

## Surgical Excision of Upper Lumbar Disc Herniations

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### Abstract

**Background Data:** Disc herniations at the L1/2 and L2/3 levels are different from those at lower levels of the lumbar spine with regard to clinical characteristics and surgical outcome. Spinal canals are narrower than those of lower levels, which may compromise multiple spinal nerve roots or conus medullaris.

**Purpose:** The aim of this study to evaluate the clinical features and surgical outcomes of upper lumbar disc herniations.

**Study Design:** A prospective descriptive clinical case study.

**Patients and Methods:** Thirty patients underwent surgeries for single fresh lumbar disc herniation at the L1/L2 or L2/3 levels. They were operated between 2011 and 2014. Participants were evaluated pre-operatively and post-operatively at 3, 6, 9, and 12 month intervals. Pain was scored by a VAS for both lower limb and back pain. The clinical outcomes were compared using the Prolo economic and functional rating scale.

**Results:** The affected levels were L1/2 in 9 patients and L2/3 in 21 patients. The mean age of patients was 52.5 years and (Range=29-67). The mean follow-up period was 13.6 months. Most patients complained of back and buttock pain (27 patients, 90%), and radiating pain in areas such as the anterior or anterolateral aspect of the thigh (23 patients, 77%). Weakness of lower extremities was observed in 12 patients (39%) and sensory disturbance was presented in 15 patients (50%). Only 4 patients (13%) had undergone previous lumbar disc surgery (One patient at L1-2 and the other 3 patients at L4-5 level). Discectomy was performed in all patients. The mean values of preoperative back pain by VAS were  $7.7 \pm 0.3$ . The mean values of radicular pain were  $8.3 \pm 1.4$ . The mean values of preoperative Prolo Scale were  $5.1 \pm 0.7$ . At 1 year follow up the mean back pain on VAS decreased significantly to  $2.6 \pm 0.4$  ( $P < 0.01$ ) and the mean lower limb pain on VAS also decreased significantly to  $2.5 \pm 0.5$  ( $P < 0.01$ ). When the outcome was evaluated by the Prolo scale, 23% (7 of 30) of all the patients experienced excellent results, 50% (15 of 30) had good results, 23% (7 of 30) had fair results, and 3% (1 of 30) had poor results. By 12 months follow up period, 73% of the study group expressed clinical success.

**Conclusion:** Clinical features of disc herniations at the L1/2 and L2/3 levels were variable, and localized sensory change or pain was rarely demonstrated. In most cases, the discectomy was performed successfully by conventional posterior laminectomy. (2015ESJ088)

**Keywords:** Lumbar disc herniation, Upper lumbar, Discectomy.

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## Introduction

Upper lumbar disc herniations are different from those that occur at lower levels due to difference in anatomical structure. Compared to the lower one, upper lumbar spine results in fewer cases of spondylosis, disc degeneration, and fewer herniated discs. Use of the term "upper lumbar" disc has been controversy. Upper lumbar discs have been reported as only L1/2 and L2/3 by some authors, and by others as T12/L1, L1/2, and L2/3.<sup>3,5,8</sup> Most previous studies of upper lumbar disc herniations included the L1-L2, L2-L3, and L3-L4 levels.<sup>8,10,11</sup> Upper lumbar disc herniations have been reported to occur with a frequency of less than 5% of all disc herniations.<sup>2,17</sup> Among these reported cases, herniations at the L3-L4 level comprise 70-83% of all upper lumbar disc herniations.<sup>2,15,19</sup> However, the anatomical characteristics of L3/4 discs are more similar to lower levels, and its surgical outcome is significantly different from that of L1/2 and L2/3.<sup>13,17</sup> Therefore, the L3/4 level might be excluded from the upper lumbar disc.

Incidence of herniated upper lumbar discs defined as only L1/2 and L2/3 are known to comprise approximately 1-2% of all herniated lumbar discs.<sup>5,10</sup> Compared with those of lower levels, upper lumbar disc herniations have a less favorable outcome after surgery.<sup>16</sup> Spinal canals are narrower than those of lower levels, which may compromise multiple spinal nerve roots or conus medullaris. Lengths of the lamina are shorter, location of pain varies, and direct cord compression may occur. Because of this unique anatomy, selection of a surgical approach is difficult.

In our research, through retrospective review of our patients' data, we investigated the clinical features and surgical outcomes of upper lumbar disc herniations.

