

Original Article**Minimally Invasive (non-microscopic) Limited Discectomy (Sequestrectomy) of Sequestered Variety of Lumbar Disc Herniation of Young Active Person; Short Term Clinical Outcome**

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Abstract

Background: Lumbar disc herniation is secondary cause of low back pain which causes morbidity. Young and active people are mostly suffering from this complaint. There are variety of options for lumbar disc herniation surgery, among them open lumbar disc surgery using minimally invasive technique is most popular procedure. Disc removal done in limited or aggressive manner.

Objective: Aim of the study is to evaluate the effectiveness of minimally invasive (non-microscopic) limited discectomy of sequestered variety of lumbar disc herniation.

Method: A retrospective cohort study was conducted among 50 young patients (<45 years) presenting low back pain with/without predominant leg pain and MRI confirmed diagnosis of sequestered disc herniation between April 2018 and January 2021. All patients underwent limited microdiscectomy. Outcomes of surgery were evaluated using visual analogue score (VAS) for leg and back pain, Oswestry Disability Index (ODI), and Mac nab's criteria.

Results: In this study, the mean age of the patients was 32.9 years, mean duration of surgeries was 55 minutes and mean follow up was 2.9 years. Maximum number (58%) of patients were in the age group of 25 to 34 years and minimum number (12%) of patients were below 25 years of age group. There were 32 (64%) male patients and 18 (36%) female patients. The VAS scores improved well in the postoperative measurements, preoperative ODI score was 62.57 and postoperatively score was 17.48 after one year ($P < .05$), 59.70% patients reported as excellent, 21.50% patients reported good, 13.40% patients reported fair, and 5.40% patients reported poor outcomes as per Mac nab's criteria.

Conclusion: In young patients, minimal microdiscectomy alone for sequestered herniation has a high success rate and a low need for secondary surgery. The key attribute for a lower occurrence of recurrence, postoperative back pain and instability requiring a secondary treatment could be patient selection in terms of sequestered disc. The additional benefit of maintaining normal spinal anatomy can be minimally invasive selective discectomy, thus reducing the need for primary spinal fusion in these patients.

Keywords: Lumbar disc herniation, Limited discectomy, minimally invasive spine surgery, Spine surgery, Sequestered disc.

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Introduction

Lumbar disc rupture (LDH) causes symptoms like intermittent low back pain, sciatica, or patients might have a lot of serious medicine symptoms. Treatment target in such cases is to cut back pain and inflammation¹. Bone discs are advanced structures comprises nucleus pulpous (NP), annulus fibrous (AF) and gristle motor end plate, and along, they confirm the disc state and experience vital axial loading, lateral bending and motion also as flexion vs. extension forces². Body part disc rupture is outlined as a localized or focal displacement of disc material on the far side the bounds of the disc area which will cause substantial radicular symptoms, that if persist, might need surgical intervention³. Herniated discs generally classified as extrusions, protrusions, or sequestrations. Narrowed-base ruptures have termed extrusions; sometimes there'll be an oversized herniaion outside the canal⁴. Wide-based ruptures are known as protrusions within which the diameter at the bottom of the herniation is wider than the canal diameter, whereas sequestrations are rupture within which there's no continuity between the rupture and also the remaining disc⁵. Lumbar disc rupture is principally postero lateral rupture that there by press on the traversing nerve root, and pain development may either be from mechanical compression or inflammatory chemical irritation of the nerve root. Mechanical compression will distort and stretch the

nerve, also as squeeze the micro vascular circulation resulting in hypo perfusion and ischemia symptoms⁶. Operation in patients with but six months period is usually recommended in those with symptomatic body part disc rupture whose complains are severe enough to justify surgery. Surgical choices used are discectomy with excision, hemilaminectomy, laminotomy, fenestration, microdiscectomy or examination discectomy⁷⁻¹⁰. The most common procedure is Discectomy with hemilaminotomy approach. Complications embrace pidural hurt, meninges tears, nerve root injury and incomplete removal of prolapsed disc fragments.

