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Acute development of spinal lumbar synovial facet cyst within 1 week after lumbar decompression: illustrative case

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BACKGROUND Synovial facet cysts can sometimes develop in patients with lumbar spinal stenosis after decompressive laminectomy. The etiology of spinal lumbar synovial cysts is still unclear, but their formation is associated with underlying spinal instability, facet joint arthropathy, and degenerative spondylolisthesis.

OBSERVATIONS A 61-year-old-male patient presented with neurogenic claudication due to lumbar spinal stenosis. Radiographic studies showed grade I spondylolisthesis and radiological predictors of delayed spinal instability. He underwent lumbar decompression and shortly thereafter developed spinal instability and recurrent symptoms, with formation of a new spinal lumbar synovial facet cyst. He required revisional decompression, cyst excision, and posterolateral spinal fusion for definitive treatment.

LESSONS The literature reports postoperative spinal instability in up to one-third of patients with lumbar spinal stenosis and stable degenerative spondylolisthesis who undergo decompressive laminectomy. Close radiographic monitoring and early advanced imaging may be prudent in this patient population if they develop new postoperative neurological symptoms and show radiographic predictors of instability on preoperative imaging. Posterolateral spinal fusion with instrumentation should be considered in addition to lumbar decompression in this select group of patients who demonstrate radiographic predictors of delayed spinal instability if they are medically capable of tolerating a spinal fusion procedure.

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KEYWORDS lumbar synovial facet cyst; lumbar decompression; synovial facet cyst excision; lumbar spinal stenosis

Although a decompressive laminectomy is a highly effective treatment for lumbar stenosis, postdecompressive radicular symptoms can occur for weeks after the initial procedure.[1] These symptoms are generally managed via pain control, the use of neuropathic pain medications such as gabapentin, and physical therapy. Repeat imaging is generally unnecessary, given the transient nature of such symptoms. However, structural pathology related to subclinical or iatrogenic instability at the decompressed level can develop shortly after surgery in patients predisposed to instability at the operative level and may be missed if traditional postoperative protocols focused on symptom relief alone are pursued.

Here we present an illustrative case of a 61-year-old-male patient who presented with neurogenic claudication due to lumbar spinal stenosis and underwent lumbar decompression. He developed recurrent radicular symptoms within days of his surgery, and repeat imaging 1 week postoperatively revealed a de novo lumbar synovial facet cyst. Important aspects of the case and a proposed clinical management algorithm are reviewed.

Illustrative Case

A 61-year-old-male with a past medical history of well-controlled Parkinson's disease presented with 2 years of low back pain without a history of trauma. He localized the pain to his upper buttocks bilaterally, with occasional radiation to the posterolateral aspect of his thighs and legs. His pain distribution was 80% buttocks and 20% legs. The patient was unable to walk more than a few blocks before having to stop due to this pain. He had received multiple injections, including a lumbar epidural steroid injection and facet joint ablations 1.5 years and 1 year, respectively, before presentation that failed to provide lasting pain relief. Oral nonsteroidal anti-inflammatory

ABBREVIATION MRI = magnetic resonance imaging.

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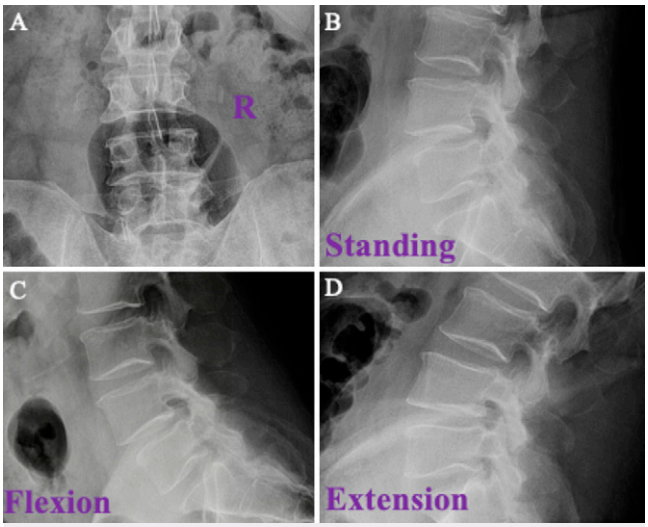

FIG. 1. Preoperative coronal (**A**) and sagittal (**B**) standing radiographs showed a low-grade spondylolisthesis measuring 4 mm with minimal motion (<3 mm) on flexion (**C**) and extension (**D**) radiographs.

treatment and multiple rounds of physical therapy had also failed. On physical examination, the patient demonstrated full strength in all muscle groups, with normal muscle tone and deep tendon reflexes throughout. His sensation was intact to light touch, his gait was normal, and the results of bilateral straight leg raise tests were negative.

