

Comparative Randomized Clinical Study between open Conventional Lumbar Discectomy and Micro-Endoscopic Lumbar Discectomy

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ABSTRACT

*Microendoscopic discectomy is a safe and effective procedure for intervertebral discs. Its results are comparable to standard open discectomy procedure. The microendoscopic system offers the benefits of a smaller incision than open discectomy and limited tissue trauma via sequential dilators. Microendoscopic discectomy has advantages over other minimally invasive surgical techniques because it can address lesions otherwise inaccessible to percutaneous techniques on the other hand, the difficulties of the endoscopic procedure are evident because of the limited exposure and two dimensional video display. **Materials and Methods:** The study was conducted on 40 patients suffering from prolapsed lumbar disc they were admitted to Ain Shams University Hospitals department of Neurosurgery from the period between December 2004 till December 2006. 20 of them underwent open or conventional discectomy and 20 underwent microendoscopic discectomy. We selected the patients according to the strict inclusion/ exclusion criteria. The comparison between the two groups was conducted through the operation time, amount of bleeding, duration of hospitalization, pre- and postoperative scores based on judgment criteria for treatment of lumbar spine disorders established by the Japanese Orthopaedic Association score, visual analog scales (VAS, 0 to 10) for back pain before surgery and at discharge, VAS for sciatica before surgery and at discharge, VAS for sciatica before surgery and at discharge, perioperative complications, and cases requiring further surgery. **Results:** The microendoscopic discectomy has the advantages of smaller skin incision less tissue trauma, less time of hospitalization and less intraoperative blood loss in our own results, but also showed equivalent clinical results to those of standard open discectomy. **Conclusions:** Strict selection criteria could ensure optimal long-term outcome as microendoscopic discectomy is not suitable for all patients with lumbar disc herniation. The optimal indication for microendoscopic discectomy is single level radiculopathy secondary to lumbar disc herniation. The advantages of microendoscopic discectomy over classic discectomy might be limited and they do not seem to last longer than the initial post operative period. And like other new minimally invasive techniques, microendoscopic discectomy has a learning curve which is related to surgery time, complications, conversion to the open procedure and recurrent disc herniation.*

Key Words: microendoscopic discectomy, standard open discectomy

INTRODUCTION

Surgeons have been evolving the technique of lumbar discectomy since *Mixer and Barr*⁽⁶⁾ first described the causal relationship between lumbar disc prolapse and lower limb radiculopathy. The aim of this evolution has been to maintain the efficacy of the procedure while

reducing treatment related morbidity⁽¹⁾.

In 1997 *Smith and Foley* introduced the micro-endoscopic discectomy system, which allowed spinal surgeons to decompress a symptomatic lumbar nerve root reliably using an endoscopic minimally invasive procedure⁽¹⁰⁾.

This minimally invasive surgical technique has gained wide spread acceptance and is now commonly used

in clinical practice. Microendoscopic discectomy offers several potential benefits over conventional open discectomy including less post operative pain, less intraoperative blood loss shorter hospital stay and less time of work. These advantages are due to the reduction in soft tissue retraction provided by the muscle splitting microendoscopic discectomy, however the restricted visualization and working space in microendoscopic technique present technical limitation in identifying sequestered disc fragments and verifying nerve root decompression⁽⁸⁾.

Presently the golden standard in surgical treatment of lumbar disc herniation is the unilateral transflaval discectomy to which all other techniques should be compared⁽⁵⁾.

The aim of our work is to:

1. Compare the results of endoscopic lumbar discectomy to that of open lumbar discectomy.
2. To evaluate the benefits of usage of the endoscope in lumbar discectomy.

PATIENTS & METHODS

The study was conducted on 40 patients suffering from prolapsed lumbar disc they were admitted to Ain Shams University Hospitals department of Neurosurgery from the period between December 2004 till December 2006. 20 of them underwent open or conventional discectomy and 20 underwent microendoscopic discectomy.

We selected the patients according to the following inclusion criteria:

Patients with sciatica with or without back pain and their radiological investigations showed ipsilateral disc herniation at a single level. L4-5 or L5-S1, lateral or posterolateral disc and with wide bony canal and all these patients should have

failed conservative treatment which had included bed rest, non steroidal anti-inflammatory medication analgesic and physical therapy.

