

Retrospective Review

A Staged Treatment of Symptomatic Lumbar Intraspinial Synovial Cysts

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Disclaimer: There was no
external funding in the
preparation of this manuscript.
Conflict of interest: Each author
certifies that he or she, or a
member of his or her immediate
family, has no commercial
association (i.e., consultancies,
stock ownership, equity interest,
patent/licensing arrangements,
etc.) that might pose a conflict of
interest in connection with the
submitted manuscript.

Manuscript received: 10-20-2018
Revised manuscript received:
02-14-2019
Accepted for publication:
02-27-2019

Free full manuscript:
www.painphysicianjournal.com

Background: Lumbar intraspinal synovial cyst (LISC) refers to a cyst that arises from the zygapophyseal joint capsule of the lumbar spine and contains serous or gelatinous fluid. In cases of LISCs resistant to conservative treatments, various minimally invasive percutaneous spinal techniques (MIPSTs) may be applied prior to open surgery.

Objectives: The outcomes of 3-staged MIPSTs for the treatment of symptomatic LISCs resistant to conservative treatments were evaluated.

Study Design: An institutional review board approved retrospective chart review.

Setting: University hospital inpatients referred to our pain clinic.

Methods: Review of charts of all patients who underwent MIPSTs for symptomatic LISCs resistant to conservative treatments during a time period of 13 years at a university hospital pain clinic. Patients with symptomatic LISCs resistant to conservative treatments were treated with 3-staged MIPSTs, including image-guided intraarticular aspiration, cyst distention and rupture, and injection of corticosteroids (ARI), endoscopic cyst enucleation (ECE), and endoscopic superior facetectomy (ESF) by a single pain specialist. A symptom-free period after each intervention was evaluated. Recurrence was defined as the same recurrent symptomatic radicular pain with confirmation of the LISC on magnetic resonance imaging. All patients with a minimum follow-up time of 3 years were included.

Results: Of the 40 patients who underwent ARI, 3 patients failed to complete a follow-up and 19 patients (51.4%) who had recurring symptoms received ECE. Ten patients (52.6%) who had re-recurring symptoms after ECE received ESF. There was no recurrence after ESF.

Limitations: This retrospective and observational study with a limited number of patients does not represent a high level of evidence.

Conclusions: This information provided the recurrence rate after each intervention. Half of the patients who went on to receive ARI experienced recurrence, whereas half of the patients with recurrence who received ECE experienced re-recurrence. ESF treatment resulted in no recurrence within the 3-year study period.

Key words: Conservative treatment, endoscopic surgical procedures, facet joint, intraarticular injection, minimally invasive surgical procedures, needle biopsy, nerve root compression, radiculopathy, synovial cysts

Pain Physician 2019; 22:E451-E456

The conventional treatment modalities for lumbar intraspinal synovial cysts (LISCs) resistant to conservative therapy include image-guided intraarticular aspiration, cyst distention and rupture, and injection of corticosteroids (ARI), or surgical removal of a unilateral cyst with or without fusion. Surgical decompression with or without fusion results in the resolution of over 90% of back and radicular

pain; however, ARI often reveals short-term benefits coupled with 50% to 100% long-term failure rates (1-4). In addition, patients who underwent a repeated ARI had a 50% chance of a responsive outcome (2). In cases of symptomatic LISCs resistant or recurrent to ARI, a repeated ARI or subsequent open surgery seems to be the next step in the conventional treatment modalities. However, various minimally invasive percutaneous spinal techniques (MIPSTs) under monitored anesthetic care may be applied prior to open surgery under general anesthesia. Endoscopic cyst enucleation (ECE) removes the root of the LISC by bipolar radiofrequency using an endoscope; endoscopic superior facetectomy (ESF) partially removes the superior facet with a drill bit endoscopically.

OBJECTIVES

The aim of this study was to find the outcomes of 3-staged MIPSTs—ARI, ECE, and ESF—for the treatment of symptomatic LISCs resistant to conservative treatments.

METHODS

Study Design

The protocol was approved by the ethics committee at Pusan National University Hospital institutional review board (IRB 05-2017-037). A review of the charts of all patients who underwent interventional treatments for symptomatic LISCs resistant to conservative treatments during a time period of 13 years was performed to evaluate the outcomes. Patients with symptomatic LISCs resistant to conservative treatments were treated with 3-staged MIPSTs including ARI, ECE, and ESF by a single pain specialist.

