LUMBAR MICRODISCECTOMY: TECHNIQUE, ADVANTAGES AND OUTCOMES. SURABAYA EXPERIENCE ON 83 PATIENTS

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ABSTRACT

From the initial work in Europe by Yasargil and Caspar to the popularization by Williams and Wilson in the United States, lumbar microdiscectomy has successfully reduced surgical morbidity and incision size while allowing patients to work faster. Emphasis is placed on the importance of a careful preoperative clinical and radiographic evaluation by identifying factors that may help in the prediction of successful surgical outcome. The objective of this study was to evaluate the outcome of patient with lumbar disc herniation that underwent microdiscectomy procedure including: return to normal ADL, return to work and evaluate the patient using the Mac Naab criteria, and, in addition, to learn the obstacles from this procedure. Eighty-three consecutive patients underwent microdiscectomy, at several hospitals in Surabaya, for one-level unilateral first-time lumbar disc herniation. Microdiscectomy was considered to involve a small incision with removal or opening of the ligamentum flavum, no or minimal bone excision, and use of the operating microscope to remove the disc material. Follow-up investigation was also conducted at least 1 year period. Relief of radicular pain, improvement in muscle power, and changes in sensory and/or reflex abnormality were documented. Assessment of outcome was performed using the Mac Naab criteria. Excellent and good result according to Mac Naab criteria were demonstrated in 84% patients. Return to work and return to normal activities of daily living (ADL) were 58% and 78% in 6 weeks post operation respectively. Microdiscectomy allows the neurosurgeon good visualization and in less traumatic to the involved tissues. The author found that lumbar microdiscectomy allows patients earlier return to work and normal ADL with less reliance on postoperative narcotic analgesic agents.

Keywords: lumbar microdiscectomy, return to work, return to normal ADL

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INTRODUCTION

Low back pain with sciatica is one of the common complaints for which patients seek medical advice. Approximately 12 – 33% of the adult work force is affected by low back pain each year and between 70 - 95% of adults will suffer from one at some time during their lifetime. Lumbar disc herniation is the most common cause of low back pain with sciatica which shows its peaks between 24 and 45 years of age with the incidence leading to surgery occurring most often in patients in the 30- to 39-year-old range.

The surgical procedure for lumbar disc disease has challenged spine surgeons since the first case reported by Dandy in 1929. In 1934, William J. Mixter, a neurosurgeon at Harvard College, and his orthopedic colleague, Joseph Barr, has described the lumbar discectomy technique involving an extensive removal of the lamina and offending ruptured disc through an intradural approach (Frymoyer 1985). The first reports of this less invasive microsurgical discectomy (microdiscectomy) were published in 1977: both Yasargil, a neurosurgeon working in Switzerland and Caspar, a neurosurgeon working in Germany reported their experience in applying the operating microscope to surgery for lumbar disc disease (Caspar 1977). During the following year, Williams, a neurosurgeon, popularized the microdiscectomy technique in the US. He demonstrated in a series of 532 patients that surgical scars could be minimized and patients could return to work more quickly through the use of a more conservative technique of removing only a portion of the offending disc to decompress the affected nerve root (Williams 1978). These techniques provided the surgeon with excellent lighting and magnification of the operative field, which in turn enabled the use of smaller incision and facilitated a less traumatic procedure. A debate ensued over which microsurgical technique produced the best outcome regarding recurrence rate and the need for reoperation. Caspar and colleagues (Caspar 1991), Wilson and Harbaugh (Wilson DH, 1981), and others believed a more extensive removal of the disc was needed to prevent recurrence and provide
better relief of the nerve root compression. Despite this debate, Goald (1978), Wilson and Harbaugh (1981), Maroon and Abla (Maroon 1986) and many others have confirmed the ability to reduce incision size, blood loss, and morbidity with the microsurgical technique compared with other discectomy techniques. Microdiscectomy success rates is within range from 88 to 98.5% in various series, although authors of a recent studies suggest that a success rate of 75 to 80% is a more accurate and realistic outcome expectation (Andrew 1990; Hudgins 1983).

MATERIAL AND METHODS

Patient Population

An observational descriptive study was carried out at several hospitals in Surabaya, from July 1995 to July 2005 that comprised of 83 patients with lumbar disc herniation who were managed with lumbar microdiscectomy. Criteria for inclusion were primary unilateral one-level lumbar disc herniation, neurological deficit that correlated with appropriate level and side of neural compression revealed on MR imaging, and no MR imaging-documented associated lumbar disease such as lumbar spinal stenosis or spondylolisthesis (Figure 1). Patients with lumbar disc herniation at two or more levels were excluded in this study (Figure 2). All patients first underwent conservative therapy that included rest, pharmacotherapy, and often physical therapy. The median time from first neurosurgical consultation to surgery was 6 weeks (range 1 day-3 months).

