

Comparison of Outcomes Postoperation between Straight Leg Raising Test Negative and Positive Patients Who Underwent Percutaneous Transforaminal Endoscopic Discectomy for Lumbar Disc Herniation

Feilong Wei

Xi'an Tangdu Hospital of No4 Military Medical University <https://orcid.org/0000-0002-9260-5386>

Haoran Gao

Xi'an Tangdu Hospital of No4 Military Medical University

Yifang Yuan

Xi'an Tangdu Hospital of No4 Military Medical University

Shu Qian

Xi'an Tangdu Hospital of No4 Military Medical University

Quanyou Guo

Xi'an Tangdu Hospital of No4 Military Medical University

Shikong Guo

Xi'an Tangdu Hospital of No4 Military Medical University

Weigao Xue

Xi'an Tangdu Hospital of No4 Military Medical University

Chengpei Zhou

Xi'an Tangdu Hospital of No4 Military Medical University

Jixian Qian (✉ pasmiss2012@163.com)

<https://orcid.org/0000-0002-4023-8828>

Research article

Keywords: Percutaneous Transforaminal Endoscopic Discectomy (PTED); Lumbar Disc Herniation(LDH); Straight leg raising(SLR); Clinical Efficacy; Related Factors

Posted Date: October 11th, 2019

DOI: <https://doi.org/10.21203/rs.2.15446/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: Percutaneous Transforaminal Endoscopic Discectomy is used increasingly in patients with Lumbar Disc Herniation. There is little knowledge on the related factors including SLR test influencing the operation. Therefore, we designed this prospective study to explore the relevant factors influencing postoperative effect of PTED surgery.

Methods: Consecutive patients with LDH who came to our hospital from August 2015 to September 2016 and received PTED surgery. 4 kinds of scales including VAS (lumbar/leg), ODI and JOA were measured and reassessed at 1 day, 3 months, 6 months, 12months and 36 months after the PTED to assess their surgical outcomes.

Results: All the patients had successful surgery. ODI and VAS (lumbar/leg) decreased in all patients and groups. And there was a statistically significant difference in each postoperative follow-up compared with that before surgery in every visit. In addition, the increase of JOA in postoperation was statistically significant compared with that before surgery. And, there is statistically significant difference between the three subpopulations (patients with SLR Positive (0°-30°), SLR Positive (31°-60°) and SLR Negative (61°-) in the changes of the scores of VAS(leg), ODI and JOA. However, there is no statistically significant difference between the three subpopulations (patients with SLR Positive (0°-30°), SLR Positive (31°-60°) and SLR Negative (61°-RRB- in the changes of the score of VAS(lumbar).

Conclusions: PTED showed great effect on treating patients with lumbar disc herniation. And the main scale score such as VAS(leg). ODI and JOA showed that there is a statistically significant difference between the three subpopulations treated by PTED. Patients with SLR negative may get greater benefit from PTED.

Background

Lumbar disc herniation(LDH) is one of the most common disorders whose prevalence is about 77.8%[1]. LDH is mainly due to compression of nerve by the nucleus pulposus, annulus fibrosis and cartilage plate, especially the nucleus purposes. After the degenerative changes of lumbar vertebra in different degrees, the intervertebral disc annulus fibrosis is broken under the action of external factors, and the nucleus pulposus enters the posterior vertebral canal, which then leads to the stimulation or compression of the nerve roots of the adjacent spinal cord. Then a series of clinical symptoms such as lumbar pain, numbness and pain in one lower limb or both lower limbs are produced.

Traditional open lumbar microdiscectomy (OLM) is considered the gold standard of LDH treatment for its good efficacy in long-term follow-up [2, 3]. In recent years, minimally invasive techniques have developed rapidly and minimally invasive discectomy (MID) has been gradually applied in lumbar intervertebral disc herniation which is more minimally invasive and conducive to postoperative rehabilitation compared with open surgery [4]. Novel MID procedures have many Potential advantages over standard Microdiscectomy

or open discectomy (MD/OD) including less blood loss, less postoperative pain, shorter hospitalisation and earlier return to work [5].

