Early follow-up of microscopy-assisted percutaneous nucleotomy technique for the treatment of lumbar disk prolapse in Egyptian patients

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Study design
This is a prospective study on the efficacy of a microscopy-assisted less-invasive approach for the operative treatment of lumbar disk prolapse.
Summary of background data
Less invasive techniques such as percutaneous endoscopy and microscopy-assisted procedures play an important role in disk surgery. The main advantages of these techniques are minimal surgical trauma, early rehabilitation, shorter hospital stay, and better cosmetic outcome.
Objectives
The aim of this study was to evaluate the efficacy of this minimally invasive approach as an alternative for the operative treatment of lumbar disk prolapse.
Patients and methods
Twenty consecutive patients with a mean age of 31.25 years were operated upon using this technique. The study included 20 lumbar segments. The mean follow-up period was 17.1 months. The visual analogue scale for back and leg pain and the Oswestry Disability Index were used to assess the patients preoperatively and postoperatively.
Results
The average operative time for one-level decompression was 61 min, and the average blood loss was 50 ml/patient. Two patients (10%) underwent revision procedures by means of open surgery. Visual analogue scale for leg pain showed statistically significant improvement from 7.85 preoperatively to 1.1 postoperatively. The Oswestry Disability Index improved from 33.6 (preoperatively) to 17.3 (postoperatively).
Conclusion
This percutaneous technique is effective in treating lumbar disk prolapse. It carries the advantage of early mobilization and rehabilitation with shorter hospital stay.

Keywords:
lumbar disk prolapse; microscopy-assisted nucleotomy; minimally invasive percutaneous approach

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Introduction

Elective lumbar discectomy is regarded as a good treatment option for lumbar discectomy prolapse (LDP) if sciatica or neurological deficits occur and still persist after 6 weeks of conservative therapy [1–3]. Mixter and Barr [4] first described herniated disk as a cause of neural compression in the lumbar spinal canal in 1934. They described a surgical approach to the problem that involved partial hemilaminectomy and partial removal of the disk. In 1977, a new technology was introduced by Yasargil [5] and Caspar [6] that involved the use of an operating microscope for the surgical removal of the disk. They independently described microsurgical techniques that provided excellent lighting and magnification of the operative field. Compared with standard open discectomy, the microdiscectomy enabled the use of smaller incisions of the skin and fascia and facilitated a less traumatic surgical procedure. The first follow-up report of Williams [7] in 1978 showed encouraging results following lumbar microdiscectomy. Since then these two procedures have been considered the gold standard for the surgical treatment of LDP.

Microscopy-assisted percutaneous nucleotomy (MAPN) was developed by Greiner-Perth and Boehm as a tubular system using a muscle splitting posterior approach for lumbar disk surgery [8].

The aim of our work was to assess the results of this technique in Egyptian patients.

Patients and methods

Patients

This prospective study included 20 patients (seven women and 13 men) with a mean age of 31.25 years who were operated upon using this technique. A total of 20 lumbar segments were included. The follow-up period ranged from 6 to 30 months with an average of 17.1 months. This study approved by the Ethical committee of Alexandria University.

The main symptoms were back and radicular pain. All patients suffered from sensory abnormalities, but motor deficits or bladder and bowel disturbances were not observed. All patients were subjected to conservative treatment for 6 weeks with no satisfying pain improvement.

LDP was diagnosed using MRI. Conventional radiographs were taken to rule out spine instability and to help leveling. An important restriction to the use of this technique is the presence of spinal instability — for example, isthmic spondylolisthesis.

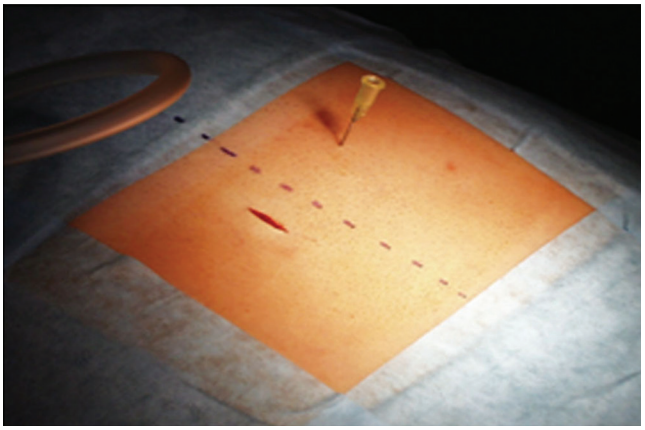
Preoperatively the patients were assessed clinically using the visual analogue scale (VAS) for back and leg pain [9] as well as the Oswestry Disability Index (ODI) [10]. The patients were subjected to clinical examination 3 months postoperatively. At the end of the follow up period, the patients were asked to answer the questions in VAS in written form.

