Original Article

Results of Treatment of Herniated Nucleus Pulposus with Microdiscectomy

Chavasiri C, MD[1], Chotivichit A, MD[1], Korwutthikulrangsri E, MD[1], Luksanapruksa P, MD[1], Siribanchachai K, BSc[1]

[1] Siriraj Spinal Unit, Department of Orthopaedic Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

Background: Microdiscectomy is becoming a popular minimally invasive spine surgery for lumbar disc herniation. This procedure is performed by both neurosurgeons and orthopedists.

Objective: The present study aimed to evaluate the efficacy and outcomes of microdiscectomy for treatment of Thai patients with lumbar disc herniation.

Materials and Methods: This retrospective chart review included 112 Thai patients who underwent microdiscectomy for lumbar disc herniation during November 2006 to June 2014 at Siriraj Hospital (Bangkok, Thailand). Data collected from medical records and a telephone conversation included demographic, anthropometric, clinical, intra-operative, and postoperative data. Oswestry Disability Index (ODI) and EuroQol instrument (EQ5D5L) were used for outcome evaluation.

Results: The average age of patients was 45.7±13 years (range: 18 to 72), and there were 62 males and 50 females. Average body mass index (BMI) was 24.4±4.2 kg/m^2 (range: 15.8 to 44.3). The most commonly treated level was L4 to 5. Mean operative time was 92.7±33.1 minutes per level (range: 50 to 220), and the average length of stay was 3.8±2.1 days (range: 2 to 13). Mean estimated blood loss was 60.1±66.5 ml (range: 5 to 400). Average follow-up was 51.3±38.8 months (range: 0.5 to 118). Seventy-three percent (73.2%) of patients were followed-up for at least 1 year, 63.4% were followed-up for at least 3 years, and 50% were followed-up for at least 4 years. Sixty-three patients (63.4%) completed the postoperative outcome questionnaires. Mean ODI score was 62.9±16.6 (range: 20 to 93.3) pre-operatively, and 11.3±12.2 (range: 0 to 60) postoperatively (p<0.001). Mean EQ-5D-5L was 0.016±0.247 (range: -0.254 to 0.861) pre-operatively, and 0.938±0.162 (range: 0.197 to 1) postoperatively (p<0.001).

Conclusion: Microdiscectomy was found to be an effective surgical treatment for Thai lumbar disc herniation patients, with minimal blood loss, short hospital stay, and low complication rate.

Keywords: Microdiscectomy, Lumbar disc herniation, ODI, EQ5D5L (spinal diseases)

J Med Assoc Thai 2019;102(Suppl.9): 91-4
Website: http://www.jmatonline.com

Lumbar disc herniation with sciatica is a common disorder, especially in middle-aged patients. Several risk factors have been identified, such as heavy lifting, labor work, and smoking. Although most patients' symptoms resolve spontaneously within 6 weeks, some require surgical intervention. In 1934, Mixter and Barr[(1)] described a successful novel discectomy technique that could best be described as a partial laminectomy. Since then, this discectomy had been described in several techniques. In 1976, Williams[(2)] translated and refined this technique into a microdiscectomy technique that is still widely used today. This procedure is widely taught in neurosurgery training, but not in orthopedic training in Thailand. Orthopedic residents in Thailand are well-trained in microsurgery to repair nerves and vessels, so this microdissection technique should be safely and efficaciously manageable by orthopedic surgeons in Thailand. This microdissection procedure has also gained in popularity due to less blood loss, and shorter recovery time in the hospital[(3-5)]. The aim of the present study was to evaluate the efficacy and outcomes of microdiscectomy to treat Thai lumbar disc herniation patients by a single orthopedic surgeon at Siriraj Hospital-Thailand's largest national tertiary referral center.

Correspondence to:

Chotivichit A.

Siriraj Spinal Unit, Department of Orthopaedic Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, 2 Wanglang Road, Bangkoknoi, Bangkok 10700, Thailand.

Phone: +66-2-4197968; **Fax:** +66-2-4197967

E-mail: areesak.cho@mahidol.ac.th

Materials and Methods

This retrospective study included Thai patients who underwent microdiscectomy for lumbar disc herniation at the Department of Orthopaedic Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand during the November 2006 to June 2014 study period. Data were collected from medical records and telephone conversations. All included patients were operated on by a single surgeon (AC). Patients with previous spine surgery, spinal stenosis, severe previous infection, and/or spine abnormality were excluded. The protocol for the present

How to cite this article: Chavasiri C, Chotivichit A, Korwutthikulrangsri E, Luksanapruksa P, Siribanchachai K. Results of Treatment of Herniated Nucleus Pulposus with Microdiscectomy. J Med Assoc Thai 2019;102(Suppl.9): 91-4.

study was approved by the Siriraj Institutional Review Board (SIRB) (COA No. Si 596/2014).