Straight leg raising(SLR) test is a common valuable examination method, which can reflect the severity of lumbar disc herniation and the degree of nerve root compression to some extent [6]. Jonsson's research showed that a SLR test has a strong correlation with various parameters of pain degree. And positive postoperative SLR test was associated with inferior outcome [7]. However, there are few studies on the related factors including SLR test influencing the operation, and there are few reports on which type of patients will benefit more from this kind of operation. Therefore, we designed this prospective study to explore the relevant factors influencing postoperative effect of PTED surgery, so as to provide a reference for clinical diagnosis and treatment. In this study, we collected preoperative and postoperative the Visual Analogue Scale(VAS) score, Oswestry Disability Index and Japanese Orthopaedic Association score (JOA) of patients and analyzed the relationship between these scores and SLR to find the influence of SLR on postoperative clinical results. It provides reference for clinical selection of surgical indications and contraindication.

Methods

Patients and follow-up

Methods: According to the strict inclusion and exclusion criteria, we selected 118 consecutive patients with LDH who came to our hospital from August 2015 to September 2016 and received PTED surgery. Only 96 of these patients had complete data and were followed up for three years. Their surgical outcomes were assessed using VAS(lumbar/leg). ODI and JOA. And patients completed these assessments one day before surgery. 4 kinds of scales including VAS(lumbar/leg), ODI and JOA were measured and reassessed at 1 day, 3 months, 6 months, 12 months and 36 months after the PTED. Our initial hypothesis was that the differences in 4 scaled score between patients between SLR positive and negative was statistically significant. The operation was performed by two doctors who have more than 10 years of spinal neurosurgery experience and has received professional training in spinal endoscopy.

Inclusion criteria: 1. Patients with pain in the lower back with unilateral or bilateral lower limb radiating pain and/or acid trapped numbness; 2. The physical signs and symptoms of patients are consistent with those of physical examination, and they are positioned at the same responsibility segment; 3. The X-ray computed tomography(CT). Magnetic resonance imaging (MRI) and other imaging examinations confirmed that the responsible segment was consistent with the symptoms and signs, showing the compression of nerve root or dural sac by the herniation disc of a single segment. 4. Someone who has been on regular conservative treatment (medication, rehabilitation) for 8 weeks is not effective or worse; 5. The follow-up time of postoperative follow up was 36 months, and the follow-up data were complete.

Exclusion criteria: 1. Lower lumbar and lower limb pain with no apparent cause; 2. Multilevel cervical disc herniation; 3. The responsibility segment is associated with prominent posterior or lateral protrusion

deformities, extensive calcification of the intervertebral disc, and loss of intervertebral height; 4. The responsible section had been interventional, posterior excision and other surgical treatment; 5. There is spinal tuberculosis, infection, tumor and so on; 6. The diagnosis was lumbar spinal stenosis, lumbar instability or spondylolisthesis; 7. There are cardiopulmonary diseases, coagulopathy, mental diseases and other surgical contraindications.

Surgical Techniques

After the success of the anesthesia, patients were in the prone position. We choose at 8 to 10 cm away from the spine puncture, puncture Angle of 10 ° for L2/3 and L3/4, and at 8 to 10 cm away from the spine puncture, puncture Angle of 30 ° for L4/5 and L5 / S1 (Figure 1-A, B). Conventional disinfection cloths were applied with 0.125 percent lidocaine for infiltration anesthesia (Figure 1-C). Then the puncture needle enters the intervertebral disc directly through the Kambin triangle of the intervertebral foramen under fluoroscopy (YESS approach), Or 1.5mm kirschmann wire is positioned on the ventral side of the superior articular process and slides into the vertebral canal via Kambin triangle through the intervertebral foramen (TESSYS approach). Intervertebral disc staining and angiography was performed with methylene blue and iodohydrin. After the positive and lateral fluoroscopy was confirmed to be correct, the skin was cut with the guide needle as the center for 8mm, and the working sleeve was placed after gradual expansion (The casing diameter is 8.3mm, and the working casing can only be inserted after the expansion and forming of the lower intervertebral hole through trephine). Positive and lateral fluoroscopy was performed to determine the position of intervertebral space and puncture (Figure 1-D, E), and the yellow ligament and other tissues around the intervertebral foramen were gradually cleared to determine the position of nerve roots, dural sac or intervertebral disc. According to these tissue structures, further microscopical localization was performed to ensure surgical safety. After the location of the protruded nucleus pulposus was clearly identified, degenerative nucleus pulposus tissues (Figure 1-F, G) that pressed on nerves were removed, spinal canal and nerve root alignment areas were carefully explored, residual nucleus pulposus tissues in the disc and spinal canal were cleared, and dural sac and nerve root decompression were thoroughly observed. 0.9% sodium chloride solution was repeatedly washed in the operation area, and then the working channel was removed, and the incision was sutured. A representative case is shown in Figure 1.