Statistical analysis was performed with SPSS version 11.5 statistical software (SPSS Inc., Chicago, Illinois, USA). Statistical significance was noted when *P* value was less than 0.05.

Surgical technique

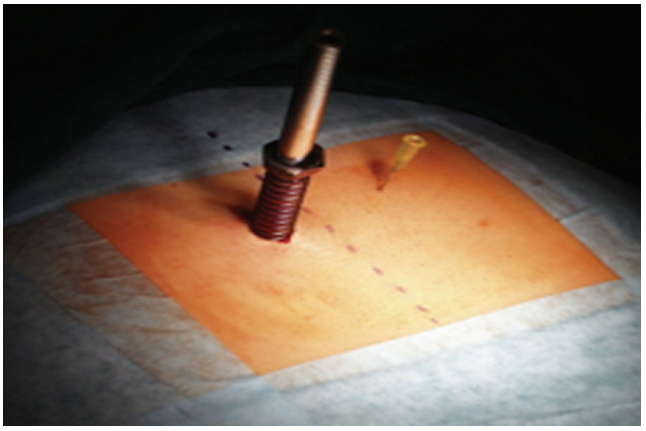
All patients were surgically managed by the first author. The operation was performed under general anesthesia in the prone position. The level of interest was localized using an image intensifier (lateral view). A paramedian 15-mm skin incision was made (Fig. 1) and was followed by transmuscular dilatation of paravertebral muscles to the limit that allows the introduction of the working channel (Fig. 2). The handle allows directing the working channel in different directions. The working channels (Fa. Medicon, Tutlingen, Germany) are available in three different lengths (45, 55, and 65 mm), with an outer diameter of 14 mm and inner diameter of 11 mm (Fig. 3). The operative microscope was then moved into the field, and the interlaminar space as an anatomical landmark was identified. Next, using a fine dissector, an opening was made in the ligamentum flavum, followed by its resection. Resection of the medial part of the facet complex was performed as necessary to identify the nerve root. Retraction of the nerve root is followed by removal of the sequestrated disk. In subligamentous herniation, a small incision was made in the annulus using the microscissor,

Figure 1



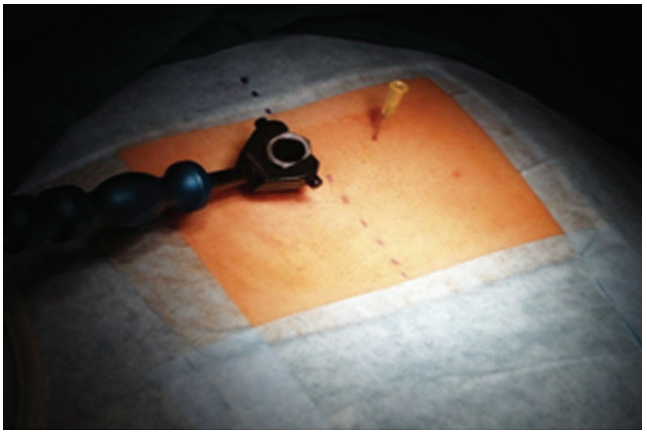
Paramedian skin incision (1.5 cm).

Figure 2



Insertion of the working channel over the muscle dilator.

Figure 3



The handle attached to the working channel.

and the disk was manipulated by the hooks to remove it (Figs. 4 and 5).

At the end of the operation, closure of subcutaneous tissue by a single suture was done, followed by approximation of skin edges using Steristrips. In principle, patients were mobilized the day after surgery. Lumbar brace was not necessary.

Results

The average operative time for one level was 61 min, and the average blood loss was about 50 ml/patient. The L4–L5 disk was the most common (12 patients), followed by the L5–S1 disk (seven patients) and finally the L3–L4 (one patient). LDP was right sided in 11 patients and left sided in nine patients. The postoperative length of hospital stay ranged from 2 to 3 days.