Among the various choices of surgery one is aggressive discectomy, which implies removal of the violative ruptured intervertebral disc also as surgical process of the traditional disc¹¹. and alternative is restricted discectomy which implies removal of the violative disc fragment alone with or while not minimum invasion of the disc space^{12,13}. Its repetition (at identical level no matter ipsilateral or contra lateral herniaion) following disc excision is reported to be five to seven day¹⁴⁻¹⁷.

Objective

In this study we aimed to evaluate the short term clinical outcome of open limited discectomy for lumbar disc prolapse.

Methodology

Type of study	Retrospective study
Place of study	Enam Medical College and other renowned private hospital
Study period	April 2018 to January 2021
Study population	50 patients were included in the study

Inclusion criteria

- Age <45 and >20
- Back pain with or without leg pain
- MRI confirmed sequestered disc herniation

Exclusion criteria

- Age more the 45 and less than 20
- Associated stenosis and segmental instability as predominant cause of pain as determined by preoperative clinical and radiological assessment
- Extension-dominant pain
- Cases with multilevel disc involvement, recurrent disc herniation and previous surgery of lumbar spine

Surgical technique

The patient was seated in a prone position on a radiolucent table with bolsters below the chest and the iliac crest holding the abdomen free, head end elevated and well-padded pressure points. The surgeon was on the side of the patient with symptoms; the surgeon was on the side with more serious symptoms in cases with bilateral symptoms. All patients were unilaterally approached. On the ipsilateral side, a 20G spinal needle was inserted all the way down to the lamina or the interlaminar space using lateral fluoroscopy imaging, so that the trajectory of the needle bisected the disc space involved. The needle, 0.8 to 1 cm lateral to the midline, was inserted. 10 cm³ of 0.5 percent diluted bupivacaine was injected to provide preemptive analgesia until the position was verified on the image intensifier. A vertical incision of 2-5cm long to the skin centered over the spinal needle. The lumbar fascia was incised and only the symptomatic side was dissected from the spinous process of the paraspinal muscle and the right angled retractor was inserted. To enter the affected interlaminar space, dissection was performed under direct vision. In order to expose the sequestered

herniated disc, the nerve root was located and mobilized. Using disc forceps, removal of the offending herniated disc was carried out and the nerve root was released using a nerve hook and Penfield dissector all around. The opposite side axilla as well as the shoulder of the nerve root and the anterior part of the dura were examined for secret fragments according to the criteria of a specific case, based on the symptomatology and the MRI location of the fragments. The patient received routine patient pre-and post-operative treatment, including pain control, prevention of post-operative cephalosporin infection of the third generation. 12 hours after surgery, patients were confined to bed, then the patient was made to stand up and incremental walking was encouraged, prolonged stopping and flexion was prevented. After two weeks, the sutures were removed. Prohibited from lifting and bending for 6 weeks. A routine post-operative back exercise regimen was prescribed after 4 weeks for all patients.

Measurement of outcome

At intervals of 1 week, 6 weeks, 3 months, 6 months and 12 months, the patients were followed up. The visual analog scale (VAS) for leg pain, VAS for back pain and the Oswestry Impairment Index (ODI) questionnaire were evaluated for patients. Using mean and standard deviation, continuous variables are expressed. The normal distribution of data was accompanied by VAS for leg pain and ODI scores; therefore, the paired t test was used to test the statistical significance of the change in mean pre- and postoperative parameter values. VAS did not come under the usual data distribution for back pain. All statistical analysis was conducted using version 20.0 of IBM SPSS Program. A probability value of P < .05 was considered statistically significant.

