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Clinical Research

Quality of life and clinical outcome of post-micro endoscopic discectomy in lumbar disc disease at Soebandi General Hospital

I Nyoman Semita

Orthopaedic Department, Faculty of Medicine, Jember University, Soebandi General Hospital, Jember, Indonesia

ABSTRACT

Introduction: Open surgery can cause many complications. Currently, micro endoscopic discectomy (MED) is providing effective treatment, less muscle and local damage, better cosmetics, decreased pain and operative time, and faster recovery after surgery. We report quality of life and clinical outcome of lumbar disc disease post- MED.

Methods: 45 consecutive patients underwent MED. The patients were observed for 12-24 months. The results were evaluated by using VAS and Macnab criteria. All patients were operated by a single spine surgeon with the METRxTM system (Medtronic Sofamor-Danek, Memphis, TN, USA).

Results: The quality of life of most patients improved to good to excellence with 94.4% patients return to work post-MED. Clinical outcome by Macnab criteria post-MED for the patients showed excellence (83,3%), good (11,1%), fair (2,8%), and poor (2,8%). Evaluation of back pain and leg pain were performed with VAS. VAS scale showed no pain (88,9%), back pain (8,3%), and leg pain (2,8%). The average of time of operation were 57 minutes, but stenosis needed longer operative time. Hospital length stay was less than 2 days, but older patients needed longer. Blood loss less than 50cc. With this technique, we didn't get neurological injuries but we got one discitis and dural tear, this complication was immediately overcome by open surgery.

Conclusion: The MED technique is a feasible and efficacious, minimally invasive, approach for lumbar disc disease without instability.

ABSTRAK

Pendahuluan: Operasi terbuka dapat menyebabkan banyak komplikasi. Saat ini, micro-endoscopic discectomy (MED) memberikan perawatan yang efektif dengan lebih sedikit kerusakan otot lokal, kosmetika yang lebih baik, turunnya rasa sakit dan waktu operasi, dan pemulihan yang lebih cepat setelah operasi. Kami melaporkan kualitas hidup dan hasil klinis penyakit diskus lumbar pasca-MED.

Metode: 45 pasien menjalani MED. Pasien diamati 12-24 bulan. Hasilnya dievaluasi dengan menggunakan kriteria VAS dan Macnab. Semua pasien dioperasi oleh seorang ahli bedah tulang belakang dengan sistem METRxTM (Medtronic Sofamor-Danek, Memphis, TN, USA).

Hasil: Kualitas hidup dari sebagian besar pasien membaik luar biasa dengan 94,4% kembali bekerja pasca-MED. Hasil klinis berdasarkan kriteria Macnab pasca-MED, pasien menunjukkan luar biasa (83,3%), baik (11,1%), cukup (2,8%), buruk (2,8%). Untuk evaluasi nyeri punggung dan nyeri kaki dilakukan dengan VAS. Skala VAS tidak menunjukkan rasa sakit (88,9%), sakit punggung (8,3%), dan nyeri kaki (2,8%). Waktu operasi rata-rata adalah 57 menit, tetapi stenosis membutuhkan waktu lebih lama. Lama tinggal di rumah sakit kurang daripada 2 hari, tetapi pasien yang lebih tua membutuhkan waktu lebih lama. Kehilangan darah kurang dari 50cc. Pada teknik ini, kami tidak mendapatkan cedera neurologis tetapi kami mendapat satu discitis dan robekan dural, komplikasi ini segera diatasi dengan operasi terbuka.

Kesimpulan: Teknik MED layak untuk pendekatan invasif minimal dan efektif untuk penyakit diskus lumbar yang stabil.

