Clinical Study

Outcome of percutaneous rupture of lumbar synovial cysts: a case series of 101 patients

Julia F. Martha, BS\textsuperscript{a}, Bryan Swaim, BS\textsuperscript{a}, David A. Wang, BS\textsuperscript{a}, David H. Kim, MD\textsuperscript{a,b}, James Hill, MD\textsuperscript{c}, Rita Bode, PhD\textsuperscript{d}, Carolyn E. Schwartz, ScD\textsuperscript{a,b,e,*}

\textsuperscript{a}Department of Orthopedics, New England Baptist Hospital, Boston, MA 02120, USA
\textsuperscript{b}Department of Orthopaedics, Tufts University School of Medicine, Boston, MA 02111, USA
\textsuperscript{c}Department of Radiology, New England Baptist Hospital, Boston, MA 02120, USA
\textsuperscript{d}Department of Physical Medicine & Rehabilitation, Feinberg School of Medicine, Northwestern University, Chicago, IL 60611, USA
\textsuperscript{e}DeltaQuest Foundation, Inc., Concord, MA 01742, USA

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Abstract

BACKGROUND CONTEXT: Lumbar facet joint synovial cysts are benign degenerative abnormalities of the lumbar spine. Previous reports have supported operative and nonoperative management. Facet joint steroid injection with cyst rupture is occasionally performed, but there has been no systematic evaluation of this treatment option.

PURPOSE: To profile the role of facet joint steroid injections with cyst rupture in the treatment of lumbar facet joint synovial cysts.

STUDY DESIGN/SETTING: Retrospective chart review and long-term follow-up of patients treated for lumbar facet joint synovial cysts.

PATIENT SAMPLE: One hundred one patients treated for lumbar facet joint synovial cysts with fluoroscopically guided corticosteroid facet joint injection and attempted cyst rupture.

OUTCOME MEASURES: Oswestry Disability Index and numeric rating scale score for back and leg pain.

METHODS: A retrospective review and a subsequent interview were conducted to collect pretreatment and posttreatment pain and disability scores along with details of subsequent treatment interventions. Group differences in pain and disability scores were assessed using paired t test. Multiple clinical factors were analyzed in terms of risk for surgical intervention using logistic regression modeling and Cox proportional hazards modeling.

RESULTS: Successful cyst rupture was confirmed fluoroscopically in 81% of cases. Fifty-five patients (54%) required subsequent surgery over a period averaging 8.4 months because of inadequate symptom relief. All patients reported significant improvement in back pain, leg pain, and disability at 3.2 years postinjection, regardless of their subsequent treatment course (p \textless 0.0001 in all groups). There was no significant difference in current pain between patients who received injections only and those who underwent subsequent surgery.

CONCLUSIONS: This study presents the largest clinical series of nonsurgical treatment for lumbar facet joint synovial cysts. Lumbar facet joint steroid injection with attempted cyst rupture is correlated with avoiding subsequent surgery in half of treated patients. Successful cyst rupture does not appear to have added benefit, and it was associated with worse disability 3 years postinjection. Long-term outcomes are similar, regardless of subsequent surgery. © 2009 Elsevier Inc. All rights reserved.

Keywords: Synovial cyst; Facet cyst; Facet joint; Zygapophyseal joint; Facet injection; Steroid injection; Retrospective pretest
Although synovial cysts arising from lumbar spinal facet joints are among the most common symptom-producing conditions affecting the lumbar spine, there have been very few comprehensive studies published on the natural history, appropriate evaluation, and management of this condition. Synovial cysts have been reported in association with both facet joints and the ligamentum flavum, but most of the facet joint cysts appear to arise from the joint capsule in association with degenerative spondylosis involving the facet joints [1–4]. Although these cysts are considered benign, when associated with spinal stenosis or direct nerve root compression, persistent neurogenic claudication or sciatica symptoms can result.

