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Minimally Invasive Lumbar Spine Surgeries for Herniated Disk

Dr. Haidar Karim Hussein
M.B.Ch.B., F.I.B.M.S., C.A.B.N.S. \ (Neurosurgery)
Iraqi Ministry of Health, Baghdad Al-Rusafa Health Directorate, Dr. Saad Al-Witry Hospital for Neurosciences, Baghdad, Iraq.
haidarkarim1981ns@gmail.com

Dr. Basim Nema Furaih
M.B.Ch.B., F.I.C.M.S. \ (Neurosurgery)
Consultant Neurosurgeon
Iraqi Ministry of Health, Baghdad Al-Rusafa Health Directorate, Neurosurgical Hospital, Baghdad, Iraq.

Dr. Ardam Jamal Ahmed
M.B.Ch.B., F.I.C.M.S. \ (Neurosurgery)
Iraqi Ministry of Health, Kirkuk Health Directorate, Azadi Teaching Hospital, Kirkuk, Iraq.
ardemkatan@yahoo.com

ABSTRACT

Background: Lumbar disc herniation surgery has evolved in recent decades towards the use of less invasive techniques. These new techniques maintained the effectiveness of the procedure by reducing the morbidity of patients. Objective: Our study was assessed minimally invasive lumbar spine surgeries for Herniated disks. Patients and methods: This study collected clinical data for patients who underwent both endoscopic discectomy and laser disc decompression. One hundred twenty patients aged between 30 and 60 years were recruited, and the patient's clinical data were identified and collected before surgery. Patient data were collected for both surgeries, which were divided into arthroscopic discectomy, with 48 patients, and laser disc decompression, with 72 patients. To compare the two surgeries, this study determined intra- and postoperative outcomes, which included operative time, rate of blood loss during surgery, mortality rate, recurrence, recovery time, complications, pain rate, and postoperative quality of life assessment. Results: To compare the two surgeries, the clinical results recorded the duration of surgery for arthroscopic discectomy was 114.78 ± 7.2, and laser disc decompression was 54.65 ± 6.8. The average patient rate and length of hospital stay were 1.1 ± 0.2 days after arthroscopic discectomy and 2.01 ± 0.32 days after laser disc decompression surgery. The mortality rate included two cases in the group that underwent arthroscopic disc decompression surgery and only one case in the group that underwent laser disc decompression surgery. The recovery time for patients was 2.8 ± 1.07 for the group that underwent arthroscopic disc decompression surgery, while it was 1.6 ± 0.71. For the group that underwent laser disc decompression surgery, the complication rate for patients was post-operative endoscopic discectomy. It included seven patients and 4 cases after laser disc decompression surgery, the most prominent of which were bleeding and infection. Conclusion: The current study indicates that the superiority and effectiveness of the two surgeries, laser disc decompression over arthroscopic discectomy, because of its high success rate in terms of pain rate, faster recovery, fewer complications, and a significant and noticeable improvement in the quality of life of patients in the long term.

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KEYWORDS: Minimally invasive lumbar spine surgeries; herniated disk; clinical outcomes; quality of life; post-operative complications.

INTRODUCTION

The intervertebral disc is the anatomical structure that joins two vertebral bodies; skeletally, three main areas can be differentiated: the cartilaginous plate that separates the vertebral bodies from the annulus fibrosus, the annulus fibrosus, and the nucleus pulposus. [1,2]

The lumbar pain syndrome associated with lumbar disc herniation is an injury that clinically presents as low back pain, radiated to the gluteal area, thigh, leg, and foot, can follow a dermatome and present weakness, numbness, and tingling of the pelvic limbs [3]. Among most people who have ever suffered from low back pain, usually between 20 and 60 years of age, a high percentage of them have had episodes of low-intensity pain for short periods that have not required medical treatment, but another percentage has had to be operated on because the pain is associated with 45% of lumbar disc herniations. [4,5]

Minimally invasive surgery is the current trend for all types of surgery, especially in the spine, where surgical approaches and procedures are still considered by many as a treatment of last resort unless there is evidence of progressive neurological injury [6]. In part, the hesitation to consider surgery is due to concerns about the morbidity of traditional spinal surgery, which can injure muscles during the approach to the spine [7]. Minimally invasive dysedomy is considered convenient by most patients and by many surgeons [8].