Statistical Analyses

The statistical analysis of this study was performed with the statistical package SPSS, version 23.00 (SPSS Inc, Chicago, Illinois). Data is shown as meaning \pm standard deviation(SD). Then independent t-test, Mann-Whitney U test, Chi-square test, and Fisher's exact test were used to compare the differences of clinical and radiological outcomes. P values < 0.05 were accepted as statistically significant.

Results

This study involved 96 patients who underwent PETD surgery between August 2015 to September 2016 including 61(63.5%) males and 35(36.5%) females. With respect to LDH sections, 2(10.5%) was presented at L3-L4, 5(26.3 %) at L4-L5 and 12(63.2%) at L5-S1 among SLR Positive $0^{\circ}-30^{\circ}$ patients; 1(2.0%) was presented at L3-L4, 25(49.0%) at L4-L5 and 25(49.0%) at L5-S1 among SLR Positive $31^{\circ}-60^{\circ}$ patients and 2(7.7%) was presented at L3-L4, 13(50.0%) at L4-L5 and 11(42.3%) at L5-S1 among SLR negative patients (Table 1). Of 96 patients, 72 patients were SLR positive, and 24 patients were SLR negative. BMI is 21.78 ± 6.30 for patients with SLR Positive $0^{\circ}-30^{\circ}$, 24.06 ± 3.27 for patients with SLR Positive $31^{\circ}-60^{\circ}$ and 23.61 ± 3.26 with SLR negative. And there is no statistically significant difference between BMI and SLR. All the surgeries were successful, and none of the patients went to open surgery. In addition, there is no statistically significant difference between the three subpopulations (SLR Positive ($0^{\circ}-30^{\circ}$), SLR Positive ($31^{\circ}-60^{\circ}$) and SLR Negative ($61^{\circ}-$)), which is crucial because the three groups being compared have similar starting characteristics (Table 2 and Figure 2).

Ninety-six of the 118 patients were included in the follow-up. The remaining 22 patients were excluded due to follow-up failure, 2 for 1 month, 6 at 6 months, 5 for 12 months and 9 at 36 months. Therefore, the 3-year follow-up rate accounted for 83.36%. To evaluate the postoperative efficacy, internationally recognized ODI index, JOA score, and VAS score was used to evaluate the postoperative efficacy of patients who were followed up for 3 years. All patients showed significant improvement after surgery. ODI and VAS (lumbar/leg) decreased in all patients and groups, and there was a statistically significant difference in each postoperative follow-up compared with that before surgery (Figure 3, * $P < 0.05$). Moreover, the increase of JOA after operation was statistically significant compared with that before the operation (Figure 3, * $P < 0.05$).

In terms of graphic characterization, VAS and ODI score at 1 day, 3, 6, 12 and 36 months after surgery were significantly lower than those before surgery, with statistically significant differences in both the SLR positive and SLR negative. Moreover, the changes of VAS (leg), ODI and JOA scores among patients with SLR negative were significantly higher in each 2 phase than that among patients with SLR positive, and the difference was statistically significant (Figure 4A–4D; Table 3). And changes of VAS (leg), ODI and JOA scores at 1 day, 3, 6, 12 and 36 months postoperation compared with those before surgery showed statistically significant differences among SLR Positive ($0^{\circ}-30^{\circ}$), SLR Positive ($31^{\circ}-60^{\circ}$) and SLR Negative ($61^{\circ}-$). However, changes of VAS (lumbar) at 1 day, 3, 6, 12 and 36 months postoperation compared with those before surgery showed no statistically significant differences among SLR Positive ($0^{\circ}-30^{\circ}$), SLR Positive ($31^{\circ}-60^{\circ}$) and SLR Negative ($61^{\circ}-$) (Figure 4A–4D; Table 3).

