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Clinical Study

Minimally invasive pars approach for foraminal disc herniation

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ABSTRACT

We present a retrospective cohort study on the outcome of patients with foraminal disc herniations (FDH) treated with partial pars resections using minimally invasive surgery (MIS) through a tube. FDH present a challenge due to the more lateral trajectory needed for their excision and thereby more muscle dissection and possibly facet resection. Forty patients, 19 women and 21 men with a mean age ± standard deviation of 58 ± 12 years, underwent MIS for FDH. Data on length of hospital stay, body mass index and outcomes were collected prospectively and reviewed retrospectively. Average length of stay following surgery was 1 ± 1 days. There was one wound infection and four unsatisfactory results. Using the Macnab score, good to excellent results were achieved in 89% of the patients. Based on these results, MIS surgery with partial pars resection is an attractive option in the treatment of FDH with low morbidity and short hospital stays.

1. Introduction

Far lateral lumbar disc herniations, or foraminal disc herniations (FDH), account for up to 12% of lumbar disc herniations [1–9]. The discs are found lateral to the pedicle causing foraminal stenosis with compression of the exiting nerve root. Different surgical techniques can be utilized for excision of the herniation and decompression of the affected nerve root. The traditional approach is that of a midline laminotomy with extension into the neural foramen [2,10–13]. With this approach the inferior facet is oftentimes, but not always, sacrificed. The second approach is that of partial pars resection with unroofing of the foramen, exposing the nerve root and offending disc [4,7,14–17]. More recently, the method of choice is increasingly shifting towards minimally invasive surgery (MIS) with a tube to achieve decreased operative time, lessen blood loss, make smaller surgical incisions, reduce postoperative pain and hasten return to activities of daily living [5,11,14,16–26].

Minimally invasive discectomy in FDH, as described in this manuscript, involves the use of serial tubular dilators to dissect the paraspinal muscles and eventually dock on the pars, with partial resection of the latter. In this review, we describe our experience with this approach in a cohort of 37 patients.

2. Methods

2.1. Presentations and studies

Retrospective review of prospectively acquired data was performed after approval by the Institutional Review Board. A total of 40 patients with FDH were evaluated for symptoms of radiculopathy with imaging showing FDH. As the involved levels are generally L3–4 and L4–5, patients presented with complaints of back and leg pain with gradual subsidence of the former and persistence of the latter. Patients often described difficulty climbing stairs and on exam displayed weakness of knee extension and a depressed knee jerk. The diagnosis of FDH was established in all cases using MRI. Sagittal and axial images reveal the canal stenosis and the displacement of the nerve root and ganglion rostrally and posteriorly. T1-weighted images, both sagittal and axial, are the preferred modality for diagnosis (Fig. 1). All underwent minimally invasive surgery through a 22 mm tube. Patients had completed appropriate conservative therapies before surgical consideration consisting of analgesics and relaxants, physical therapy and Pain Clinic consultation. Spinal levels that received intervention had no history of prior surgeries. Surgery was performed by the primary surgeon with the assistance of one of the residents. The size of the herniation was measured by the surgeons and graded large (>10 mm), moderate (5–10 mm), or small (<5 mm) depending on the largest diameter of the fragment.

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2.2. Surgical technique

The technique of MIS in FDH involves the insertion of a series of dilators through a 2.5 cm incision 15–30 mm lateral to the midline depending on the size of the patient. The dilators penetrate the paraspinal muscles (multifidus and longissimus) and using fluoroscopic monitoring the 18–22 mm working channel is docked on the pars dorsal to the foramen of interest. In cases where the facet is hypertrophied it may be easier to dock with an 18 mm rather than a 22 mm channel. The former is less likely to get hung up on the facet joint allowing closer approximation to the pars. Under microscopic visualization the neural foramen can be probed ventral to the pars with a ball-tipped dissector. Once the location of the foramen is confirmed with the dissector and fluoroscopy, the lateral 1/4 to 1/3 of the pars is resected gaining access to the foramen (Fig. 2). The inferior facet is neither resected nor disarticulated. At L4–5 and L5–S1 where the pars becomes shorter, a portion of the superior facet may have to be removed as well to fully access the foramen. Following resection of the lateral pars, the nerve and disc bulge/fragment are identified (Fig. 3). The herniation is located ventral and in the axilla of the nerve root. Excision of the herniation requires little, if any, retraction or elevation of the nerve root.

Evaluation of outcomes was based on the patient's subjective assessment according to the Macnab scale [27] with excellent indicating that all preoperative symptoms have been relieved, good indicating minimum persistence of preoperative symptoms, fair indicating only partial relief of preoperative symptoms with limited physical activities and poor indicating unchanged or even worse symptoms. These four categories were assigned numerical values, with four representing an excellent outcome and one a poor outcome. Patients were evaluated in the immediate postoperative period and at postoperative follow-up. Generally, this follow-up was at 6 weeks, 3 months, 6 months and thereafter as necessary. The Macnab score was obtained from every patient on the most recent follow-up by a nurse practitioner who was not involved in the surgery. MRI and CT scans were not routinely obtained postoperatively except in case of complication or as clinically indicated.