For lumbar disc herniation, however, the degree of minimally invasiveness varies widely among surgeons [9]. The most common modern adaptation of such a technique is described as a micro lumbar discectomy, which offers several advantages [10]. Adaption of a technique of this type is described as a micro lumbar discectomy, it offers several advantages. [11]

The use of smaller incisions is made possible by means of specialized or tubular mini retractors that dilate the muscle [12]. Many use an endoscope or an operating microscope [13]. For the least invasiveness, the muscle is divided along the dilator into smaller incisions that have defined most microdysemies that are performed today [14].

Minimally invasive adaptations of standard laminectomy in the discectomy include smaller incisions, surgical techniques that use minimal manipulation of the nerve root, such as ring fenestration, and removal of only the sequestered fragment that can be easily extracted through the annular defect [15-17].

PATIENTS AND METHODS

We conducted a cross-sectional study that focused largely on analyzing and evaluating outcomes associated with minimally invasive lumbar spine surgery for the treatment of herniated discs. Clinical and demographic data were collected for patients whose ages ranged between (30 to 60) years, which included 120 samples that underwent surgery. Demographic characteristics included age, sex, body mass index, ASA, smoking status, marital status, income level, employment status, opioids used before the operation, hernia level, comorbidities, and symptoms, as all outcomes were diagnosed and determined for patients before they underwent surgery.

Regarding patient outcomes during and after surgery, this study collected clinical data for 120 patients while undergoing surgical procedures, which included both endoscopic discectomy with 48 patients and laser disc decompression with 72 patients under both types of general anesthesia and local anesthesia. The

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data included both time of surgery, rate of blood loss during surgery, number of cases who lost blood during surgery, mortality rate, recurrence, and recovery time.

Moreover, this present study recorded the clinical results of patients' postoperative pain scores by VAS scale for 5 hours, 24 hours, two days, one month, and three months after surgery. Also, our results determined the postoperative complications and the satisfaction rate of patients with the surgery and the hospital in managing the surgical procedure, which were classified in terms of excellent, good, satisfactory, and poor. In addition, this study evaluated the quality of life after surgery for both groups, as the criteria included physical function, social function, psychological function, and daily activities on a healthy quality of life scale with a range between 0 - 100, where 100 represents the best quality, and 0 represents the worst. The data and clinical outcomes of patients were designed and analyzed by the SPSS program, version 22.0. This study excluded patients who had previous surgeries, those with serious diseases, people in the age group under 30 years, or pregnant women.

RESULTS

Table 1: Clinical and preoperative characteristics in this study.

Characteristics	Number of patients [120]	Percentage [%]
Age group		
30 – 39	24	20%
40 – 49	36	30%
50 – 60	60	50%
Sex		
Males	78	65%
Females	42	35%
BMI [Kg/m2]		
18.5 – 24.9	30	25.0%
25 – 29.9	35	29.17%
> 30.0	55	45.83%
ASA		
I	28	23.33%
II	58	48.33%
III	34	28.33%

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Smoking status		
Yes	58	48.33%
No	62	51.67%
Marital status		
Single	12	10.0%
Married	89	74.17%
Divorced	11	9.17%
Widow	8	6.67%
Income level, $		
Less than 900 $	72	60%
More than 900 $	48	40%
Employment status		
Employed	84	70%
Unemployed	36	30%
Preoperative opioid use		
Yes	90	75%
No	30	25%
Herniation level		
L3/4	36	30%
L4/5	60	50%
L5/S1	24	20%