Preoperative Assessment

All patients underwent standardized neurological and clinical assessment. Criteria for surgical procedures were persistent or recurrent sciatic pain, gross motor weakness, bowel and bladder dysfunction, abnormalities on neurologic examination and/or nerve conduction studies. Preoperative data were collected through standardized patient questionnaires before surgery (Table 1).

![Figure 1. Sagittal (left) and axial (right) T2-weighted MR images of an L5-S1 paramedian herniation of the nucleus pulposus through a ruptured annulus fibrosis.](image1)

![Figure 2. Sagittal T2-weighted MR images of two level lesions. This patient is not included in this report.](image2)

<table>
<thead>
<tr>
<th>Table 1. Patient characteristics</th>
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<tr>
<td>Characteristic</td>
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<tr>
<td>No. of patient in study</td>
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<tr>
<td>Male/female ratio</td>
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<tr>
<td>Clinical sign / symptom :</td>
</tr>
<tr>
<td>1. Back pain</td>
</tr>
<tr>
<td>2. Sciatic pain</td>
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<tr>
<td>3. SLR test</td>
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<tr>
<td>Deficits :</td>
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<tr>
<td>1. Sensory</td>
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<td>2. Motor :</td>
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<tr>
<td>- Foot drop</td>
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<tr>
<td>- Cauda syndrome</td>
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<tr>
<td>Self score ability to work :</td>
</tr>
<tr>
<td>1. Totally unable</td>
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<tr>
<td>2. Severely restricted</td>
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<tr>
<td>3. Work with minor limitation</td>
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<tr>
<td>4. Work without restriction</td>
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Surgical Procedures

The main reason for surgery is to relieve pain more rapidly. The operations were all performed by the author. After induction of general endotracheal anesthesia, the patient was in a prone position. Prophylactic antibiotic agents were administered preoperatively in all cases. Briefly, the spine was exposed through a 3- to 5-cm posterior paramidline
incision, and subperiosteal muscle dissection was performed laterally to the posterior aspect of the facet joint. After insertion of a microdiscectomy retractor, the operating microscope then was brought into use. Two-and three-millimeter angled kerrison rongeurs were used to remove or open ligamentum flavum with no or minimal bone excision, and when indicated a foraminotomy and/or medial facetectomy was conducted using angled kerrison rongeur or high-speed drill with 4- to 5-mm coarse diamond. The interspinous ligament was preserved. Epidural veins are coagulated with low-setting-bipolar forceps. The disc was palpated with a blunt dissector or right angle nerve hook, and the nerve root is retracted using a modified louve hook. Free fragments are removed from the epidural space, and the anulus fibrosus was incised and nuclear material was removed. The disc space was not curetted or debrided deeply except for removing loose fragments. After thorough superior, medial, and inferior exploration, evaluation on the nerve root were free and mobile, leaving no fat or foreign materials, the fascia was closed with two to three sutures and the skin was closed with a subcutaneous stitch (fig.3). Drain was used in some patients.

Data Collection

One to 2 weeks prior to surgery all patients were canvassed that included complaints, clinical signs/symptoms, and objective data from neurological examinations. Patients also filled out a questionnaire to assess the ability to work according to a four-part scale in which grade 1 was able to work without restriction; grade 2, able to work with minor limitation; grade 3, severely restricted; and grade 4 was totally disabled. In addition to the presurgical assessment, patients filled out questionnaires at 1 and 10 days, 6 weeks, 6 months, and at least 1 year after undergoing surgery. After termination of the study all patients would have an opportunity to report the outcome 1 year after surgery. The results of this solicitation were termed “final follow up”.

RESULTS

Perioperative Data

All patients underwent microdiscectomy were of single level, either L2-L3 (3%), L3-L4 (10%), L4-L5 (35%), L5-S1 (52%), right side herniations dominated somewhat in number, it 58% compared to 42% that of the left. The type of herniation including: free fragment (31%), sub-ligamentary fragment (58%), and trans anular herniation (21%).