While we excluded patients with the following exclusion criteria

- Associated canal stenosis
- Recurrent cases
- Present of contralateral symptoms to the side of the disc at the radiological investigations.
- Morbid obesity.
- Patient presented with only lower back pain without sciatica.

All the patients underwent the following pre operative evaluation:

- Full detailed history including personal history, pain, radiculopathy and history of previous treatment
- Careful clinical and neurological examination.
- Pre operative evaluation for both back pain and leg pain using the visual analogue scale⁽⁴⁾.
- The JoA score (Japanese orthopedic associations evaluation system for lower back pain syndrome) was determined before surgery to assess subjective symptoms, clinical signs and restriction of ADL (activity of daily living).

Preoperative investigations which include:

- Routine pre-operative laboratory investigation (Hematological, chemistry and coagulation profile).
- Plain X-ray lumbosacral spine; Antero-posterior and lateral views.
- CT scan lumbosacral spine.
- MRI lumbosacral spine.

During each procedure we are going to report the following points:

- Operative duration
- Operative complication
- Blood loss → by calculating the blood in the container of suction in

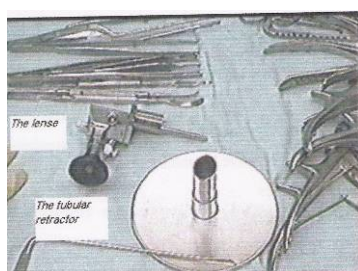
every case.

- Postoperative complication
- Difficulties encountered

We used two surgical procedures:

A- Micro-endoscopic lumbar discectomy

Endoscope used (Figure 1): We used Vertebroscope and endospine.



Vertebroscope (Zeppelin)



Endospine (Distantu, Storz)
(Figure 1): Endoscope used

Technique:

Anesthesia:

All patients underwent Micro-Endoscopic discectomy are performed under general anesthesia.

Patient position:

The patient position is prone over a bridge, with the abdomen free and the spine flexed to open the interlaminar space as any conventional disc procedure.

Operating room set up and patient preparation:

The operating room should be of adequate size to accommodate. The fluoroscopy unit, its monitor, and the video equipment for the endoscope. The C-arm fluoroscope is then positioned to obtain lateral fluoroscopic images of the operative lumbar interspace. We stand on the side of the patient ipsilateral to the herniated disc (Figure 2).

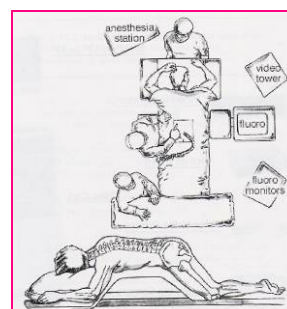


Figure (2): Operating room set-up for Micro-Endoscopic discectomy procedure⁽⁷⁾

Once the operative field has been prepared, the lumbar midline is identified and a second line is drawn parallel to it, approximately 1-1.5 cm from the midline and ipsilateral to the side of the disc herniation.

Skin incision and sequential soft tissue dilation:

Under fluoroscopic guidance, a spinal needle is inserted and repositioned along the paramedian line previously drawn at the level of the appropriate disc space (Fig. 3). A 15-mm longitudinal incision is made, only into the superficial tissues including the skin, subcutaneous tissue and lumbar fascia centered on the needle puncture site. A guide wire is then inserted through the small incision under fluoroscopic control, and directed toward the inferior edge of the superior lamina (Fig. 3). Three or four progressive cannulated soft tissue dilators are now put over the guide wire and each other (Fig. 4). The first dilator is advanced through the lumbodorsal fascia until it is docked on the inferior edge of the superior lamina, and the guide wire is then removed. We can confirm proper placement of the dilator in the sagittal plane by lateral fluoroscopy, and by palpating the lamina with the tip of the dilator in the axial plane. In this fashion, just lateral to the base of the spinous process and just above the laminar edge, the correct positioning of

the dilator is obtained. It is very useful at this point to scratch the lamina edge to free it from muscle attachments. Then other dilators are placed in sequential order over the first, to achieve a gentle dissection of the soft tissues and the fibers of the paraspinal muscles, leaving intact the lumbodorsal fascia and the muscular attachments to spinous process and to

most of the lamina.