Keywords: Lumbar disc disease, Micro endoscopic discectomy, minimally invasive spine surgery

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Corresponding author : I Nyoman Semita, MD. nyomansemita@yahoo.com

INTRODUCTION

Micro Endoscopic Surgery (MED) was first described in 1997 as a minimally invasive trans-muscular approach using advanced optics. In the last decades, endoscopic techniques have become well-developed methods to perform discectomy under direct visualization and with local anesthetic.¹ Foley and Smith (1997) introduced an operative endoscope with a tubular system called “Endoscopic Discectomy”. As an alternative to the endoscope, Foley *et al.* (2003) modified the tubular retractors to include a microscope, which is termed “Micro Endoscopic Discectomy” (MED). The potential benefits of this technique include less muscle and local damage, better cosmetics, decreased pain and operative time, and faster recovery after surgery. On the other hand, open surgery includes extensive retraction and dissection of para-spinal muscles, longer operative time, longer incisions and bone resection.² We report quality of life and clinical outcome of lumbar disc disease post- MED.

METHODS

45 consecutive patients (29 lumbar disc herniation and 16 lumbar stenosis) underwent surgery for lumbar radiculopathy using micro endoscopic surgery. Patients were observed for 12-24 months for increasing neurological deficit, significant neurological deficit with significant SLR reduction, bladder and bowel involvement, failure of conservative treatment (no relief of pain, no improvement of SLR, recurrent in 6 weeks–3 months). Patients with wrong diagnosis, lumbar instability, painless HNP, inexperienced surgeon, and lack of adequate instruments were excluded from our study. Patient’s data were collected by using computer database, medical record, interview, and modified Macnab criteria for characterizing outcome after the spinal surgery. All patients were operated by a single spine surgeon with the METRx™ system (Medtronic Sofamor-Danek, Memphis, TN, USA).

Operative Procedure

1. MED, developed by Foley 1997
2. Knee chest position
3. C- Arm: Lat. View at any stage of intervention
4. Paravertebral 16 mm skin incision
5. Guidewire is inserted, inferior edge superior lamina
6. Three cannulated soft tissue dilators over wire
7. Tubular retractor fixed with a self-retaining arm

8. Dilators are removed
9. Endoscope is fixed on the tubular retractor
10. Dissect ligamentum flavum
11. Laminotomy
12. Explore disc space and nerve root
13. Resects the hernia and discectomy
14. Follow the procedure on the monitor

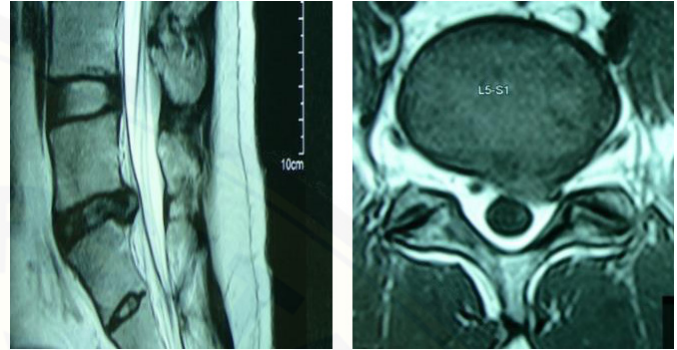


Figure 1. Male, 29 y.o., chronic radicular pain S1, failure of conservative treatment, MRI: left extruded HNP disc L5-S1