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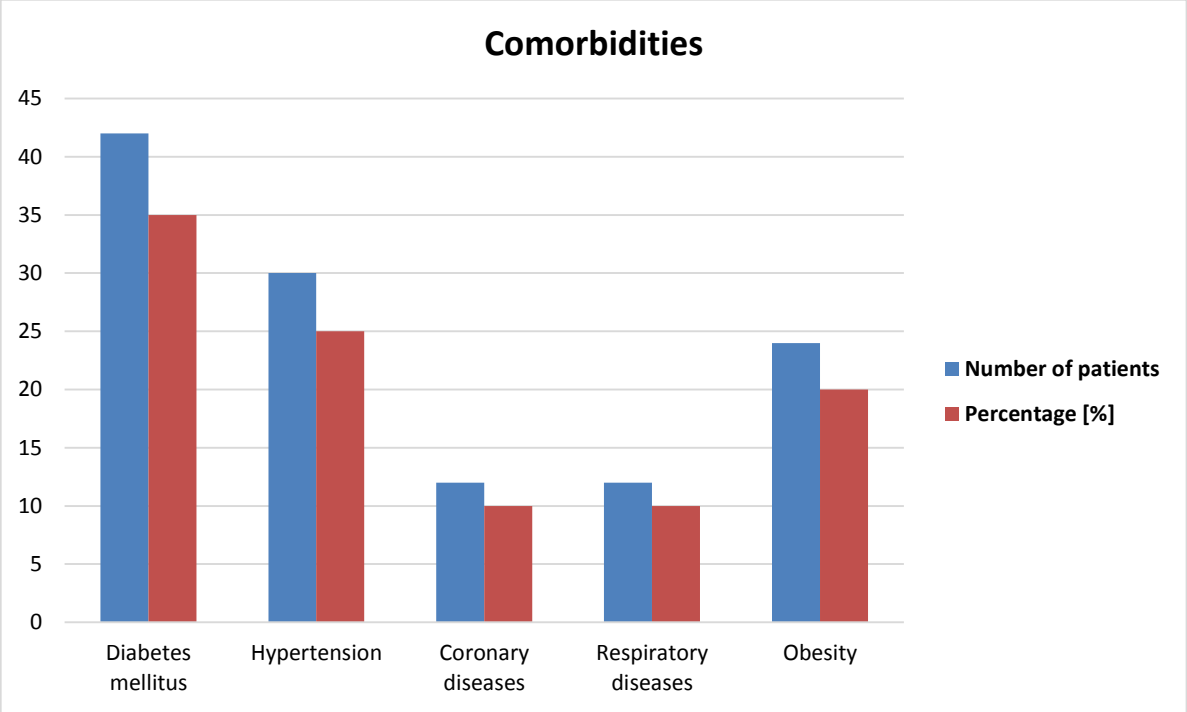

Figure 1: Determine outcomes of comorbidities related to patients.