Preoperative radiographs demonstrated a low-grade spondylolisthesis measuring 4 mm with minimal motion (0.7 mm) on flexion and extension radiographs (Fig. 1). Magnetic resonance imaging (MRI) of the lumbar spine showed moderate right facet arthropathy and fluid within the right L4–5 facet joint (Fig. 2). The L4–5 combined average facet angle was 67.25°. There was also a central disc bulge and bilateral ligamentum flavum thickening causing central and lateral recess stenosis, respectively. He had moderate to severe right L4 foraminal stenosis and severe left L4 foraminal stenosis. Disc height at the L4–5 level was generally well preserved and measured 11 mm. There was no evidence of a facet cyst formation on his preoperative lumbar MRI.

Surgery was recommended for persistent and symptomatic lumbar spinal stenosis with neurogenic claudication and radiculopathy that were refractory to conservative and interventional treatments. The surgical risks, benefits, and alternatives were discussed with the patient. Informed consent was obtained using a shared decision-making approach for a lumbar decompression. A single-level bilateral laminectomy/lumbar decompression was performed at L4–5. The patient was informed of the radiological evidence of potential postoperative spinal instability revealed by the images: the high L4–5 facet angle, an L4–5 disc height of 11 mm, and the L4–5 facet effusion. He understood the risks of lumbar decompression destabilizing his already tenuous L4–5 motion segment, and in that case, a lumbar spinal fusion would be required. Intraoperatively, a sublaminar laminectomy and bilateral L4–5 foraminotomies were performed in order to preserve the superior half of the posterior ligament complex tension band at the L4–5 motion segment. The facet joints were not removed, and the facet joint capsules were not violated during the procedure. The pars interarticularis on each side was preserved. The surgery was uncomplicated. The patient reported improved neurogenic pain symptoms immediately after surgery and was discharged home on postoperative day 1.

The patient called the office on postoperative day 4, complaining of a new shooting pain down his right leg that was causing him to have trouble bearing weight on it. A Medrol Dosepak was prescribed empirically for possible postoperative lumbar spinal nerve irritation. Two days later, the patient reported persistent radicular pain down his right leg that prompted a trial of gabapentin and lumbar spine radiography with flexion and extension sequences that did not show any worsening translational motion or spinal instability (Fig. 3). The patient's symptoms remained stable and severe for 1 week, prompting a new MRI of the lumbar spine that revealed diastasis of the right L4–5 facet joint with a synovial facet cyst that compressed the traversing right L5 nerve root and a left L4–5 facet joint effusion (Fig. 4). The patient returned to the operating room for a revision lumbar decompression, synovial facet cyst excision, and L4–5 posterolateral fusion with instrumentation, which were performed without complications. Postoperative plain radiographs demonstrated reduction of the patient's spondylolisthesis and confirmed correct placement of hardware (Fig. 5). He remained neurologically intact postoperatively and reported continued gradual improvement in his right leg pain without any axial back pain complaints at his follow-up visits.

Discussion

Observations

A 61-year-old male patient presented with neurogenic claudication due to lumbar spinal stenosis and radiological predictors of