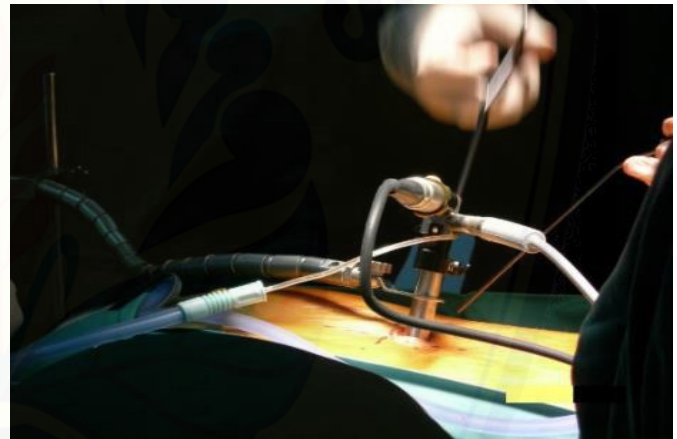


Figure 2. MED procedure

Quality of Life and Clinical Outcome Assessment

Quality of life was performed by VAS scale and Macnab criteria. The evaluation of back pain, leg pain, and postoperative pain were performed with VAS (score range: 0-10). VAS pain score was evaluated by using a 10 cm horizontal line. One end of the line is 0 representing no pain, and the other end is 10 representing most pain. The middle part of the line represents different degrees of pain. Additionally, the overall response was assessed with modified MacNab criteria. According to the modified Macnab criteria, the clinical efficiency was graded into 4 levels including excellent, good, fair and poor. The four levels were determined based on the following standards:

symptoms completely disappear, restore the original work and life; mild symptoms, activities mildly limited, no impact on public life and work; symptoms mildly relieved, activity is limited, affecting the work and life; no differences before and after treatment or even worse.

Table 1. Modified Macnab Criteria¹¹

| Result | Criteria |
|-----------|---|
| Excellent | No pain; no restriction of mobility; able to return to normal work & activities |
| Good | Occasional non-radicular 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 operation intervention needed at the index level, irrespective of length of post-operative follow up |

RESULTS

From the patient’s profile, it could be seen that male got more lumbar disc disease (58,3%) than female (41,7%). Most level affected were L4-5 (69,4%), L5-S1 (27,8%), and L3-4 (2,8%). Pre-operative symptoms were leg pain (63,9%) and claudication (36,1%). Most patients didn’t show any neurological sign (93,9%). Radiological assessment with MRI showed more HNP (63,9%) than HNP stenosis (36,1%). Post-operative hospital stay was <48 hours (63,9%) and >48 hours (36,1%). There was longer operative time <60 minutes (70%) compared to >60 minutes (30%). There were more patients with <50cc blood loss (72,2%) compared to 51-100cc (27,8%). Most patients didn’t show any pain (88,9%), but some experienced back pain (8,3%) and leg pain (2,8%) post-operatively. Only one patient had complication post-MED with discitis and dural tear (2,8%). Clinical Macnab criteria post-MED in most patients showed excellence (83,3%), good (11,1%), fair (2,8%), and poor (2,8%) outcome.

Table 2. Patient’s Profile

| Variable | Characteristics | Frequency | Percent |
|------------------------|----------------------|-----------|---------|
| Gender | Male | 26 | 58.3% |
| | Female | 19 | 41.7% |
| Level of Pathology | L3-4 | 1 | 2.8% |
| | L4-5 | 31 | 69.4% |
| | L5-S1 | 13 | 27.8% |
| Pre-Operative Symptoms | Leg Pain | 29 | 63.9% |
| | Claudication | 16 | 36.1% |
| Neurological Sign | Yes | 4 | 8.3% |
| | No | 41 | 91.7% |
| MRI | HNP | 29 | 63.9% |
| | HNP Stenosis | 16 | 36.1% |
| Hospital stay post-op | <48 hours | 29 | 63.9% |
| | >48 hours | 16 | 36.1% |
| Operative time | <60 minutes | 32 | 70% |
| | >60 minutes | 14 | 30% |
| Blood loss | 50cc | 32 | 72.2% |
| | 50-100cc | 13 | 27.8% |
| Post-operative pain | No Pain | 40 | 88.9% |
| | Leg Pain | 1 | 2.8% |
| | Back Pain | 4 | 8.3% |
| Complication | Discitis, dural tear | 1 | 2.8% |

Table 3. Clinical Outcome by Macnab Criteria

| Criteria | Frequency | Percent |
|------------|-----------|---------|
| Excellence | 37 | 83.3% |
| Good | 5 | 11.1% |
| Fair | 1 | 2.8% |
| Poor | 1 | 2.8% |

