

A Study to Assess the Functional Outcome After Laminotomy and Microdiscectomy in Lower Lumbar Disc Prolapse

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Abstract

Background: Advances in technology with better surgical techniques and instrumentation have proved time and again to reduce the incidence of complications and cosmetic morbidities caused by the traditional techniques in the management of intervertebral disc prolapse of the lumbar spine. By limiting the width of the surgical corridor the risk of muscle crush, exposure of soft tissues for infection and post-operative morbidity and complications can be minimized by great amounts.

Aims and Objectives: The aim of the study was to assess the functional outcome of the spine after laminotomy and microdiscectomy in cases of lower lumbar intervertebral disc prolapse.

Materials and Methods: A prospective study was conducted in the department of orthopedics of a teaching hospital in Southern India. A total of 28 diagnosed cases of intervertebral disc prolapse at L5-S1 levels were included in the study. The pre-operative functional status was assessed as per the modified Oswestry disability index (ODI) and visual analog scale (VAS). All of them underwent laminotomy of L5 vertebra and microdiscectomy at L5-S1 level. The patients were reviewed at post-operative weeks 6, 12, and 24 and the functional status of the spine was assessed and tabulated using the modified ODI and VAS. All results were tabulated and calculated with repeated measures ANOVA using SPSS software version 20.0.

Results: It was noted that the modified ODI scores preoperatively had a mean of $75 \pm 11.85\%$ which improved to $55 \pm 9.18\%$ at 6 weeks, $45 \pm 9.37\%$ at 12 weeks, and $36 \pm 8.65\%$ at 24 weeks. The VAS scores were noted to have a mean of 8 ± 0.93 mm preoperatively. It was noted to have improved to 6 ± 0.93 mm at 6 weeks, 5 ± 0.74 mm at 12 weeks, and then to 5 ± 0.73 mm at 24 weeks. This showed that there was an improvement in the back function after surgery in all the cases. No complications were noted in any of the cases.

Conclusion: Laminotomy and microdiscectomy level is an excellent technique of management of intervertebral disc prolapsed of L5-S1 with minimal complication rate.

Keywords: Visual analogue scale, Oswestry Disability Index, lumbar spine, laminotomy, microdiscectomy.

Introduction

Low back pain is a very common condition which is experienced by almost 70–80% of the population at some point in their life [1].

The major cause of low back pain in the working class population is primarily an

intervertebral disc prolapse [2]. Of all the cases of a low backache only clinical significant low back pain accounts to only 4–6% [2]. Degeneration of the disc causes prolapse of the disc into the intervertebral foramina causing clinical

signs and symptoms [2]. The surgical results depend on detailed history, physical and radiological examination so as to assess and confirm the real cause of back pain [2].

Surgical disc removal is a simple solution for patients with severe back pain with satisfactory results

[3]. The traditional technique of extensive laminectomy and discectomy lead to extensive disruption of posterior stabilization structures and complications which followed later [3].

Aims and objectives

The aim of the study was to assess the functional outcome of the spine after laminotomy and microdiscectomy in the management of back pain with or without radiculopathy in patients with lower lumbar intervertebral disc prolapse and to study the complications occurring due to the technique.

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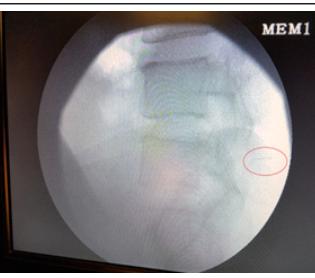


Figure 1: (a) Pre-operative marking of L5-S1 level for incision with a sterile needle under fluoroscopic guidance. (b) Fluoroscopic image of L5-S1 level. The needle is marked by the red ellipse.



Figure 2: Fluoroscopic image showing marking of L5 spinous process intraoperatively.



Figure 3: Disc material after discectomy.

Materials and Methods

A prospective study was conducted from August 2015 to May 2017 in the department of orthopedics of teaching hospital in southern India after obtaining clearance from the ethical committee of the University. A total of 28 patients were included in the study. The patients included under study were patients who had symptoms of pain in the lower back with or without radiation to the lower limb and were diagnosed to have intervertebral disc prolapse at L5-S1 levels (diagnosed by magnetic resonance and imaging), between 20 and 40 years of age with no neurological deficits were included in the study.

These patients must have had undergone a minimum of 2 months of failed conservative management in terms of skin traction, physiotherapy, and analgesics.

Patients with a history of neurological involvement, history of diabetes mellitus, or other systemic diseases including cancer or tumors, also other spinal pathologies such as spondylolisthesis, arthritis, and disc prolapsed at levels other than L5-S1 were excluded from the study. Even patients who had undergone surgeries to the spine or any other procedures like epidural injections were excluded from the study. A thorough clinical examination was done, and the findings were recorded. The scoring of spinal function was done as per the modified oswestry disability index (ODI) and visual analog scale (VAS) [5].

