Endoscopic lumbar discectomy, cost effective operative procedure at tertiary care centre

Jayprakash V. Modi[1], Ashish D. Yadav[2], Kaushal R. Patel[3,*], Shardul S. Soman[4]

[1]Professor, [2]3rd Year Resident, [3]2nd Year Resident, [4]Senior Resident, B.J. Medical College, Ahmedabad

***Corresponding Author:**
Email: kaushal71190@gmail.com

Abstract

Study design: Retrospective study

Background: Endoscopic lumbar discectomy using endoscopic tubular retractor system(METRx-MD) are considered popular minimally invasive surgery (MIS) methods for the treatment of lumbar disc herniation**.** Our main aim is to apread the benefits related endoscopic technique for lumbar disc herniation at tertiary care centre through which we can reduce the huge patient's workload and patients are also getting best treatment for their respective disease through minimal invasive surgery.

Objective: To evaluate the effectiveness of Endoscopic Lumbar Discectomy as cost effective procedure at tertiary care center where there is huge patient's workload.

Methods: It is a retrospective study of 40 patients were operated during the period between August-2013 to August-2015, at B.J Medical college, civil hospital, Ahmedabad out of which 29 were males and 11 females between age group of 17 and 72 years and compared with the standard results of open mini incision discectomy.

Inclusion criteria: Single level lumbar disc herniation, Unilateral or bilateral radiculopathy

Exclusion criteria: Multiple level disc bulge, Presence of spinal instability, Presence of gross spinal deformity

Results:

- In our study out of 40 patients, 29(72.5%) were males and 11(27.5%) were females.
- 22 (55%) patients had L4-L5 level disc herniation while 18 (45%) patients had L5-S1 level disc herniation.
- Out of 40 patients, only 3 patients presented with complications.
- Complications observed in our study were dural tear, infection and recurrence of radiculopathy.
- Immediate post-op improvement of VAS, oswestry and SF-12 score was noted in all patients.

Conclusion and Summary: Endoscopic Discectomy is a minimally invasive spine surgery which has better outcome (as compared with standard mini incision discectomy) in terms of:

- Better Pain Relief
- Decreased Intra-op Blood Loss
- Lesser duration of operation
- Earlier Mobilization
- cosmesis
- Decreased duration of hospitalization
- Decreased rate of infection
- Cost effective in a government setup in low income country
- Complications observed in our study can be attributed to the longer learning curve for the procedure endoscopic discectomy.

However long term outcomes for pain relief and complications need to be studied in detail.

Key Word: Endoscopic lumbar discectomy, Lumbar disc herniation, Minimal invasive spine surgery, Cost effectiveness

Access this article online	
Quick Response Code:	**Website:** www.innovativepublication.com
	DOI: 10.5958/2395-1362.2016.00033.5

Introduction

The basic tenet of any surgery is to effectively treat pathology with minimal disturbance of normal anatomy: leaving "the smallest footprint". MISS (Minimally Invasive Spine Surgery) is a similar advancement in the field of spine surgery that treats the pathology leaving behind the smallest footprint. Discectomy performed open or with an operating microscope remains the standard surgical management. Tubular retractor system is being increasingly used. Potential benefits include less muscle and local damage, better cosmesis, decreased pain and operative time and faster recovery after surgery. We have evaluated the outcome of micro endoscopic discectomy (MED) utilizing tubular retractors in terms of safety and efficacy of the technique.

Ideally the goal of developing MISS is to get the same results obtained by using standard microdiscectomy, providing effective treatment, targeted to the nerve decompression and not only focused on pain relief, like in nerve root/epidural

injections, but at the same time avoiding discomfort related with open techniques.

Materials and Methodology

It is a retrospective study of 40 patients being operated for lumbar disc herniation during the period between August-2013 to August-2015, out of which 29 were males and 11 females between age group of 17 and 72 years and compared with the standard results of open mini-incision discectomy. Proforma was made in form of questionnaire and filled by patients when they came for follow up while for others it was completed via telephonic conversation.

The approval from the review board of the B.J Medical collage was given for this research.

