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Extreme-lateral, minimally invasive, transpsoas approach for the treatment of far-lateral lumbar disc herniation

Report of 2 cases

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The authors present 2 cases of far-lateral lumbar disc herniations treated surgically via an extreme-lateral transpsoas approach. The procedure was performed using the MaXcess minimally invasive retractor system to access and successfully remove the disc fragments without complication. To the authors' knowledge, these are the first reported cases of using a minimally invasive retroperitoneal approach for the treatment of far-lateral disc herniations.
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Key Words • far-lateral disc herniation • extreme-lateral transpsoas approach • minimally invasive surgery

Far-lateral disc herniations represent 7–12% of all lumbar disc herniations.[1,4,8,9] These herniations can often be difficult to access because of the need to transgress the facet joint or pars interarticularis. Classically these types of herniations have been treated via a variety of posterior surgical approaches, including a medial facetectomy intertransverse technique, full facetectomy trans pars technique, and extraforaminal technique.[3] More recently, minimally invasive options have arisen, including percutaneous endoscopic techniques and transmuscular techniques through tubular retractors.[4,10,11] These recent techniques have focused on treatment of this entity through a posterior approach. In this report we present the clinical, radiographic, and operative treatment of far-lateral disc herniations through an entirely lateral, minimally invasive, retroperitoneal, transpsoas approach.

Case Reports

History and Presentation. Case 1 involved a 53-year-old man who suffered from severe right-back, proximal leg, and groin pain. The pain was associated with progressive radicular numbness and tingling for 4 months. His symptoms remained refractory to conservative treatment measures including physical therapy and numerous steroid injections. He rated his pain as 9 out of 10 on the visual analog scale while taking diazepam, acetaminophen/hydrocodone, and amitriptyline. On examination, the patient did not have an isolated motor deficit, but demonstrated decreased sensation to both pin prick and light touch in the right anterior thigh and groin. His reflexes were symmetric and he showed no clonus. Magnetic resonance imaging demonstrated a significant far-lateral disc herniation with an associated annular tear at L2–3, with severe neural foraminal stenosis and impingement of the exiting L-2 nerve (Fig. 1A and B).

Case 2 involved a 71-year-old woman who presented with a progressive history of pain and numbness in her right anterior, lateral, and posterior thigh. Physical therapy, along with antiinflammatory and narcotic medications, were initially successful in treating her symptoms. Her anterior thigh pain acutely returned, necessitating numerous emergency room evaluations due to her inability to ambulate from the severity of the pain. Examination revealed an obese woman in severe distress with pain-limited weakness of her right hip adductor and decreased sensation in the right anterior thigh. Magnetic

This article contains some figures that are displayed in color online but in black and white in the print edition.

Abbreviation used in this paper: EMG = electromyography.