***Insertion of tubular retractor
endoscope and image orientation:***

The tubular retractor is advanced over the final dilator down to the lamina. Its proper positioning is confirmed fluoroscopically, and we may connect it to the pneumatic flexible arm fixator to maintain its position at the operative field (Fig. 5).

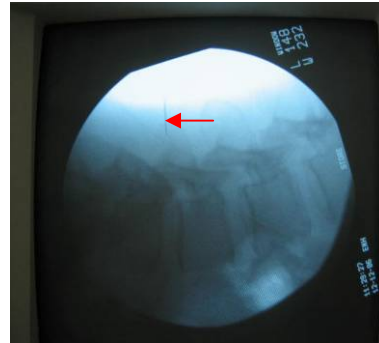


Figure (3): Insertion of spinal needle with intra operative lateral view



Figure (4): Insertion of sequential dilators

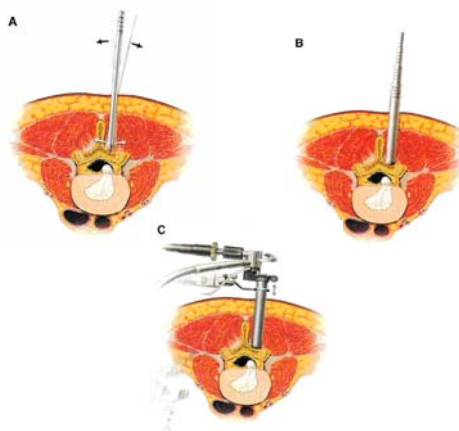


Figure (5): A: Illustrations showing initial dilator in place sweeping paraspinal musculature off lamina: B: sequential dilators for muscle splitting approach, and C: tubular retractor with endoscope in place⁽⁷⁾

After connecting the endoscope to the camera and to the light source, we start to do the white balance on the camera and then doing the external orientation of the upside and down and the degree of magnification (Fig. 6). It is then inserted into the tubular retractor this allows the endoscope to be positioned anywhere around the retractor for 360° vision, and to be advanced or withdrawn for variable magnification. The suction tube can be used through the irrigation and suction to clean the endoscope lens if it is dirty, or by removing, wiping and reinserting the endoscope.

A key point for a correct surgery is the orientation of video image when the endoscope is first inserted into retractor, because the view on the screen must be similar to those commonly observed through an open surgery.

Laminotomy and flavectomy (Fig. 7):

Some times soft tissue including part of the muscle dissected from the lamina passes and bulged through the tubular retractor obscuring the field of vision this can be removed with a small rongeur and some hemostasis with a bipolar forceps, the inferior edge of the superior lamina is identified using curette, the ligamentum flavum is gently detached from the lamina, and generally a small laminotomy is performed using a Kerrison punch. In this fashion, adequate bone removal can be performed to address disc pathology. The ligamentum flavum is then opened, using hook and removed with a Kerrison rongeur.

The same technique used when using the Endospine (Distandau) endoscopic set except it has a small working channel so its special instruments should be used during this procedure.



Figure (6): Preparing the lens by doing white balance and image orientation

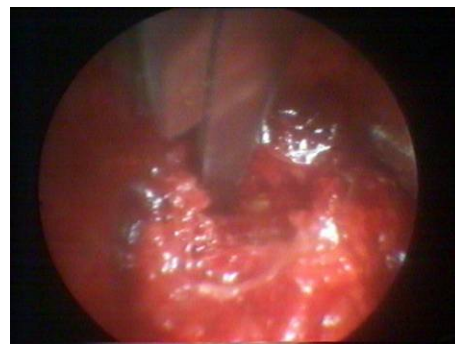
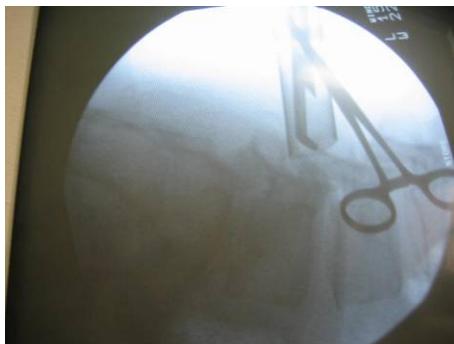