Inclusion criteria:

- Single level lumbar disc herniation
- Unilateral or bilateral radiculopathy

Exclusion criteria:

- Multiple level disc bulge
- Presence of spinal instability
- Presence of gross spinal deformity

Pre-Op Evaluation: Patients were evaluated clinically for their symptoms which mostly included Low Bachache/ Radiculopathy/ Both and detailed:
Neurological assessment was done.
Radiological investigations were done in the form of X-ray Lumbosacral spine-

- AP
- Lateral- Flexion and Extension (To rule out instability)

MRI L-S Spine to judge the degree of disc herniation. Routine blood investigations in the form of CBC/RFT/HIV/HBsAg were done. 2nd generation cephalosporins were administered intravenously, one night before and 1 hour before operation. Proper pre-op assessment was done. Pre-operatively VAS, Oswestry and SF-12 scoring was done. Written and informed Spine surgery consent was taken.

Operation

All patients were operated by using Metrx System (Medtronics) at Civil Hospital Ahmedabad by a single surgeon.

Under GA, in prone position, patients were operated by endoscopic discectomy using interlaminar approach and closure of wound done in layers. A Kirschner wire was passed through the skin approximately one fingerbreadth lateral to the midline of the affected side to the caudal border of the rostral lamina in the appropriate interspace, the placement being confirmed by lateral C-arm fluoroscopic guidance. An 18 mm paramedian incision was made, then dilators were sequentially placed over the Kirschner wire down to the lamina and a working channel placed over the final dilator. A flexible arm, which was fixed to the table, was attached to the tubular retractor to hold it firmly. The sequential dilators were then removed to establish a tubular operative corridor to the lamina and interlaminar space. An endoscope was then inserted into the tubular retractor and secured to the tubular retractor with a locking arm on the ring attachment. Next the ligamentum flavum was opened with an up-ward angled curette. The ligament was penetrated with the curette using a twisting motion, then peeled back caudally and dorsally. The dura and traversing nerve root were then identified and the nerve root retracted medially with a dissector or suction retractor. The ventral epidural space was then explored. After protecting the nerve root with suction retractor, the herniated disc was removed with a pituitary rongeur in a standard fashion. Once the nerve root had been decompressed, the disc space was thoroughly irrigated. The flexible arm assembly was then loosened and the tubular retractor slowly removed. Any bleeding in the paraspinal musculature was controlled with bipolar forceps Operative duration and blood loss during surgery were noted.

Post-operatively

Patients were given IV antibiotics for 24-48 hours and were mobilized on day 1.

Physiotherapy in the form of Back Extension Exercises, pelvic floor raising were taught.

Single stitch line dressing was done on POD-1 and patients were given discharge on POD-2/3. Stitch removal was done 14 days after surgery. Post operatively VAS, Oswestry and SF-12 scoring was done on POD-1, 3 months, 6 months and 12 months. Regular follow-up of patients at 3,6,12 months were done. Three scores were used for removing confounding while comparing our results with open mini incision endoscopic discectomy.

Observation and Analysis

Variable	Pre-op	Post-op
Visual analogue score (VAS)	7	5.1
Oswerty Score	60-65	38-40
SF- 12	25-30	12-14
Disc Herniation	L4-L5 level	
Average Blood Loss	30-40 ml	
Average Hospitalization	2-3 Day	
Days of Mobilization	1st Day	
Duration of Surgery	40-60 Min	

Level of disc herniation: Out of 40 patients, 22 (55%) patients had L4-L5 level disc herniation while 18 (45%) patients had L5-S1 level disc herniation.

Neurology of patients: Out of 40 patients observed, only 4 patients presented with abnormal neurology while 36 patients presented with normal neurology.

History of epidural injection: Out of 40 patients operated, 2 patients had taken epidural injection for pain relief.

Day of mobilization: Post-operatively all patients were mobilized within 2 days of operation, out of which 37 patients were mobilized on the 1st day. Average day of mobilization was 1.08 day.

Duration of hospitalization: As per our standard protocol, patients were admitted 2 days prior to the date of operation and discharged within 1 to 3 days after operation. Average duration of hospitalization was 3.95 days. All the patients were discharged within 3 days of surgery, with maximum number of discharge on day 2.

Average blood loss during surgery: Average blood loss during the surgery was 32.125 ml. Out of 40 patients operated, 17 had <30 ml of blood loss, 12 had 30-40 ml of blood loss and 11 patients had more than 40 ml of blood loss. In our study blood loss was measured by using collection in suction bottle. Wash given during surgery was deducted from final collected volume in suction bottle to obtain true blood loss.

