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Clinical Study

Extreme lateral interbody fusion with posterior instrumentation for spondylodiscitis

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ABSTRACT

The purpose of this study was to evaluate our initial experience utilizing extreme lateral interbody fusion (XLIF; NuVasive, San Diego, CA, USA) with percutaneous posterior instrumentation to treat 11 spondylodiscitis patients between January 2011 and February 2014. Although medical management is the first line treatment for spondylodiscitis, many patients fail antibiotic therapy and bracing, or present with instability, neurologic deficits, or sepsis, requiring operative debridement and stabilization. High rates of fusion and infection clearance have been reported with anterior lumbar interbody fusion (ALIF), but this approach requires a morbid exposure, associated with non-trivial rates of vascular and peritoneal complications. XLIF is an increasingly popular interbody fusion technique which utilizes a fast and minimally invasive approach, sparing the anterior longitudinal ligament, and allowing sufficient visualization of the intervertebral discs and bodies to debride and place a large, lordotic cage. The outcome measures for this study included lumbar lordosis, sagittal balance, subsidence, fusion, pain, neurological deficit, and microbiology/laboratory evidence of infection. The mean follow-up time was 9.3 months. All patients had improvements in pain and neurological symptoms. The mean lordosis change was 11.0°, from 23.1° preoperatively to 34.0° postoperatively. Fusion was confirmed with CT scans in five of six patients. At the last follow-up, all patients had normalization of inflammatory markers, no symptoms of infection, and none required repeat surgical treatment for spondylodiscitis. XLIF with percutaneous posterior instrumentation is a minimally invasive technique with reduced morbidity for lumbar spine fusion which affords adequate exposure to the vertebral bodies and discs to aggressively debride necrotic and infected tissue. This study suggests that XLIF may be a safe and effective alternative to ALIF for the treatment of spondylodiscitis.

1. Introduction

Spondylodiscitis is complicated and challenging to diagnose, and is afflicting a growing number of people due to increased numbers of spinal procedures, use of hemodialysis, intravenous drug use and improved diagnostics with neuroimaging [1,2]. Most patients with spondylodiscitis can be treated conservatively with intravenous antibiotics, followed by oral antibiotics and immobilization with bracing [1,3]. Although medical management remains the first line treatment for spondylodiscitis, many patients will fail antibiotic therapy and bracing, or may present with instability, neurologic deficits, or fulminant sepsis requiring operative debridement and stabilization [4].

The goals of operative treatment are the debridement of infected tissue, intervertebral fusion for stabilization, and organism identification, if necessary. The optimal surgical treatment remains controversial. Anterior lumbar interbody fusion (ALIF), with or without posterior instrumentation, remains the most widely used technique for surgical treatment. Although very high rates of fusion and infection clearance have been reported, this approach requires a morbid exposure associated with non-trivial rates of vascular, peritoneal, and wound complications. Other authors have reported experience using posterior debridement, bone grafting, and posterolateral (PLF) or posterior interbody fusion (PLIF) for treatment [5–7]. This technique allows access to directly decompress the spinal canal and neuroelements, but limits exposure to the vertebral bodies and inherently precludes interbody fusion and correction of a loss of lordosis.

Extreme lateral interbody fusion (XLIF; NuVasive, San Diego, CA, USA) is an increasingly popular interbody fusion technique which

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utilizes a fast and minimally invasive approach, sparing the anterior longitudinal ligament and allowing sufficient visualization of the intervertebral discs and bodies to radically debride the vertebral body and intervertebral disc, and place a large, lordotic cage [8–10]. To our knowledge, there are no prior reports that describe the use of lateral interbody fusion to treat spondylodiscitis. Herein, we report our experience with 11 spondylodiscitis patients who required operative treatment.

2. Materials and methods

This study was approved by our Institutional Review Board as a retrospective study of patients who were treated at our institution by two surgeons between April 2011 and April 2014. Patients with an International Classification of Diseases code of 722.90 (unspecified disc disorder, unspecified region), who subsequently underwent lateral lumbar interbody fusion, were identified by the current procedural terminology code from our institutional database. The charts of these patients were reviewed for clinical (fever, chills, night sweats, pain), laboratory (erythrocyte sedimentation rate [ESR], C-reactive protein [CRP], white blood cells [WBC]), imaging (plain radiographs, MRI), and culture or histopathological evidence (blood and biopsy) of spondylodiscitis. There were 11 patients identified, five men and six women, with an average age of 66 years (range: 54–77). The average number of comorbidities was 5.9. All patients had culture-positive disease confirmed by either biopsy or intraoperative specimens. The indications for operative treatment included failed conservative management with intravenous antibiotics and bracing, neurological deficit, uncontrolled pain, and/or instability.