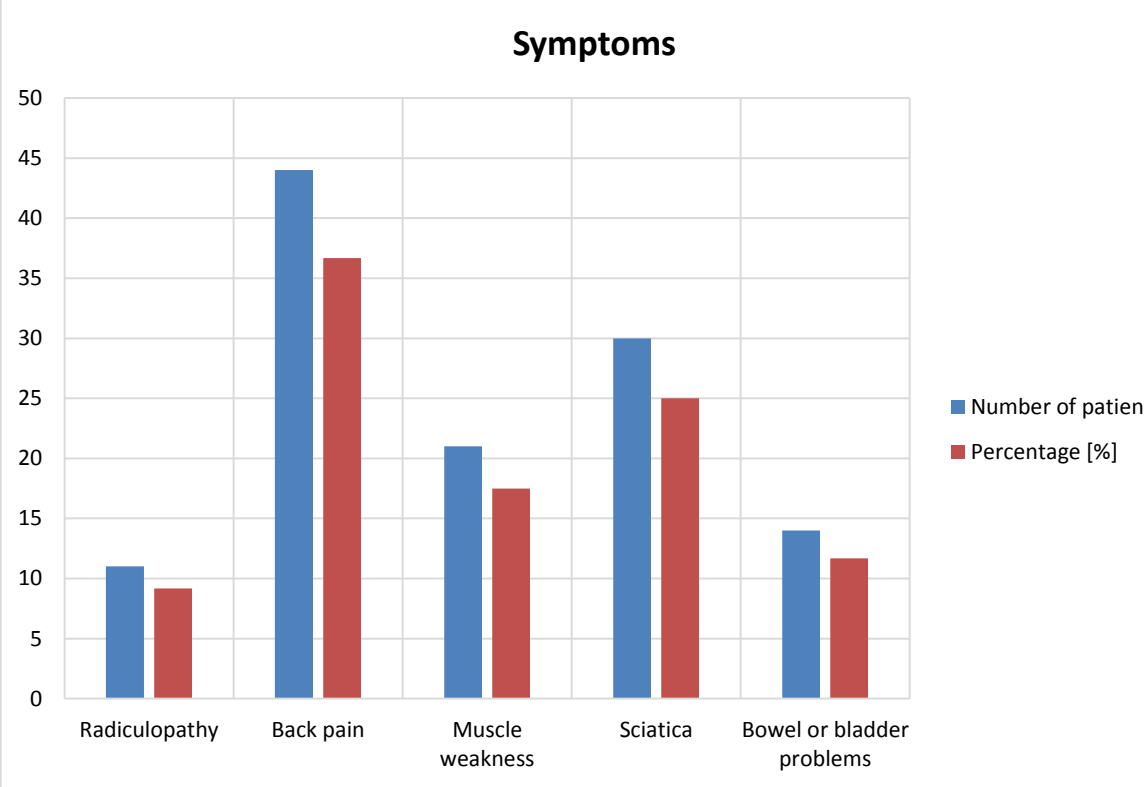

Figure 2: Preoperative symptoms.

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Table 2: Identify types of surgeries of herniated disks in this study.

Types of surgeries	Number of patients [120]	Percentage [%]
Endoscopic discectomy	48	40%
laser disc decompression	72	60%

Table 3: Herniated disk outcomes associated with intraoperative and postoperative parameters.

Parameters	Endoscopic discectomy [48]	Laser disc decompression [72]	P – value
Operative time [min]	114.78 ± 7.2	54.65 ± 6.8	0.0061
Intraoperative hemorrhage (mL)	253.50 ± 121.51	246.18 ± 116.25	0.0338
Bleeding N [%]	8 [16.67%]	5 [6.94%]	0.00382
Length of stay, days	1.1 ± 0.2	2.01 ± 0.32	0.0448
Recurrence, n (%)	0 [%]	0 [%]	0.05
Mortality rate N [%]	2 [4.17%]	1 [1.39%]	0.0022
Recovery time, weeks	2.8 ± 1.07	1.6 ± 0.71	0.0075

Table 4: Clinical outcomes of pain score for patients after surgery by VAS scale.

Time	Endoscopic discectomy	Laser disc decompression	P – value
Preoperative	7.5 ± 1.6	8.4 ± 1.03	0.048
5 hours after surgery	5.42 ± 0.83	5.46 ± 0.70	0.0477
24 hours after surgery	4.3 ± 0.52	3.83 ± 0.65	0.0382
Two days after surgery	2.92 ± 0.22	2.33 ± 0.68	0.0477
One month after surgery	1.55 ± 0.76	1.51 ± 0.54	0.0446
Three months after surgery	0.68 ± 0.35	0.52 ± 0.14	0.0494

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Table 5: Post-operative complications.

Complications	Endoscopic discectomy	Laser disc decompression	P – value
Infection	2 [4.17%]	2 [2.78%]	0.025
Bleeding	2 [4.17%]	1 [1.39%]	0.022
Recurrent symptoms	1 [2.08%]	0 [0%]	0.0158
Spinal cord injury	1 [2.08%]	0 [0%]	0.0158
Nerve damage	1 [2.08%]	1 [1.39%]	0.0488

Table 6: Determine the satisfaction level of patients for both groups

Satisfaction level	Endoscopic discectomy [48]	Laser disc decompression [72]	P – value
Excellent	26 [54.17%]	51 [70.83%]	< 0.0001
Good	11 [15.28%]	12 [16.67%]	0.0488
Satisfactory	8 [11.11%]	7 [9.72%]	0.0462
Poor	3 [4.17%]	2 [2.78%]	0.0477

Table 7: Assessment of postoperative quality of life related to both groups.