DISCUSSION

Lumbar disc disease causing significant or new neurological deficit, cauda equina syndrome, or those refractory to conservative treatment are dealt surgically. A proper technique should lead to satisfactory outcomes, minimal morbidity, and good cosmetics. It should be cost-effective, able to adjust to patient factors like obesity, ethnicity, etc.⁴ The advantages of MED over OD include small incision, better cosmetics, early ambulation, less postoperative pain, less blood loss, short hospital stay, fewer analgesics, short time to return to work, and thus less cost of treatment. If one would compare MED to OD, if both procedures have the same overall outcome, then the procedure with lesser tissue invasion, lesser length of incision, lesser use of postoperative analgesics with an early return to work becomes the procedure of choice.⁴ We have compared the following results with other published series, the quality of life and clinical outcomes were compared with Macnab criteria, back pain and leg pain were evaluated by VAS score, and we compared the mean operative duration, blood loss during surgery, mean hospital stay, time taken to return to work, level of pathology, and complication.

Post-MED quality of life of most patients in our cases improved: 94.4% good to excellence to return to work, 5.2% fair and poor in lumbar stenosis, 2.6% poor due to discitis. Bookwalter *et al.*⁵ reported that 40% of their patients returned to work in fewer than 5 weeks proving the cost-effectiveness of this treatment. Caspar *et al.*⁶ reported a mean return time to work of 18.6 weeks, and Foley and Smith⁷ reported a mean return time to work of 17.6 days. Arvind *et al.*,⁴ reported return time to work after 2 weeks following surgery. Mick *et al.*,⁸ reported mean return time to work of 17 days. Wu *et al.*¹⁶ reported the average days taken to return to work of 15 days. Destandau *et al.*¹⁷ who have reported the largest MED series in the world, reported 4 weeks as the average duration to return to work. Marappan *et al.*¹⁸ reported the mean duration to return to work of 4.05 weeks. Most of

them showed improvement and fast duration to return to work.

As to clinical outcome by Macnab criteria post-MED, most patients in our cases showed excellence (83,3%), good (11,1%), fair (2,8%), and poor (2,8%). Giulio *et al.*,⁹ reported the result of Macnab criteria good to excellent in 70 to 90% patients. Mick *et al.*,⁸ revealed that 77% patients had excellent, 17% had good, 3% had fair, and 3% had poor outcomes. Alok *et al.*,¹⁰ reported the overall success rate was 92,4%, in which seventy-six patients had excellent outcome, 22 patients had good outcome, 5 had fair outcome, and 3 patients had poor outcome. All data showed the success in using MED as lumbar disc treatment was between 70-95%. Wu *et al.*¹⁶ reported that 74% patients had excellent, 19% patients had good, 3% had fair, and 4% patients had poor outcomes. Destandau *et al.*¹⁷ reported that out of 1,027 patients, 980 patients gave excellent, 6 patients gave good, 1 patient gave fair, and 40 patients gave poor outcomes. Marappan *et al.*¹⁸ reported that from 40 patients, 28 had excellent, 5 had good, 4 had fair, and 3 had poor outcomes.

To evaluate back pain and leg pain, we performed VAS. VAS scale showed no pain (88,9%), back pain (8,3%), and leg pain (2,8%). Xinyu *et al.*,¹² reported VAS score for persistent strong low back pain (LBP) (0), LBP (6), leg pain (7,2), and incision pain in day 1-3 (2,1-3). Zihao Chen *et al.*,¹⁵ reported average VAS back score of 3,7 and VAS leg score of 5,5. All data showed less pain post-operatively.

In our cases, male had higher score than female and all of the clinical researches showed male were more affected by lumbar disc disease than female, and therefore, male were more impacted in his work and common positions. The average operative time was 57 minutes, but in our cases, stenosis needed longer operative time. Xinyu *et al.*,¹² reported that the average duration of operation was 57 minutes. Arvind *et al.*,⁴ reported the average operative time of 50 minutes. Most of the operative times were less than 60 minutes but the operative time of Mick *et al.*,⁸ was longer with mean operative time of 97 minutes. Alok *et al.*,¹⁰ reported mean operative time of 120 minutes in their early operative experience. Wu *et al.*¹⁶ reported a mean value of 75±26 minutes for their first 220 patients and it was significantly reduced to 49±21 minutes in their last 653 patients. Nakagawa *et al.*¹⁹ reported the mean duration for MED was 95.3 minutes. Zhang *et al.*²⁰ reported 64.77±17.83 as the mean duration. Marappan *et*

*al.*¹⁸ reported the mean duration was 43 minutes.