There are currently no established guidelines with respect to treatment of symptomatic lumbar synovial cysts. Treatment options have been reported in several clinical series and include steroid injection and cyst aspiration, as well as surgical excision [4,5]. Nearly all studies of nonsurgical management of lumbar synovial cysts have involved small numbers of patients [6–8]. Bureau et al. studied 12 percutaneous steroid injections and reported pain relief in 75% of patients, whereas Slipman et al. and Parlier-Cuau et al. studied 14 and 30 steroid injections, respectively, and reported symptomatic relief in up to one-third of the patients. Studies involving larger patient populations have addressed surgical treatment and have recommended decompressive laminectomy and cyst excision with or without concomitant fusion as an effective treatment option [9–15]. There have been no clinical series that specifically evaluate the technique of facet joint steroid injection with cyst rupture and how this technique relates to the need for subsequent treatment. This treatment technique is thought to provide symptom relief through a reduction in cyst protrusion onto surrounding anatomy and also through the analgesic effects of locally administered steroid, which is released into the epidural space on successful cyst rupture.

In this study, the role of fluoroscopically guided facet joint steroid injection with cyst rupture is examined in 101 symptomatic cases, with particular attention paid to the need for subsequent surgical intervention.

Materials and methods

A retrospective analysis was performed on a consecutive series of 101 patients who underwent fluoroscopically guided percutaneous corticosteroid injection therapy, with attempted cyst rupture as primary treatment for a diagnosis of a lumbar facet joint synovial cyst located within the spinal canal. During this procedure, local infiltration of the skin was conducted with 1% lidocaine, and a 22-G spinal needle was advanced into the facet joint under fluoroscopic control. Depo-Medrol (methylprednisolone acetate; Pharmacia & Upjohn Company, New York, NY, USA) and bupivacaine 0.25% were injected into the joint. Cyst rupture was attempted by forceful pressurization of the injection solution and distention of the cyst. Successful cyst rupture was confirmed by the loss of resistance to the injection method and by extravasation of Isovue-200 (iopamidol; Bracco Diagnostic Inc, Princeton, NJ, USA) contrast into the epidural space. All injections were performed by one neuroradiologist between 1999 and 2005. A medical chart review was conducted at a mean of 3.2 years after the index injection to collect data regarding cyst location; rupture success; height, weight, and age at the time of injection; and subsequent nonsurgical and surgical treatments at the same institution. Telephone interviews were conducted to investigate current height, weight, employment status, use of pain medication, and subsequent nonsurgical and surgical treatments at other institutions. Back pain and leg pain were also assessed during the telephone interview using a numeric rating scale (0–10, with 10 being worst possible pain), and disability was assessed by mail using the Oswestry Disability Index (ODI) [16]. Patients were asked to assess their current level of back and leg pain and disability before the index rupture injection, and 2) a posttest, in which respondents were asked to rate their current level of back and leg pain and disability after all treatment, at the time of study data collection. Patients provided written authorization for release of medical record data and verbal informed consent for both the phone interview and study by mail. This study was approved by the hospital’s Institutional Review Board.

Statistical analysis

Logistic regression modeling was used to examine predictors of the need for surgery after injection therapy, with a follow-up cutoff of 500 days after index injection to ensure that all patients included in the analysis had the same opportunity for being censored observations (ie, equivalent follow-up time across patients). This yielded an effective sample size of 94
for the logistic regression models. Cox proportional hazard modeling was used to investigate predictors with respect to the risk of undergoing subsequent surgery, with the outcome being time to surgery. For the Cox models, the assumption of proportional hazards was tested for significant predictors and, when violated, dummy variables were created to alleviate these violations. The Cox model had a sample size of 99, because of missing data on one or more predictors. Predictors analyzed included age, gender, body mass index, cyst level, rupture status, subsequent injections, and retrospective pretest ODI score to control for estimated baseline severity. Backward selection was initially used to select the most relevant predictors of outcome for the logistic and Cox models, and the final models controlled for significant predictors and rupture status because it was deemed to be a clinically relevant parameter. Paired t tests were used to compare retrospective pretest and posttest scores within groups.

Results

Initial chart review yielded 129 patients with records of a facet joint steroid injection with attempted cyst rupture as treatment for a lumbar synovial cyst between 1999 and 2005 and current contact information. Of these, 102 patients were successfully contacted (79% response rate), and one was dropped from analysis because the patient did not have a facet joint synovial cyst. Thus, the study sample comprised a consecutive series of 101 patients with a diagnosis of lumbar facet joint synovial cyst treated with fluoroscopically guided percutaneous corticosteroid injections for the purpose of cyst rupture. The sample age ranged from 20 to 85 years at the time of the index rupture injection, with a mean of 59.8 years (standard deviation [SD], 10.7) (Table). Patients tended to be overweight (mean body mass index, 25.9) and were predominantly female (68.3%). Approximately half of the sample was actively employed, 39% were retired, and the remainder was disabled, unemployed, or “other.”

