation into a nerve root. If the spinous process below the stenosed level is contacted, distraction can further stenose the vertebral or osseoligamentous canals by forcing facets or disk herniation into the nerve roots superior to the contact. It is recommended that one always contact the spinous process above the level of stenosis.²⁶

Fig 6. Manually applied Cox flexion distraction spinal manipulation being applied at the L3-L4 level of the right-sided synovial cyst.

Tolerance testing is a part of this chiropractic manipulation technique. Before first applying Protocol I distraction, such tolerance testing is done by applying manual flexion distraction to the patient as he or she lies on the instrument with the lower extremities that are on the caudal section of the instrument acting as the minimal distractive force. The lower extremities act as a tractive force as the caudal section is placed into flexion. As the caudal section is flexed downward 2 in, the doctor contacts the spinous process above the segment to be decompressed; and the patient is asked to report any pain in the back or extremity. If there is none, the doctor next contacts the facet joint on the uninvolved lower extremity side of pain while holding the patient's ankle and applying unilateral specific level distraction. Again, patient pain is monitored as the caudal section is moved into flexion of less than 2 in of downward movement. The same testing is performed on the painful lower back or extremity side. If no pain is reported, the ankle cuffs are placed on the patient's ankles; and the tolerance testing is repeated. The doctor will then choose the applied force tolerated best by the patient. That may be with only extremity weight as the distractive force, hold the ankle with unilateral distraction, or using the ankle cuffs to apply traction.

The initial treatment frequency plan consisted of 4 visits per week for 3 weeks. During the early sessions of spinal manipulation, application is limited to this manual form of distraction and decompression. The goal was to decompress the level of stenosis with specific level force while constantly monitoring the patient's pain tolerance. This manually controlled application of spinal decompression is followed by positive galvanism and tetanizing currents into the L3-L4 synovial cyst. This patient was instructed to perform the knee chest, pelvic tilt, and pelvic lift exercises at home. He was also instructed to apply 10 minutes of heat, followed by 10 minutes of ice, and followed by 10 minutes of heat again to the low back preceding the low back exercises. The Protocol I manipulation was applied from the L1 through L3 levels with careful tolerance testing before and during the administration.

The Protocol I application of mechanical forces shown in Fig 6 consists of three 20-second manually controlled flexion distraction manipulations at the specified spine level. In this patient, the contacts for the three 20-second distractions started at the L1, then L2, and then L3 levels. No contact at the L4 degenerative spondylolisthesis level was applied. Each 20 seconds of distraction consists of five 4-second applications of flexion distraction while the patient's pain tolerance is monitored. No patient pain is the

goal. At any point of pain, the distraction is stopped at that level and only increased as patient pain tolerance allows. The downward movement of the caudal section of the manipulation instrument is limited to 6°, or 2 in, as this is found to be within safe spinal ligament tolerances.²⁶

In severe cases of stenosis and pain generation of the severity seen in this case of L3-L4 synovial cyst, this author (JMC) prefers holding the ankle on the involved side and applying manual Protocol I distraction at the specific level, which in this case is L3-L4. This allows monitoring of the patient's tolerance and application of the proper force (Fig 7).

Attended motorized caudal section distraction is instituted as the patient shows reduced levels of back and extremity pain while under Protocol I care, as shown in Figs 6 and 7. Again, tolerance testing of the patient is monitored during this shift of manual to automated long y-axis flexion distraction. Figs 8 and 9 show this as the doctor contacts the spinous process as the caudal section is placed into flexion distraction and decompression by initiating automated long y-axis movement of the caudal section with a foot or tiller bar switch. The doctor has the capability to use both hands to contact the spine during treatment with this automated technique.

Unattended long y-axis distraction decompression is started at 50% relief of the back and radicular pain as measured by NPS subjective instrument and objective tests of range of motion, straight leg raise, Kemp sign, and Dejerine triad. Unattended long y-axis distraction is a smooth, rhythmic, constant, and

Fig 7. Unilateral distraction decompression with ankle control. Doctor spine contact is at the L3-L4 level with applied distraction decompression on the right side via the ankle contact.