Results

Table 1 shows the characteristics of the patients. It shows the mean age of the patients was 32.9 years, mean duration of surgeries was 55 minutes and mean follow up was 2.9 years. See table 1 below-

Table 1: Characteristics of the patients

Characteristics	Mean value
Mean age	32.9 years
Mean duration of surgery	55 minutes
Mean follow -up	2.9 years

In table 2, the age group of the patient's are shown. Here, maximum number (58%) of patients was in the age group of 25 to 34 years and minimum number (12%) of patients was below 25 years of age group. See table 2 below-

Table 2: Age group of the patients

Age group	Frequency (n=5 0)	Percentage
<25	6	12%
25-34	29	58%
35-45	15	30%

Figure 1 shows the gender distribution of the patients in our study. There were 32 (64%) male patients and 18 (36%) female patients in this study. See figure 1-

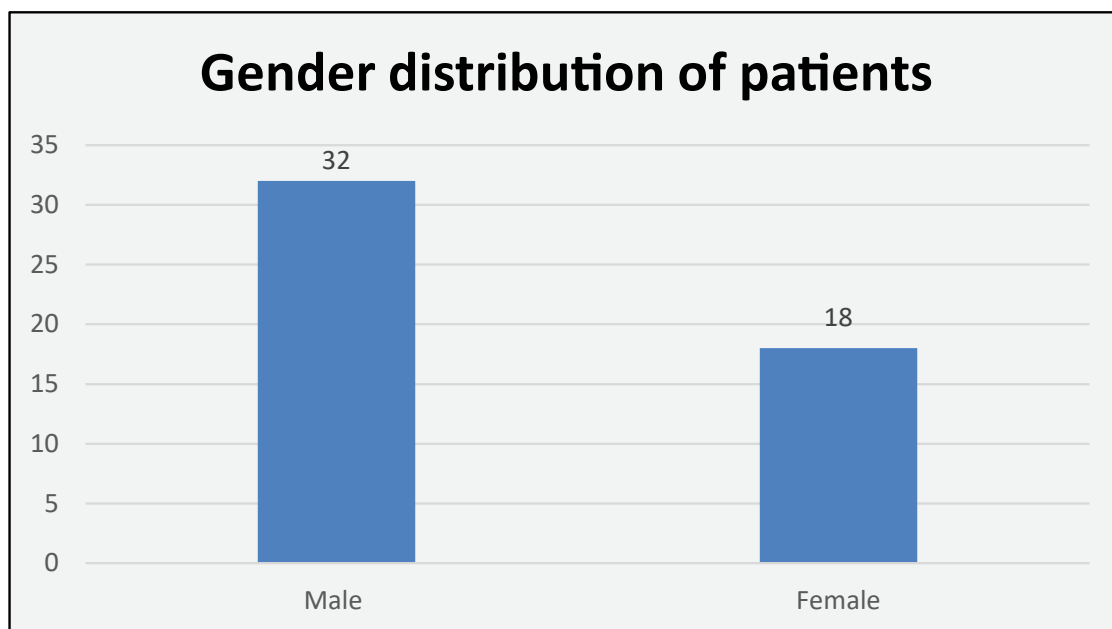


Figure 1: Gender distribution of the patients.

Table 3 shows the preoperative and postoperative mean VAS scores of the patients in this study. The VAS scores improved well in the postoperative measurements. See the values in table 3 below-

Table 3: Preoperative and postoperative VAS comparison

Mean VAS comparison	Preoperative VAS	Postoperative VAS	P value
Mean VAS score for leg pain	8.97±0.3	2.68±0.65	0.041
Mean VAS score for back pain	4.23±1.67	2.82±1.39	0.032

Figure 2 shows the mean ODI scores changed gradually. Preoperative ODI score was 62.57 and postoperatively score was 17.48 after one year ($P < .05$). See figure 2-