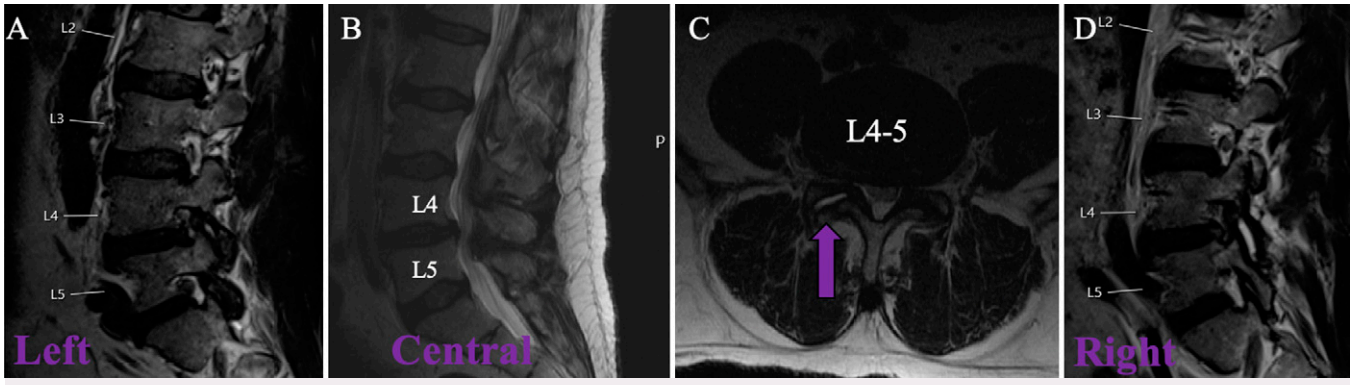

FIG. 2. MRI of the lumbar spine showed severe left L4 neural foraminal stenosis (**A**), moderate central stenosis at L4–5 (**B**), moderate right facet arthropathy and fluid within the right L4–5 facet joint (*arrow*, **C**), and moderate to severe right L4 neural foraminal stenosis (**D**).

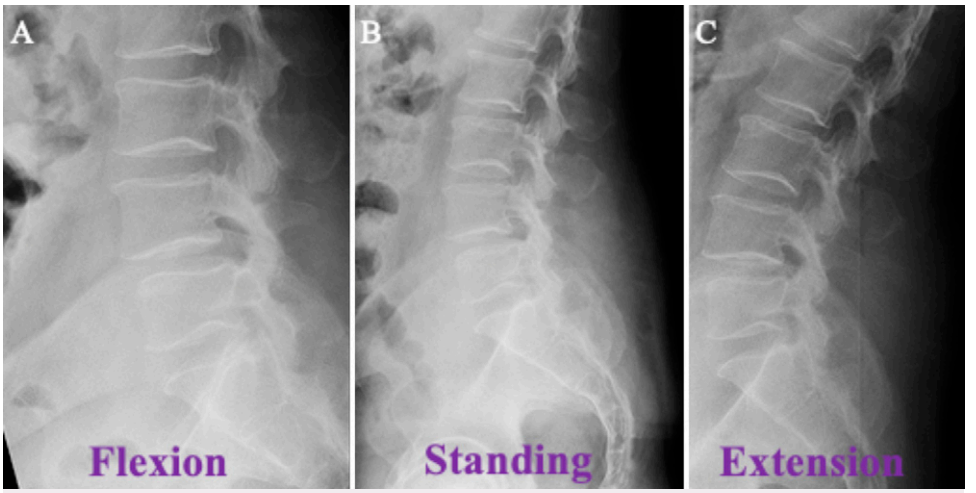

FIG. 3. Postoperative flexion (**A**), standing neutral (**B**), and extension (**C**) radiographic sequences did not show any worsening translational motion or spinal instability.

delayed spinal instability. Understanding the risks of potential spinal instability in the future, the patient and surgical team opted for a lumbar decompression alone. The rationale for this treatment decision was driven by our hope to potentially avoid the morbidity and surgical risks of an upfront lumbar fusion. Within days of surgery, the patient developed spinal instability and recurrent symptoms due to the formation of a lumbar synovial facet cyst. He required a revision decompression, cyst excision, and posterolateral spinal fusion, which led to definitive resolution of his symptoms.