General anesthesia was used in all patients. Patients were put in the prone position on a Wilson frame. A two-person intra-operative microscope was used after the spine level to be operated upon was checked by an intraoperative C-arm x-ray. An incision of 2.5 cm was used. A one-leg Gelpie retractor or a Rudoff self-retaining retractor was used to gain access to the inter-laminar space. A high-speed burr remover (Midas Rex, Fort Worth, TX, USA) and a bayonet micro curette were used. The fragment of the herniated disc was removed (sequestrectomy) along with loose fragments of intradiscal material if there was a large opening of the annulus[2]. No drain was used. Fascia and skin were sutured. Unless indicated otherwise, patients resumed upright activities on postoperative day one. Postoperative morphine was minimized, with non-steroidal anti-inflammatory drugs (NSAIDs) being the pain rescue medication of choice. Routine postoperative follow-up visits were scheduled for 2 weeks, 6 weeks, 3 months, 6 months, 1 year, and then annually thereafter. The outcome measurements were Oswestry Disability Index and the EuroQol 5D-5L instrument (EQ5D5L), both of which were administered at every visit after 6 weeks from the index surgery. A telephone interview was used at the last follow-up (June 2017).

Statistical analysis

SPSS Statistics (SPSS, Inc., Chicago, IL, USA) was used to perform all statistical analysis. Descriptive statistics were used to summarize patient data. Data were reported as mean ± standard deviation and range. Wilcoxon signed-rank test was used to compare the two outcome measures between before and after surgery. A *p*-value less than 0.05 was considered statistically significant for all tests.

Results

A total of 112 patients were included. The average age of patients was 45.7±13 years (range: 18 to 72), with a gender proportion of 62 males and 50 females. The average BMI was 24.4±4.2 kg/m^2 (range: 15.8 to 44.3). Mean operative time was 92.7±33.1 minutes per level (range: 50 to 220), and the average length of hospital stay was 3.8±2.1 days (range: 2 to 13). Mean estimated blood loss was 60.1±66.5 ml (range: 5 to 400). The most commonly treated level was L4 to 5 (Figure 1), and the average follow-up time was 51.3±38.8 months (range: 0.5 to 118). Seventy-three percent (73.2%) of patients were followed-up for at least 1 year, 63.4% were followed-up for at least 3 years, and 50% were followed-up for at least 4 years.

Sixty-three patients (63.4%) completed the postoperative outcome questionnaires. Outcomes, as defined by the difference between preoperative and postoperative survey scores, were statistically significant for both measures. The mean Oswestry Low Back Disability score was 62.9±16.6 (range: 20 to 93.3) pre-operatively, and 11.3±12.2 (range: 0 to 60) postoperatively (p<0.001). The mean EQ-5D to 5L score was 0.016±0.247 (range: -0.254 to 0.861) pre-operatively, and 0.938±0.162 (range: 0.197 to 1) postoperatively (p<0.001) (Figure 2 and Table 2).

Complications

Dura tear occurred in 4 cases (3.6%). All of those patients underwent successful wound repair with subsequent bedrest for 72 hours, and no further events were observed. Another patient had a superficial wound infection (0.9%) that required debridement at 8 days after the index surgery. That patient's infection eventually healed without further complication. There were 7 recurrent disc herniations (6.3%) that occurred at time points ranging from one week to 8 years after the index surgery. Three of those recurrent herniations occurred during the first months. Two patients underwent laminectomy fusion due to degenerative spondylosis and stenosis at 5 years and 9 years after the index surgery, respectively.

Discussion

Lumbar herniated disc (LHD) is a common spinal disease. In South Korea, the prevalence of LDH in 19-year-old males was reported to be 0.47%[6]. Badlani, et al recommended surgical intervention in patients who remain refractory to conservative treatment for at least 6 weeks, but

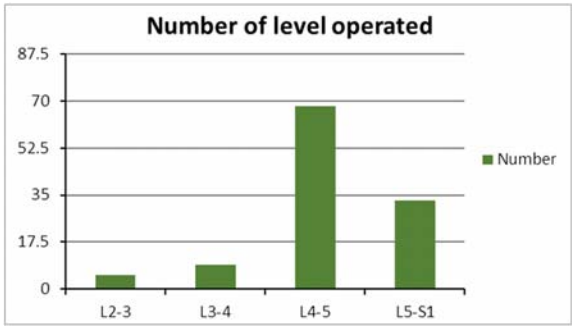

Figure 1. Number of levels operated. Most common was at L4 to 5.

