CLINICAL STUDY

Symptomatic Lumbar Facet Synovial Cysts: Clinical Outcomes Following Percutaneous CT–Guided Cyst Rupture with Intraarticular Steroid Injection

Steffen J. Haider, MD, MPH, Nu R. Na, BS, Clifford J. Eskey, MD, PhD, Jessica G. Fried, MD, Natalie Y. Ring, BS, Mike H. Bao, BS, and David A. Pastel, MD

ABSTRACT

Purpose: To evaluate clinical outcomes following percutaneous rupture of symptomatic lumbar facet synovial cysts (LFSCs) with intraarticular steroid injection.

Materials and Methods: In this retrospective review, 44 consecutive patients with symptomatic LFSCs received primary treatment with CT–guided synovial cyst rupture with intraarticular steroid injection. Outcomes questionnaires were obtained before and 1, 4, 26, and 52 weeks after LFSC rupture. Assessment included pain medication use and numeric rating scale (NRS), Oswestry Disability Index (ODI), and 12-item short form health survey (SF-12) physical and mental composite scores (PCS and MCS). Clinical endpoint was 52-week survey response or surgery.

Results: LFSC rupture was technically successful in 84% (37/44) of cases. Clinical endpoint was reached in 68% (30/44) of patients with 82% overall 1-year follow-up. Lumbar spine surgery was performed in 25% (11/44) of patients within 1 year after procedure. Mean NRS, ODI, and SF-12 PCS demonstrated significant improvement at all follow-up time points ($P < .001$). At 52-week follow-up, NRS decreased from 8.1 to 3.7 ($P < .001$), ODI improved from 35 to 24 ($P = .006$), and SF-12 PCS improved from 31 to 42 ($P < .001$). Daily pain medication decreased from 71% (31/44) of patients before procedure to 29% (9/26) at 52-week follow-up ($P = .012$). History of prior lumbar intervention was associated with poorer LFSC rupture success ($P = .025$) and ODI ($P = .047$).

Conclusions: NRS, ODI, and SF-12 PCS indices improved and pain medication use decreased significantly at all time points over 1-year follow-up after percutaneous rupture of symptomatic LFSCs with intraarticular steroid injection.

ABBREVIATIONS

LESI = lumbar epidural spinal injection, LFSC = lumbar facet synovial cyst, MCS = mental composite score, NRS = numeric rating scale, ODI = Oswestry Disability Index, PCS = physical composite score, SF-12 = 12-item short form health survey

Synovial cysts arising from the lumbar spine facet joints are most commonly seen in the setting of degenerative facet joint spondylosis (1–4). Lumbar facet synovial cysts (LFSCs) that project into the spinal canal may result in radiculopathy (87%), neurogenic claudication (44%), sensory loss (43%), and motor weakness (27%) (5). Percutaneous LFSC rupture (5–10), facet steroid injection (11,12), and surgical lumbar decompression (13–15) have been described as effective treatment modalities. Recent meta-analyses favor lumbar decompression over percutaneous interventions, citing only a lower cyst recurrence rate with surgery (16,17). The published literature on LFSC rupture is limited by narrow outcomes metrics or nonstandardized retrospective single-time-point follow-up (5–7,10). Demonstration of early pain relief and improved function would likely favor percutaneous

From the Department of Radiology (S.J.H.), Columbia University Medical Center, New York City, New York; Department of Radiology (N.R.N., C.J.E., N.Y.R, M.H.B., D.A.P.), Dartmouth-Hitchcock Medical Center, 1 Medical Center Drive, Lebanon, NH 03756; and Department of Radiology (J.G.F.), Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania. Received December 23, 2016; final revision received April 20, 2017; accepted April 22, 2017. **Address correspondence to** D.A.P.; E-mail: david.a.pastel@hitchcock.org

C.J.E. is a stockholder for Relievant Medsystems (Redwood City, California) and is a paid consultant for Intrinsic Therapeutics (Woburn, Massachusetts). None of the other authors have identified a conflict of interest.

J Vasc Interv Radiol 2017; ■:1–7

http://dx.doi.org/10.1016/j.jvir.2017.04.021

approaches given the low morbidity associated with percutaneous LFSC rupture (16). The purpose of the present study was to provide a comprehensive assessment of clinical outcomes at multiple standardized time points after computed tomography (CT)–guided LFSC rupture to inform clinician and patient expectations. To this end, 4 different validated outcome scoring systems, progression to surgery, and use of pain medication over 1 year following CT-guided LFSC rupture are reported.

MATERIALS AND METHODS

The study was approved by the institutional review board, which waived consent for the study. A retrospective review of the institutional synovial cyst database was performed. The institutional database includes all 44 consecutive patients who underwent a CT-guided percutaneous LFSC rupture procedure from October 1, 2013, to September 30, 2015. The decision to perform LFSC rupture was based on the presence of a synovial cyst on lumbar spine magnetic resonance (MR) imaging performed ideally within 2 months of the procedure and lower extremity radiculopathy corresponding to the location of the LFSC.