Postdecompressive Neuropathy and Indications for Postoperative Imaging

Postdecompressive radiculopathy after lumbar laminectomy with or without an instrumented fusion occurs in up to 77% of patients.[1] The majority these symptoms improve with conservative treatment and resolve completely within 1 year of surgery. As such, it is reasonable to approach a recurrent radiculopathy so quickly after spine surgery as a transient phenomenon to be managed conservatively unless there are concerning clinical red flags, such as infection, cauda equina syndrome, or a new neurological deficit. Advanced imaging is generally not indicated at our institution until 6–8 weeks postoperatively. However, in select situations where a patient might be predisposed to early recurrent pathology, such as those with radiographic predictors of delayed instability on preoperative imaging, we resort to an early aggressive imaging strategy (Supplementary Figure 1). Patients who present with clinical red flags, signs, or symptoms also receive early postoperative lumbar MRI. Patients who did not demonstrate radiographic predictors of delayed instability on preoperative imaging and who do not present with clinical red flags are managed conservatively for 6–8 weeks until postoperative imaging is ordered. This postoperative imaging protocol seeks to optimize the use of healthcare resources but still permit the early diagnosis of postoperative spinal instability in at-risk patients, which in the present case was manifested by the formation of a new synovial facet cyst.

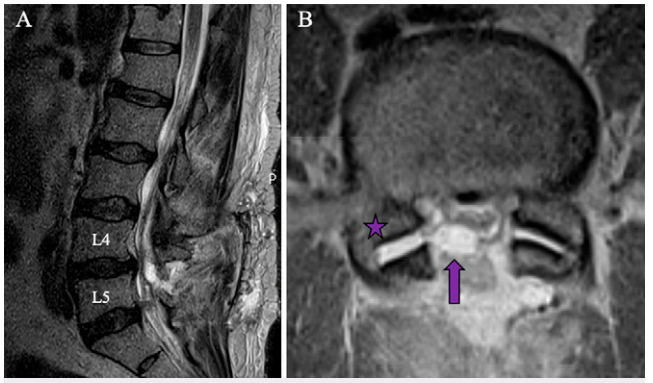

FIG. 4. Central sagittal (**A**) and axial (**B**) T2-weighted MRI of the lumbar spine performed 1 week after surgery, revealing diastasis of the right L4–5 facet joint (*star*) with an associated new synovial facet cyst (*arrow*) compressing the traversing right L5 nerve root and left L4–5 facet joint effusion.

Radiographic Predictors of Delayed Instability

In a 2013 prospective study by Blumenthal et al.,[2] 40 patients with stable grade I degenerative lumbar spondylolisthesis (3–14 mm) with

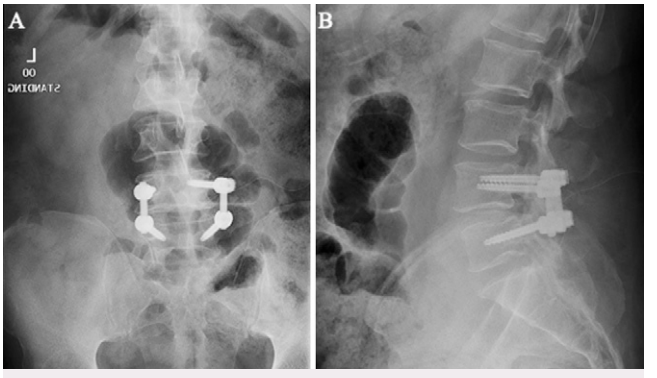

FIG. 5. Postoperative coronal (**A**) and sagittal (**B**) radiographs showing reduction of the spondylolisthesis and confirmed correct placement of hardware.

symptomatic lumbar spinal stenosis were treated with decompressive laminectomy without fusion. The reoperation rate was 15 (37.5%) of 40 patients over a mean follow-up of 3.6 years. Four (26.7%) of these 15 patients underwent reoperation within 6 months of the index procedure. The investigators observed a higher risk of reoperation with each of the following radiographic factors: a facet angle $>50°$ with a 39% rate of reoperation, disc height >6.5 mm with a 45% reoperation rate, and motion at spondylolisthesis >1.25 mm with a 54% rate of reoperation. Patients with all three risk factors for instability had a 75% reoperation rate, whereas patients with no risk factors had a 0% reoperation rate ($p = 0.14$). Our patient had an L4–5 facet angle of 67.25°, an L4–5 disc height of 11 mm, and motion of his spondylolisthesis of 0.7 mm, thereby meeting two of the three risk factors and therefore having a $>50\%$ risk of delayed postoperative instability.