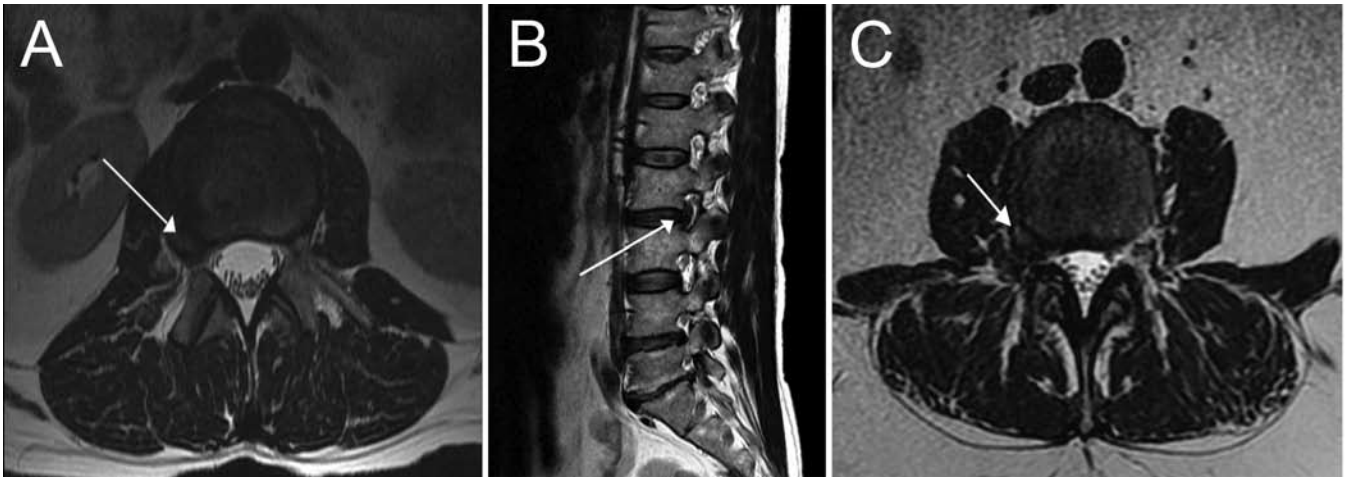

Fig. 1. Magnetic resonance images showing the far-lateral disc herniations in each case. **A:** Axial image of the patient in Case 1 demonstrating the herniation at L2–3 *(arrow)* with impingement of the exiting L-2 nerve root. **B:** Sagittal image of the patient in Case 1 demonstrating narrowing of the L2–3 foramen *(arrow)* due to disc herniation. **C:** Axial image of the patient in Case 2 demonstrating the herniation at L3–4 *(arrow)* with impingement of the exiting L-3 nerve root.

resonance imaging revealed a large far-lateral disc herniation at L3–4 with impingement of the exiting L-3 nerve root (Fig. 1C).

Operative Procedure. In the extreme-lateral, minimally invasive, transpsoas approach for the treatment of far-lateral disc herniation, the patient (under general anesthesia) is placed on the operating table in the lateral position with the afflicted side up. The table is flexed to maximize the rib-to-pelvis interspace, after which fluoroscopy is used to confirm a perpendicular trajectory to the spine overlying the relevant disc space (Fig. 2A). A 2-cm flank incision is performed and blunt finger dissection sweeps the peritoneal contents anteriorly, enabling entrance into the retroperitoneal space (Fig. 2B). The transverse process and lateral spine are palpated. A series of EMG-monitored tubular dilators are advanced under fluoroscopic guidance. The MaXcess retractor (Nuvasive, Inc.) is advanced over the dilators at the appropriate disc level (Fig. 2C). Using the operating microscope, the disc space is clearly identified and a blunt-tip EMG probe is used to identify the location of the traversing nerve root. Ideally, the root is safely retracted behind the posterior blade of the MaXcess retractor. In the event that the nerve remains in the tubular corridor, the retractor can be repositioned anteriorly to sweep the nerve safely out of the working channel. Alternatively, a manual retractor can be used to carefully displace the nerve. Following the decompression and removal of all free fragments, the retractor system is extricated and the wound is closed in standard subcuticular fashion.

In Case 1, using a blunt dissector, the annular tear and extruding fragment were easily identified and extended, enabling a large free disc fragment to self-extrude (Fig. 3). In Case 2, the bulging disc space was identified and a scalpel was used to perform a cruciate annular incision, allowing removal of significant disc material.

Postoperative Course. In Case 1, the patient's back, thigh, and groin pain significantly improved in the immediate postoperative period and he was discharged 18 hours later. At the 6-week follow-up he reported significant pain relief, full motor strength, and partial recovery of his sensory thigh dysesthesias. Six months after surgery the patient has continued to maintain his clinical improvement.

Fig. 2. Intraoperative images of the extreme-lateral, minimally invasive, transpsoas approach for the treatment of far-lateral disc herniation. **A:** Setup of the operating table. Note that the table is flexed in such a way as to maximize rib-to-pelvis distance. **B:** Typical incision size. **C:** Fluoroscopic image demonstrating the position of the MaXcess retractor after sequential dilation.