QoL domains	Endoscopic discectomy	Laser disc decompression	P – value
Physical function	88.63 ± 3.38	93.54 ± 2.76	0.0433
Social function	86.41 ± 5.62	89.11 ± 4.55	0.0458
Psychological function	80.82 ± 2.44	86.64 ± 5.8	0.0458

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Daily activates	87.15 ± 5.2	91.23 ± 2.68	0.0485

DISCUSSION

Clinical data showed a higher rate of infection in males, with 78 patients, compared to females, with 42 patients. The age group with the highest incidence and registration of surgery was patients between 50 and 60 years old, which included 60 patients. The body mass index of the patients most at risk for high obesity was > 30.0, with 55 patients. The percentage of patients who were smokers was 58 patients, and non-smokers were 62 patients, and the number of cases of married patients was 89; patients who used opioids were 90 patients; hernia level L3/4 included 36 patients, L4/5 included 60 patients, and L5/S1 included 24 patients. The most common comorbidities for patients were diabetes (42 patients), hypertension (30 patients), and obesity (24 patients). The most widely distributed symptoms were back pain (44 cases), sciatica (30 cases), and muscle weakness (21 patients).

Regarding the results during and after surgery, data were recorded for the patients who underwent both surgeries. The duration of surgery for arthroscopic discectomy was 114.78 ± 7.2, and for laser disc decompression was 54.65 ± 6.8. The average number of patients who experienced bleeding during surgery included 8 cases while undergoing surgery for arthroscopic discectomy and 5 cases during They underwent laser disc decompression, and the length of stay in the hospital was 1.1 ± 0.2 days after arthroscopic disc decompression surgery and 2.01 ± 0.32 days after laser disc decompression surgery.

The mortality rate included two cases for the group that underwent arthroscopic disc decompression surgery and only one case for the group. Who underwent laser disc decompression surgery, and the recovery time for patients was 2.8 ± 1.07 for the group that underwent arthroscopic disc decompression surgery while 1.6 ± 0.71 for the group that underwent laser disc decompression surgery. The complication rate for patients after arthroscopic disc decompression surgery was seven patients and 4 cases after laser disc decompression surgery, the most prominent of which were bleeding and infection. The percentage of patients who were satisfied with the endoscopic disc decompression surgery was 26 patients with excellent condition, 11 patients with good condition, and a poor level with only 3 cases, while the percentage of patients who were satisfied with the endoscopic disc decompression surgery on... Endoscopic laser discography was excellent for 51 patients; 12 patients were good and poor for only two patients. Our study evaluated the pain rate over three months and found that the pain rate decreased sharply one month after surgery and was 1.55 ± 0.76 after arthroscopic discectomy surgery it was 1.51 ± 0.54 after laser disc decompression surgery it was 1.51 ± 0.54 after three months pain scores were recorded after Arthroscopic discectomy was 0.68 ± 0.35 after laser disc decompression surgery was 0.52 ± 0.14.

Previous studies have agreed that both surgeries, laser disc decompression and arthroscopic disc resection, have effectiveness and a major role in the success rate of managing patients during and after surgery in terms of pain and bleeding and promote a high recovery in patients and reduce the incidence of severe long-term risk factors in terms of complications, which weakens of patients' quality of life. [18-20]

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CONCLUSION

Our results indicated a higher rate of infection in males compared to females. Also, these results found that smoking and comorbidities negatively affect patient outcomes in terms of the risk of complications and the possibility of increasing the rate of pain after the operation. However, our study demonstrated the effectiveness of both arthroscopic discectomy or laser disc decompression in treating herniated discs in patients. However, this study reinforced the preference of laser disc decompression surgery over arthroscopic discectomy because laser disc decompression surgery has advantages in terms of slightly less hospital stay time, a faster recovery rate, a lower number of bleeding cases, a lower mortality rate, as well as complications and a lower pain rate.