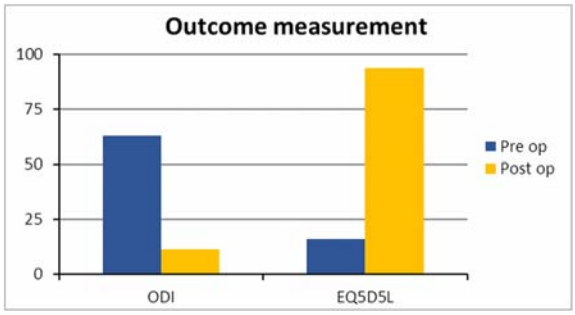

Figure 2. Outcome measurement (ODI and EQ5D5L) comparing preoperative and last follow-up after the surgery.

that urgent surgery may be considered in patients with severe or progressive neurological deficits[7].

Microdiscectomy is a minimally invasive surgical procedure that was reported to show good efficacy and safety when compared with conventional discectomy[3-5]. Arts, et al reported that tubular discectomy did not result in significant disability improvement, and that it resulted in less favorable back pain, leg pain, and recovery when compared with conventional microdiscectomy at the 8-week and 1-year postoperative time points[8]. At the 2-year follow-up, tubular discectomy resulted in clinical outcomes similar to those observed after microdiscectomy, but tubular discectomy had more leg and low-back pain[4]. In terms of cost-effectiveness, Cahill, et al reported the total charges in tubular discectomy to be on average $5,453 less than conventional discectomy (p = 0.02), because the length of stay was significantly shorter (mean 1.5 days open vs. 0.9 days tubular, p = 0.01); however, there were no significant differences in operative time or complications[9]. In contrast, a double-blind randomized controlled trial and cost utility analysis performed by van den Akker, et al found no significant difference in quality-adjusted life-years (difference for US EuroQol: -0.012, 95% confidence interval: -0.046 to 0.021) between procedures, or for cost from both a healthcare and a societal perspective (prefer conventional microdiscectomy)[4].

Similar to previous studies[5], the present study showed good postoperative clinical outcomes. Patients who underwent microdiscectomy had significantly improved ODI score[5,10], back pain[5], and quality of life at last follow-up. The average hospital stay was 3.8 days, which is less than the mean LOS of 4.6 days reported by Chotigavanichaya, et al[5]. The complication rate in the present study was 3.6% (incidental durotomy in 4 cases), which is lower than the previously reported rate of 9.5%[5,10]. The 6.3% recurrence rate in present study (7 cases of reherniation) is consistent with previously reported relapse rates that ranged from 3 to 11.1%[3,5,10]. One of our patients also had torn dura at the level of L2 to L3. All dura tears were successfully repaired. However, they are all required extended incision in order to gain access for good repair. The instruments used were microscope tools that could work with noncutting six zero Prolene. TISSEAL fibrin glue was used in all repair cases. There were no rare or severe complications, including rupture of the ureter[11], laceration of the abdominal aorta and/or vena cava[12], or bowel injury[13].

The present study showed a low recurrence rate that can be explained by good patient selection. Broad base herniation was treated conservatively in all cases. Outcomes were significantly improved, even over a long follow-up period. The mean operative time was approximately one hour. The average intraoperative blood loss was 61.1 ml. This high level of blood loss could be related to the fact that almost half of patients had a BMI greater than 24. Therefore, venous congestion in the prone position on a Wilson frame would be expected. Two patients with a BMI of 29.3 and 44.3 kg/m^2, respectively, had blood loss of approximately 400 ml per level. Another possible explanation for the observed high blood loss in the present study may be the described popularity of herbal medicine use among the present study cohort.