Setting, Patients, Variables, Data Sources and Measurement, Bias, and Study Size

A symptom-free period after each intervention was evaluated. Recurrence was defined as the same recurrent symptomatic radicular pain with confirmation of the LISC on magnetic resonance imaging. All patients with a minimum follow-up time of 3 years were included.

ARI Procedure

The ARI procedure was started by placing a 22-gauge, 10-cm-long block needle deep into the target joint via the oblique fluoroscopic view. Contrast medium was injected into the needle until the LISC ruptured on the lateral fluoroscopic view. After

confirmation of leakage of the contrast medium into the epidural space, 1 mL of 1% lidocaine with 4 mg of triamcinolone acetonide was injected.

ECE Procedure

The ECE procedure was performed for the patients with recurrence after ARI. A prophylactic antibiotic (1 g cefazolin) was given intravenously. The patients were placed in a prone position, with a pillow under the abdomen above the iliac crest and the pelvis. Continuous infusion of dexmedetomidine was given, loaded with 1 µg/kg per hour over 10 minutes followed by a maintenance dose of 0.6 µg/kg per hour. A single dose of 50 µg of fentanyl and 30 mg of ketorolac was injected intravenously while the patient was sterile draped.

Like the ARI procedure, a 22-gauge, 10-cm-long block needle was placed deep into the target joint via the oblique fluoroscopic view. A 17-gauge, 10-cm-long needle was placed at the facet joint just below the targeted LISC. A guidewire was inserted into the needle after removal of the stylet of the needle. An obturator dilator was inserted along the guidewire, and then a working channel was inserted over the dilator. After removal of the dilator, a 27-mm-diameter endoscope was inserted into the working channel. The tissues surrounding the facet joint were removed using forceps and bipolar radiofrequency. A mixture of 1 mL of indigo carmine and 4 mL of contrast medium was injected slowly via the first needle placed on the facet joint, while observing the outflow of the mixture under both the endoscope and fluoroscope, simultaneously. After confirmation of the location of the LISC through the endoscope, the root of the LISC was removed using radiofrequency or forceps (Fig. 1).

ESF Procedure

The ESF procedure was performed for the patients with recurrence after the ECE. The same prophylactic antibiotic with the same dose was given just prior to the procedure. The same monitored anesthetic care using dexmedetomidine, ketorolac, and fentanyl was provided during the procedure.

A 22-gauge, 10-cm-long block needle was placed on the targeted facet joint. The targeted superior articular process (SAP) of the facet joint was positioned to be seen clearly under the fluoroscope. The skin and periosteum of the base of the triangle of the targeted SAP were infiltrated with 1% lidocaine using a 26-gauge, 6-cm-long needle. A 17-gauge, 10-cm needle was placed on the periosteum of the SAP. After