All patients underwent single staged treatment with XLIF, supplemented with posterior percutaneous pedicle screw fixation. A lateral retroperitoneal, transpsoas approach was performed according to the previously described surgical technique [9]. Under direct visualization, an aggressive annulotomy was performed to permit complete discectomy and debridement of the end plate cartilage. The anterior longitudinal ligament and posterior annulus was left intact. The debridement of any necrotic vertebral body bone was undertaken if endplate destruction was present, and continued until healthy bleeding bone was identified. The field was then copiously irrigated. Interbody distraction followed by interbody cage placement spanning the epiphyseal ring, or an expandable cage in patients with extensive end plate destruction, was utilized to correct sagittal and coronal imbalance. No drains were placed. Following the wound closure, the patients were placed in the prone position and underwent posterior percutaneous pedicle screw fixation under fluoroscopic guidance as part of the single stage treatment.

Postoperatively, all patients were continued on intravenous antibiotics which were tailored to culture sensitivities for 6 weeks, followed by a variable course of oral antibiotics. All patients underwent follow-up surveillance consisting of clinical and radiographic examinations and laboratory inflammatory markers at approximately 2 weeks, 6 weeks, 3–6 months and 1 year. Inflammatory markers were checked until they returned to a normal range.

The preoperative neurological functioning was assessed using the Frankel score. The preoperative radiographic measures included segmental and global lumbar lordosis, and severity of spondylodiscitis using the classification published by Pee et al. [11]. Grade I represents isolated discitis with minor destruction of vertebral endplates, Grade II represents discitis with moderate endplate destruction (including a portion of the vertebral body), and Grade III represents discitis with destruction of the vertebral body (complete destruction of the endplate; Table 1). The postoperative radiographic measures included lumbar lordosis and the presence or absence of subsidence at the operative levels. CT scans were obtained inconsistently in this population but, when available, fusion was assessed by the presence or absence of bony bridging. Pain was categorized as none, mild, moderate, or severe.

Table 1
Severity of disease based upon imaging studies, according to Pee et al. [11]

Grade	Description	Patients (n)
I	Isolated discitis or discitis with minor destruction of endplates	3
II	Discitis with moderate endplate destruction	2
III	Discitis with destruction of the vertebral bodies	6

3. Results

The diagnosis of spondylodiscitis was based on the combined presence of culture-positive disease (blood, percutaneous biopsy, and/or operative culture), imaging evidence of disc and/or vertebral body changes, and elevated inflammatory markers (Table 2).

The duration of symptoms prior to operative treatment ranged from 5 days to 8 months (mean 5.4 months). All patients presented with back pain and malaise, six (55%) with objective fever, five (45%) with either chills or night sweats, and four (36%) with neurological deficits. All patients had elevated ESR and CRP levels, and seven patients (64%) had an elevated WBC count. Five patients had previous lumbar surgeries, all of whom developed spondylodiscitis at a level that was involved in the incident surgery.

Six patients (55%) underwent organism-specific intravenous antibiotics with external bracing before ultimately undergoing surgery for progression of their symptoms or instability. Five patients underwent operative treatment without an initial attempt at medical management for symptoms/findings including: vertebral body destruction resulting in kyphosis, epidural abscess with sepsis, and new motor and/or sensory deficits.

Blood cultures were obtained from 10 patients and percutaneous biopsy cultures from three. The blood cultures were positive from five (50%) patients and all three percutaneous biopsy cultures were positive. Tissue sample cultures were obtained from all patients intraoperatively and eight (73%) were positive. There were no discrepancies in the organisms between the cultures for any of the patients. Four (80%) of the patients with positive blood cultures had additional positive intraoperative cultures.

The preoperative severity of disease was evaluated using plain films, MRI and CT scans [11]. Segmental and global lordosis were assessed preoperatively and at the latest postoperative follow-up with standing thoracolumbar radiographs (Table 3). The evaluation of the postoperative CT scans, which were obtained greater than 6 months after surgery, revealed bony fusion in six of seven (86%) patients. No subsidence was found in any patient at the last radiographic follow-up.

Inflammatory markers were checked in all patients at the routine postoperative visits until all values were normalized. The values normalized for all patients by 6 months postoperatively. At the time of the last follow-up, six patients reported no back pain, two reported mild back pain, and three reported resolution of the acute back pain which was experienced at the time of spondylodiscitis diagnosis, but they had continued baseline back pain. Seven patients had expandable cages for large defects and four had standard fixed height cages placed.

None of the patients required reoperation for infection or instability at the operative levels. Two patients subsequently developed adjacent segment disease with junctional kyphosis, however, at the time of this study, neither of them had developed related symptoms.