Figure (7): Small laminotomy is performed using a Kerrison punch

Nerve root retraction and disc removal:

Once identified, the nerve root is exposed with a gentle epidural dissection, using some micro-instruments, like probes, dissectors or a fine suction retraction tip. In this way, if necessary, the root can be retracted medially or explored in its axilla. In cases we used the endospine (Distandau) it has a build in root retractor which is descended gradually to retract the root away from the disc and we precede the same as with the Vertebroscop (zeppelin).

In some cases a good undercutting of the medial facet (partial medial facetectomy) to obtain a further exposure of the nerve root when needed. Free fragments or contained disc herniations can be identified in this fashion and removed after annulotomy which can be performed with the microknife

The discectomy is then performed with pituitary rongeurs in a standard fashion, as usually done in a standard open discectomy. Afterwards, the root and dural sac are finally explored to check for any residual compression and/or retained disc fragments, controlling epidural bleeding, if significant, with the bipolar forceps.

Closure:

Before the final closure, the wound is irrigated with cold saline solution. At this point, we prefer to add some steroids the tubular retractor then removed, the paraspinal muscles approximate to each other after this maneuver, resuming their normal anatomic position at the first post

operative contraction.

The fascia is then closed with a single suture, the subcutaneous tissues with an inverted suture and the skin with subcuticular suture.

B- Conventional lumbar discectomy***Technique:*****Step 1:**

Position and anesthesia as A

Step 2:

Skin incision is preferably midline and centered as nearly as possible over the involved disc level. The level is detected by lateral fluoroscopic imaging).

Step 3:

An incision in the paravertebral fascia is extended, dividing the underlying ligamentous insertion and exposing the superior lateral tip of each spinous process.

Step 4:

Dissection of muscle is best accomplished with a periosteal elevator and a fine electrocautery needle or knife exposing two hemilaminas and a portion of hemilaminae above or below to permit retraction without undue tension.

Follow-up:

All patients were evaluated through

1. Clinical evaluation
2. Postoperative investigations
 - a) Plain x-rays
 - b) CT scans lumbosacral
 - c) MRI lumbosacral if needed.
3. Pain scales
 - Including the following
 - a) Visual analogue score
 - b) Modified Macnab criteria after spinal surgery as shown in table 1

Table (1): Showing the Modified Macnab criteria and its score

| <i>Result</i> | <i>Grade</i> | <i>Criteria</i> |
|---------------|--------------|--|
| Excellent | 4 | No pain no restriction of mobility return to normal work and activity |
| Good | 3 | Occasional non radicular pain: relief of presenting symptoms: return to modified work |
| Fair | 2 | Some improved functional capacity still handicapped and unemployed |
| Poor | 1 | Continued symptoms of nerve root involvement additional operative intervention needed at the index level irrespective of post of duration. |

c) The JoA (Japanese orthopedic association evaluation system for lower back pain syndrome).

d) The recovery rate of the JoA was also calculated at each follow up is:

$$\text{Recovery rate \%} = \frac{\text{Postoperative score} - \text{preoperative score}}{29 - \text{Preoperative score}} \times 100$$

We used the 15 point system for the JoA score which does not include the 14 point of restriction of activities of daily living. At early follow up and late follow up to compare both methods and the recovery rate of the 15 point system for the JoA at early and late follow up.

4. The comparison of the 2 procedures was also done by comparing:

- The operative time
- The blood loss
- The results of pain scales for patients of the 2 groups in the regular follow up post operative.

The follow up was done at 1 week, 1 month, 6 months post operative.

The hospital stay and return to preoperative activity. We excluded the hospital stay and the return to pre-operative activity from the comparison of the 2 groups as it did not reflect the actual need for hospitalization postoperative or the

actual ability of the patient to return to work as many of our patients were seeking for secondary gain postoperative.

Statistical analysis methods:

Statistical analysis was performed using statistical program "Stat-view" and statistical significance was set at a P value (probability for making error).