Presenting Symptoms and Diagnostic Imaging of Spinal Lumbar Synovial Facet Cysts

Primary synovial cysts can form as outpockets of any joint throughout the body.[3] They may develop at any segment of the spine but are overwhelmingly more common in the lumbar spine.[4] The most common spinal level where synovial facet cysts are found is the L4–5 motion segment, which corresponds with the site of maximum mobility in the lumbar spine.[5] The next most common levels by incidence are L5–S1, L3–4, and L2–3.[5,6] Synovial cysts are not always symptomatic and are thus far more prevalent than reported clinically. A retrospective review of 303 MRI scans obtained for all causes reported that 7.3% had posterior spinal cysts.[7,8] Synovial cysts are internally lined with cuboid or pseudostratified columnar epithelium and are usually filled with clear fluid.[9–11] The predominant presentation of synovial facet cysts in the elderly population is as a manifestation of degenerative spine disease, such as facet joint arthropathy and degenerative spondylolisthesis. Synovial cysts are markers of spinal instability because of their association with facet joint disruption.[12] Symptomatic synovial facet cysts are those that grow to take up sufficient space in the spinal canal to cause nerve compression. Cervical and thoracic spinal synovial facet cysts may even cause patients to present with cervical radiculomyelopathy[13] and isolated myelopathy.[14] Cysts in the lumbar spine cause symptomatic patients to present with radicular pain (most common) and neurological deficits, including neurogenic claudication in the setting of larger space-filling cysts.[5,6] A history of low back pain usually precedes radicular pain.[15] MRI is considered the diagnostic imaging modality of choice in the work-up of suspected synovial cysts.[16] Synovial cysts on MRI appear well circumscribed and smooth and are located in the extradural space adjacent to the facet joint. The proteinaceous cyst contents can have greater signal intensity than the surrounding cerebrospinal fluid on both T1- and T2-weighted images.[16]

Synovial Facet Cysts Formed After Lumbar Decompression Surgery

A recent 8-year retrospective review by Morishita et al.[17] reported that 15 patients with 18 decompressed segments of 326 patients with 384 segments ($\sim$5%) developed a symptomatic synovial facet cyst after decompressive laminectomy. All 18 segments had been treated with bilateral posterior decompression, and no patient treated with a unilateral posterior decompression developed a postoperative synovial lumbar facet cyst. The average time until the recurrence of radicular symptoms was 8 months (range 0.25–24 months). The most commonly affected lumbar motion segments that developed cysts were L4–5 (n = 10 [56%]), L3–4 (n = 6 [33%]), and L2–3 (n = 2 [11%]). Three (20%) of the 15 patients required additional surgery to resolve their radicular symptoms. There were no significant differences in the degree of vertebral slippage on the preoperative versus postoperative flexion and extension radiographs of affected patients. However, spondylotic changes at the facet joints on preoperative axial computed tomographic images were seen in 17 (94.4%) of 18 segments, and 13 (72.2%) of 18 segments had facet joint effusions on preoperative axial T2-weighted MRI scans. The authors propose that after decompression surgery, the facet joint capsule of the treated site may easily protrude into the spinal canal because the medial portion of the facet joint can become weakened after removal of the ligamentum flavum. Mechanical stress in the form of segmental instability may further exacerbate the protrusion of the synovial membrane through defects in the joint capsule. These observations are consistent with our patient's history of developing a postoperative synovial facet cyst after undergoing a bilateral decompressive laminectomy and having radiographic markers of potential lumbar instability, such as articular spondylotic changes and right L4–5 facet joint effusion.

Lumbar Laminectomy for Excision of Synovial Cyst

Synovial facet cysts in patients with coexisting lumbar spinal stenosis or degenerative spondylolisthesis can be treated with decompressive laminectomy alone, but this approach comes with the attendant risks of worsening postoperative anterolisthesis. Epstein[18] performed decompression laminectomies on patients with synovial facet cysts and coexisting lumbar stenosis (45 patients) and grade I degenerative spondylolisthesis (35 patients). Five (11%) patients with stenosis alone developed postoperative spondylolisthesis, and the anterolisthesis of existing degenerative spondylolisthesis increased in 11 (31%) patients. In a 2010 study, Xu et al.[19] reported outcomes after treating 167 symptomatic primary lumbar synovial cysts over 19 years. This study found that at a mean follow-up of $\sim$17 months, patients who underwent laminectomy had significantly increased cyst recurrence incidence compared with fusion groups via log-rank test ($p = 0.042$). Our patient's spondylolisthesis did not worsen after his decompressive laminectomy, but he did develop facet diastasis and a new synovial facet cyst, likely secondary to disruption of the facet joint and inherent spinal instability. For this reason, we elected to perform a spinal fusion in addition to synovial cyst excision during his revision procedure. A 2019 systematic review assessing the association between lumbar synovial cysts and degenerative spinal pathological features showed that patients with coexisting spondylolisthesis were more likely to undergo spinal fusion surgery (versus laminectomy alone) than were patients without spondylolisthesis (odds ratio 11.5, 95% confidence interval 4.5–29.1; $p < 0.0001$).[20]