3. Results

All results are reported and the mean ± standard deviation, unless otherwise specified. There were 19 women and 21 men identified with FDH with an average age of 58 ± 12 years. Average body mass index of the patients who underwent surgery was 28.9 ± 5.3 (range: 20.1–43.7). Duration of symptoms ranged from 2 weeks to 13 months with an average of 3 ± 3 months. Two years after having a left L2–L3 FDH operated, one patient developed a second herniation at L3–L4 also on the left side which necessitated surgery. Therefore, there was one herniation at L1–L2, six at L2–L3, 14 at L3–4, 15 at L4–5 and five at L5–S1 (Fig. 4). The size of the herniations was categorized as large in 24, moderate in six, and small in 11 patients.

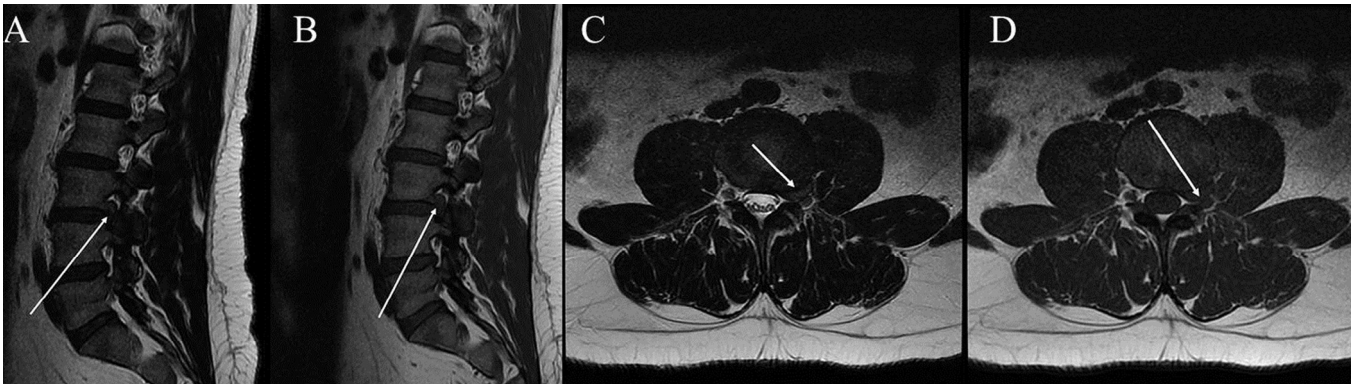

Fig. 1. MRI images of a left foraminal L3–4 herniated disc (arrow). (A) Sagittal T2-weighted; (B) Sagittal T1-weighted; (C) Axial T2-weighted; (D) Axial T1-weighted.

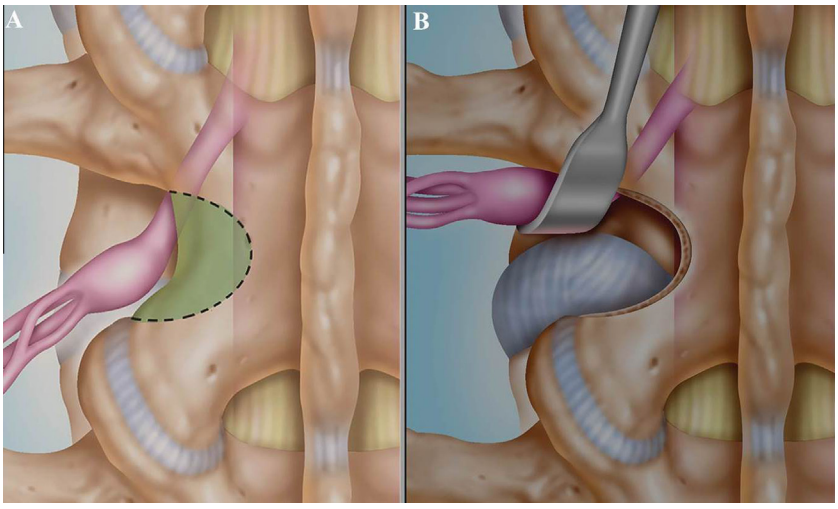

Fig. 2. (A) The area indicated by the dashed line is excised using a power drill and/or punch. Smaller caliber tubes (18 mm) may be advantageous over a larger tube (22 mm) to avoid hanging up on the facet joint, thus preventing the surgeon from docking on the pars. (B) Following partial pars resection, the herniation is identified with minimal retraction of the nerve, which is usually displaced dorsally and rostrally. (This figure is available in colour at www.sciencedirect.com.)