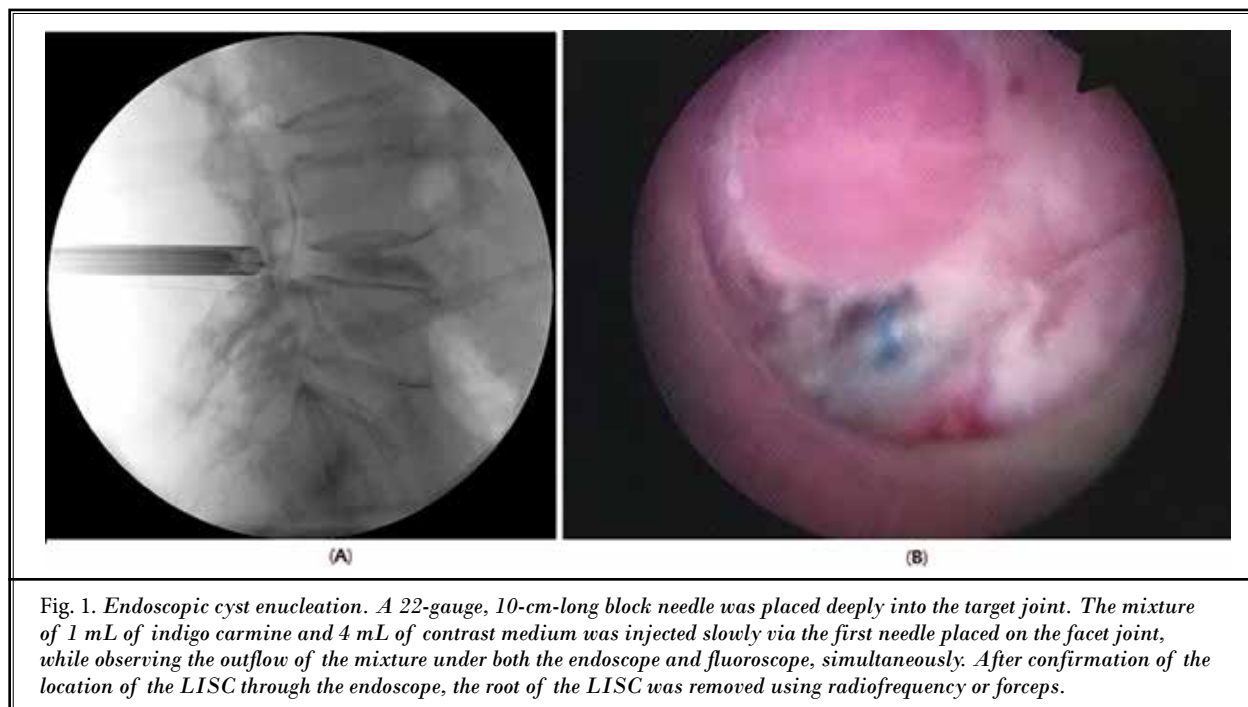


Fig. 1. Endoscopic cyst enucleation. A 22-gauge, 10-cm-long block needle was placed deeply into the target joint. The mixture of 1 mL of indigo carmine and 4 mL of contrast medium was injected slowly via the first needle placed on the facet joint, while observing the outflow of the mixture under both the endoscope and fluoroscope, simultaneously. After confirmation of the location of the LISC through the endoscope, the root of the LISC was removed using radiofrequency or forceps.

