

Lumbar microdiscectomy with the simply modified taylor retractor

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Abstract

Aim: To describe the modifications we made to the Taylor retractor (TR) used in routine spinal surgery and present the results of cases that underwent surgery with the modified TR.

Materials and Methods: We made two basic modifications to the TR used in standard spinal surgery practice: reducing the size of the instrument and reshaping the blade part. The study included the cases in which we performed unilateral lumbar microdiscectomy (LM) at one level with standard and modified TR between January 2016 and August 2020. The preoperative and postoperative third-month low back pain and ODI scores were statistically analyzed.

Results: The mean age of the 50 patients was 42 years, and the male/female ratio was 1.38. Except a skin infection in Group A, no other complication was seen. The mean follow-up period was 12 months. The length of incision was 28 mm in Group A and 17 mm in Group B. When the preoperative and postoperative third-month VAS and ODI scores were statistically analyzed in terms of low back pain, a significant difference was found ($p < 0.001$).

Conclusion: Microdiscectomy is a gold standard method in LDH surgery. TR is a practical and easily accessible surgical instrument in spinal surgery. Technological advances in optical systems have provided a significant reduction in normal tissue damage in LM. In addition, the modified TR we presented in this paper does not require a learning curve and can contribute to obtaining satisfactory results in terms of normal tissue damage and reducing postoperative low back pain complaints.

Keywords: Lumbar disc herniation; microdiscectomy; taylor retractor

INTRODUCTION

Various methods have been described in line with the developing technologies in lumbar disc herniation (LDH) surgery. Although incisions are now smaller and minimally invasive methods are recently more preferred, the gold standard is still microdiscectomy, which mostly involves the use of the Taylor retractor (TR), an easily accessible instrument (1). Developments in the lighting and magnification features of operating microscopes, which are an indispensable element in daily neurosurgical surgery practice, led to consider modifications to the TR used in routine spinal surgery.

MATERIALS and METHODS

Advances in optical systems have allowed for the TR, which is widely used and easily available commercially, especially in the public domain, to be further reduced in size and modified depending on the area of use by surgeons. In this retrospective study, we aimed to describe the modifications we made to the TR and present our results, especially in terms of postoperative low back

pain in patient groups in which we used the standard and modified TRs.

Historically, various changes have been made to TR at different times. We made two basic modifications according to our preference of use. The first was reducing the size of the retractor. The proximal end of the blade part extending toward the skin was narrowed to 1 cm in width outwards to allow for a smaller skin incision. The second modification was reshaping the blade part. The blade part extending from a depth of 2 cm under the skin to the distal end was given both a concave shape (i.e., ovalized toward the medial) and an oval shape at the proximal and distal sides for easy entry and exit through a small skin incision. As a result of these modifications, an optimal operation area was obtained by the maximal retraction of the paravertebral muscle with a small skin incision (Figure 1).

Between January 2016 and August 2020, excluding extraforaminal LDH cases, the cases that underwent unilateral surgery at one level at L3-4/L4-5/L5-S1 25 with the standard TR (Group A, $n = 25$) and the modified TR

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(Group B, n = 25) were included in the study. All operations were performed by the same neurosurgeon. All cases with surgical indications based on clinical and preoperative MRI findings, were placed in the prone position on the radiolucent operating table in a standardized manner. The iliac crest and abdomen were freely rested, with the compression points supported by chest padding. The surgeon stood on the side of LDH. Under preoperative fluoroscopy, the level was determined. After performing antibiotic prophylaxis and skin cleaning and covering procedures, a subcutaneous and fascial incision was made, and TR was placed in the lateral of the facet. The area was visualized with a microscope (*Leica, M720 OH5* or *Leica, M530 OHX*, Switzerland), and to achieve better optical illumination in relation to the position of the disc, an angled Kerrison was used to perform superior and inferior partial hemilaminectomy and flavectomy, followed by peridural site dissection with pad dissection. Epidural veins were preserved. The disc was exposed, and following excision and sufficient decompression, the fascial, subcutaneous and intracutaneous layers were closed with skin sutures. Epidural bleeding was controlled with the use of padding and Surgicel® (*Ethicon™, Johnson & Johnson, USA*) or bipolar cautery, and bone-induced bleeding was controlled with bone wax. All patients were ambulated four hours postoperatively and discharged one night after surgery. The postoperative routine follow-up of the patients was undertaken at postoperative week 1 and months 1. The patients were allowed to return to work after three weeks and recommended an exercise program to be started at six weeks after surgery and gradually increased in intensity.

The preoperative and postoperative third-month VAS and ODI scores were statistically analyzed using SPSS v 23.0 (*SPSS Inc., Chicago, IL, USA*).