Hospital length stay in our cases was less than 2 days, but older patients needed longer. Xinyu *et al.*,¹² reported the average length of hospital stay of 3 days. Garg *et al.*,¹³ reported shorter hospital stay for patients underwent MED. Teli *et al.*¹⁴ reported significantly smaller surgical incisions and shorter hospital stay for patients who were randomly assigned to undergo MED. Alok *et al.*,¹⁰ reported 24-48 hours hospitalized for patients underwent MED. Wu *et al.*¹⁶ reported 4.8 days and Mick *et al.*⁸ reported 7.7 hours. Marappan *et al.*¹⁸ reported the mean hospital stay in their first 20 cases was 2.75 days and in their last 20 cases was 2.98 days. In general, hospitalization for patients receiving MED is between 24-72 hours.

Intra-operative blood loss in our study was less than 50cc. Garg *et al.*,¹³ reported that patients who underwent MED had smaller amount of intraoperative blood loss. Xinyu *et al.*,¹² reported an average intraoperative blood loss of 23ml. Arvind *et al.*,⁴ reported the estimated average blood loss of 30 ml. Wu *et al.*¹⁶ reported of 44 mL and Nakagawa *et al.*¹⁹ reported of 67.5 mL, while Zhang *et al.*²¹ series of 47.5±11.62 mL. Marappan *et al.*¹⁸ reported the mean blood loss of 17.8 mL. According to those data, the estimated intraoperative MED blood loss is 20-50 ml. We didn't get neurological injuries with this technique but we got one discitis and dural tear, this complication had already overcome by open surgery. Arvind *et al.*,⁴ reported no discitis and 11 dural tears (11). Alok *et al.*,¹⁰ reported long dural tear and short dural tear. Giulio *et al.*,⁹ reported 1 dural tear. Mick *et al.*,⁸ reported 8 dural tears. Wu *et al.*¹⁶ stated that 5.3% of the patients had significant medical complications, while Nakagawa *et al.*²⁰ had complications in 4% of the patients. Destandau *et al.*¹⁷ reported that 10.6% of the patients also had significant medical complications as well as Marappan *et al.*¹⁸, who reported that 10% of the cases had complications. All data showed less complications.

The most affected level is L4-L5 (31) because most of the body weight is born on that vertebrae. Shun Li *et al.*,¹¹ reported that lumbal disc disease mostly occurred in the L4-5 (536), so did Arvind *et al.*,⁴ (111,56%) and Alok *et al.*,¹⁰ (111). However, L5-S1 is the most affected in lumbal disc disease according to Mick *et al.*,⁸ (82) and Zihao *et al.*,¹⁵ (79).

Based upon Sasaoka *et al.*²¹, Chao *et al.*²², Zhang *et al.*²⁰, Huang *et al.*²³, and Schick *et al.*²⁴ series, the magnitude of

tissue damage and surgical trauma response in MED are significantly lower than open discectomy. Sasani *et al.*²⁵ reported that the MED procedure could be considered as a safe alternative for extraforaminal disc migrations. Le *et al.*²⁶ and Isaacs *et al.*²⁷ stated also that MED might be used as a treatment modality for recurrent lumbar disc herniation.

Limitation in our research was short follow up (12-24 months) in patients who underwent MED. We didn't compare pre-operative and post-operative state of patients who underwent MED. We didn't compare MED with other surgical techniques in order to get better technique. This research is considered to give better review if used as an analytical study. Further research needs to complete our limitation in patients who underwent MED.

CONCLUSION

1. The quality of life and clinical outcome in most patients with lumbar disc disease post-MED give excellence to good criteria (94,4%)
2. MED technique is a feasible and efficacious, minimally invasive, approach for lumbar disc disease without instability.

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