The VAS for back improved from 6.2 (preoperatively) to 3.4 (postoperatively), and the VAS for leg pain improved from 7.85 (preoperatively) to 2.3 (postoperatively). The ODI improved from 33.6 (preoperatively) to 17.3 (postoperatively). The improvement in both scales proved to be statistically significant.

Two patients (10%) underwent revision surgery. The first one was a 30-year-old woman with a huge L4–L5 disk whose condition was revised 4 weeks after surgery by means of posterior lumbar interbody fusion. Fusion was performed because of the instability noted during surgery. The second patient was a 48-year-old man with an L4–L5 disk. Revision was performed 3 years after the first surgery by means of microscopy-assisted nucleotomy. Both had completely recovered from back and leg symptoms. In addition, one case of dural tear occurred, and the dura was covered by gel foam.

Discussion

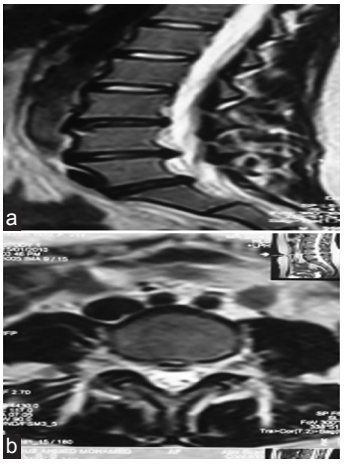
Our work assesses a single-surgeon experience with treating LDP in Egyptian patients using the MAPN technique. We are unaware about similar studies in Egyptian patients using this technique. The operative time for one level was 61 min in our study. The operative duration reported in the literature for a standard microdiscectomy ranges from 54 to 70 min [11–14]. For an endoscopic procedure using a tubular system, Nakagawa and colleagues [15–17]reported a duration of 79 min. Franke *et al.* [18] reported 49 min for a single-level MAPN, which is less than that of our study. The possible explanation for this is the cooperation of the surgery team, including the scrubbing nurse and the technician responsible for the C-arm, who needs more training to shorten the operative time.

Wu *et al.* [14] found in a study of 821 patients a mean postoperative OSW of 23%, compared with 48% before surgery, for a minimally invasive procedure. The VAS dropped on an average from 7.8 preoperatively to 2.3 postoperatively. Oesterman *et al.* [19] reported for the standard discectomy an average drop in the oswestry disability index scoring (OSW) score for surgical patients from 39 to 10 at 1 year, and an average drop in VAS for leg pain from 6.1 to 0.6 and for back pain from 5.3 to 1.9 at 1 year postoperatively. These were comparable to the findings in our study in which the VAS for back pain improved from 6.2 (preoperatively) to 3.4 (postoperatively), that for leg pain improved from 7.85 (preoperatively) to 2.3 (postoperatively), and

Figure 4

(a) Preoperative T2 sagittal MRI showing L4–L5 disk herniation. (b) Preoperative T2 axial MRI showing a huge L4–L5 disk herniation.

Figure 5



(a) One-year follow-up T2 sagittal MRI of the same patient. (b) One-year follow-up T2 axial MRI of the same patient.

the ODI improved from 33.6 (preoperatively) to 17.3 (postoperatively).

Regarding complications, there were no dural tears. In addition, nerve root lesions did not occur, nor further complications such as wound infections or spondylodiscitis. Two patients (10%) underwent revision procedures. The first one was a 30-year-old woman with a huge L4–L5 disk whose condition was revised 4 weeks after surgery by means of posterior lumbar interbody fusion. Fusion was performed because of the instability noted during surgery. The second patient was a 48-year-old man with an L4–L5 disk. Revision was performed 3 years after the first surgery by means of microscopy-assisted nucleotomy. Both had completely recovered from back and leg symptoms. Franke *et al*. [18] reported an incidence of 5% for intraoperative dural tears, which is higher than 3.7 by Oppel *et al*. [20], whose study comprised the largest patient in the literature.

Although we assessed a single-surgeon experience of that unique technique, which probably adds to the strength of our work, we feel that the study had inherent shortcomings. Besides the nonrandomized nature, the relatively small material and short follow-up could be considered limitations.

Conclusion

From the previously mentioned clinical results, it seems that this percutaneous technique is both safe and effective in treating lumbar disk prolapse in the Egyptian population. It carries the advantages of early mobilization and rehabilitation with shorter hospital stay and better cosmetic outcome.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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