The most frequently involved level was L4–L5 (68.3%), with less frequent involvement of the L5–S1 (20.8%), L3–L4 (8.9%), and L2–L3 (2.0%) levels. The period of follow-up ranged from 1.1 to 5.7 years after the index rupture injection (mean, 3.2 years; SD, 1.3; median, 3.33 years). Forty-five percent of the sample reported current use of pain medication (narcotic, nonsteroidal anti-inflammatory, or acetaminophen) at the time of follow-up. Injection resulted in successful cyst rupture in 81 patients (81.0%). Seventy percent of the sample had one or fewer subsequent injections (including both epidural and facet joint injections) for pain at the affected level, and 30% of the sample reported two or more injections. Fifty-five patients (54%) required surgical intervention at the involved level, and the mean time to surgery was 0.70 years after the index injection (SD, 0.70; 95% confidence interval, 0.51, 0.89 years). Surgical treatment consisted of fusion and/or decompressive laminectomy or laminotomy with complete or partial cyst excision.

Retrospective pretest revealed an average level of pretreatment back pain of 5.5 (SD, 3.4), pretreatment leg pain

<table>
<thead>
<tr>
<th>Table</th>
<th>Descriptive statistics of study sample</th>
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<tr>
<td>Age, y</td>
<td>Mean 59.8 (n=101, SD 10.7, range 20–85)</td>
</tr>
<tr>
<td>Body mass index</td>
<td>Mean 25.9 (n=99, SD 5.2, range 17.8–43.2)</td>
</tr>
<tr>
<td>Gender, n (%)</td>
<td>Female 69 (68.3)</td>
</tr>
<tr>
<td>Employment status, n (%)</td>
<td>Employed 49 (48.5)</td>
</tr>
<tr>
<td>Cyst level, n (%)</td>
<td>L2–L3 2 (2.0)</td>
</tr>
<tr>
<td>Follow-up period, y</td>
<td>Mean 3.2 (n=101, SD 1.3, range 1.1–5.7)</td>
</tr>
<tr>
<td>Pain medication use, n (%)</td>
<td>55 (55.0)</td>
</tr>
<tr>
<td>Successful rupture, n (%)</td>
<td>81 (81.0)</td>
</tr>
<tr>
<td>Additional injections</td>
<td>None, n (%) 50 (49.5)</td>
</tr>
<tr>
<td>Type of surgical procedure, n (%)*</td>
<td>None 46 (45.5)</td>
</tr>
<tr>
<td>Disability</td>
<td>ODI before injection Mean 46.4 (n=67, SD 19.3, range 8–88)</td>
</tr>
<tr>
<td>ODI 3.2 y after</td>
<td>Mean 19.5 (n=66, SD 20.6, range 0–66)</td>
</tr>
<tr>
<td>Back pain</td>
<td>NRS before injection Mean 5.5 (n=99, SD 3.4, range 0–10)</td>
</tr>
<tr>
<td>NRS 3.2 y after</td>
<td>Mean 2.3 (n=100, SD 2.7, range 0–10)</td>
</tr>
<tr>
<td>Leg pain</td>
<td>NRS before injection Mean 7.4 (n=100, SD 2.3, range 0–10)</td>
</tr>
<tr>
<td>NRS 3.2 y after</td>
<td>Mean 2.1 (n=100, SD 2.9, range 0–9)</td>
</tr>
</tbody>
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SD, standard deviation; CI, confidence interval; ODI, Oswestry Disability Index; NRS, numeric rating scale.

* Type of surgical procedure sums to more than 100%, because 44% of the sample had combinations of more than one procedure.
of 7.4 (SD, 2.3), and pretreatment ODI score of 46.4 (SD, 19.3). Posttest analysis revealed an average level of follow-up back pain of 2.3 (SD, 2.7), follow-up leg pain of 2.1 (SD, 2.9), and follow-up ODI score of 19.4 (SD, 20.6). The differences between pretreatment back pain, leg pain, and ODI compared with follow-up back pain, leg pain, and ODI were statistically significant (p<.0001 in all cases) (Fig. 1).