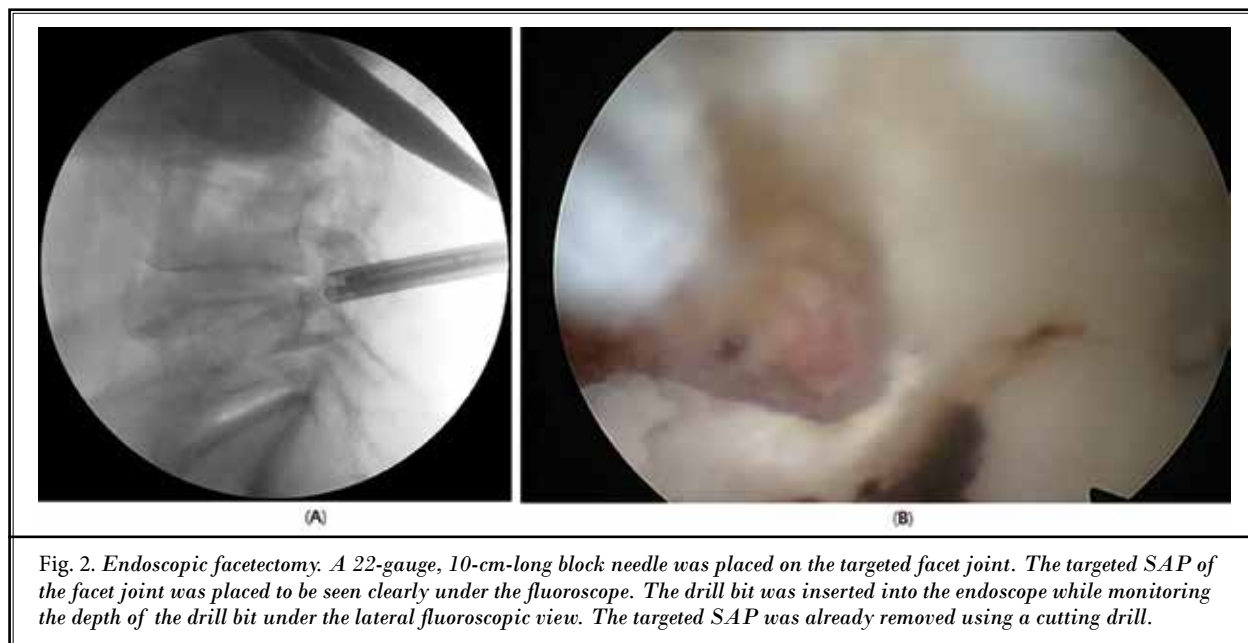
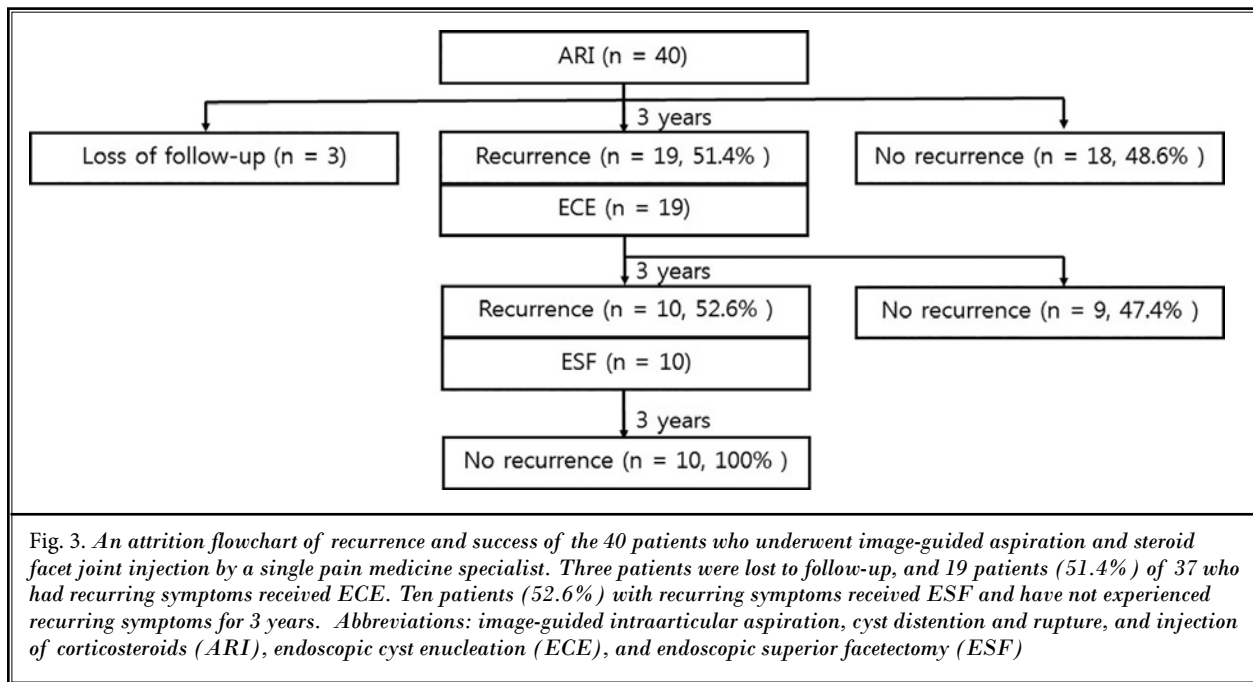


Fig. 2. Endoscopic facetectomy. A 22-gauge, 10-cm-long block needle was placed on the targeted facet joint. The targeted SAP of the facet joint was placed to be seen clearly under the fluoroscope. The drill bit was inserted into the endoscope while monitoring the depth of the drill bit under the lateral fluoroscopic view. The targeted SAP was already removed using a cutting drill.

removal of the stylet of the needle, the guidewire was inserted through the needle. An obturator dilator was inserted over the guidewire and a working channel was inserted over the dilator, then the endoscope was inserted into the working channel. The ECE procedure was performed prior to the ESF procedure because

the facet joint was to be exposed clearly. The drill bit was inserted into the endoscope while rotating the fluoroscope to monitor the lateral view to check the depth of the drill bit. The targeted SAP was removed with a cutting drill bit at the speed of 3,000 to 10,000 revolutions per minute (Fig. 2).



Statistical Methods

Age and mean body mass index were expressed as mean \pm standard deviation. The number of the symptomatic LISCs were counted according to the spinal level.