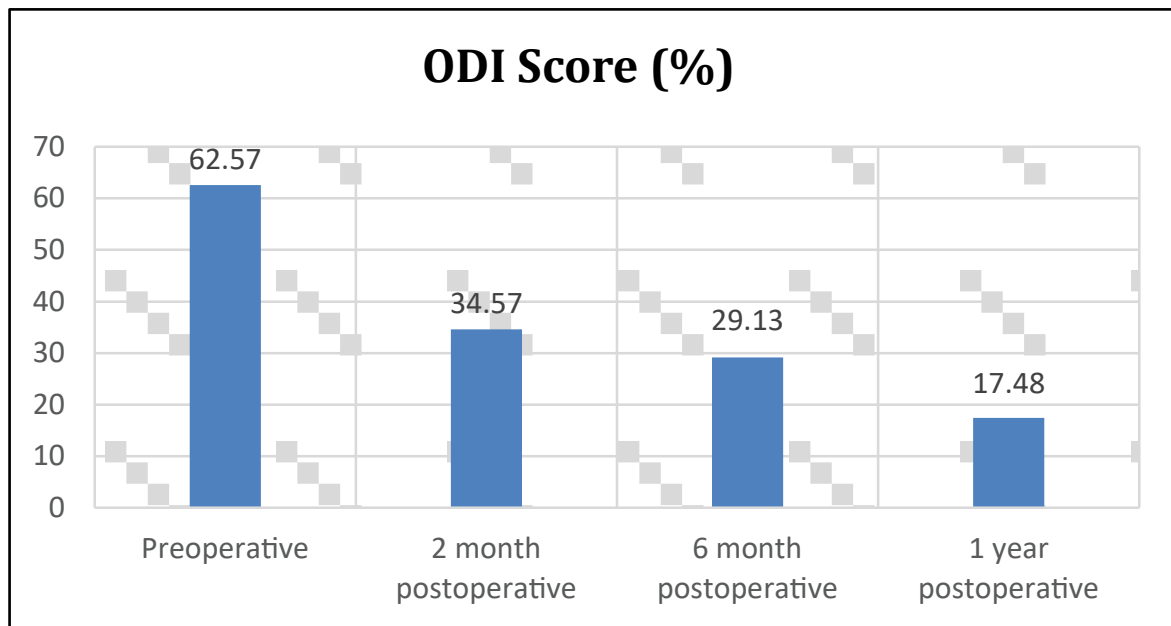


Figure 2: Preoperative and postoperative ODI scores of the patients.

In this study 2 (67%) patients presented with caudaequina syndrome and 1 (33%) patient with foot drop after surgery. Patient with foot drop improved completely and patients with caudaequina improved significantly by time in terms of useful muscle power and bladder and bowel continence. See the complications in figure 3-