Duration of surgery: Average duration of surgery was 48.75 minutes. 6 patients had operative duration of less than 40 minutes, 25 patients had surgical duration between 40 to 60 minutes and 9 patients had operative duration of 60 minutes or more.

Complications: Out of 40 patients, 3 patients presented with complications.
Complications observed in our study were:

- Dural tear-1 patient
- Infection-1 patient
- Recurrence of radiculopathy- 1 patient

Improvement of VAS: Immediate post-op improvement of VAS was noted in all patients, average improvement was 6.05 with maximum improvement in age group of more than 40 patients.

After 6 months of follow up, average improvement of VAS as compared to pre-op status was maximum in age group of >/= 40 years.

After 12 months of follow-up, VAS was noted and it was observed that as compared to immediate post-op and 6 month status, VAS values were higher

Improvement in Oswestry score: Immediate post-op improvement in Oswestry score was noted.

Average improvement was 39.33 with maximum improvements in age group of 40 years or more. After 6 months follow up, Oswestry score was calculated and maximum improvement was noted in age group of 40 years or more with average improvement being 42.31 in that group. After 12 months follow up, Oswestry score was calculated and maximum improvement was noted in age group of 40 years or more with average improvement being 42 in that group.

Improvements in SF-12 score: Average improvements in SF-12 score was noted in post-operative period, average improvements in MCS was 15.95 and average improvements in PCS was 13.5. All the age groups showed improvements in SF-12 score with maximum improvement in age group of 25-40 years.

Average improvements in SF-12 score was noted on 6 months follow up, all the age groups showed improvements in SF-12 score with maximum improvement in age group of 25-40 years. On 12 months follow-up, all patients had improved SF-12 scoring suggesting overall success of endoscopic discectomy.

Discussion

In our study we concluded that Minimally Invasive Spine Surgery (MISS) has advantage of early ambulation, less duration of hospitalization, less intra-op blood loss and so less need of blood transfusion, comparable duration of surgery with open approach, reduced rate of complications, improvement of VAS, Oswestry and SF-12 score immediate post-operatively and on mid-term follow-up. "minimally invasive surgery" was operationally defined as surgery conducted through a tube, cylindrical retractor blades, or sleeves *via* a muscle-dilating or muscle-splitting approach and bundled as "minimal access spine surgery" (MAS). Conventional or open spine surgery was defined as surgery conducted through an approach that includes elevating or stripping the paraspinal muscles to gain access to the spine even if by a limited midline incision

Ours a single centre study from a tertiary care centre from civil hospital, Ahmedabad where there is huge number of spine surgeries performed around 100 per month and provided to patients free of cost. Due to reduced operative time and less hospital stay and less complication patient can be discharged early and in such a huge workload it results in overall reduced expense to the government. By limiting the tissue manipulation *via* small incisions and minimal muscle dissection, this techniques are purported to have better perioperative outcomes, including shorter hospital stays, less blood loss, less pain medicine requirement, decreased surgical site infection (SSI) rate, and quicker return to activities, than conventional open approaches. more over skin incision was 1.8-2 cm initially which after shrinkage become shorter and leads better cosmesis. We usually allows the patients to resume their work after 2 weeks after surgery. Bookwalter et al (10) reported 40% of their patients returned to work less than 5 week. Foley and Smith (11) reported a mean return-to-work time of 17.6 days.

Kulkarni et al(9) study shows The mean age of patients was 46 years (range 16-78 years) and the sex ratio was 1.5 males to 1 female. The mean follow up was 22 months (range 8-69 months). The mean VAS scale for leg pain improved from 4.14 to 0.76 ($P < 0.05$) and the mean VAS scale for back pain improved from 4.1 to 0.9 ($P < 0.05$). The mean ODI changed from 59.5 to 22.6 ($P < 0.05$). The mean operative time per level was about 50 minutes (range 20-90 minutes). Dural punctures occurred in 11 (5%) cases. Average blood loss was 30 ml (range 10-500 ml).