Differences of the mean values of the JoA score and VAS between both groups were assessed using student's unpaired t test before surgery and at subsequent visits. Differences in the recovery rate at each follow up visit operative time and amount of blood loss were also compared using the student's unpaired t test.

The male to female ratio and the pre operative clinical presentation and examination and results of preoperative MRI of lumbar spine were compared using chi square test (X²) test.

RESULTS

During this study 40 patients were operated upon 20 using the endoscopic technique and 20 using open or conventional method.

Age: In the open or conventional method the age incidence ranged between 23-62 years with mean of 41.5. In the endoscopic method the age incidence ranged between 23-52 with mean of 36 years.

Pre-operative Clinical Examination and Presentation:

All patients in the 2 groups had

sciatica in addition some patients had back pain or sensory manifestation in the form of numbness.

Table (2): Showing clinical presentation finding

| | Open | Endoscopic |
|--|-------------|-------------------|
| <i>Back pain</i> | 15 75% | 18 90% |
| <i>Sensory in the form of numbness</i> | 3 15% | 12 60% |

Patient's clinical examination revealed the following:

All patients were intact all patients had positive straight leg raising, but

some patients had altered reflex changes, some had sensory hypothesia with the following distribution:

Table (3): Showing clinical examination findings

| | Open | Endoscopic |
|-------------------------------|-------------|-------------------|
| <i>Sensory hypothesia</i> | 3 15% | 6 30% |
| <i>Altered reflex changes</i> | 2 10% | 11 55% |

Preoperative Investigation

All patients of the 2 groups underwent MRI which shows the following:

Table (4): The affected disc level in both methods

| Disc level | Open | Endoscopic |
|-------------------|-------------|-------------------|
| <i>L4-5</i> | 10 50% | 15 75% |
| <i>L5-s1</i> | 10 50% | 5 25% |

Table (5): Showing site of disc pathology

| Site | Open | Endoscope |
|-----------------------|-------------|------------------|
| <i>Posterolateral</i> | 3 15% | 4 20% |
| <i>Lateral</i> | 15 75% | 13 65% |
| <i>Foraminal</i> | 2 10% | 3 15% |

We used 2 type of endoscope in our study as follows:

Table (6): Types of endoscope

| Vertebroscopie | Endospine |
|----------------|-----------|
| 16 80% | 4 20% |

The operative time and blood loss mean values for the 2 methods were as follows in table 7:

Table (7): Showing mean values of operative time of 2 methods

| | Open | Endoscopic | P value |
|-----------------------|-------------|------------|---------|
| <i>Operative time</i> | 118 ± 25.46 | 139 ± 55 | > 0.05 |
| <i>Blood loss</i> | 307.5 ± 112 | 44 ± 52 | < 0.05 |

The Clinical Results

We used assessment tools as questionnaires or scales, which helped to translate the subjective experience of pain into more objective evidence that can be analyzed and used for comparison on subsequent visits at one week, one month, six months and twelve months. We used the visual analogue scale (VAS), the modified

Macnab criteria after surgery and Japanese orthopaedic association's evaluation system for low back pain syndrome. A lot of evaluation and scoring system are present for evaluation of the pain but we prefer these systems because they are applicable to our Egyptian society and can be easily understood by our patients.

The VAS for low back pain

Table (8): shows comparison of the mean values of VAS for low back pain between the open discectomy group and the endoscopic discectomy group during one year follow-up.

| | Open | Endoscopic | P value |
|-----------|------------|-------------|---------|
| Pre-op | 5 ± 1.86 | 8.6 ± 1.14 | < 0.05 |
| 1 week | 1.75 ± 0.7 | 0.85 ± 0.81 | < 0.05 |
| 1 month | 2.2 ± 1.55 | 1.85 ± 2 | > 0.05 |
| 6 months | 1.4 ± 0.59 | 1.7 ± 1.38 | > 0.05 |
| 12 months | 1.2 ± 0.6 | 1.8 ± 1.32 | > 0.05 |

VAS for leg pain (Sciatica)

Table (9): Shows comparison of the mean values of VAS for leg pain (Sciatica) between the open discectomy group and the endoscopic discectomy group during one year follow up.

