Extensive Laminectomy for Redo Lumbar Discectomy; Could it Be A Successful Alternative Option in Stable Single Level Post Inter-Laminar First Recurrence?

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Abstract

Background: Recurrence after lumbar discectomy cannot be prevented. Recurrence rates vary between 5 to 20% being independent from the technique employed. If the patients can no longer tolerate the pain, there are different surgical options on how to handle the disc re-herniation.

Objective: To assess extensive laminectomy as a possible option for redo discectomy in stable single level post inter-laminar first recurrence in well selected patients with sciatica as main complaint.

Patients and Methods: A prospective study of redo discectomy through extensive laminectomy with one year follow-up in selected 28 patients aged 23 to 58 years, with recurrent single level stable lumbar disc herniation that previously underwent inter-laminar discectomy, revision done at L 4-5 level in 19 cases (67.85%) and at L5-S1 level in 9 cases (32.1%). All suffer from sciatica as the main complaint, which was proven radiologically to be attributed to recurrent stable single level lumbar disc herniation.

Results: The mean of preoperative Visual Analogue Score (VAS) for leg pain was 81.25 and improved to 24.7 at 12 months postoperatively. One year postoperative the rate of improvement according to the JOA score system for low-back pain ranged between 55.5%-91.6% (Mean ±SD=75.4%±9.2). 25 patients (89.3%) have no interruption of work or daily life activities according to post-operative Dennis pain scale.

Conclusion: This technique seems to be a successful alternative surgical option for redo.

Discectomy in stable single level post inter-laminar first recurrence in well selected patients with sciatica as the main complaint with no or mild low back pain.

Key Words: Extensive laminectomy – Redo discectomy – Disc re-herniation.

Introduction

LUMBAR disc prolapse is a disease most common between 30 and 50 years of age, with a male preponderance, as well as an association with repeated mechanical forces and smoking. It may occur at any level, but 95% occur at L4/5 or L5/S1. In the older population, with chronically degenerative discs, compression of the nerve root is more likely to be due to facet joint or ligamentum flavum hypertrophy. Surgical intervention is best directed at those with unremitting nerve root symptoms [7].

Recurrence after lumbar discectomy cannot be prevented. Unfortunately, even after successful lumbar discectomy surgery, there is between a 5% and 15% chance of a recurrent disc herniation at the same location. The reason is secondary to the nature, and size of the lumbar disc. Most disc herniations are pieces of annulus, endplate, and or nucleus elements of the disc. The fragments, however, are only a very small piece compared to the whole disc. No matter how much disc is removed during the original discectomy surgery, there is always more disc material available to herniate. In addition to the amount of disc material still present; the hole where the disc material herniated is still present, even though there is some scar tissue and repair of the hole, it will never be as strong as the original annulus. Just so it is clear, once a disc herniates, it will always have the 5%-15% chance of re-herniation, with or without surgery [15].

Recurrence rates after discectomy vary between 5 to 20% being independent from the technique employed [3,4]. Success rate for revision operations, on the other hand, is worse than primary operations due to epidural fibrosis scar tissue, stenosis, segmental instability and additional traumas to develop during the revision procedure [9]. Epidural fibrosis is the most important risk factor in terms of causing injuries to the dura and neural structures [15].

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If there is a recurrent disc herniation after prior successful discectomy surgery, most physicians will still try to treat the disc herniation nonsurgically. If the patients can no longer tolerate the pain, there are different surgical options on how to handle the lumbar recurrent disc herniations [11].

The aim of this study was to assess extensive laminectomy as a possible option for redo discectomy in stable single level post inter-laminar first recurrence in well selected patients with sciatica as the main complaint with no or mild low back pain.

**Patients and Methods**

This is a prospective study of redo discectomy through extensive laminectomy with one year follow-up in properly selected 28 patients whom were operated upon in Neurosurgery Department of Benha University Hospital from May 2010 to May 2014 and all share the fact that they suffer from sciatica as main complaint (all these patients had positive straight leg raising test), with no or mild midline low back pain that were proven to be attributed to recurrent stable single level lumbar disc herniation based on preoperative MRI Lumbosacral Spine (LSS) with IV contrast and plain X-ray of lumbosacral spine (A-P, lateral, right and left oblique, maximum flexion and extension views) that confirm the level of the recurrence and stability of the spine at that level. Before revision discectomy, all cases tried conservative measures as long as no indication for urgent surgery for at least three months of non-steroidal anti-inflammatory medications and neurotonics and physiotherapy program but failed. Postoperative plain X-ray LSS (A-P and lateral views) were done to show the extent of bony work in the revision surgery and dynamic views (maximum flexion and extension views) to assess one year postoperative stability and when indicated postoperative MRI lumbosacral spine with IV contrast was done.