In a head-to-head comparison of current reported pain scores for patients who received injections only versus patients who underwent subsequent surgery, no statistically significant differences were found (Fig. 2). Neither current back pain nor current leg pain was significantly different (chi-square, 2.24, p=.33 and chi-square, 1.49, p=.48, respectively) between the two groups.

Results of linear models evaluating the impact of rupture status on patient-reported outcomes revealed that patients whose cysts were successfully ruptured reported higher levels of current pain-related disability on the ODI (adjusted mean, 22.22 as compared with 8.68, p<.03) but no difference in back pain (adjusted mean, 2.56 vs. 2.36, p<.77) or leg pain (adjusted mean, 1.92 vs. 2.25, p<.64), after adjusting for current use of pain medications, whether the patient had surgery, and gender. Fig. 3 shows adjusted means for the outcome variables by rupture status.

Discussion

This case series reports the clinical outcome of 101 patients with lumbar synovial cysts 3 years after undergoing fluoroscopically guided steroid injection with cyst rupture. This study represents the first large systematic evaluation of this treatment technique, and to the authors’ knowledge, this study is also the largest clinical series to date evaluating nonsurgical care of lumbar facet joint synovial cysts. The sample size is sufficient to allow meaningful implementation of multivariate analyses with adequate power.

Approximately two-thirds of the patients presenting for treatment were female, and the most frequent level treated...
was L4–L5. Previous studies have reported lasting symptomatic relief in approximately one-third of patients receiving steroid injections \[7,8\]. Our results showed that cyst injection rupture was associated with greater psychosocial and physical outcomes, with patients reporting higher levels of current pain-related disability on the ODI, but no difference on back pain or leg pain, after adjusting for current use of pain medications, gender, and whether the patient had surgery (\(p<.03\), .67, and .77, respectively).

Fig. 3. Adjusted means for patient-reported outcomes 3.2 years postinjection by rupture status. Patients whose cysts were successfully ruptured reported higher levels of current pain-related disability on the ODI, but no difference on back pain or leg pain, after adjusting for current use of pain medications, gender, and whether the patient had surgery (\(p<.03\), .67, and .77, respectively).

This suggests that about half of patients who receive a facet joint steroid injection as initial treatment for a lumbar synovial cyst will go on to subsequent surgical treatment.

Most of the treatment attempts (81%) were associated with successful cyst rupture based on the sudden loss of injection resistance and the appearance of radiocontrast dye in the epidural space during fluoroscopic monitoring. However, successful cyst rupture during the index injection did not prevent surgery in our sample. Of note, regardless of whether patients underwent surgery, most of the patients continued to require regular use of pain medication at the time of last follow-up, suggesting a degree of pain chronicity in this patient population. All patients in this case series reported significant perceived improvement in disability, back pain, and leg pain, regardless of whether they had surgery, and there was no significant difference in current posttest back or leg pain among patients who received injections only versus patients who underwent surgery. This suggests similar long-term outcomes after injection with attempted cyst rupture, irrespective of surgical intervention.

Interpretation of this study is somewhat limited by the fact that pain and disability outcome data related to the time of index injection were collected retrospectively. Although a notable finding of this study was the observation of significant clinical improvement on all three self-reported outcome scores for both the nonsurgically and surgically treated groups, there were insufficient presurgical data to perform statistical adjustments based on symptom severity. The generalizability of our study is limited somewhat by our response rate of 79%. It is possible that the 21% of patients lost to follow-up are different with regard to treatment satisfaction or some other variable that is related to clinical outcome. Finally, our findings are somewhat limited by the fact that data were collected on patients with a range of follow-up periods (1.1–5.7 years). Future research could improve on our study by implementing a large prospective inception cohort or randomized trial to investigate the impact of fluoroscopically guided cyst injection rupture compared with a sham-injection control group.

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Patients provided written authorization for release of medical record data and verbal informed consent for both the phone interviews and survey by mail used in this study. This study was approved by the Institutional Review Board of New England Baptist Hospital (IRB#2006-017).

References