Surgical Decision Making: To Fuse or Not to Fuse?

Lumbar laminectomy for spinal stenosis is one of the most common spinal operations performed in people over the age of 65 years in the United States.[21] Many surgeons perform laminectomy without fusion as part of their routine clinical practice for patients with lumbar spinal stenosis and coexisting grade I spondylolisthesis. We often ask ourselves if we can help patients get by with "just a decompression" without spinal fusion, because lumbar spinal fusions have been associated with higher complications, higher intraoperative blood loss, and longer operative times.[22–24] However, if we identify the radiological signs of potential delayed spinal instability, our

concern increases, and the question instead becomes, "How much time can we buy a patient by offering a decompression alone before having to resort to a spinal fusion?" In our illustrative case, we attempted a decompressive laminectomy in a patient with lumbar spinal stenosis and stable low-grade spondylolisthesis with risk factors for potential delayed instability in an attempt to avoid a lumbar spinal fusion. Just 4 days after his index surgery, our patient complained of new radicular pain and was found to have formed a facet cyst in the setting of radiographic evidence of lumbar instability on a postoperative MRI just 1 week after surgery. This acute clinical decompensation represents an early failure of lumbar decompression for lumbar spinal stenosis with a stable grade I spondylolisthesis.

The 2016 randomized controlled trial by Ghogawala et al.[22] showed that lumbar laminectomy plus fusion was associated with a slightly greater but clinically meaningful improvement in physical health–related quality of life (as measured by 36-item Short Form Health Survey physical component summary scores) compared with laminectomy alone at 2, 3, and 4 years after surgery in patients with symptomatic lumbar spinal stenosis and stable degenerative spondylolisthesis. In this study, approximately one-third of patients in the decompression-alone cohort developed instability and required a reoperation compared with 14% of patients in the decompression and fusion cohort who required a reoperation ($p = 0.05$). Of note, all of the reoperations performed in the decompression-alone group were at the index level to address subsequent clinical instability, whereas all the reoperations performed in the fusion group were at an adjacent lumbar level due either to disc herniation or to clinical instability. Patients in the lumbar fusion cohort lost significantly more blood (514 versus 83 mL, $p < 0.001$), had longer hospital lengths of stay (4.2 versus 2.6 days, $p < 0.001$), and sustained longer operative times (290 versus 124 minutes, $p < 0.001$) than the decompression-alone cohort. Thus, it is important to be mindful that lumbar fusion may not be appropriate for elderly patients with coexisting medical comorbidities.

Lessons

Close radiographic monitoring and early advanced imaging may be prudent in select patients with lumbar spinal stenosis and stable degenerative spondylolisthesis who are treated solely with lumbar decompression but have radiographic predictors of instability. Should a revision surgery be necessary, posterolateral spinal fusion with instrumentation should be considered in addition to revision lumbar decompression in such patients who are medically capable of tolerating a spinal fusion procedure.

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Disclosures

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author Contributions

Conception and design: Sarmiento, Lovecchio, Lyons. Acquisition of data: Sarmiento, Lovecchio. Analysis and interpretation of data: Sarmiento, Fourman. Drafting the article: Sarmiento, Lyons. Critically revising the article: Fourman. Reviewed submitted version of manuscript: Sarmiento, Farmer. Approved the final version of the manuscript on behalf of all authors: Sarmiento. Administrative/technical/material support: Sarmiento.

Supplemental Information

Online-Only Content

Supplemental material is available with the online version of the article.
Supplementary Figure 1. https://thejns.org/doi/suppl/10.3171/CASE2226.

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