**Exclusion criteria:** The patients responded to conservative treatment were not subjected to revision surgery, the patients underwent laminectomy for primary lumbar discectomy, the patients with post inter-laminar recurrent disc when associated with multi-level lumbar canal stenosis or with multi-level disc prolapse, or with vertebral instability were not included in our study.

**Surgical procedure:**

All patients were operated upon in the knee-chest position under general anesthesia and were given the same prophylactic antibiotic agents with induction of anesthesia. A standard longitudinal midline skin incision was made 5-8cm in length, centered over the aimed level and confirmed with intra-operative radiographs when needed the paraspinal muscles elevated carefully exposing L4 or L5 lamina according to level of recurrence, then spino laminectomy of targeted L4 or L5 done and removal of the underlying remaining part of ligationum flavum, then medial facetectomy (extension of bony removal to include medial 1/3 of the facet joint) exposing and decompressing the traversing nerve root in the lateral recess after careful dissection of the fibrous scar. In all the procedures after foraminotomy performed, careful medial retraction of the nerve root permitted identification of the disc space and recurrent prolapse.

Any sequestrated disc fragment (if present) was removed at first then unilateral annular scalpel incision was done, thus the disc space itself was entered with subsequent discectomy (as much of disc material as possible was removed by piecemeal fashion), so that no significant disc bulge beneath the traversing nerve root was left at the end of the procedure. Good hemostasis before closure then wound closure in layers and skin closed with subcuticular absorbable sutures over non-suction drain removed 24 hours postoperative. Only in the first postoperative day a single dose of narcotic analgesic was given. The patients discharged after surgery on the same antibiotics for 10 days and non-steroidal anti-inflammatory drugs for 2 weeks.

Pre-and post-operative (at 6 months and at one year follow-up) Visual Analogue Score (VAS) [5] for leg pain was recorded. One year only scored to eliminate the effect of the patients' related factors; especially work activities, obesity and smoking.

One year postoperative improvement was rated according to the Japanese Orthopedic Association (JOA) score system for low-back pain [8]. (Total score=15 points).

\[
\text{Rate of improvement} = \frac{\text{Postoperative score} - \text{Preoperative score}}{15 \text{ full score} - \text{Preoperative score}} \times 100\%
\]

Dennis pain scale, is a simple method used to evaluate the preoperative severity of pain and one year postoperatively to evaluate efficacy of discectomy and the functional outcome [11]. The scale contains a 5 point response option, ranging from:

- **P1 = No pain.**
- **P2 = Occasional minimal pain; no need for medication.**
P3 = Moderate pain, occasional medications with no interruption of work or activities of daily life.

P4 = Moderate to severe pain, occasionally absent from work; significant changes in activities of daily life.

P5 = Constant, severe pain; chronic pain medication.

**Statistical analysis:** The collected data were tabulated and analyzed using SPSS version 16 software (SpssInc, Chicago, ILL Company). Categorical data were presented as number and percentages while quantitative data were expressed as mean ± standard deviation. Paired t-test was used to compare between means of two matched samples of numerical data. The level of significance was 0.05.

**Results**

The study population comprised 28 properly selected patients aged 23 to 58 (mean=38) years, with recurrent single level stable lumbar disc herniation that previously underwent inter-laminar discectomy for primary lumbar disc herniation. 22 patients are males (78.57%) and 6 patients are females (21.42%), and revision was done at L4-5 level in 19 cases (67.85%) and at L5-S1 level in 9 cases (32.1%). The main complaint of the patients was sciatica at the same side as in the primary discectomy in 23 cases (82.1%) and at contralateral side to that of the primary discectomy in 5 cases (17.85%).

According to VAS scores for Leg pain, the preoperative mean ± SD was 81.25±4.11 that improved to 34.1±6.56 and 24.71±4.89 at 6 and 12 months postoperatively respectively. The improvement 6 months postoperative when compared to the preoperative one was found statistically high significant (81.25±4.11 vs 34.1±6.56=34.5 and \(p<0.001\), paired t-test).

The improvement 12 months postoperative when compared to the preoperative one was also found statistically high significant (81.25±4.11 vs. 24.71±4.89=45.7 and \(p<0.001\), paired t-test).

One year postoperatively improvement was rated according to the JOA score system for low-back pain [8].

According to JOA score, the JOA scores were higher post-operative compared to preoperative and this improvement was found statistically significant (\(p<0.001\), paired t-test).