Discussion

PTED is considered as a secure and effective method for the treatment of soft disc herniation. The advantages of this technology include the preservation of the posterior disc structure which has less impact on the stability of the spine and the effectiveness similar to that of traditional open discectomy [8, 9]. In recent years, PTED has undergone significant technological evolution and the indications of PTED are also expanding [10–12]. There several randomized controlled studies have demonstrated that the new

method showed great effectiveness in the treatment of LDH which is consistent with our study[8, 13, 14]. While PTED brings great benefits to most patients, a small number of them have poor outcomes or complications[15, 16]. Therefore, we need further research to explore the best indications for PTED so as to bring the greatest benefit to patients with LDH.

SLR test serves as a valuable common examination method, which can reflect the severity of lumbar disc herniation and the degree of nerve root compression to some extent[6]. Jonsson's research showed that the SLR test has a strong correlation with various parameters of pain degree. And positive postoperative SLR test was associated with inferior outcome[7]. However, there are few studies on whether SLR test could influence the operation, and there are few reports on which type of patients will benefit more from this kind of operation. Therefore, we designed this research to compare the prognostic differences between patients with SLR positive and negative who have LDH after PTED surgery. Our study showed that patients with PTED had a very good prognosis after surgery, and patients with very severe cases could take care of themselves and gradually return to a normal life after surgery. This is similar to most reports on the efficacy of PTED procedure[17, 18]. There was no statistically significant difference in preoperative VAS(lumbar/leg), JOA, ODI, etc. among three groups we selected, ensuring that the comparison was reliable and valuable. It is assumed that this is of great significance for postoperative recovery of patients. And the changes of VAS(lumbar/leg), JOA and ODI are greater in patients with SLR negative than those in patients with SLR positive. This may show that SLR negative patients had more benefits from the operation, although there was a statistically significant difference among the three groups in the main scaled scores. In brief, PTED as a novel technique showed an excellent effect in the treatment of LDH. And there is a study performed by Hyeun that has shown that PTED works well for all types of lumbar disc herniation, including extremely difficult cases[18]. Overall, there was statistically significant difference in postoperative changes among SLR Positive (0° – 30°), SLR Positive (31° – 60°) and SLR Negative (61° -). Therefore, there is an obvious difference in the effect of PTED surgery between patients with SLR positive and SLR negative.

Surgery-induced instability is a common consequence of OLM which may occur as much as to 22% after OLM[19]. Instability of the spine results from the removal of small lumbar muscles attached to the lamina and the removal of the facet joints. Patients with PTED have less possibility of instability because these structures are preserved in this kind of surgery. A short-term retrospective study performed by Lee demonstrated that no patients in the PELD group developed instability, but 3.4% of patients who underwent OLM developed instability on final follow-up[20].

PTED has incomparable advantages over other technologies, only resecting part of the superior articular process bone and most structures preserved so as not to damage the biomechanical structure of the spine, local anesthesia, small incision, less bleeding, short operation time and early ground access[21–23]. And there are three systematic reviews that suggest that PELD seems to be a safe and effective LDH intervention with similar clinical efficacy compared with traditional open microdiscectomy[24–26].

This study has several limitations. For design reasons, there is no suitable control group, because the purpose of this study is not to emphasize the possible advantages of PTED over other surgeries, but to show the improvement of patients after receiving this surgery and the relationship with SLR. In addition, for many reasons, some patients lost follow-up and did not complete the study.

While there have been many studies of PTED for LDH, none have looked at differences in improvement and postoperative recovery in the terms of SLR. According to our findings, PTED seems to be a safe and effective technique. Patients with SLR negative may have good outcomes according to VAS(leg). ODI and JOA. In a word, there was significant difference among the three groups. All in all, these have important clinical impact. But whether SLR plays a role in the outcome requires large, multicenter, randomized, controlled studies. This study laid the foundation for a multicenter randomized controlled study.

Conclusions

PTED showed great effect on treating patients with lumbar disc herniation. And the main scale score such as VAS(leg). ODI and JOA showed that there is a statistically significant difference between the three subpopulations treated by PTED. Patients with SLR negative may get greater benefit from PTED.

