Micro-endoscopic Disectomy: Early Experience and Results

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ABSTRACT
Objective: This prospective study was conducted to assess results and experience with microscopic endoscopic disectomy (MED).

Study Design: This is a prospective study carried out at PNS Shifa, which is a tertiary care hospital, from July 2011 to June 2012.

Methods: Thirty eight patients underwent surgery in which the MED system was used; all procedures were performed under general anesthesia. All patients were followed prospectively. MED system used in this study consisted of tubular retractors and an endoscope with xenon light source and HD image system by Karl Storz co. Germany. Outcomes were measured using Macnab criteria.

Results: Thirty eight patients (27 males, 11 females) underwent MED for prolapsed lumbar intervertebral disc. Mean operating time was 80 minutes. Follow up ranged from 3 to 12 months with a mean follow up 7.8 months. Thirty two patients had an excellent outcome while three had a good outcome. Three patients had a poor outcome. One patient with a big dural tear required conversion to a standard microdiscectomy and was excluded from outcome assessment. Three complications were noted and were all related to dural tears.

Conclusions: Minimally invasive surgery using MED is clinically effective and reliable. Patient satisfaction is high and complications rates are comparable with those associated with traditional microdiscectomy procedures.

Abbreviations: MED: Microendoscopic discectomy, HD: High Definition.

Key Words: lumbar herniated disc • microdiscectomy • minimally invasive surgery • operating microscope.

INTRODUCTION
The surgical treatment of prolapsed lumbar intervertebral disc has evolved since the initial report of lumbar discectomy by Mixter and Barr in 1934.1 Caspar2 in 1977 and Williams3 in 1978 reported refinements in approach. Microsurgical discectomy or microdiscectomy is the currently accepted surgical procedure for lumbar disc prolapse with which all other techniques are compared.4 In recent years new minimally invasive technologies have come up which have been applied to spinal surgery. The advantages of minimally invasive techniques have included smaller incision, less perioperative pain, early ambulation, short hospital stay and early return to work.5,6 We report our results in 38 patients who underwent minimally invasive disectomy using MED with a new tubular dilator system.

MATERIAL AND METHODS
Thirty eight patients with prolapsed lumbar intervertebral disc who were seen at our institution between May 2007 and April 2008 were included in the study. Data was collected prospectively. Pre-operatively all patients had a trial of conservative therapy before surgery was offered. This included a minimum period of 6 weeks of analgesics and rest. All patients had a preoperative MRI of the lumbar spine. Lateral recess stenosis at the involved level was not a contraindication to MED. Informed written consent was taken from all patients. All patients completed a consent form and Patient Questionnaire – A form, prior to surgery. Detailed history and neurological examination were undertaken. Bladder and bowel dysfunction were specifically asked. Office follow-up visits were conducted at
2 weeks, 6 weeks, and 3 months. Office follow up was extended when clinically indicated.

Operative Technique
Under general anesthesia the patient was positioned prone on spinal frame. Skin preparation was done with povidone iodine. The MED system used for the procedure consisted of 19 mm tubular retractor system, endoscope with xenon light source and High definition image system. Under X-ray control a spinal needle was placed paramedian (1 cm lateral to midline) on the side of disc herniation and the position of the needle was adjusted till it was parallel to the center of the involved disc space. Subsequently a small incision was made and a K wire was placed under X-ray control at the offending disc level parallel to the disc space. Serial dilators were then passed over this Fig. 1.

Finally, the largest 20 mm dilator was placed and fixed to the holding arm. Endoscope was then attached to the tubular retractor and rest of the procedure was done under endoscopic control. The laminae, facet and ligamentum flavum were identified and a proper orientation and focus was achieved. Laminotomy and medial facetectomy was done using kerrison punches. Ligamentum flavum was then cut using a knife and flavectomy achieved using a Kerrison rongeur. The nerve root and dural tube and protruded disc were identified Fig. 2.