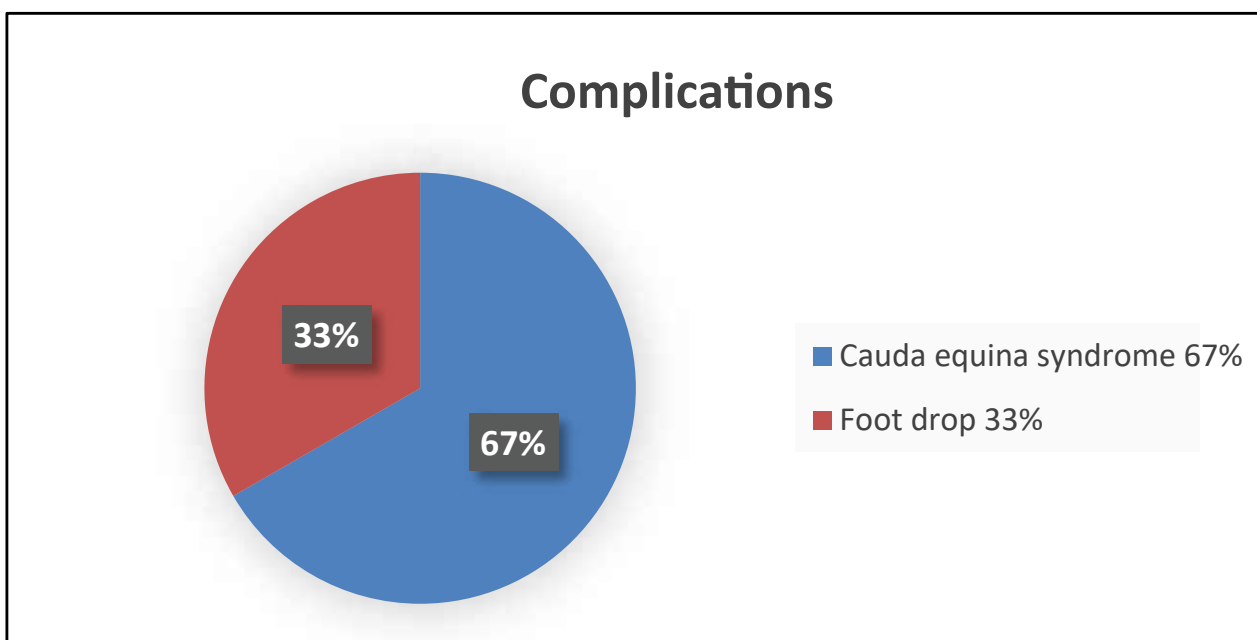


Figure 3: Complications after surgery among the patients.

Patient satisfaction rates are shown in figure 4. 59.70% patients reported as excellent, 21.50% patients reported good, 13.40% patients reported fair, and 5.40% patients reported poor outcomes as per Macnab’s criteria. See figure 4 below-

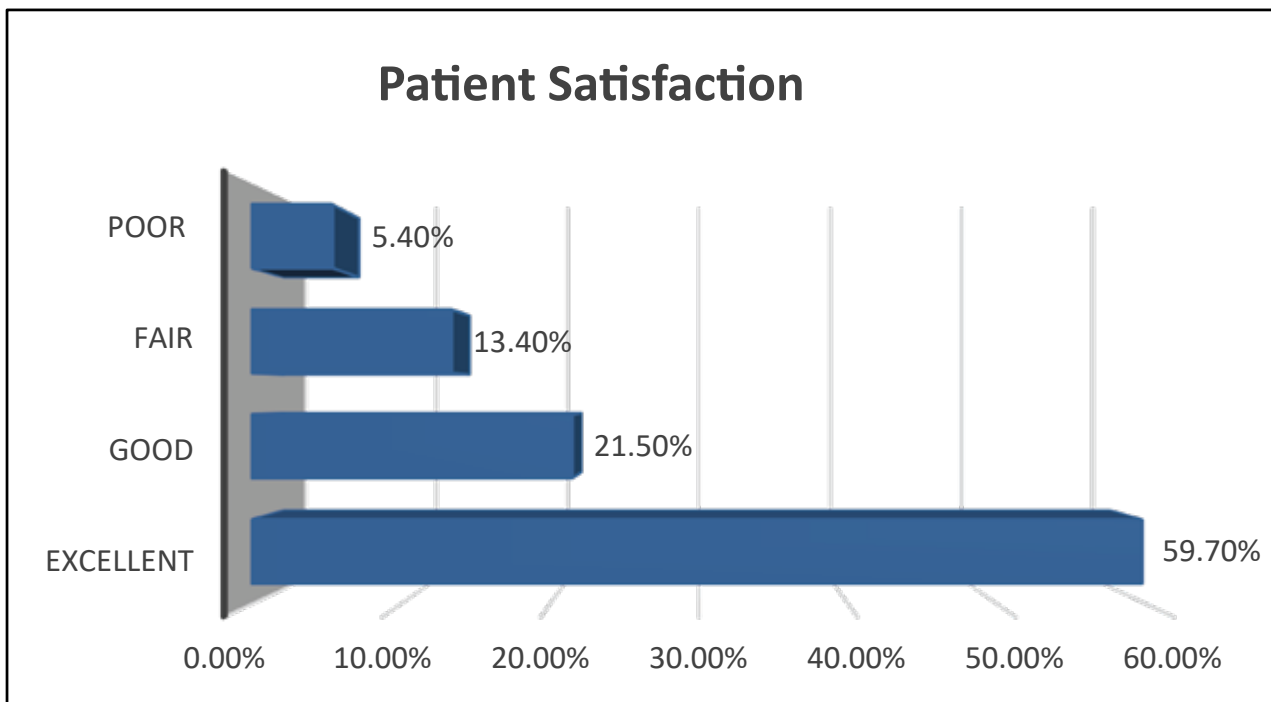


Figure 4: Satisfaction rate of the patients.