Abbreviations

PETD: Percutaneous Transforaminal Endoscopic Discectomy; LDH: Lumbar disc herniation; OLM: Traditional open lumbar microdiscectomy; MID: minimally invasive discectomy; SLR: Straight leg raising; VAS: the Visual Analogue Scale; ODI: Oswestry Disability Index; JOA: Japanese Orthopaedic Association score)

Declarations

Acknowledgements

We would like to thank the National Natural Science Foundation of China for making this research possible.

Competing interests

There is no financial/personal interest or belief that could affect our objectivity. The authors declare that they have no competing interests.

Authors' contribution

Conception and Design: FLW, HRG, PCZ, JXQ. Data analysis and interpretation: FLW, HRG, CPZ, YFY, SQ, QYG. Manuscript preparation: FLW, HRG, CPZ, SKG.

Manuscript editing: FLW, HRG, WGX, CPZ, JXQ. Manuscript review: FLW, HRG, CPZ, JXQ. Final approval of the version submitted: FLW, HRG, CPZ, YFY, SQ, QYG, SKG, WGX, CPZ, JXQ. All authors have read and approved the manuscript.

Funding

This study was supported by National Natural Science Foundation of China (No. 81871818). The funding body had no role in the design of the study, data collection, analysis, and interpretation and in writing the manuscript.

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to the need to protect individual privacy but are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

Not applicable, as all data was received completely anonymous. According to national regulations, it is not necessary to conduct ethical approval.

Consent for publication

Not applicable.

Author details

¹ Department of Orthopedics, Tangdu Hospital, the Fourth Military Medical University, Xi'an Shaanxi, 710038, PR China

References

1. Iversen T, Solberg TK, Romner B, Wilsgaard T, Nygaard O, Waterloo K, Brox JI, Ingebrigtsen T (2013) Accuracy of physical examination for chronic lumbar radiculopathy. *BMC Musculoskelet Disord* 14:206. doi: 10.1186/1471-2474-14-206

2. Yorimitsu E, Chiba K, Toyama Y, Hirabayashi K (2001) Long-term outcomes of standard discectomy for lumbar disc herniation: a follow-up study of more than 10 years. *Spine (Phila Pa 1976)* 26:652–657
3. Son IN, Kim YH, Ha KY (2015) Long-term clinical outcomes and radiological findings and their correlation with each other after standard open discectomy for lumbar disc herniation. *J Neurosurg Spine* 22:179–184. doi: 10.3171/2014.10.SPINE131126
4. Corniola MV, Tessitore E, Schaller K, Gautschi OP (2015) [Cervical disc herniation—diagnosis and treatment]. *Revue medicale suisse* 11:2023–2029
5. Rasouli MR, Rahimi-Movaghar V, Shokraneh F, Moradi-Lakeh M, Chou R (2014) Minimally invasive discectomy versus microdiscectomy/open discectomy for symptomatic lumbar disc herniation. *Cochrane Database Syst Rev*:CD010328. doi: 10.1002/14651858.CD010328.pub2
6. Xin SQ, Zhang QZ, Fan DH (1987) Significance of the straight-leg-raising test in the diagnosis and clinical evaluation of lower lumbar intervertebral-disc protrusion. *J Bone Joint Surg Am* 69:517–522
7. Jonsson B, Stromqvist B (1995) The straight leg raising test and the severity of symptoms in lumbar disc herniation. A preoperative evaluation. *Spine (Phila Pa 1976)* 20:27–30
8. Hermantin FU, Peters T, Quartararo L, Kambin P (1999) A prospective, randomized study comparing the results of open discectomy with those of video-assisted arthroscopic microdiscectomy. *J Bone Joint Surg Am* 81:958–965
9. Maroon JC (2002) Current concepts in minimally invasive discectomy. *Neurosurgery* 51:S137–145
10. Jasper GP, Francisco GM, Aghion D, Telfeian AE (2014) Technical considerations in transforaminal endoscopic discectomy with foraminoplasty for the treatment of spondylolisthesis: Case report. *Clin Neurol Neurosurg* 119:84–87. doi: 10.1016/j.clineuro.2014.01.019
11. Kitahama Y, Sairyo K, Dezawa A (2013) Percutaneous endoscopic transforaminal approach to decompress the lateral recess in an elderly patient with spinal canal stenosis, herniated nucleus pulposus and pulmonary comorbidities. *Asian J Endosc Surg* 6:130–133. doi: 10.1111/ases.12004
12. Wang YP, Zhang W, An JL, Zhang J, Bai JY, Sun YP (2016) Evaluation of Transforaminal Endoscopic Discectomy in Treatment of Obese Patients with Lumbar Disc Herniation. *Med Sci Monit* 22:2513–2519
13. Mayer HM, Brock M (1993) Percutaneous endoscopic discectomy: surgical technique and preliminary results compared to microsurgical discectomy. *J Neurosurg* 78:216–225. doi: 10.3171/jns.1993.78.2.0216
14. Hoogland T, Schubert M, Miklitz B, Ramirez A (2006) Transforaminal posterolateral endoscopic discectomy with or without the combination of a low-dose chymopapain: a prospective randomized study in 280 consecutive cases. *Spine (Phila Pa 1976)* 31:E890–897. doi: 10.1097/01.brs.0000245955.22358.3a
15. Ahn Y, Kim JU, Lee BH, Lee SH, Park JD, Hong DH, Lee JH (2009) Postoperative retroperitoneal hematoma following transforaminal percutaneous endoscopic lumbar discectomy. *J Neurosurg Spine* 10:595–602. doi: 10.3171/2009.2.SPINE08227