Fig 8. Automated long y-axis and flexion distraction manipulation with doctor control. With the caudal section of the instrument in a flexion position, the doctor's hand on the tiller bar initiates long y-axis distraction and decompression to the patient's spine. Here the contact hand is the L3 spinous process. See Fig 9 for illustration of the instrument's caudal motion during this application of long y-axis flexion distraction decompression.

equal distraction force applied in 12.5-minute increments after patient tolerance is carefully tested with its application. The distraction opening of the caudal and thoracic piece is from $\frac{1}{2}$ to $2\frac{1}{2}$ in and is tolerance tested to achieve the optimum tolerated distance (Fig 10). Note that the lumbar restraint belt is placed just superior to the segment level that specific level distraction is to be applied. In this case, the belt is placed superior to the L3 spinal level. Lateral flexion and circumduction motions are also started at 50% relief. The caudal instrument section is moved into these physiological ranges of motion as

Fig 10. Unattended long y-axis decompression distraction with spine level restraint in place. The movement shown in Fig 9 occurs in this manipulation session. The restraint is superior to the L3-L4 level, thus allowing distraction of the specific level of the lumbar spine required for decompression. The restraint can be placed at the specific level application of distraction necessary.

decompression distraction is applied. This aids in attaining and maintaining full physiological range of motion for the spine and prevention of recurring pain. Again, patient tolerance is tested before application. The application of ranges of motion under distraction is termed *Protocol II* and is only started when lower extremity pain is reduced by 50% or greater.

Outcome

Following 2 office treatments with the above-outlined Protocol I care, the patient was relieved of all left leg pain and right anterior thigh pain. The only remaining complaint was low back and right buttock pain. The NPS in the low back had reduced from 9 to 6. At this time, his home active exercises were increased to stretching of the abductor hip muscle group along with hamstring stretching, increased walking, and knee chest exercise before arising from bed in the morning.

After 7 visits, his NPS was reduced to 4 for the low back and right hip. Before the ninth visit, he had developed some left posterior thigh pain that was attributed to exacerbation of the L4-L5 spinal stenosis levels following increased activity.

After 13 visits over a 7-week period, his NPS was at a 2 for the low back and 2 to 3 for left hip pain. He had no right anterior thigh pain. Continued treatment for a total of 16 visits over a 3-month period resulted in a reduction of pain in the low back and buttocks to an NPS 2 with no lower extremity pain. The patient was

Fig 9. Illustration of the caudal movement of the instrument as attended (as shown in Fig 8) and nonattended long y-axis decompression is applied to the patient's spine (as shown in Fig 10).

Table 1 Clinical outcomes and timeline

No. of visits and days of care	Clinical relief
2 visits in 3 d	Relief of lower extremity pain. NPS dropped from 9 to 6.
7 visits in 2 wk	NPS for low back pain was 4.
13 visits in 7 wk	NPS was 2 for low back and 2-3 for left pain. No extremity pain.
16 visits in 12 wk	NPS 2 for low back and buttock pain. No extremity pain. Patient reported 80% relief of his pain with return to all normal activities of daily living

satisfied with his relief; had returned to his normal activities of daily living; continues his home therapies of hot, cold, and hot; and exercises faithfully (Table 1).

Discussion

The patient in this case achieved 80% relief of his pain without spinal surgery. Traditionally, spinal stenosis patients as seen in this case report, with the presence of synovial cysts, may be told at the onset of care that 50% relief of their pain within 3 months of care would be an excellent clinical result. This case has exceeded that degree of relief. Although not suggested to be the definitive treatment of synovial cyst-induced stenosis, flexion distraction spinal manipulation can be a first line of care before more aggressive forms of care are given, as was seen in this case. Flexion distraction is considered less invasive with minimal adverse outcomes compared with other procedures.

The literature cites various outcomes in the surgical and nonsurgical care of symptomatic synovial cyst patients to include facet joint arthrography,²⁷ steroid injection into the apophyseal joint,²⁸ and direct puncture of the cyst.^{29,30} Spontaneous resolution of synovial cyst has been reported.²⁵ Concomitant fusion with cyst excision is reported to reduce recurrent synovial cyst formation at the same level. Facet joint aspiration at the L4-L5 level in an 86-year-old woman with lateral and central spinal stenosis secondary to bilateral spondylolysis of L5 with anterolisthesis of L5 on sacrum and severe bilateral degenerative facet arthrosis at L4-5 was reported to have immediate relief that was maintained long term. A 3-year history of progressive low back and bilateral lower extremity pain in the L5 and S1 distribution was reported for which conservative care with physical therapy and medications such as pregabalin (Lyrica; Parke Davis, NY, NY) and duloxetine hydrochloride (Cymbalta; Eli Lilly,