REFERENCES

1. Weinstein, J.N., Lurie, J.D., Tosteson, T.D., Tosteson, A.N., Blood, E.A., Abdu, W.A., et al. (2008) Surgical versus Nonoperative Treatment for Lumbar Disc Herniation: Four-Year Results for the Spine Patient Outcomes Research Trial (SPORT). Spine, 33, 2789-2800.
2. Lee S, Kim SK, Lee SH, et al. Percutaneous endoscopic lumbar discectomy for migrated disc herniation: classification of disc migration and surgical approaches. Eur Spine J. 2007;16 (3):431–437.
3. Liu C, Chu L, Yong HC, Chen L, Deng ZL. Percutaneous endoscopic lumbar discectomy for highly migrated lumbar disc herniation. Pain Physician. 2017;20 (1): E75–E84.
4. Ruan W, Feng F, Liu Z, Xie J, Cai L, Ping A. Comparison of percutaneous endoscopic lumbar discectomy versus open lumbar microdiscectomy for lumbar disc herniation: a meta-analysis. Int J Surg. 2016; 31:86–92.
5. Mobbs RJ, Sivabalan P, Li J. Minimally invasive surgery compared to open spinal fusion for the treatment of degenerative lumbar spine pathologies. J Clin Neurosci. 2012;19 (6):829–835.
6. Foley KT, Holly LT, Schwender JD. Minimally invasive lumbar fusion. Spine (Phila Pa 1976). 2003;28 (15 Suppl): S26–35.
7. Sheng SR, Geng YB, Zhou KL, Wu AM, Wang XY, Ni WF. Minimally invasive surgery for degenerative spondylolisthesis: transforaminal or oblique lumbar interbody fusion. J Comp Eff Res. 2020;9 (1):45–51.
8. Chen YC, Zhang L, Li EN, et al. An updated meta-analysis of clinical outcomes comparing minimally invasive with open transforaminal lumbar interbody fusion in patients with degenerative lumbar diseases. Medicine (Baltimore). 2019;98 (43): e17420.
9. Lin GX, Park CK, Hur JW, Kim JS. Time course observation of outcomes between minimally invasive transforaminal lumbar interbody fusion and posterior lumbar interbody fusion. Neurol Med Chir (Tokyo). 2019;59 (6):222–230.
10. Yang Y, Liu ZY, Zhang LM, et al. Microendoscopy-assisted minimally invasive versus open transforaminal lumbar interbody fusion for lumbar degenerative diseases: 5-year outcomes. World Neurosurg. 2018;116: e602–e610.
11. Karikari IO, Isaacs RE. Minimally invasive transforaminal lumbar interbody fusion: a review of techniques and outcomes. Spine (Phila Pa 1976). 2010;35 (26 Suppl): S294–301.

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www.inter-publishing.com

12. Parker SL, Adogwa O, Witham TF, Aaronson OS, Cheng J, McGirt MJ. Post-operative infection after minimally invasive versus open transforaminal lumbar interbody fusion (TLIF): literature review and cost analysis. Minim Invasive Neurosurg. 2011;54 (1):33–37.
13. Yao Y, Zhang H, Wu J, et al. Comparison of three minimally invasive spine surgery methods for revision surgery for recurrent herniation after percutaneous endoscopic lumbar discectomy. *World Neurosurg*. 2017; 100:641–647 e641.
14. Peng CW, Yeo W, Tan SB. Percutaneous endoscopic lumbar discectomy: clinical and quality of life outcomes with a minimum 2-year follow-up. J Orthop Surg Res. 2009;4 (1):20.
15. Choi G, Lee SH, Lokhande P, et al. Percutaneous endoscopic approach for highly migrated intracanal disc herniations by foraminoplastic technique using rigid working channel endoscope. Spine (Phila Pa 1976). 2008;33 (15): E508–515.
16. Than KD, Mummaneni PV. Unilateral approach for bilateral decompression with MIS TLIF. World Neurosurg. 2014;82 (5):646–647.
17. Du J, Tang X, Jing X, Li N, Wang Y, Zhang X. Outcomes of percutaneous endoscopic lumbar discectomy via a translaminar approach, especially for soft, highly down-migrated lumbar disc herniation. Int Orthop. 2016;40 (6):1247–1252.
18. Wu X, Fan G, Gu X, Guan X, He S. Surgical outcome of two-level transforaminal percutaneous endoscopic lumbar discectomy for far-migrated disc herniation. Biomed Res Int. 2016; 2016:4924013.
19. Zhao Y, Fan Y, Yang L, et al. Percutaneous Endoscopic Lumbar Discectomy (PELD) via a transforaminal and interlaminar combined approach for very highly migrated Lumbar Disc Herniation (LDH) between L4/5 and L5/S1 level. Med Sci Monit. 2020;26: e922777.
20. Wang Y, Ning C, Xu F, et al. Recurrent lumbar disc herniation recurrence after percutaneous endoscopic lumbar discectomy: a case report. *Medicine (Baltimore)*. 2018;97 (34): e11909.