The incidence of recurrence within 3 years after each procedure was expressed as a number and percentile. The attrition flowchart was expressed for recurrence and success of each procedure.

All data were analyzed using the SPSS Statistics Version 23.0 software package for Windows (IBM Corporation, Armonk, NY).

RESULTS

Patients

Forty patients received ARI in the treatment of symptomatic LISCs. The man to woman ratio was 16:24. Mean age was 57.2 ± 4.8 years. Mean body mass index was 32.7 ± 4.5 (kg/m²), which included the criteria of obesity.

Data

The majority of symptomatic LISCs occurred at the L4-L5 level (36), followed by at the L5-S1 level (6), L3-L4 level (2), and both L4-L5 and L5-S1 levels (1). Although both right and left LISCs were found in 2 patients, symptomatic LISC existed only on one side.

Main Results

Three patients failed to complete the follow-up after ARI. Nineteen of 37 patients (51.4%) had recurring symptoms of symptomatic LISCs within 3 years (Fig. 3).

These 19 patients received ECE. All patients completed the subsequent follow-up. Ten of 19 patients (52.6%) experienced recurrence after the ECE during the 3-year follow-up.

Of all the patients who received ESF and a follow-up within the 3-year period, no patient (0%) experienced recurrence of symptomatic LISCs.

DISCUSSION

In this study, half of the patients who received ARI experienced recurrence, whereas half of the patients with recurrence who received ECE experienced re-recurrence. However, ESF treatment resulted in no recurrence within the 3-year study period.

LISC was first described as causing symptoms of spinal nerve compression in 1950, and Kao et al (5) later confirmed this in 1968. They also proposed the term "juxta-facet cyst" to represent both synovial and ganglion cysts in 1974 (6). In 1995, Hsu et al (7) first used the term "intraspinous facet cyst" to designate cysts associated with the facet joints, regardless of whether synovial lining cells were present because there were cysts that exhibited the histologic features of both synovial and ganglion cysts. However, Christophis et al (8)

insisted that “juxta-facet cyst” was a misleading name for cystic formations of the mobile spine.

LISCs appear at the final stage of the degenerative process of the lumbar spine. On the grading scale for lumbar facet joint degeneration using computed tomography and magnetic resonance imaging, the presence of LISCs indicates grade 3. In grade 0, the normal facet joint space of 2 to 4 mm width is maintained; grade 1 includes narrowing of the facet joint space to < 2 mm, small osteophytes, and/or mild hypertrophy of the articular process; grade 2 includes narrowing of the facet joint space, moderate osteophytes, moderate hypertrophy of the articular process, and/or mild subarticular bone erosions; and grade 3 demonstrates narrowing of the facet joint space, large osteophytes, severe hypertrophy of the articular process, severe subarticular bone erosions, and/or subchondral cysts (9-11).

LISCs are classified into 4 types according to their shape: type 1, a protrusion with fissure; type 2, a protrusion with an increased cavity from the previous fissure; type 3, (3a) increased size of the cyst and granulation, (3b) much increased size of the cyst and cavity; type 4, (4a) the cyst can transform, (4b) as the cystic cavity becomes larger, the cyst wall becomes thinner with fibrinoid degeneration.

In summary, these cysts can exhibit 3 shapes, appearing as a small protrusion (type 1 and 2), a semi-circular cyst (type 3), and a round cyst (type 4) with progression of the cysts (12).

Demographic data related to age (mean age 57 years), gender (predominantly women), and level (L4-L5) in this study were not different from previous articles (13-15). The preferential L4-L5 level is strongly related to the most mobile and unstable joint in the spine, associated with spondylolisthesis, osteoarthritis,

and intervertebral disc herniation (14). Obesity (mean body mass index: 32.7 kg/m²) seemed to be a risk factor.

Recurrence after ARI was inevitable if the patients lived with the same lifestyle and overcharged weight-bearing to the facet joints, similar to developing mechanism of Baker’s cyst from osteoarthritis of the knee. ECE was an idea for reducing the chance of cyst re-formation from the remnant root of the LISC. The remnant of the LISC may be removed using epiduroscope (16). ESF was tried to remove the source of the root from one side of the facet joint, without developing instability of the posterior element of the spine (17,18).

Limitations

This retrospective and observational study with a limited number of patients does not represent a high level of evidence. However, this information provided the recurrence rate after each intervention.