16. Choi G, Kang HY, Modi HN, Prada N, Nicolau RJ, Joh JY, Pan WJ, Lee SH (2011) Risk of developing seizure after percutaneous endoscopic lumbar discectomy. *J Spinal Disord Tech* 24:83–92. doi: 10.1097/BSD.0b013e3181ddf124
17. Ruetten S, Komp M, Merk H, Godolias G (2008) Full-endoscopic interlaminar and transforaminal lumbar discectomy versus conventional microsurgical technique: a prospective, randomized, controlled study. *Spine (Phila Pa 1976)* 33:931–939. doi: 10.1097/BRS.0b013e31816c8af7
18. Kim HS, Paudel B, Jang JS, Lee K, Oh SH, Jang IT (2018) Percutaneous Endoscopic Lumbar Discectomy for All Types of Lumbar Disc Herniations (LDH) Including Severely Difficult and Extremely Difficult LDH Cases. *Pain Physician* 21:E401-E408
19. Hedtmann A (1992) [The so-called post-discectomy syndrome—failure of intervertebral disk surgery?]. *Z Orthop Ihre Grenzgeb* 130:456–466. doi: 10.1055/s-2008-1039653
20. Lee DY, Shim CS, Ahn Y, Choi YG, Kim HJ, Lee SH (2009) Comparison of percutaneous endoscopic lumbar discectomy and open lumbar microdiscectomy for recurrent disc herniation. *J Korean Neurosurg Soc* 46:515–521. doi: 10.3340/jkns.2009.46.6.515
21. Mathews HH (1996) Transforaminal endoscopic microdiscectomy. *Neurosurg Clin N Am* 7:59–63
22. Yeung AT, Yeung CA (2007) Minimally invasive techniques for the management of lumbar disc herniation. *Orthop Clin North Am* 38:363–372; abstract vi. doi: 10.1016/j.jocl.2007.04.005
23. Turk CC, Kara NN, Biliciler B, Karasoy M (2015) Clinical outcomes and efficacy of transforaminal lumbar endoscopic discectomy. *J Neurosci Rural Pract* 6:344–348. doi: 10.4103/0976-3147.154575
24. Nellensteijn J, Ostelo R, Bartels R, Peul W, van Royen B, van Tulder M (2010) Transforaminal endoscopic surgery for symptomatic lumbar disc herniations: a systematic review of the literature. *Eur Spine J* 19:181–204. doi: 10.1007/s00586-009-1155-x
25. Kamper SJ, Ostelo RW, Rubinstein SM, Nellensteijn JM, Peul WC, Arts MP, van Tulder MW (2014) Minimally invasive surgery for lumbar disc herniation: a systematic review and meta-analysis. *Eur Spine J* 23:1021–1043. doi: 10.1007/s00586-013-3161-2
26. Qin R, Liu B, Hao J, Zhou P, Yao Y, Zhang F, Chen X (2018) Percutaneous Endoscopic Lumbar Discectomy Versus Posterior Open Lumbar Microdiscectomy for the Treatment of Symptomatic Lumbar Disc Herniation: A Systemic Review and Meta-Analysis. *World Neurosurg* 120:352–362. doi: 10.1016/j.wneu.2018.08.236