Discussion

The most common complaint in patients with LDH is low back pain. Leg pain may accompany the low back pain later. Both undesirable clinical symptoms may sometimes be seen simultaneously. Low back pain is also reduced over time. However, severe pain, as a sciatica-like pain, spreading from the hip to the leg may be observed. Radicular type pain within the lower extremities may reveal LDH progression¹⁸. The mechanical compression of the affected structure thanks to disc herniation, then, paresthesia-like symptoms within the areas innervated by the affected nerve because of the biochemical changes within the neural tissue may occur within the progressive periods. Furthermore, weakness in muscle groups innervated by the affected nerve, deep losses in tendon reflexes, sphincter defects may be observed. Patients may sometimes have symptoms like physiological posture disorders, gait disturbances, and neurogenic claudication. This clinical picture originates within the mechanical and chemical response of the disc pathology which results in the compression of the neural tissue¹⁹.

Williams (12) in 1978 was the primary who described a limited Discectomy (fragmentectomy) operation; within which he removed only the herniated part of the disc to treat the lumbar saucer prolapsed (IVDP) and described successful rate of 90% and a recurrence rate of (4-9%)²⁰. Several articles were published following that, which confirmed William’s results^{21,22}. By this method, the surgeon avoids entering the disc space and avoids destruction of the intervertebral disc height and its complications. Comparison studies have shown both limited and aggressive Discectomy had equivalent reherniation rate and complications but limited discectomy maintains a lower incidence of recurrent low back pain and better satisfactory rate²³. Both young and old population, suffer the lumbar disc herniation, but the very best incidence of prolapsed disc in most of the reported series are between 30-50 years^{24,25} which were consistent in our series. Ozalp et al. reported²⁶ that microdiscectomy was initially performed for the operation of spongy sequestered disc herniations, however, that it absolutely was performed later for the treatment of advanced degeneration and concomitant pathologies. They also suggested that microdiscectomy, a minimally invasive technique,

could be more reliable and effective procedure than conventional open discectomy thanks to the employment of a minimal incision, relatively low incidence of subperiosteal muscle dissection, providing a decent exposure, and lower blood loss²⁶. Limited discectomy or sequestratomy technique might be performed for the treatment of protruded disc herniations with the intact capsule, whether or not it had been designed for the treatment of laterally sequestered disc herniation²⁷. He et al. reported²⁸ that microdiscectomy provided less postoperative pain, early mobilization after surgery, and early return to way of life. However, the authors emphasized that there have been no significant differences in clinical outcomes of those methods in many studies comparing standard open surgery with microdiscectomy²⁸. On the opposite hand, men with markedly degenerated discs are more vulnerable to recurrence, particularly after an injury or a precipitating event²⁶.

Complications

There were 4 incidental dural tear cases in our study and all were minor tears. The masterly inactivity and watertight closure managed these tears successfully (due to inherent quality of technique there is no dead space formation to encourage collection of cerebrospinal fluid).

Conclusion

In young patients, limited microdiscectomy alone for sequestrated herniation has a high success rate and a low need for secondary surgery. The main attribute for a lower incidence of recurrence, postoperative back pain and instability requiring a secondary procedure may be patient selection in terms of sequestrated disc. The additional advantage of preserving normal spinal anatomy may be minimally invasive limited discectomy, thereby minimizing the need for primary spinal fusion in these patients.

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