Discectomy and rhizolysis of the involved nerve root was carried out. Where necessary posterior osteo-
phytes could also be removed and lateral recess could also be adequately decompressed. Closure involved sub-cuticular absorbable stitches. Peri-operative antibiotics were given for 48 hours. The patients were ambulated as soon as the effects of general anaesthesia wore off (usually within 6 hours of the surgery) and were discharged on the 2\textsuperscript{nd} post operative day. Post-operative MRI was done in early cases in the series to assess the postoperative status Fig. 3, Fig. 4.

Outcome assessment was done using the modified Macnab criteria.\textsuperscript{5} (Table 1).

**Table 1:** Modified Macnab criteria to assess clinical outcome following MED.

<table>
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<th>Level</th>
<th>Description</th>
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| Excellent | Free of pain  
No restriction of mobility  
Able to return to normal work and activities |
| Good   | Occasional nonradicular pain  
Relief of presenting symptoms  
Able to return to modified work |
| Fair   | Some improved functional capacity  
Still handicapped and / or unemployed |
| Poor   | Continued objective symptoms of root involvement, Additional operative intervention needed at the index level, irrespective of repeat or length of post operative follow up |

**RESULTS**

Thirty eight patients underwent MED at our institution between July 2011 and June 2012. There were 27 males and 11 females. The age group ranged from 22 years to 58 years. All patients had a virgin posterolateral disc herniation and of these 2 patients also had associated lateral recess stenosis. L\textsubscript{4} – 5 and L\textsubscript{5} – S\textsubscript{1} were the most commonly involved levels (Table 2). All patients were ambulated within 6 hours of the surgery and were discharged within 48 hours of the surgery. During the latter part of series, patients were discharged within 24 hours of surgery. This excluded the patient with long dural tear in whom a conversion to the open procedure was done. Duration of post-operative follow up ranged from 3 months to 12 months with a mean follow up of 7.8 months. Most of the patients were able to return to work within six weeks. Although some of them could return to work as early as 15 days, the average time was around 28 days. There were a total of 3 complications (7.89%). All three were cases of dural tears and one was big enough to warrant conversion to open standard disectomy. The patient with dural tear which required conversion to the standard microdiscectomy was excluded from outcome assessment. Thirty two patients had excellent outcome, three patients had a good outcome and three had a fair outcome. Thus, overall success rate was 92.1\% in our series. The mean operative time was 100 minutes. The cases done early in the series took a longer time of up to 160 minutes, however after gaining experience, the average time taken for surgery came down to about 80 minutes. The difficult cases which included migrated fragments and those with associated stenosis took a longer time, even after familiarization with the technique and equipment.

**Table 2:** Levels of herniated disc noted in patients included in our study (n = 38).

<table>
<thead>
<tr>
<th>Level of Herniation</th>
<th>No.</th>
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<tr>
<td>L\textsubscript{3} – L\textsubscript{4}</td>
<td>2</td>
</tr>
<tr>
<td>L\textsubscript{4} – L\textsubscript{5}</td>
<td>22</td>
</tr>
<tr>
<td>L\textsubscript{5} – S\textsubscript{1}</td>
<td>14</td>
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**DISCUSSION**