According to Dennis pain scale, eighteen patients (64.3%) presented in P5, and 10 patients (35.7%) were in P4. One year post operatively, complete pain relief P1 was achieved in four patients (14.3%), fifteen patients (53.6%) were in P2, six patients (21.4%) were in P3 and three patients (10.7%) were in P4.

The mean operative time from skin incision to skin closure in revision discectomy was 152min (range, from 140 to 170min), and the mean Perioperative blood loss (intraoperative bleeding and postoperative drain) was 270ml (range, 230-360ml).

The patients left hospital within 48 hours after surgery except 3 complicated cases needed from 2-3 weeks to leave hospital. All were advised to use hard lumbar corset for three months post operatively during daily activity, initially avoiding prolonged sitting periods and activities involving heavy lifting or repetitive mechanical stress and gradually return to normal activities. At the end of the study, no vertebral instability could be detected on plain X-ray dynamic views.

The operative complications were, a dural tear in two patients (7.1%) detected intraoperative and repair was done with water tight sutures at the same surgery with no detected postoperative CSF leak, they left hospital two weeks after surgery. Five patients (17.9%) had increased numbness than preoperative that spontaneously resolved 3 to 6 weeks after surgery and superficial wound infection in one patient (3.6%) resolved after IV antibiotic therapy for 4 weeks but left hospital three weeks after surgery. One patient (3.6%) had postoperative partial foot drop that returned to normal after three months of physiotherapy.

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Fig. (2): MRI LSS sagittal T2WI (A), post contrast sagittal T1WI (B) and axial T2WI (C), views showing recurrent right paracentral L5-S1 LDP with encroachment on lower aspect of corresponding right neural foramen of a female patient 38 years old with mild LBP and RT. Sciatica.

Fig. (3): Post-operative plain X-ray LSS of the same patient A-p and lateral views (A) and (B) respectively, showing L5-S1 interlaminar intervention and maximum flexion and extension views (C) and (D) respectively. Showing maintained stability at L5-S1 level.

Fig. (4): Post-operative plain X-ray LSS of the same patient showing L5 laminectomy, medial facetectomy with right foraminotomy A-p (A) and lateral (B) views.

Table (1): Comparison of pre and postoperative 6 and 12 months VAS scores for leg pain.

<table>
<thead>
<tr>
<th></th>
<th>Preoperative</th>
<th>6 months postoperative</th>
<th>12 months postoperative</th>
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<tbody>
<tr>
<td>Range</td>
<td>75-89</td>
<td>25-49</td>
<td>18-40</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>81.25±4.11</td>
<td>34.1±6.56***</td>
<td>24.71±4.89***</td>
</tr>
</tbody>
</table>

VAS: Visual Analogue Scale, N: Number, SD: Standard Deviation. ***: Significant difference compared to preoperative VAS scores (p<0.001; paired t-test).

Table (2): Rate of improvement one year postoperative according to JOA score.

<table>
<thead>
<tr>
<th></th>
<th>Preoperative</th>
<th>One year postoperative</th>
<th>Rate of improvement (%)</th>
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<tbody>
<tr>
<td>Range</td>
<td>4-9</td>
<td>11-14</td>
<td>55.5-91.6</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>6.1±1.19</td>
<td>12.8±0.86***</td>
<td>75.4±9.2</td>
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</tbody>
</table>

JOA: Japanese Orthopedic Association, N: Number, SD: Standard Deviation. ***: Significant difference compared to preoperative JOA scores (p<0.001; paired t-test).
Discussion

Recurrence after lumbar discectomy cannot be prevented. Unfortunately, even after successful lumbar discectomy surgery, there is between a 5% and 15% chance of a recurrent disc herniation at the same location [18].

Recurrence rates after discectomy vary between 5 to 20% being independent from the technique employed [34]. Success rate for revision operations, on the other hand, is worse than primary operations due to epidural fibrosis scar tissue, stenosis, segmental instability and additional traumas to develop during the revision procedure [9].

If there is a recurrent disc herniation after prior successful discectomy surgery, most physicians will still try to treat the disc herniation nonsurgically. If the patients can no longer tolerate the pain, there are different surgical options on how to handle the lumbar recurrent disc herniations [11]. The possible different surgical options include open and minimally invasive techniques (full-endoscopic interlaminar and transforaminal lumbar discectomy and conventional microsurgical technique).

According to VAS scores for leg pain, the preoperative mean ± SD was 81.25±4.11 that improved to 34.1±6.56 and 24.71±4.89 at 6 and 12 months postoperatively respectively. The improvement 6 months postoperative when compared to the preoperative one was found statistically high significant (81.25±4.11 vs 34.1±6.56, =34.5 and p<0.001, paired t-test). The improvement 12 months postoperative when compared to the preoperative one was also found statistically high significant (81.25±4.11 vs 24.71±4.89=45.7 and p<0.001, paired t-test).