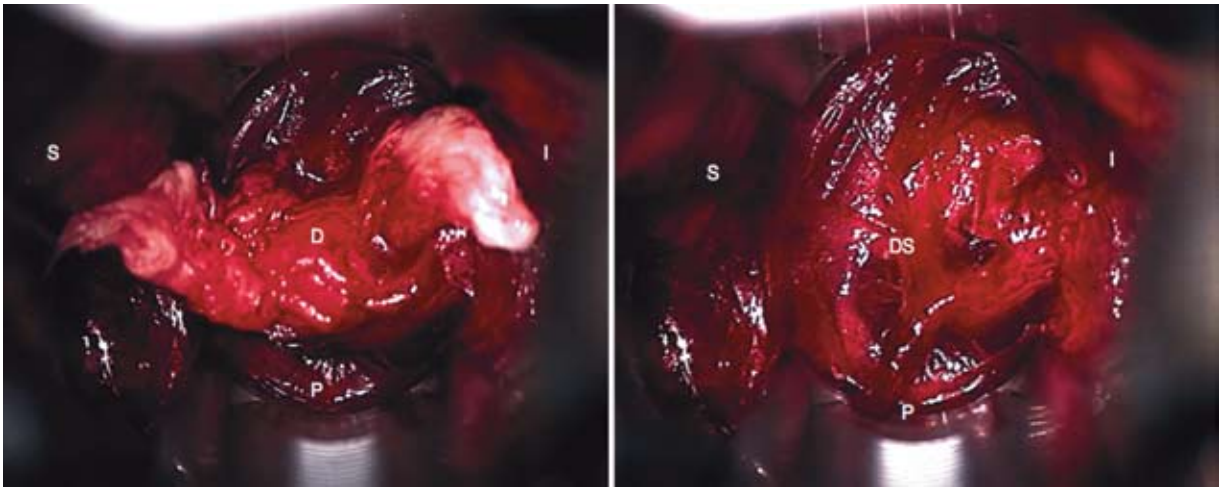

Fig. 3. Case 1. Intraoperative photographs demonstrating the large disc fragment at the L2–3 level before **(left)** and after **(right)** its complete removal. D = disc material; DS = disc space; I = inferior; P = posterior; S = superior.

In Case 2, on postoperative Day 1, the patient's pain had decreased to 3 out of 10 on the visual analog scale. She was ambulating independently, free of all burning pain, and discharged home following evaluation and clearance by the physical therapy department. At the 6-week follow-up, the patient continued to report significant pain relief. At the 6-month follow-up, the patient has continued to maintain her clinical improvement.

Discussion

The lateral transpsoas approach to the lumbar spine has been previously described for the treatment of degenerative disease, scoliosis, and for lumbar anterior interbody fusion.[7] However, its use in the treatment of far-lateral disc herniation has yet to be described. Typically, the surgical treatment of far-lateral disc herniations has been performed via a posterior approach. These approaches have included the hemilaminectomy and medial facetectomy, intertransverse technique, full facetectomy, and trans pars technique.[3] These approaches often require removal of native laminar bone and thus increase the risk of future spinal instability. Other authors have described a combination of techniques to surgically approach both medial and lateral compartments.[6] The extraforaminal approach limits bone removal but is often limited by the fact that the compressed nerve root lies dorsal to the fragment.[8,12] More recently, with the advance of minimally invasive techniques, percutaneous approaches as well as posterior access through tubular dilators have been described.[2,4,8,11]

Porchet et al.[9] reported their clinical outcomes in 202 patients following far-lateral discectomies via the para- and transmuscular approach. Seventy-three percent of patients reported excellent or good outcomes; 11 patients presented with reherniations. Hodges et al.[5] similarly described a transmuscular approach, accessing the disc fragment through the intertransverse ligament to prevent resection of the pars interarticularis and disruption of the facet joint. None of the 25 patients experienced postoperative instability but transient neuropathic pain was routinely noted, presumably secondary to manipulation of the dorsal root ganglion.

Ryang et al.[10] described a minimally invasive approach to accessing far-lateral disc pathology. Using a transmuscular approach, microsurgery was performed through an 11.5-mm trochar. Good to excellent outcomes were achieved in 14 of 15 patients. Sasani et al.[11] performed a percutaneous endoscopic discectomy in 66 patients. In their series, 2 nerve roots were damaged during fixation and 2 others via grasping forceps during the discectomy. In 5 patients in their study, results were not satisfactory. The authors concluded that the percutaneous endoscopic technique is an option but that it requires extensive experience.

In 2006, Ozgur et al.[7] described an extreme-lateral interbody fusion technique (XLIF; Nuvasive, Inc.) that had been previously presented by Pimenta. Access to the lumbar spine was obtained via a lateral approach through retroperitoneal fat and the psoas muscle. This approach enables direct access to and visualization of the lateral spine structures without bone drilling or the need for an access surgeon.

Using this approach, we were able to directly access the L2–3 (Case 1) and L3–4 (Case 2) disc spaces without significant manipulation of the traversing neural structures that were easily located and protected utilizing blunt-probe EMG monitoring. The approach is ideal, secondary to the extraforaminal nature of the disc herniation. This approach is not ideal to access far-lateral disc herniations at L5–S1 due to obstruction by the iliac crest. The surgeon must also be aware of any concomitant rotational scoliosis when planning the surgical trajectory. There is clearly a learning curve associated with this type of approach, and the use of tubular retractors to access this area and potential complications can include bowel injury, psoas hematoma, nerve root injury, iliopsoas weakness, and paresthesias. This report simply serves

to illustrate the surgical feasibility and efficacy of the extreme-lateral, minimally invasive, transpsoas approach for the treatment of far-lateral disc herniations.

We present 2 cases of far-lateral disc herniations treated surgically via an extreme-lateral, minimally invasive, transpsoas approach. This approach enabled direct visualization and identification of the neural elements and the protruding pathology without the need for significant manipulation or removal of surrounding bone or anatomical structures. Further experience will likely validate this approach. This report serves to demonstrate the efficacy and feasibility of this approach for the treatment of far-lateral disc herniations.

Disclosure

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

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