Tables

Table 1. Demographic and baseline characteristics

	Count n(%)	BMI (Mean±SD)	L3-L4(%)	L4-L5(%)	L5-S1(%)
SLR					
Positive 0°-30°	19(21%)	21.78±6.30	2(10.5%)	5(26.3%)	12(63.2%)
Positive 31°-60°	51(54%)	24.06±3.27	1(2.0%)	25(49.0%)	25(49.0%)
Negative(61°-)	26(25%)	23.61±3.26	2(7.7%)	13(50.0%)	11(42.3%)
			χ^2 , p=0.464	χ^2 , p=0.492	

SLR : Straight leg raising test ; *Statistically significant (P < 0.05)

Table 2 Preoperative estimation of mean values of VAS, ODI and JOA for patients between SLR positive and negative (mean±SD).

SLR	Preoperative VAS lumbar	Preoperative VAS leg	Preoperative ODI	Preoperative JOA
Total	4.09±3.16	7.06±2.40	58.08±20.47	11.84±4.56
Positive 0°-30°	3.69±2.52	6.47±1.78	49.34±17.62	13.53±2.93
Positive 31°-60°	4.00±3.38	7.14±2.46	59.02±19.77	11.57±4.64
Negative(61°-)	4.58±3.19	7.35±2.68	62.60±22.48	11.15±5.17
	χ^2 , p=0.614	χ^2 , p=0.114	χ^2 , p=0.065	χ^2 , p=0.076

SLR: Straight leg raising test; VAS: visual analog scale; ODI: Oswestry Disability Index; JOA: Japanese Orthopedic Association; *Statistically significant (P < 0.05)

Table 3 Comparison of change of mean values for all chronological phases (2 phases each time) for patients between SLR positive and negative (mean±SD).

SLR	Pre-op to 1d	Pre-op to 3 mo	Pre-op to 6 mo	Pre-op to 12 mo	Pre-op to 36 mo
VAS(lumbar)					
Positive[0°-30°]	2.42±2.27	2.21±2.70	2.42±2.63	2.68±2.60	2.78±2.71
Positive[31°-60°]	3.04±3.12	3.22±3.13	3.33±3.14	3.41±3.16	3.43±3.13
Negative(61°-)	3.73±3.21	3.81±3.25	3.85±3.17	3.88±3.03	3.88±3.03
	0.403	0.372	0.385	0.498	0.520
VAS(leg)					
Positive[0°-30°]	4.89±1.73	5.11±1.29	5.37±1.46	5.32±1.53	5.39±1.54
Positive[31°-60°]	5.84±2.49	6.10±2.47	6.25±2.46	6.51±2.39	6.59±2.38
Negative(61°-)	6.69±2.60	6.77±2.57	6.80±2.59	6.73±2.44	6.73±2.44
	0.012*	0.006*	0.020*	0.010*	0.008*
ODI					
Positive[0°-30°]	24.77±13.76	30.96±14.97	36.19±13.55	39.02±16.55	44.92±18.23
Positive[31°-60°]	39.99±21.19	47.09±19.45	50.55±19.66	53.28±19.19	56.41±20.49
Negative(61°-)	46.13±20.37	50.55±21.41	54.08±20.79	56.20±21.91	58.83±22.32
	0.002*	0.001*	0.002*	0.008*	0.026*
JOA					
Positive[0°-30°]	8.42±3.25	9.11±3.11	10.21±2.66	11.15±2.32	11.61±5.11
Positive[31°-60°]	11.08±4.94	11.98±4.71	13.04±4.71	14.12±4.60	15.18±6.12
Negative(61°-)	12.65±4.72	12.73±5.20	13.46±4.93	13.92±5.03	14.96±6.48
	0.006*	0.012*	0.010*	0.010*	0.019*

VAS: visual analog scale; ODI: Oswestry Disability Index; JOA: Japanese Orthopedic Association; SLR: Straight leg raising test;