In accordance with our study, Shunwu et al(7) showed that Minimally invasive spine surgery as a management of 1-level degenerative lumbar diseases is superior to the traditional open procedure in terms of postoperative back pain, total blood loss, need for transfusion, time to ambulation, length of hospital stay, soft-tissue injury, and functional recovery. In contrast to our study this study showed procedure takes longer operative duration and requires close attention to the risk of technical complications. Average day of mobilization in their study was 3.2 days for patients treated with MISS and 5.4 days for conservative approach. In my study average day of mobilization post-operatively was 1.08 day. Average duration of hospitalization in their study was-9.3 days for MISS and 12.5 days for Open Surgery. Average duration of hospitalization in my study is 3.95 days. Complication rate in this study was-20.7% for MISS and 17.9% for Open approach as compared with the 7.5% in my study. Average VAS improvement post-operatively were 4.5 and 3.6 for MISS and open surgery respectively as compared to my study which showed average 6.05 improvement of VAS scoring post-operatively. Change in Oswestry Disability Index (ODI) was 25 and 24.8 postoperatively in MISS and open groups respectively whereas my study showed average improvement of 39.33 ODI.

Conclusion and Summary

Endoscopic Discectomy is a minimally invasive spine surgery which has better outcome (as compared with standard mini incision discectomy) in terms of-

- Better Pain Relief
- Decreased Intra-op Blood Loss
- Lesser duration of operation
- Earlier Mobilization
- Decreased duration of hospitalization
- Decreased rate of infection
- Cost effective in a government setup in low income country

Endoscopic procedure is technically more demanding procedure and requires long learning curve. There is a learning curve associated with the procedure to reach an adequate level of expertise. Adequate training of surgeons and effective utilization of the technique can harness the benefits of this procedure and make it a gold standard in management of prolapsed lumbar discs.

Bibliography

1. Campbell's Operative Orthopaedics, 12th Edition.
2. Issacs RE, Podichetty V, Fessler RG. Microendoscopic discectomy for recurrent disc herniations. Neurosurg Focus. 2003;15:11.
3. Destandau J. Endoscopically-assisted treatment of lumbar disc prolapse – Endoscopic microdiscectomy. Cabinet de Neurochirutgie de. 2002;1:4–13.
4. Harrington JF, French P. Open versus minimally invasive lumbar microdiscectomy: comparison of operative times, length of hospital stay, narcotic use and complications. Minim Invasive Neurosurg 2008;51:30–5.
5. Caspar W. A new surgical procedure for lumbar disc herniation causing less tissue damage through a microsurgical approach. Advances in Neurosurgery. 1977;4:74–80.
6. Ofman JJ, Sullivan SD, Neumann PJ, et al. Examining the value and quality of health economic analyses: implications of utilizing the QHES. *J Manag Care Pharm* 2003;9:53–61.
7. Shunwu F, Xing Z, Fengdong Z,et al. Minimally Invasive Transforaminal Lumbar Interbody Fusion for the treatment of Degenerative Lumbar Diseases. Spine 2010;X:X-Y.
8. Stevenson RC, McCabe CJ, Findlay AM. An economic evaluation of a clinical trial to compare automated percutaneous lumbar discectomy with microdiscectomy in the treatment of contained lumbar disc herniation. *Spine*1995;20:739–42.
9. Arvind G Kulkarni et al. Microendoscopic lumbar discectomy: Technique and results of 188 cases Indian J Orthop. 2014 Jan-Feb;48(1):81–87.
10. Bookwalter JW, III, Busch MD, Nicely D. Ambulatory surgery is safe and effective in radicular disc disease. Spine (Phila Pa 1976) 1994;19:526–30.
11. Smith MM, Foley KT. Microendoscopic discectomy (MED): the first 100 cases. Neurosurgery, 1998,43:702.
12. Freudenstein D, Duffner F, Bauer T. Novel retractor for endoscopic and microsurgical spinal interventions. Minim Invasive Neurosurg. 2004;47:190–5.
13. Detmer DE, Buchanan-Davdson DJ. Ambulatory surgery. In: Rutkow IM, editor. Socioeconomics of surgery. St. Louis (MO): CV Mosby Co;1989. pp. 30–50.
14. Williams RW. Microlumbar discectomy: A conservative approach to virgin herniated lumbar disc. Spine. 1978;3:175–82.