| | Open | Endoscopic | P value |
|-----------|-------------|-------------|---------|
| Pre-op | 8.05 ± 0.82 | 8.85 ± 0.93 | > 0.05 |
| 1 wk | 0.5 ± 0.82 | 0.4 ± 0.59 | > 0.05 |
| 1 month | 1.9 ± 1.48 | 1.2 ± 0.61 | > 0.05 |
| 6 months | 1.25 ± 0.7 | 1.55 ± 1.39 | > 0.5 |
| 12 months | 1.05 ± 0.82 | 1.8 ± 1.36 | <0.005 |

The JOA score

The Japanese orthopaedic associations (evaluation system)

Table (10): shows comparisons of the mean values of the JOA score between the open discectomy group and the endoscopic discectomy group during one year follow-up

| | Open | Endoscopic | P value |
|-----------|--------------|-------------|---------|
| Pre-op | 15.85 ± 1.59 | 13.45 ± 1.5 | < 0.05 |
| 1 week | 22.2 ± 1.36 | 22.5 ± 0.6 | > 0.05 |
| 1 month | 22.7 ± 2.6 | 22.4 ± 2.1 | > 0.05 |
| 6 months | 23.75 ± 1.44 | 22.75 ± 1.8 | > 0.05 |
| 12 months | 23.9 ± 1.3 | 23.1 + 1.16 | < 0.05 |

Table (11) shows comparison of the mean values of the recovery rate of the JOA between the open discectomy group and the endoscopic discectomy group during one year follow-up.

| | Open | Endoscopic | P value |
|----------------|---------------|-------------|---------|
| Post 1 week | 47.65% ± 11.9 | 55.35% ± 12 | < 0.05 |
| Post 1 month | 50.96% ± 21 | 57.05% ± 13 | > 0.05 |
| Post 6 months | 58.9% ± 13 | 59.4% ± 12 | > 0.05 |
| Post 12 months | 59% ± 13 | 61% ± 10 | > 0.05 |

Table (12) showing comparison of the mean values of the 15 point system of the JoA between open discectomy group and endoscopic discectomy group during early and late follow-up.

| | Open | Endoscopic | P value |
|-----------------|--------------|--------------|---------|
| Pre op | 9.6 ± 1.23 | 8.05 ± 1.39 | < 0.05 |
| Early follow up | 13.3 ± 0.57 | 13.75 ± 0.44 | < 0.05 |
| Late follow up | 13.55 ± 0.68 | 13.25 ± 1.25 | > 0.05 |

Table (13): showing comparison of the mean values of the recovery rate of the 15 point system of the JOA between open discectomy group and endoscopic discectomy group during early and late follow up.

| | Open | Endoscopic | P value |
|-----------------|-------------|-------------|---------|
| Early follow up | 68% ± 10.2 | 69% ± 6.8 | < 0.05 |
| Late follow up | 72% ± 14.09 | 71% ± 15.26 | 0.05 |

Table (14): showing comparison of modified Macnab criteria after surgery between the open discectomy group and the endoscopic discectomy group, at an average follow up of 12 months.

| | Open | Endoscopic |
|-----------|-----------|------------|
| Fair | 1 5% | 1 5% |
| Good | 6 30% | 5 25% |
| Excellent | 13 65% | 14 70% |

Complications

We had 2 types of complications:

- Intraoperative → dural tear (unintended durotomy)
- Postoperative complications → Discitis

Table (15): Showing the incidence of intra operative complications in each group.

| | Open | Endoscopic |
|------------|----------------|----------------|
| Dural tear | 2 cases 10% | 4 cases 20% |
| Discitis | 2 cases 10% | 2 cases 10% |

DISCUSSION

The surgical treatment of intervertebral disc herniation has most often been approached by partial hemilaminectomy or fenestration and partial removal of the disc, as described by *Mixer and Barr*⁽⁴⁾. In 1939 *Love* described the extradural approach to disc herniation macrodiscectomy (the love method) is widely known as a common surgical procedure for lumbar disc herniation.

In 1977 and 1978, *Yasargil*⁽¹¹⁾, *Caspar*⁽³⁾ and *Williams*⁽⁹⁾ all described microsurgical techniques for discectomy using the operating microscope, slight modifications to these techniques have been made over the last thirty years but the operation has not changed much since described by these three neurosurgeons.