Demographic and comorbid characteristics are presented in Table 1. Mean age of patients was 65 years (range, 43–94 y) with 30% (13 of 44) having a body mass index > 30. Of patients, 32% (14 of 44) had at least 1 prior spinal intervention, 78% of which were lumbar epidural spinal injection (LESI), prior lumbar surgery, or LFSC rupture (Table 1). In this study, 61% of LFSCs treated were located at the L4-L5 spinal level with a mean cyst diameter of 9 mm (Table 1). There were 9 faintly calcified synovial cysts; the rest of the LFSCs had no calcifications. There were no densely calcified cysts.

Table 1. Baseline Characteristics of Patients Undergoing LFSC Rupture (N = 44)

Characteristic	Value
Male sex	19 (43%)
Age, y, mean ± SD (range)	65 ± 12 (43–94)
Mean BMI, mean ± SD	28 ± 7
Obese (BMI > 30)	13 (30%)
Prior lumbar spine intervention	14 (32%)
Lumbar epidural spinal injection	11 (25%)
Lumbar surgery	3 (7%)
LFSC rupture	2 (5%)
Cyst level	
L2-L3	1 (2%)
L3-L4	8 (18%)
L4-L5	27 (61%)
L5-S1	7 (16%)
Multilevel	1 (2%)
Cyst diameter, mm, mean ± SD (range)	9.2 ± 3.4 (2–18)

Note–Values are presented as number (%) unless otherwise noted.
BMI = body mass index; LFSC = lumbar facet synovial cyst.

All patients underwent MR imaging a mean 38 days (SD 27 d; range, 2–266 d) before the LFSC rupture. The MR examinations included T2-weighted axial and sagittal images with repetition time of 3,000–6,000 ms, echo time of 80–110 ms, section thickness of 4 mm with 5-mm spacing, and a matrix of 256 × 256 or 512 × 512 (Fig 1a, b). Follow-up imaging was performed only for symptomatic patients at the discretion of the primary providers.

The LFSC rupture procedures were performed using a single treatment protocol by 6 different neuroradiologists with 3–31 years of experience. In this series, the 6 neuroradiologists each performed 1–13 LFSC rupture procedures. Procedural conscious sedation with fentanyl and midazolam was administered. For local anesthesia, 1% lidocaine buffered with 8.4% sodium bicarbonate was used. A 20-gauge spinal needle was advanced under intermittent CT fluoroscopy into the facet joint, and 1–2 mL of iohexol (Omnipaque 350; Nycomed Amersham, Princeton, New Jersey) diluted in normal saline at a ratio of 1:10 was injected to confirm continuity of the facet joint with the synovial cyst (Fig 1c). In patients with osteophytes covering the facet joint (14 patients), a 14-gauge coaxial system (Bonopty; AprioMed, Uppsala, Sweden) was used to access the facet joint. Once the cyst was opacified with contrast material, a 3-mL syringe made of polycarbonate to withstand high-pressure hand injection was used to rapidly inject saline with dilute contrast agent. Technical success of cyst rupture was defined by demonstration of contrast material within the epidural space but outside the confines of the cyst wall on CT and by loss of resistance (Fig 1d). After cyst rupture, 80 mg of methylprednisolone (DepoMedrol; Pfizer Inc, New York, New York) was injected. Patients were observed for 1 hour after the procedure. The referring spine specialist then followed patients clinically as outpatients.

Four outcome-scoring indices were used for each patient. The primary outcome measures were the numeric rating scale (NRS) (on a scale of 0–10, with 0 indicating no pain and 10 indicating "pain as bad as you can imagine") and the Oswestry Disability Index (ODI) (scores 0–20 minimal, 21–40 moderate, 41–60 severe, 61–80 crippling, 81–100 bedbound) (18,19). The 12-item short form health survey (SF-12) physical composite score (PCS) and mental composite score (MCS) were the secondary outcomes (scale 0–100 with higher scores representing higher physical and mental well-being) (20).

Outcomes scores and pain medication frequency and dose were recorded immediately before the LFSC rupture procedure and 1 week, 4 weeks, 26 weeks, and 52 weeks after the procedure. The initial questionnaire was completed in the holding room before the procedure. Subsequent surveys were completed by mail or telephone. Patient demographics were collected with chart review of the electronic medical record (EPIC Systems Corp, Verona, Wisconsin). Prior lumbar intervention was defined as a history of lumbar surgery, LESI, or prior LFSC rupture. Progression to subsequent lumbar spinal surgery or LESI within 1 year of LFSC rupture was also recorded. If a patient