## Patients and Methods

### Patient Selection:

Between February 2011 and April 2014, at Suez Canal University and affiliated Hospitals a total of 30 consecutive patients were recruited for this study. All patients between 18-70 years with predominantly radicular symptoms (intolerable femoralgia), significant neurological loss (motor weakness or cauda equina syndrome), and Magnetic Resonance Imaging confirming an L1/2 or L2/3 disc

herniation were included in this study. All patients showed no response to conservative management for a minimum of 6 weeks. Exclusion criteria ruled out patients with general diseases that preclude surgical management (severe osteoporosis, osteopenia, immune suppression, malignancy and active local and/or systemic infection), morbid obesity as measured by body mass index > 40, and those with spondylolisthesis or any form of degenerative segmental instability.

### Preoperative Assessment:

The preoperative assessment included patient's history, physical and neurological examination. Imaging included antero-posterior, lateral and dynamic lateral plain X-rays, CT-scan, and MRI of the lumbo-sacral spine. Preoperative as well as the postoperative economic (activity) and functional (pain) statuses were assessed using the Prolo economic and functional rating scale. Also the preoperative and postoperative pain was evaluated using visual analog scale (VAS) for both leg and axial low back pain.

### Surgical Procedure:

All patients underwent a discectomy via a posterior approach. Under general anesthesia, the patient is usually prone positioned on an operating frame. The accurate level of herniated disc was checked by intraoperative fluoroscopy. Unilateral laminectomy in symptomatic lesions and medial resection of the zygoapophyseal joints were performed in order to gain sufficient exposure of the discs. After retracting the compressed dural sac exploration is then started to look for annular defect or any free fragments and then discectomy is accomplished. The nerve root was then decompressed.

### Perioperative Data:

In all patients, duration of surgery, blood loss, and the duration of inpatient treatment were recorded. Intraoperative and perioperative major and minor complications were assessed.

### Clinical Follow up:

Patients were followed up at the out patients clinic at 3 weeks, 3, 6, 9 and 12 months after surgery. During follow up visits the intensity of leg and back pain according to the VAS and assessment of the patient's clinical outcome was evaluated using the Prolo economic and functional rating scale (Table 1). The Prolo rating scale is a 10 points where Poor=2-4, fair=5-6, good=7-8, and excellent=9-10

points. Good and excellent results were considered a clinical success. Finally patients were asked to rate their condition has improved, unchanged, or worse; they were also questioned as to whether they would undergo the same procedure again under the same circumstances.

#### **Radiological Follow up:**

Patients underwent postoperative radiograph prior to discharge. Follow up radiographs included standing anteroposterior, lateral lumbar views, and dynamic flexion/extension radiographs for determination of the stability status.

## **Results**

#### **Preoperative Data:**

A total of 30 patients were included in this study. The mean age of patients was  $52.5 \pm 9.1$  years (Range=29-67 years). There were 21 males and 9 females. The average BMI was 27.9. A positive smoking history was recorded in 8 patients of the study group (26.6%) and secondary gain issue was present in 10% of the study group.

Clinical features of disc herniations at the L1-L2 and L2-L3 levels were variable, and localized sensory change or pain was rarely demonstrated. Specific clinical syndrome was evident only in 57% of our series. Most patients complained of back and buttock pain (N=27, 90%), and radiating pain in areas such as the anterior or anterolateral aspect of the thigh (N=23, 77%). Weakness of lower extremities was observed in 12 patients (39%) and sensory disturbance was presented in 15 patients (50%). Only one patient (2.4%) had symptoms of autonomic (bowel/bladder sphincter) dysfunction from a cauda equina lesion. The positive femoral stretch test was present in 57% of upper lumbar disc herniation. Only 4 patients (13%) had undergone previous lumbar disc (One patient at L1-2 and the other 3 patients at L4-5 level). On average, patients had preoperative symptoms duration for 1.5 years (Range 0.2–2.9).

#### **Operative Data:**

The affected levels were L1/2 in 9 patients and L2/3 in 21 patients. Discectomy was performed through conventional horse-shoe lumbar laminectomy in all patients. The average intraoperative blood loss was 257 CC, the average operative time was 65 minutes and the average hospital stay was 3 days.

#### **Post-operative Data:**

The mean follow-up period was  $13.6 \pm 7.1$  months. The mean values of preoperative back pain as determined by VAS (0-10) were  $7.7 \pm 0.3$ . The mean values of radicular pain were  $8.3 \pm 1.4$ . The mean values of preoperative economic and functional state as determined by Prolo Scale (2-10) were  $5.1 \pm 0.7$ . In the study group, at 1 year follow up and in comparison to the preoperative level, the mean back pain on VAS decreased significantly to  $2.6 \pm 0.4$  (range 0-6) ( $P < 0.01$ ) and the mean lower limb pain on VAS also decreased significantly to  $2.5 \pm 0.5$  (range 0-4) ( $P < 0.01$ ). When the outcome was evaluated by more objective means, such as the Prolo economic and functional scale, 23% (7 of 30) of all the patients experienced excellent results, 50% (15 of 30) had good results, 23% (7 of 30) had fair results, and 3% (1 of 30) had poor results. Clinical success was considered if the patient got good or excellent score on Prolo scale ( $\geq 7$  points). By 12 months follow up period, 73% of the study group expressed clinical success.