One year postoperative improvement was rated according to the JOA score system for low-back pain [6]. The rate of improvement ranged between 55.5%-91.6% (mean ± SD=75.4%±9.2).

According to Dennis pain scale, 25 patients (89.3%) have no interruption of work or activities of daily life.

The mean operative time from skin incision to skin closure in revision discectomy was 152min (range, from 140 to 170min), and the mean perioperative blood loss (intraoperative bleeding and postoperative drain) was 270ml (range, 230-360ml). The patients left hospital within 48 hours after surgery except 3 cases left within 2-3 weeks post-op. No vertebral instability one year post-op. could be detected on plain X-ray dynamic views but this needs to be re-evaluated on longer term basis.

The operative complications were, a dural tear in two patients (7.1 %) detected intraoperative and repair was done with water tight sutures at the same surgery with no detected postoperative CSF leak and superficial wound infection in one patient (3.6%) resolved after IV antibiotic therapy for 4 weeks. One patient (3.6%) had postop. partial foot drop that returned to normal after three months of physiotherapy.

Discectomy for recurrent LDH is accompanied by a higher morbidity rate compared with primary LDH. Because of the limited operating field, the majority of surgeons have been discouraged from utilising a minimally invasive approach for revision surgery [6]. The treatment of recurrent disc herniation usually uses an open technique with a wide exposure for discectomy or lumbar interbody fusion [13-16].

Ruetten et al., reported a comparison of results of lumbar revision discectomies in full-endoscopic interlaminar and transforaminal lumbar discectomy and conventional microsurgical technique. Eighty-seven patients with recurrent herniation after conventional discectomy underwent full-endoscopic or microsurgical intervention and were followed for 2 years. Postoperatively, 79% of the patients no longer had leg pain, and 16% had occasional pain. The clinical results were the same in both groups. The re-recurrence rate was 5.7% with no difference between the groups. The full-endoscopic techniques brought significant advantages in the following areas: Rehabilitation, complications, and traumatization. Recurrent lumbar disc herniations can be sufficiently removed using the full-endoscopic technique. Full-endoscopic surgery is a sufficient and safe supplementation and alternative to microsurgical procedures [18].

In recent years, Microendoscopic Discectomy (MED) for lumbar disc herniation has been widely applied in clinical practice due to its minimal exposure and certain efficacy [13,14]. The recurrence rate of MED is between 3.5% and 10.8% [12,17]. MED is seldom used in clinical practice and is considered to be contraindicated for the treatment of recurrent disc herniation due to extensive adhesion in the spinal canal, difficult exposure and potential damage to the nerve root and dural sac [14].

While Evangelos et al., reported a systematic review done to investigate which minimally invasive techniques have been used for discectomy in...
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recurrent Lumbar Disc Herniation (LDH), presented the success and complication rates and evaluated the advantages and limitations of each technique. Microendoscopic Discectomy (MED), endoscopic transforaminal and interlaminar discectomy (ETD and EID) have been used for treatment of recurrent LDH. The reported success rate is 60-95%. Full endoscopic techniques, especially ETD, showed favorable results concerning dural tear rates but have a demanding learning curve. All three techniques have a low delayed instability rate. MED, ETD and EID are safe and efficient treatment options for surgical management of recurrent LDH with good success and low complication rates. At the same time, they offer the advantages of minimally invasive access. Minimally invasive techniques have gained ground in the treatment of primary LDH and an increasing number of patients are expressing interest in such techniques for the treatment of recurrent LDH [6].

Conclusion:

According to the results of this study, this technique seems to be a successful alternative surgical option for redo discectomy in stable single level post inter-laminar first recurrence in well selected patients with sciatica as the main complaint with no or mild low back pain. Bigger number of cases and longer follow-up period four to ten years still recommended.

Acknowledgement:

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References

الملخص العربي

المقدمة: الفضروف القطنى المرجع تتراوح معدلاتها بين 5-20% بغض النظر عن التقنية المستخدمة.

هدف الدراسة: تقييم استئصال الصفحية القطنية الشامل كبدائل يتبع التدخل لاستئصال الفضروف القطنى المرجع على مستوى واحد

ثابت تم استئصال سابق بالتدخل بين الصفائح القطنية.


النتائج: تحسن الام الساق بشكل ملاحظ وعمرة 38.2% من المرضى لعملهم ونشاطهم اليومي المعتاد.

الخلاصة: من النتائج السابقة توصي بهذه التقنية الناجحة في مثل هذه الحالات المختارة جيدا.