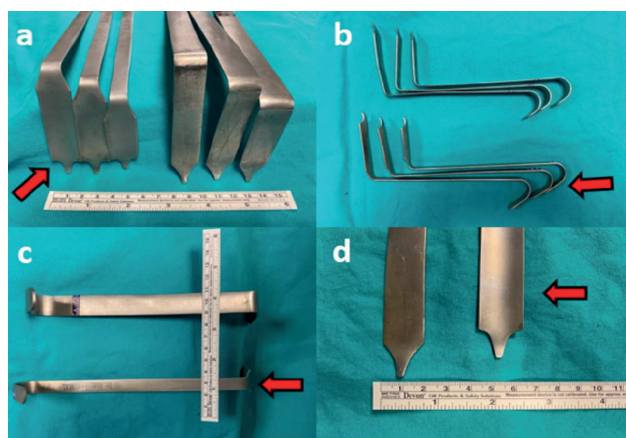


Figure 1. a-d: Standard and modified Taylor retractors in different directions of view (Red arrows shows modified Taylor retractors)

RESULTS

The mean age of the 50 operated cases was 42 (range; 21 to 68) years, and the male/female was found to be 1.38. The mean operation time was determined as 45 (range; 30-85) minutes. The mean duration of follow-up was 12

(range; 5-16) months, and the mean peroperative blood loss was 40 (range; 20-550) ml in Group A and 30 (range; 10-350) ml in Group B, indicating no statistically significant difference ($p > 0.05$). The mean length of skin incision was 28 (range; 25-38) mm for Group A (Figure 2) and 17 (range; 15-22) mm for Group B (Figure 3) ($p > 0.05$). Apart from one patient (2%) in Group A, who had a skin infection treated with antibiotherapy, no other complication such as dural damage, cerebrospinal fluid fistula, postoperative discitis, wrong distance, and residual or recurrent LDH was observed.

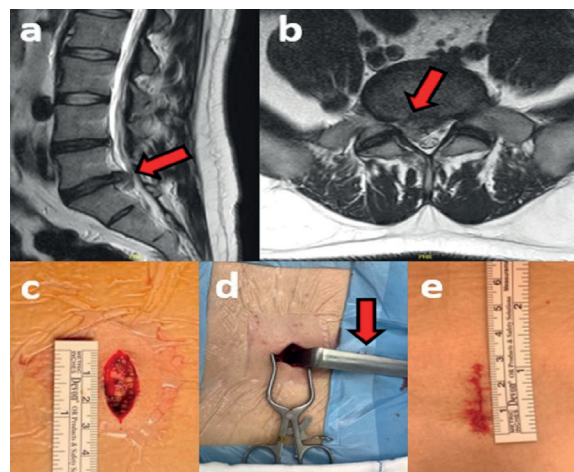


Figure 2. a-d: A case operated with standard Taylor retractor, a) preoperative T2-weighted sagittal MRI, b) preoperative T2-weighted axial MRI shows right-sided L5-S1 LDH. c) skin incision, d) insertion of Taylor retractor, and e) closure of skin

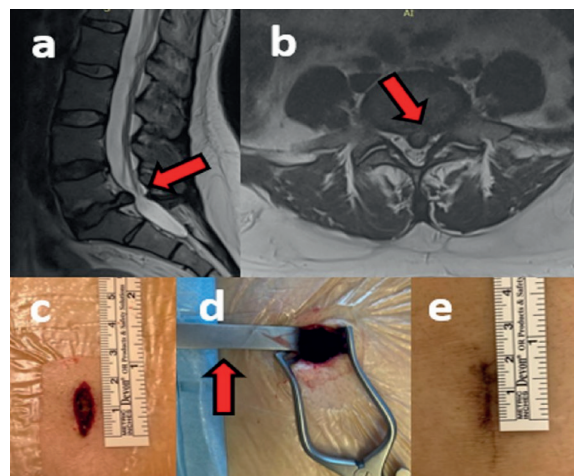


Figure 3. a-d: A case operated with modified Taylor retractor, a) preoperative T2-weighted sagittal MRI, b) preoperative T2-weighted axial MRI shows left-sided L5-S1 LDH. c) skin incision, d) insertion of Taylor retractor, and e) closure of skin

The preoperative and postoperative third-month VAS and ODI scores of our cases in terms of low back pain are presented in Table 1. When the results were analyzed statistically, there was no difference between the two groups, but a significant difference was detected between the preoperative and postoperative scores in VAS and ODI ($p < 0.001$).