In 12 months follow up visit, when the patients were asked if under the same circumstances they would undergo the procedure again, 70% of the patients (21 patients) answered affirmatively and this reflects their satisfaction with the results of their surgeries.

#### **Complications:**

Complications in the study group are summarized in (Table 2). Intraoperative complications include three dural tears that were recorded in whole series. Early postoperative complications included 2 superficial wound infections and one deep wound infection that were treated with intravenous antibiotics.

**Table 1.** Summary of Prolo Functional Economic Rating Scale.

Score	Description
<b>Economic status</b>	E1: Complete invalid E2: No gainful occupation (including ability to do housework or continue retirement activities) E3: Able to work but not at previous occupation E4: Working at previous occupation on part-time or limited basis E5: Working at previous occupation w/ no restrictions of any kind
<b>Functional status</b>	F1: Total incapacity (or worse than pre-operative) F2: Mild to moderate level of LBP &/or sciatica (or pain same as pre-operative but able to perform all daily tasks of living) F3: Low level of pain & able to perform all activities except sports F4: No pain, but has had 1 or more recurrences of LBP or sciatica F5: Complete recovery, no recurrent LBP, & able to perform all previous sports activities

**Table 2.** Complications Recorded in the Study Group.

	Morbidity	Total
Intraoperative	Dural tear	3
Post-operative	Radicular pain and dyesthesia	2
	Increased motor weakness	1
	Superficial wound infection	2
	Deep wound infection	1



**Figure 1.** Sixty year-old male presented with pain in both legs for 3 months. Preoperative sagittal (A) T2-weighted MR images show a marked, diffuse central disc at the L2-L3 level. Postoperative sagittal (B) T2-weighted MR images demonstrate complete decompression of the L2-L3 disc.

## Discussion

Clinical symptoms and neurological findings associated with upper lumbar disc herniations are non-specific and often useless for accurate diagnosis of the level of the disease. Unique characteristics of upper lumbar disc herniation include ill-defined polyradiculopathies that cannot be clearly categorized into typical muscle group weakness, dermatome sensory deficits, or reflex deficits.<sup>17</sup> These polyradiculopathies may be associated with a narrower upper lumbar spinal canal compared with the lower spinal canal, resulting in compromise of multiple roots by a single disc herniation.<sup>6,17,18</sup>

In this study, clinical symptoms are quite variable, and localized sensory change or pain was rarely demonstrated. An accurate diagnosis is often difficult. The positive femoral stretch test is known as a relatively good diagnostic method in 84 to 94% of upper lumbar disc herniation.<sup>2,13,18</sup> Pain provocation by the femoral stretch test is believed to be caused by stretching of the femoral nerve. Because the L2, L3, or L4 spinal nerve roots are the main components of the femoral nerve, cases with symptomatic upper lumbar disc herniation may have more opportunities to show positive results for the femoral stretch test compared to cases with lower lumbar disc herniation.<sup>7,13</sup> However, in our cases, it was not helpful in differentiation of diagnosis. Most patients had nonspecific and generalized symptoms, such as lower back pain, buttock pain, and posterior thigh radiating pain. The typical clinical symptom of upper lumbar herniation, anterior thigh pain or inguinal pain, was demonstrated in only 10 patients (24%). Only one patient (2.4%) had symptoms of autonomic (bowel/bladder sphincter) dysfunction from a cauda equina lesion. Previous studies have reported a rate disturbance as high as 27% in autonomic function with upper lumbar discs.<sup>4</sup> Location of the conus medullaris in association with a high lumbar disc herniation may be a cause of predisposal to these symptoms.

Treatment of upper lumbar disc herniation presents a challenge for spine surgeon due to low incidence and delay in diagnosis resulting from the absence of classic clinical characteristics.<sup>17</sup> Surgical outcomes for disc herniation at the upper lumbar levels (L1-L2 and L2-L3) are less satisfactory than for those treated at lower lumbar levels.<sup>2,16,17</sup> Albert

et al,<sup>2</sup> reported that good or excellent surgical outcome was noted in 80% of 141 patients and Sanderson et al,<sup>17</sup> found good or excellent prognosis in 53% of patients with upper lumbar disc herniation. In this series, 33 out of 41 patients (81%) showed favorable surgical outcomes.