CONCLUSIONS

Half of the patients who received ARI experienced recurrence, and half of those patients with recurrence who then received ECE experienced re-recurrence. However, once the latter group received ESF, they showed no further recurrence during the 3-year study period.

Although each procedure from least invasive ARI to more invasive ECE had a 50% recurrence rate, 50% of patients had a symptom-free period of 3 years. Only 25% of patients after these 2 consecutive procedures had finally received ESF. If a patient who recurred after the ARI procedure wants to receive a definite procedure, the ESF can be performed without the ECE procedure.

REFERENCES

1. Epstein NE, Baisden J. The diagnosis and management of synovial cysts: Efficacy of surgery versus cyst aspiration. *Surg Neurol Int* 2012; 3:157-166.
2. Allen TL, Tatli Y, Lutz GE. Fluoroscopic percutaneous lumbar zygapophyseal joint cyst rupture: A clinical outcome study. *Spine J* 2009; 9:387-395.
3. Martha JF, Swaim B, Wang DA, Kim DH, Hill J, Bode R, Schwartz CE. Outcome of percutaneous rupture of lumbar synovial cysts: A case series of 101 patients. *Spine J* 2009; 9:899-904.
4. Yu HJ, Park CJ, Yim KH. Successful treatment of a symptomatic discal cyst by percutaneous C-arm guided aspiration. *Korean J Pain* 2016; 29:129-135.
5. Kao CC, Uihlein A, Bickel WH, Soule EH. Lumbar intraspinal extradural ganglion cyst. *J Neurosurg* 1968; 29:168-172.
6. Kao CC, Winkler SS, Turner JH. Synovial cyst of spinal facet. Case report. *J Neurosurg* 1974; 41:372-376.
7. Hsu KY, Zucherman JF, Shea WJ, Jeffrey RA. Lumbar intraspinal synovial and ganglion cysts (facet cysts). Ten-year experience in evaluation and treatment. *Spine* 1995; 20:80-89.
8. Christophis P, Asamoto S, Kuchelmeister K, Schachenmayr W. “Juxtafacet cysts,” a misleading name for cystic formations of mobile spine (CYFMOS). *Eur Spine J* 2007; 16:1499-1505.
9. Weishaupt D, Zanetti M, Boos N, Hodler J. MR imaging and CT in osteoarthritis of the lumbar facet joints. *Skeletal Radiol* 1999; 28:215-219.
10. Pathria M, Sartoris DJ, Resnick D. Osteoarthritis of the facet joints: Accuracy of

- oblique radiographic assessment. *Radiology* 1987; 164:227-230.
11. Kettler A, Wilke HJ. Review of existing grading systems for cervical or lumbar disc and facet joint degeneration. *Eur Spine J* 2006; 15:705-718.
 12. DePalma MJ. Driving the lane: A clearer view of facet joint cyst intervention. *Spine J* 2009; 9:921-923.
 13. Boviatsis EJ, Stavrinou LC, Kouyialis AT, Gavra MM, Stavrinou PC, Themistokleous M, Selviaridis P, Sakas DE. Spinal synovial cysts: pathogenesis, diagnosis and surgical treatment in a series of seven cases and literature review. *Eur Spine J* 2008; 17:831-837.
 14. Khan AM, Girardi F. Spinal lumbar synovial cysts. Diagnosis and management challenge. *Eur Spine J* 2006; 15:1176-1182.
 15. Kusakabe T, Kasama F, Aizawa T, Sato T, Kokubun S. Facet cyst in the lumbar spine: Radiological and histopathological findings and possible pathogenesis. *J Neurosurg Spine* 2006; 5:398-403.
 16. Jin HS, Bae JY, In CB, Choi EJ, Lee PB, Nahm FS. Epiduroscopic removal of a lumbar facet joint cyst. *Korean J Pain* 2015; 28:275-279.
 17. Haufe SM, Mork AR. Effects of unilateral endoscopic facetectomy on spinal stability. *J Spinal Disord Tech* 2007; 20:146-148.
 18. James A, Laufer I, Parikh K, Nagineni VV, Saleh TO, Härtl R. Lumbar juxta-facet cyst resection: The facet sparing contralateral minimally invasive surgical approach. *J Spinal Disord Tech* 2012; 25:E13-17.