Table 1. Distribution of levels according to groups, and the preoperative and postoperative third-month VAS and ODI scores

	Group A [n (%)]	Group B [n (%)]
LDH level		
L3-4	6 (24%)	5 (20%)
L4-5	9 (36%)	13 (52%)
L5-S1	10 (40%)	7 (28%)
VAS [mean (range)]		
Preoperative	8.28 (6-10)	8.4 (6-10)
Postoperative	4.68 (2-6)	2.72 (1-5)
ODI [mean (range)]		
Preoperative	84.72 (66-96)	82.96 (64-96)
Postoperative	48.56 (28-60)	25.04 (10-46)

LDH: Lumbar disc herniation, VAS: Visual analogue scale, ODI: Oswestry disability index

DISCUSSION

Truumees E. et al stated in their article that LDH treatment has a long history dating back to the Hellenistic period. (2). In this context, the cornerstones in this area can be listed as follows: a Turkish doctor Sabuncuoğlu treating persistent sciatica cases with cauterization and analgesics in the 15th century; definition of Virchow's tumor in 1857; and definition of the Laseque maneuver in 1864; introduction of lumbar disk surgery by surgeons led by MacEwen, Horsley, Krause, Taylor, Dandy and Cushing in the early 19th century, although the condition was histopathologically misdefined at the time as 'enchondroma' or 'osteochondritis dissecans; use of MRI in daily practice in the 1990s; use of an operating microscope in LDH surgery for the first time by Yasargil in 1967, introduction of tubular retractors into daily practice in the 1990s, and definition of endoscopic discectomy for the first time in 1975 by Hijikata and Yamagishi (3-10).

Although lumbar radiculopathy has been known as a clinical entity since ancient times, the first diagnosis was made in 1932 by a neurosurgeon Mixer and an orthopedist Barr, who performed intentional lumbar discectomy on a 28-year-old patient with L2-S1 laminectomy using a 1-cm disk excision (11). With the introduction of CT replacing myelography in the 1970s, the clinical evaluation of patients with LDH was improved. Our knowledge about the pathophysiology, natural history and surgery of LDH has exponentially increased in parallel with the developing technology since the 1930s. The evolution from total laminectomies to laminotomies, from the transdural approach to the use of peridural distance, and improvements in illumination, magnification and retractor systems have even allowed for outpatient treatment in some LDH cases.

LDH causing radiculopathy is the most common cause of morbidity and increased health-related costs. In spine surgery practice in the USA, the incidence of symptomatic LDH is 1-2% (12). Significant or new neurological deficits,

cauda equina syndrome, and LDH unresponsive to conservative treatment are managed surgically (13-15). The most appropriate surgical technique is the one that provides satisfactory results, minimal morbidity, and good cosmetic outcomes. While many techniques have been described, lumbar microdiscectomy remains the gold standard method (16,17). The main goals in all LDH operations are better cosmetic outcomes with a small incision, earlier ambulation, reduced blood loss, postoperative pain, hospital stay and analgesic need, and shorter recovery time before returning to work, and achieving all these at a lower cost (18,19).

The differences in tissue damage between surgical techniques, measurement of the preoperative and postoperative cross-sectional areas of paraspinal muscles with MRI or CT, intraoperative EMG, serum biochemical markers, and histological findings have been previously investigated (20-23).

Previously, the Taylor retractor was modified by Bell and Lavyne in 1984 and later by Epstein in 1990 (24,25). Subsequently, further modifications were made to this retractor by various surgeons depending on the area of use. In parallel with the developments in optical magnification systems, we applied two modifications to the existing tractor to reduce the length of skin incision for paravertebral muscle dissection and retraction and simultaneously achieve the exposure of the surgical field in the most appropriate way. These two modifications can be summarized as the reduction of the retractor size and reshaping of the leaf and blade parts. Firstly, the width of the retractor was redesigned starting from a depth of 2 cm under the skin and extending 1 cm outward and the general thickness was set to 2 mm to achieve a smaller skin incision. In the second modification, the blade part extending from the subcutaneous 2 cm depth to the distal end was ovalized anteriorly; i.e., medially for more paravertebral retraction, and also the proximal and distal of the blade was given an oval shape for easy entry and exit from through a 1-1.5 cm skin incision. This aimed to achieve maximal paravertebral muscle retraction with a small skin opening, and consequently have the most optimal view of the operation area.

CONCLUSION

Microdiscectomy is the gold standard method in LDH surgery. TR is also indispensable for surgeons due to its practical features and easy accessibility in spinal surgery. In parallel with the advances in operating microscope technology, the modified TR can also provide satisfactory results without requiring a learning curve. However, these results need to be confirmed with further prospective and larger case series.

Competing Interests: The authors declare that they have no competing interest.

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Ethical Approval: This study was conducted in accordance with the Ethics Committee of Istanbul Medipol University (E-10840098-772.02-66581).

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