Complication Rate

There was no case of dural tear or CSF leakage. Infection occurred in 2.4% cases included: one case in each both discitis and wound infection. Level determinations were missed in 6 cases. More less serious complications including: inability to urinate (12 cases), temporary increase in leg pain (4 cases), nausea (4 cases), and reaction to medication (3 cases). For a while, there was no case in reaction to anesthesia.

Figure 4 shows that the final follow-up time in the first 12 months after surgery is 100% from 83 post-lumbar microdiscectomy procedure’s patients. The number of outpatient visits decreased starting from 14 to ≥ 24 months after surgery with the range from 85 to 40% subsequently. There is variation in outcomes after lumbar microdiscectomy when follow-up time varies. Therefore, we evaluate the outcomes included: patient performance by using Mac Naab criteria, returned to normal activities of daily living, and returned to work.

Table 2 reveals that satisfaction with the results of 6 weeks after surgery was excellent in 59 patients (70%) according to Mc Naab criteria that categorized the 6 weeks post operative outcome as excellent, good, fair, and poor. Good outcome was found in 14% of cases, fair in 8% of cases, and 8% of cases had a poor outcome.

Figure 5 and Figure 6 revealed that approximately half of the patients returned to normal ADL at 6 weeks and approximately two thirds by 6 months after surgery; the rate of successful return to ADL and remained at that level through final follow up. The time profile for return to work generally paralleled that for return to normal ADL, including a prominent boost in the success rate 5 months after that seen at 6 weeks.

DISCUSSION

The data in this study reinforce findings reported in earlier studies and demonstrate that lumbar microdiscectomy is a very safe and effective procedure. Compared to standard operation, microdiscectomy has the advantages of being less invasive because the skin incision is small and dissection is performed with clear visualization under microscope. Although the overall success rate is fairly the same to others lumbar procedures ranging from 70 to 80%, but microdiscectomy provides us with more advantages such as shorter hospital length of stay, less nerve root manipulation, less bone extirpation, and less muscle disturbance.
Figure 3.  *Upper*: the patient was positioned in the prone position.  *Middle left and right*: Photograph showing the 3- to 5-cm incision.  *Lower left*: C-arm guides to confirm the right level of the lesion during the operation.  *Lower right*: Photograph showing sequestered disc material.

Working under microscope takes somewhat extended operative time. Risk of infection may be increased, but the infections associated with microsurgery are most

Table 2. Outcomes of patient performance, 6 weeks after surgery using Mac Naab criteria

<table>
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<tr>
<th>6 weeks post-op (Mac Naab)</th>
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<tr>
<td>Excellent</td>
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<td>Good</td>
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<td>Fair</td>
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<td>Poor</td>
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Mac Naab Criteria (J.Bone Joint Surg 53,891-903,1971)  
Excellent: No pain, no restriction of activity  
Good: Occasional back/leg pain but not interfere ADL  
Fair: Intermittent pain interfere ADL  
Poor: Minimal improvement, further intervention required
likely related to positioning of the microscope directly over wound. This complication should occur in fewer 0.5% of lumbar microsurgical procedures. The infection rate is minimized by ensuring that surgery is performed in nutritionally sound patient and by using judicious techniques and intraoperative prophylactic antibiotics. In this series the rate of infection was 2.4%.

CONCLUSIONS

Microdiscectomy allows the neurosurgeon good visualization and in less traumatic to the involved tissues. Despite their popularity that is surfaced by the media or advertisement, financial pressures on healthcare system and the push to reduce the hospital stays have provided a strong impetus toward minimally invasive procedures which in turn makes surgeon sometimes fell pressure to use new procedures to maintain a competitive practice. Although these type of procedures are frequently associated with decreased peri-operative morbidity, decreased duration of hospital stay, and reduced costs, it frequently, however, requires highly specialized equipment and training to be carefully considered. Patient selection, surgical facilities and expertise remain a key to success for these techniques. A careful preoperative history taking and physical examination are crucial in selecting appropriate surgical candidates. The duration of radicular symptoms as well as the presence of crossed Laseque sign are important in the selection criteria, because patients with radiculopathy and sustained back pain for 6 months or more have more severe disc disease and poorer outcomes. Other clinical predictors of good outcome from surgery include : no preoperative comorbid conditions, no previous non spinal surgery, the absence of a Workers’ compensation claim, younger age, presence of radicular distribution pain extending to the foot, positive straight-leg rising examination without back pain, and reflex asymmetry; each of these factors independently predicted a good outcome from lumbar discectomy. The author found that lumbar microdiscectomy allows patients earlier return to work and normal ADL with less reliance on postoperative narcotic analgesic agents.

REFERENCES