The trend since has been to develop less invasive surgical procedures for the treatment of radiculopathy secondary to herniated disc. The concept of minimally invasive spine surgery is to provide surgical options that optimally address the disc pathology. The most recent advancement in lumbar discectomy is the introduction of the micro endoscope. *Foley and Smith* introduced microendoscopic discectomy in 1997⁽¹⁰⁾. Microendoscopic discectomy combines standard lumbar microsurgical

techniques with endoscope, enables surgeons to successfully address free-fragment disc pathologic factors. Any new technologies and procedures introduced must be evaluated. Their implementation is a balance between the potential benefits of the new therapy and the unknown negative outcomes that may also occur.

In our study we tried to compare the results of endoscopic discectomy as a new minimally invasive procedure for discectomy with the standard open discectomy. As regard a new procedure the time factor is important it usually reflects the learning curve of the procedure and also when this time factor is reduced it reduces the anesthesia time by which decreasing its risks as well as the risk of blood loss and risk of postoperative infection. For our patients who underwent microendoscopic discectomy the mean operative time for them was 139.5 min while the patients who underwent open discectomy the mean operative time for them was 118 min. in early cases of microendoscopic discectomy the mean operative time was about 173 min while in late cases it was about 93 minutes.

The mean value of blood loss during our study for patients underwent microendoscopic discectomy was 44 cc while that for patients underwent open discectomy was 307 cc. the blood loss.

Follow up assessment for our patients was done through the visual analogue score (VAS) for both back and leg pains, modified MacNab criteria for assessment of the results after surgery, also we used the Japanese orthopedic association's evaluation system for lower back pain syndromes (JOA score).

In our study the mean value of VAS for the leg pain preoperative was 8 in the open cases and 8.85 in the endoscopic cases, in the post operative follow up the mean value of the VAS at the final follow up (12 months) was 1.05 for open cases and 1.8 for the endoscopic cases. In the early follow up (1 wk/ 1 month) the mean value of the VAS for the open cases was 0.5 and 1.9 respectively and it was 0.4 and 1.25 for the endoscopic cases respectively. These results showed that there was no significant difference between the 2 groups either in the early stage or late stage.

The mean value of the VAS for the back pain preoperative was 4.9 for the open cases and 8.6 for the endoscopic cases. In the early stage follow up (1 wk, 1 month) the mean value of the VAS for the open cases was 1.75, 2.25 respectively and it was 0.85, 1.85 in the endoscopic cases respectively while the mean values of the VAS at the final follow up (12 months) was 1.2 for the open case and 1.8 for the endoscopic cases. These results show less back pain in the early stages for the microendoscopic cases which will help in early ambulation of the microendoscopic patients and early returning to their normal life style. But in the final follow up there was no significant difference between the 2 groups.

As regard the postoperative outcome and assessment using the modified Macnab criteria our results showed that the open cases had excellent result in 65% and Good in

30% fair in 5% and none showed poor result with satisfactory result in 95%. While endoscopic cases showed excellent result in 70% and good in 25% and fair in 5% and non showed poor result with satisfactory results in 95%, Showing no significant difference between the outcome in the open and the endoscopic cases.

As regard the JOA score, our results showed that the mean value of JOA score preoperative was 15.85 for the open cases and 13.45 for the endoscopic cases, while the JOA score significantly improved in both groups after surgery as in open cases it was 22.2 in early follow up (1 week) and 23.9 in late follow up (12 months) and for the endoscopic cases it was 22.5 in the early follow up (1 week) and 23.1 in the late follow up (12 months) with no significant difference between the 2 groups.

As regard the recovery rate of the JoA score there was some difference between the open cases and microendoscopic cases in the early follow up (1 week) the recovery rate for the open cases was 47.65% and for the endoscopic cases it was 55.35% which is more than the open cases and that reflects early ambulation of the endoscopic patients and their early return to normal activity. But in the late follow up (12 months) there was no significant difference the recovery rate for the open cases was 59.8% while the endoscopic cases was 61%. However, using a 15 point system for the JoA score, there was no significant difference between the 2 groups in both early and late stages.