The relationship between lumbar disc herniation and the syndrome of lumbago / sciatica has been well recognized since the 1930’s.\textsuperscript{1} Since then it has been a
constant endeavour to achieve the decompression of the offending nerve root by various operative techniques and innovations. Undoubtedly, the gold standard for lumbar disc surgery – microsurgical discectomy, was introduced by Yasargil\textsuperscript{18} and Casper\textsuperscript{15} separately in 1977. There have been several percutaneous systems introduced for lumbar disc prolapse such as chemical nucleolysis,\textsuperscript{10} percutaneous lumbar discectomy (manual\textsuperscript{14} and automated\textsuperscript{12}) and percutaneous laser assisted discectomy.\textsuperscript{13} The advantages cited for these techniques have been surgery under local anesthesia, early mobilization, non disturbance of posterior structures such as laminae, facet and ligamentum flavum, less manipulation in the introspinal space thus reducing the possibility of epidural fibrosis. The indications for these procedures are discogenic back pain and sciatica secondary to contained disc prolapse. These procedures cannot be used in cases of extruded disc fragments causing compression of the nerve root and they do not address the concomitant bony and ligamentous compression of the nerve root. The results of these procedures have been very variable and satisfactory results have ranged from 29 to 92%\textsuperscript{4}. One randomized controlled trial comparing automated percutaneous lumbar discectomy (APLD) with microdiscectomy for contained lumbar disc herniation showed that only 29% of the patients undergoing APLD had a satisfactory outcome when compared to 80% undergoing microdiscectomy.\textsuperscript{14}

The technique of microendoscopic discectomy using tubular retractors was described by Foley et al in 1997.\textsuperscript{7} The indications for this procedure are posterolateral disc herniation with or without lateral recess stenosis and foraminal and extra-foraminal disc herniations.\textsuperscript{5,6,15} It has also been successfully used for recurrent disc prolapsed,\textsuperscript{16} decompression of lumbar stenosis and lateral recess stenosis secondary to facet or ligamentum flavum hypertrophy. Its use is also being extended for cervical foraminotomies and minimally invasive spinal instrumentation. The advantages of MED over standard microdiscectomy include smaller incision, lesser post operative pain, early ambulation, short hospital stay, shorter time to return to work and lesser cost of treatment.\textsuperscript{5} The patient’s ability to return to the previous employment is a measure of success of the surgical procedure. As newer and more innovative techniques and systems for minimally invasive disc surgery are being developed, it has become important to analyse the impact of these techniques on the time taken by the patients to return to work. Bookwalter et al\textsuperscript{17} reported that 40% of their patients returned to work in fewer than 5 weeks after microdiscectomy while Casper et al\textsuperscript{18} reported a mean return-to-work time of 18.6 weeks. Palmer\textsuperscript{11} reported a mean return-to-work time of 32 days following this procedure, while Perez – Cruet et al\textsuperscript{5} reported a mean return-to-work time of 17 days. In our series the patients were able to return to work as early as 15 days while the average time being 28 days. One study comparing the intraoperative electromyography (EMG) in the lower limb between MED and standard microdiscectomy showed that there was lesser irritation of the nerve root in the former group.\textsuperscript{19} Good to excellent outcomes have been reported in up to 94% of patients undergoing microdiscectomy using tubular retractors.\textsuperscript{6,11} This correlates well with the success rate seen in current series (92.4%). There are no reported randomized clinical trials comparing MED and conventional microdiscectomy but there is one non-randomized prospective study in which the authors have compared MED with conventional microdiscectomy.\textsuperscript{20} In this study the average low back pain outcome score improvement was of clinical significance in both patient groups and there was no difference between the two groups. However, patients in the MED group required less postoperative analgesia during their stay. The authors concluded that MED is as effective as microsurgical discectomy for the treatment of contained disc herniations. The complications reported in patients undergoing MED\textsuperscript{8,10,11,20} include wound infections (0 – 0.8%), discitis (00.8%), dural tears (2.3 – 7.1%) and recurrent disc prolapse (2.6 – 2.9%). The complications reported in large series with patients undergoing microdiscectomy\textsuperscript{21} are also similar and include wound infections (0 – 7.2%), discitis (0 – 0.8%), dural tears (06.7%) and recurrent disc prolapse (3 – 14%). The complications seen in our series is comparable to the other MED series.

CONCLUSIONS

Microendoscopic Discectomy through tubular dilators is a safe and effective procedure for the treatment of prolapsed lumbar intervertebral disc. Its results are comparable to standard microdiscectomy. The current indications for this procedure include posterolateral disc herniations and/or lateral recess stenosis.

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REFERENCES