Table 1. Demographic data of the patients

Variable	Mean ± SD, (range)
Age	45.7±13 (18 to 72)
BMI	24.3±4.2 (15.8 to 44.3)
Operation time	92.7±33.1 (20 to 220)
Length of stay	3.8±2.1 (2 to 13)
Estimated blood loss	60.8±66.5 (5 to 400)
Follow-up	51.3±38.8 (0.5 to 118)

Table 2. Outcome measurement preoperative/post-operative (last follow-up)

Clinical measurement	Mean	SD	p-value
ODI			
Pre	63	16.6	<0.001
Post	11.3	12.2	
EQ5D5L			
Pre	16	24.7	<0.001
Post	93.8	16.2	

Limitations

The present study has some limitations. First, the retrospective design of the present study influences a higher likelihood of missing or incomplete data. Second, this was a single-center, single surgeon case series. Third, the dropout rate was high, with 26.8% and 33.9% of patients lost to follow-up at the 1-year and 2-year time points, respectively. Fourth, the relatively small size of the study population may have limited the statistical power of this study to identify all significant differences and associations between pre- and post-intervention. A prospective multicenter study will be beneficial for confirming and strengthening the results of this procedure in Thai patients with lumbar disc herniation.

Conclusion

Microdiscectomy was shown to be an effective surgical treatment for lumbar disc herniation, with minimal blood loss, short hospital stay, and low complication rate. Special precaution was required and is recommended in patients with high body mass index, and among those with history of herbal medicine use.

What is already known on this topic?

Microdiscectomy for lumbar disc herniation is an effective surgical treatment for reducing pain and disability.

What this study adds?

Microdiscectomy in Thai patients with lumbar disc herniation yielded significant improvement in disability and

quality of life, and 50% of patients were followed-up for at least 4 years.

Acknowledgements

The authors gratefully acknowledge Miss Nhathita Panatreswas of Research unit, Department of Orthopaedic Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand for assistance with statistical analysis.

Potential conflicts of interest

The authors declare no conflicts of interest.

References

1. Mixter WJ, Barr JS. Rupture of the intervertebral disc with involvement of the spinal canal. N Engl J Med 1934;211:210-5.
2. Williams RW. Microlumbar discectomy: a conservative surgical approach to the virgin herniated lumbar disc. Spine (Phila Pa 1976) 1978;3:175-82.
3. Lowell TD, Errico TJ, Fehlings MG, DiBartolo TJ, Ladosi L. Microdiskectomy for lumbar disk herniation: a review of 100 cases. Orthopedics 1995;18:985-90.
4. Arts MP, Brand R, van den Akker ME, Koes BW, Bartels RH, Tan WF, et al. Tubular diskectomy vs conventional microdiskectomy for the treatment of lumbar disk herniation: 2-year results of a double-blind randomized controlled trial. Neurosurgery 2011;69:135-44.
5. Chotigavanichaya C, Korwutthikulrangsri E, Suratkarndawadee S, Ruangchainikom M, Watthanaapisith T, Tanapipatsiri S, et al. Minimally invasive lumbar disectomy with the tubular retractor system: 4-7 years follow-up. J Med Assoc Thai 2012;95 Suppl 9:S82-6.
6. Kim DK, Oh CH, Lee MS, Yoon SH, Park HC, Park CO. Prevalence of lumbar disc herniation in adolescent males in Seoul, Korea: Prevalence of adolescent LDH in Seoul, Korea. Korean J Spine 2011;8:261-6.
7. Badlani N, Yu E, Ahn J, Kurd MF, Khan SN. Minimally invasive/less invasive microdiscectomy. Clin Spine Surg 2016;29:108-10.
8. Arts MP, Brand R, van den Akker ME, Koes BW, Bartels RH, Peul WC. Tubular diskectomy vs conventional microdiskectomy for sciatica: a randomized controlled trial. JAMA 2009;302:149-58.
9. Cahill KS, Levi AD, Cummock MD, Liao W, Wang MY. A comparison of acute hospital charges after tubular versus open microdiskectomy. World Neurosurg 2013;80:208-12.
10. Shrestha D, Shrestha R, Dhoju D, Kayastha S, Jha SC. Study of clinical variables affecting long term outcome after microdisectomy for lumbar disc herniation. Kathmandu Univ Med J (KUMJ) 2015;13:333-40.
11. Tainio H, Kylmala T. Rupture of the ureter: an unexpected complication of microdiskectomy. BJU Int 1999;84:369-70.
12. Young PH. Following microdiskectomy. Laceration of the abdominal aorta and vena cava. IMJ Ill Med J 1988;174:93-4.
13. Houten JK, Frempong-Boadu AK, Arkovitz MS. Bowel injury as a complication of microdiscectomy: case report and literature review. J Spinal Disord Tech 2004;17:248-50.