The surgical technique employed involved taking up all the cases under

general anesthesia. The patient was positioned prone over two bolsters: One over the nipple level and the second at the level of the anterior superior iliac spines. This allowed keeping the abdomen free to avoid any effect on respiration. Under the fluoroscopic guidance, the level of L5-S1 disc space was marked using a sterile needle (Fig. 1a and b). After a midline incision is given from the mid-spinous process of the upper vertebra to the superior margin of the spinous process of the lower vertebra at the involved level (a 2.5 cm incision), hemostasis is achieved using electrocautery as the dissection and is carried to the fascia. Fascia is incised midline using electrocautery with the help of Cobb elevator; the deep fascia and muscle on the involved side are elevated subperiosteally from the spinous process and the lamina. Under fluoroscopic guidance, a lateral radiograph is taken after a clamp is placed over the spinous process to confirm the level of the vertebrae (Fig. 2). Using the Cobb elevator the interlaminar space and the edge of each lamina is exposed. Micro lumbar

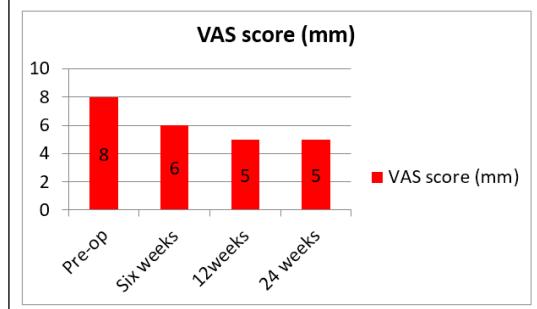
retractor is inserted into the wound. Then, the ligamentum flavum is removed using a pituitary rongeur, some bone is removed from the caudal edge of the superior lamina if required and the edge of the ligamentum flavum is excised using a Kerrison rongeur. Once the roots are identified and retracted medially. The disc becomes visible as a white, fibrous, and avascular structure. The exposed disc material is removed using disc forceps (Fig. 3). The root and adjacent dura are inspected for the disc fragments. The disc space is irrigated forcefully to dislodge any loose fragments. The laminotomy dead space is filled with gel foam. Fascia and skin are closed in layers. All the operations were carried out under the vision of microscope (Fig. 4).

The first change of dressing and drain removal was done on post-operative day 3. The suture removal and discharge of all the patients were done on post-operative day 10–12. The follow-ups were done on post-operative weeks 6, 12, and 24. The scoring of the spinal function during all the reviews was done as per the Modified Oswestry Disability Score and VAS. The results were

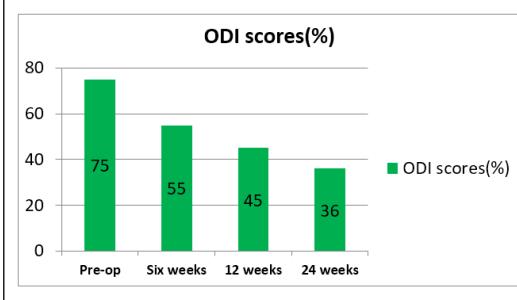


Figure 4: Intraoperative image showing laminotomy and microdiscectomy being performed under a microscope.

Graph 1: Bar graphs showing the improvement in the mean of VAS scores during the pre-operative period and then at 6, 12, and 24 weeks of post-operative. The scores fall from 8 mm to 5 mm in the course of 24 weeks post-operative *VAS: Visual analog scale.



Graph 2: Bar graphs showing the improvement in the mean of ODI scores during the pre-operative period and then at 6, 12, and 24 weeks of post-operative. The scores fall from 75% to 36%mm in the course of 24 weeks post-operative *ODI: Oswestry disability index.



tabulated and calculated as per the repeated measures ANOVA using SPSS software version 20.0.

Results

A total of 28 patients were included in the study among whom 18 were men and 10 were women. 16 patients had radiculopathy of pain to the right lower limb, and 12 patients had to the left lower limb. 12 of our patients were between the age group of 20 and 30 years and 16 were between 30 and 40 years. It was noted that the modified ODI scores preoperatively had a mean of $75 \pm 11.85\%$ which improved to $55 \pm 9.18\%$ at 6 weeks, $45 \pm 9.37\%$ at 12 weeks, and $36 \pm 8.65\%$ at 24 weeks (Graph 1). The VAS scores were noted to have a mean of 8 ± 0.93 mm

preoperatively. It was noted to have improved to 6 ± 0.93 mm at 6 weeks, 5 ± 0.74 mm at 12 weeks, and then to 5 ± 0.73 mm at 24 weeks (Graph 2). This showed that there was an improvement in the back function after surgery in all the cases. No complications were noted in any of the cases.

Discussion

The open discectomy advanced into microdiscectomy after the use of an operating microscope [6]. Endoscopic surgery for a herniated disc was first reported by Mayer and Brock [7]. The potential benefits of microdiscectomy included a smaller incision, less paraspinal injury which led to a shorter hospital stay, faster recovery, and less pain postoperatively [8, 9, 10, 11]. The surgical site infection was also reduced due to small incision and minimal exposure [12].

Of the total of 28 patients, 64.3% of our patients were men, and the rest were women. These results are comparable to the results by Bhatia et al. [13].

Improvement in the VAS scores was noted from the pre-operative period and in the follow-up period of 6–24 weeks

which was 8 ± 0.93 mm in the pre-operative period which then improved to 5 ± 0.73 mm at 24 weeks. These results are comparable to those of Bhatia et al. [13]. The ODI scores also were noted to have improved from $75 \pm 11.85\%$ preoperatively to $36 \pm 8.65\%$ at 24 weeks of follow-up. These results are comparable to the results by Bhatia et al. [13].

Dewing et al. concluded that microdiscectomy in symptomatic young patients caused a high satisfaction rate with the improvement of symptoms and early return to work [14]. They also concluded that patients with L5-S1 herniations had much better results as compared to L4-L5 herniations [14]. Lønne et al. concluded that most of their patients recovered from paresis within 1 year of microdiscectomy [15].

Conclusion

Laminotomy and microdiscectomy are an excellent technique for management of intervertebral disc prolapse at L5-S1 level with the satisfactory functional outcome and minimum complication rate.

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