Indianapolis, IN) provided minimal relief.³¹ Percutaneous fluoroscopic rupture of a synovial cyst in 32 patients with moderate-to-severe low back pain and leg pain with an average preprocedure symptom duration of 5 months showed excellent long-term (average follow-up, 1 year; range, 6-24 months) pain relief in 23 (72%) of the patients undergoing facet cyst rupture. This procedure is recommended before surgical intervention.³² Percutaneous needle injection has relieved synovial cyst pain.³³ Facet joint steroid injection in 101 patients with lumbar spine pain from a synovial cyst showed 81% successful relief; however, 54% of the patients required subsequent surgery over a period averaging 8.4 months because of inadequate symptom relief. Successful cyst rupture does not appear to have added benefit, and it was associated with worse disability 3 years postinjection.³⁴ Fluoroscopically guided, contrast-enhanced lumbar zygapophyseal joint aspiration and steroid injection combined with transforaminal epidural steroid injections for the treatment of lumbar Z-joint cyst-induced radicular pain found that 50% of 23 patients had significant long-term benefit and avoided surgical intervention at an average follow-up of 9.9 months.³⁵ Surgically excised cysts in 23 patients with untreatable radicular pain and/or neurological deficits showed hemorrhage considered to be caused by the rupture of fragile neoangiogenic vessels.³⁶ Acute onset of radicular symptoms has been reported following hemorrhage into lumbar synovial cysts after trauma or in cases of spinal instability.³⁷ The *bright facet sign* is a term given to the presence of high signal within the facet articulations (bright facet response) on fast spin echo T2-weighted images. Its prevalence averaged at 40.5% at L5/S1, 56.5% at L3/L4, and 66.5% at the L4/L5 level.

There was an association with degenerative facet and disk changes in synovial cyst formation.³⁸ Acute myelopathy has been reported due to synovial cyst.³⁹

Probable structural explanation of spinal manipulation success in treating synovial cyst

Wilby et al⁴⁰ describe a new finding of a drainage channel from the ligamentum flavum to the facet joint. The possibility that chiropractic flexion distraction spinal manipulation enhances drainage of the channel and possibly accounts for the success of the described procedure outlined in this article in relieving the back and radicular pain of synovial cyst is suggested. Wilby et al reported that the pathogenesis of lumbar juxtafacet cysts (synovial cysts) was studied in 27 consecutive patients with radiologically confirmed stenosis who

underwent laminectomy. The 27 patients yielded 51 ligamentum flavum/facet joint specimens containing 28 synovial cysts, 12 of which were unilateral and 8 were bilateral. Fragments of articular cartilage and bone were embedded in the walls of 89% of cysts and in the walls of a bursalike channel originating from the medial aspect of the facet joint capsule and extending into the ligamentum flavum. Communication with the facet joint via this channel was observed in 21 (75%) of the 28 synovial cysts. Extending up to 12 mm in length, the channel was present in nearly all control spines at the L4–L5 level but in only about half at the T12–L1 level. Advanced osteoarthritis of the facet joint causes the liberation of fragments of cartilage and bone into the synovial fluid of the joint space. This enables some fragments to escape from the joint into the channel and become lodged within its wall, where they provoke granulation tissue and scar formation. The tissue response to articular debris may block the synovial-lined channel to cause synovial cyst formation.⁴⁰

In all cases of synovial cyst-induced stenosis, other entities accounting for stenosis are often present such as ligamentum flavum hypertrophy, endplate hypertrophy, disk degeneration and bulging, degenerative spondylolisthesis, retrolisthesis, or a combination of these factors. This admittedly precludes absolute single diagnostic etiology of a patient's symptoms and signs. Often, the clinician must address variable numbers of these stenotic etiologies, making it difficult to singularly define the single cause of the patient's stenosis and to state with absolute certainty that one condition such as synovial cyst is the single cause rather than being a part of a syndrome of problems. This author makes this obvious notation so as to avoid the challenge that one cause must be cited for complete documentation of treatment results.

Limitations

The limitations of this case report include that this report is for only one patient and findings of this treatment protocol may not necessarily be the same in other patients. As well, no follow-up diagnostic imaging studies were performed for this patient; thus, it is not clear if there were anatomical changes. It is unknown how the extensive treatment before receiving spinal manipulation (ie, epidural steroid injections, adhesiolysis, narcotic drugs, physical therapy and McKenzie exercises, radiofrequency denervation of the S1–S4 nerves, facet blocks, and surgical decompression recommendation) impacted the patient's response to chiropractic care. This study only recorded

short-term follow-up; therefore, the long-term effects of the treatment for this patient are not certain.

Conclusion

More than 80% subjective relief of low back, right anterior thigh, and left lower extremity pain was achieved following the application of Cox flexion distraction spinal manipulation and physiological therapeutics and exercise to a 75-year-old man diagnosed with right L3–L4 facet joint synovial cyst-generated vertebral canal stenosis and L4–L5 level degenerative spinal stenosis.

Funding sources and potential conflicts of interest

No funding sources were reported for this study. The author is the developer of the Cox flexion distraction and decompression technique and the manipulation instrument used in the treatment shown in this case and gains a royalty from the sale of this table.

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