Concerning complications we had during the endoscopic procedure 4 cases of unintended durotomy which occurred during flavectomy in 3 cases and the other during root retraction in the 4 patients we complete the procedure without suturing the tear and with no postoperative complications in

the form of CSF leak. In 1 case during retraction of the root we had an unintended Pinhole affection of the dural sleeve of the root with a bleb of arachnoids appearing that was controlled by compression using a small piece of gel foam and small cottonoid and the procedure was completed with no CSF leak either intra or post operative. In the post operative complication we had 2 cases of discitis which presented by back pain postoperative by about 2-3 weeks both cases responded to medical treatment.

In the open standard discectomy procedure we had 2 cases of unintended durotomy and the dura was closed using sutures with no postoperative CSF leak. While as a postoperative complication we had 2 cases of discitis which responded to medical treatment. So through our study results there were no statistically significant difference in the outcome and complications of different methods of discectomy.

We actually found some differences between the microendoscopic discectomy and the open discectomy as follows; The microendoscopic discectomy procedure cause significantly less iatrogenic injury to the paraspinal musculature due to the manner in which the paraspinal muscles are handled. In the open discectomy the paraspinal muscles are detached from the lamina and retracted laterally while in the microendoscopic procedure the paraspinal muscles is not detached from the spinous processes instead, the K wire, dilators and the tubular retractor are all advanced between the fibers of the paraspinal muscles, this muscle splitting approach causes less trauma to the muscles and therefore leads to less incisional pain during the early postoperative period.

Also as regard the microendoscopic

discectomy we have to mention the following difficulties that we faced during the endoscopic discectomy. The field of view through the endoscope is limited as we worked through a tubular retractor system, and using the two dimensional vision through a monitor is one of the main cause of difficulties. We faced also the difficulty in the orientation localizing the target upside from down and medial from lateral making it difficult to expose and decompress the nerve root. These difficulties could be overcome through increasing the learning curve of the surgeon. So, the surgeon should have first considerable experience of open discectomy and an access to a training facility and /or laboratory that allows the use of cadaveric and animal microendoscopic surgery. Also, in order to achieve good decompression the working channel can be swing and repositioned, since lumbodorsal fascia and lumbar skin are relatively less movable or stretchable.

Beside varying experience of the surgeons who perform this procedure, different selection criteria of patients to be treated via the endoscope can severely influence the outcomes. The endoscope should not be used to treat patients with herniation associated with segmental instability and low back pain, patients with combined lumbar canal stenosis and herniation or patients who had previously undergone back surgery or patients with recurrent disc herniation. The optimal indication of microendoscopic discectomy is single level radiculopathy secondary to lumbar disc herniation. Aged patients complaining of segmental instability are not the optimal indication for the microendoscopic procedure.

CONCLUSION

Microendoscopic discectomy is a safe and effective procedure for

intervertebral discs. Its results are comparable to standard open discectomy procedure. The microendoscopic system offers the benefits of a smaller incision than open discectomy and limited tissue trauma via sequential dilators. Microendoscopic discectomy has advantages over other minimally invasive surgical techniques because it can address lesions otherwise inaccessible to percutaneous techniques. On the other hand, the difficulties of the endoscopic procedure are evident because of the limited exposure and two dimensional video display. The potential injury of the nerve root due to the limited working space and field of vision remains a serious concern.

Like other new minimally invasive techniques, microendoscopic discectomy has a learning curve which is related to surgery time, complications, conversion to the open procedure and recurrent disc herniation. It is advisable to start with herniation free fragments in younger patients, and only later treat older patients with bony and ligamentous pathology associated with disc herniation.

Strict selection criteria could ensure optimal long-term outcome as microendoscopic discectomy is not suitable for all patients with lumbar disc herniation. And still the optimal indication for microendoscopic discectomy is single level radiculopathy secondary to lumbar disc herniation.

As we mention the microendoscopic discectomy has the advantages of smaller skin incision less tissue trauma, less time of hospitalization and less intraoperative blood loss but our own results showed equivalent clinical results to those of standard open discectomy.

The advantages of

microendoscopic discectomy over classic discectomy might be limited and they do not seem to last longer than the initial post operative period.

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