The choice of the surgical approach is an important issue when treating patients with disc herniation in the upper lumbar spine. A patient's age or medical problems, kyphotic change or scoliosis of the thoracolumbar vertebra, and the type of disc herniation are considered carefully. Factors considered important for determination of the surgical approach include: disc size, location, extent of calcification, surgeon's experience, degree of spinal cord deformation, and the general medical condition of the patient. Radiologic findings for L1-L2 and L2-L3 disc herniations are one of the important criteria for selection of the surgical approach. Several operative procedures for treatment of patients with upper lumbar disc herniations have been introduced.<sup>1,6,11-13</sup> Anterior approaches can be used for treatment of disc herniations that are primarily anterior to the spinal cord. For anterior decompression and fusion, several surgical morbidities, such as nonunion, graft problems, and donor site complications could be associated. Postoperative external orthosis is also necessary for enhancement of graft incorporation. An endoscopic approach could be selected for an alternative to traditional open surgery. Compared with open surgery, endoscopy provides identical visualization and exposure of the spine, with reduced incidence of operative morbidity, less pain, cosmetic benefit and rapid recovery.<sup>1,6,9</sup> Endoscopic decompression, however, is a technically demanding procedure. Safe performance of the procedure requires extensive skill, steep learning curve and the unfamiliar surgical technique make this procedure less practical for surgeons who do not perform it frequently. In addition, the effectiveness has not been proven. Due to its familiarity among spinal surgeons, the posterior approach for treatment of upper lumbar disc herniation is usually preferred. The disc is commonly approached by gentle medial retraction of the nerve root using a narrow blunt retractor. This approach is particularly suitable for removal of disc material if a disc herniation is small, focal, soft, and located laterally in the spinal canal. Preoperative determination of the nature and

amount of disc material is an important parameter. Simple laminectomy is suitable for focal, unilateral, and soft disc herniation.

If patients with upper lumbar disc herniation have bilateral symptoms and corresponding bilateral radiological evidence, bilateral laminectomy can be considered. If necessary, medial facetectomy can be used for removal of ruptured fragments according to the direction of disc migration, due to the fact that unilateral or bilateral medial facetectomy has not had an impact on postoperative instability.<sup>14</sup> None of the patients in our study showed radiographic evidence of instability on flexion/extension lumbar spine X-rays. However, use of the conventional posterior approach to an upper lumbar disc herniation may sometimes increase the risk of damage to the spinal cord or the exiting nerve root due to insufficient operative field caused by the narrow lamina window of the upper lumbar spine. For avoidance of such problems, an oblique Para spinal approach may be used.<sup>11,13</sup>

## Conclusion

Clinical features of disc herniations at the L1-L2 and L2-L3 levels were variable, and localized sensory change or pain was rarely demonstrated. In most cases, the discectomy was performed successfully by conventional posterior laminectomy.

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## الملخص العربي

### الاستئصال الجراحي للانزلاق الغضروفي القطني العلوي

**البيانات الخلفية:** الانزلاق الغضروفي بين الفقرتين الأولى والثانية وكذلك الثانية والثالثة يختلف عن الانزلاق الغضروفي في المستويات الدنيا من العمود الفقري القطني فيما يتعلق بالخصائص السريرية ونتائج العمليات الجراحية.

**الهدف:** توضيح الخصائص الأكلينيكية والنتائج الجراحية للانزلاق الغضروفي القطني العلوي.

**طريقة الدراسة:** دراسة لحالات أكلينيكية على ٣٠ مريض بالانزلاق الغضروفي القطني العلوي.

**الطرق و المرضى:** تم إجراء جراحة استئصال الغضروف القطني بين الفقرات القطنية العليا في ٣٠ مريض و تم مقارنة النتائج باستخدام المضاهي البصري لألم الظهر وألم الطرفين السفليين. وكذلك مقارنة النتائج باستخدام مقياس برولو.

**النتائج:** عانى ٩ مرضى من انزلاق غضروفي بين الفقرتين الأولى والثانية و عدد ٢١ مريض من انزلاق غضروفي بين الفقرتين الثانية والثالثة. أظهر ٧٣٪ من المرضى تحسن كبير بعد جراحة استئصال الغضروف القطني العلوي وأظهر ٢٣٪ من المرضى تحسن جزئي.

**الاستنتاج:** الاستئصال الجراحي للانزلاق الغضروفي القطني العلوي عمل جراحي يحتفظ بنسبه نجاح عاليه في الشفاء