*Statistically significant (P < 0.05)

Figures

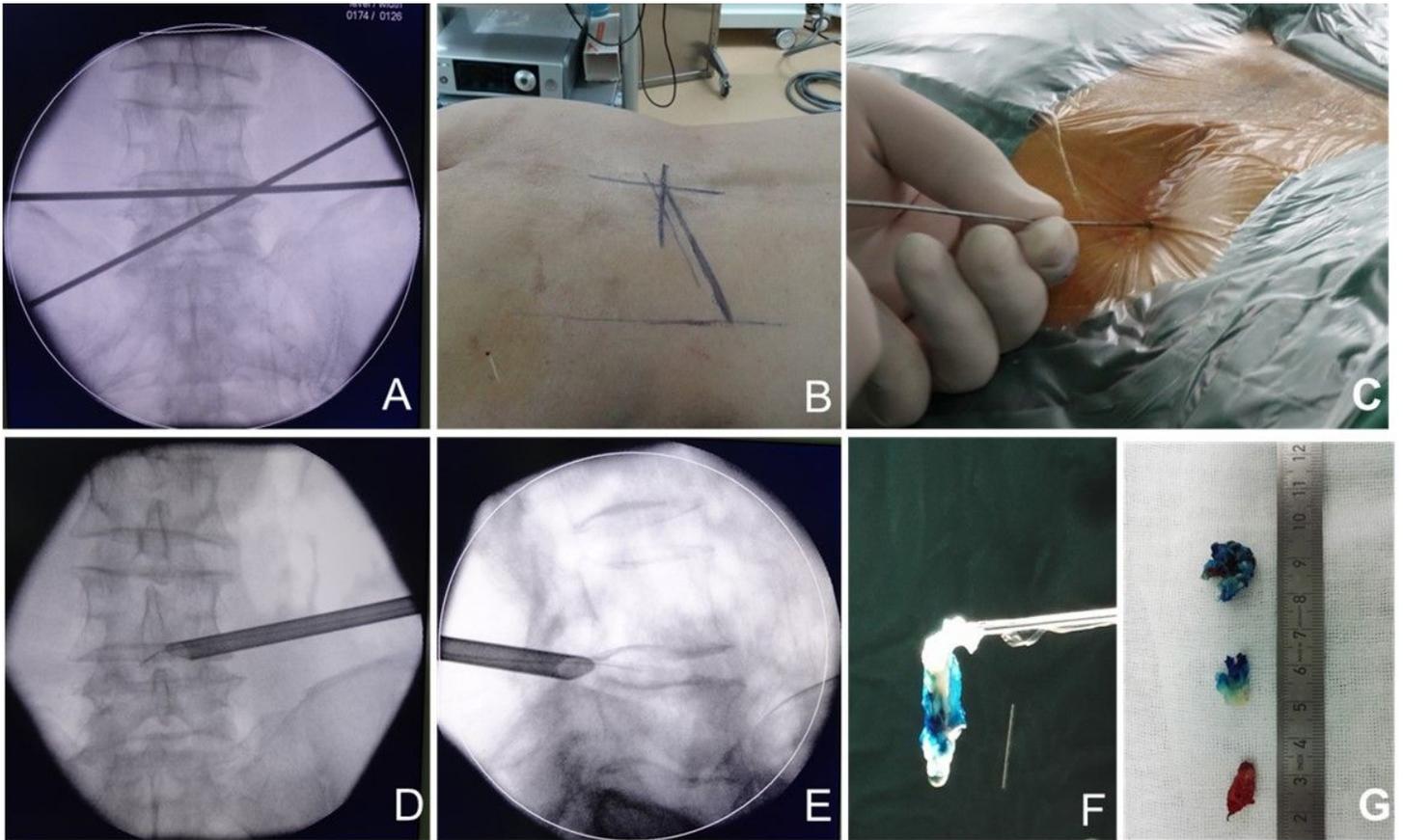


Figure 1

A representative case. (A) Puncture positioning; (B) Skin marking; (C) Local infiltration anesthesia; (D) Positive perspective puncture position; (E) Lateral perspective of the placement position; (F) Lumbar 4/5 disc removal; (G) Bone mass and intervertebral disc mass were removed.

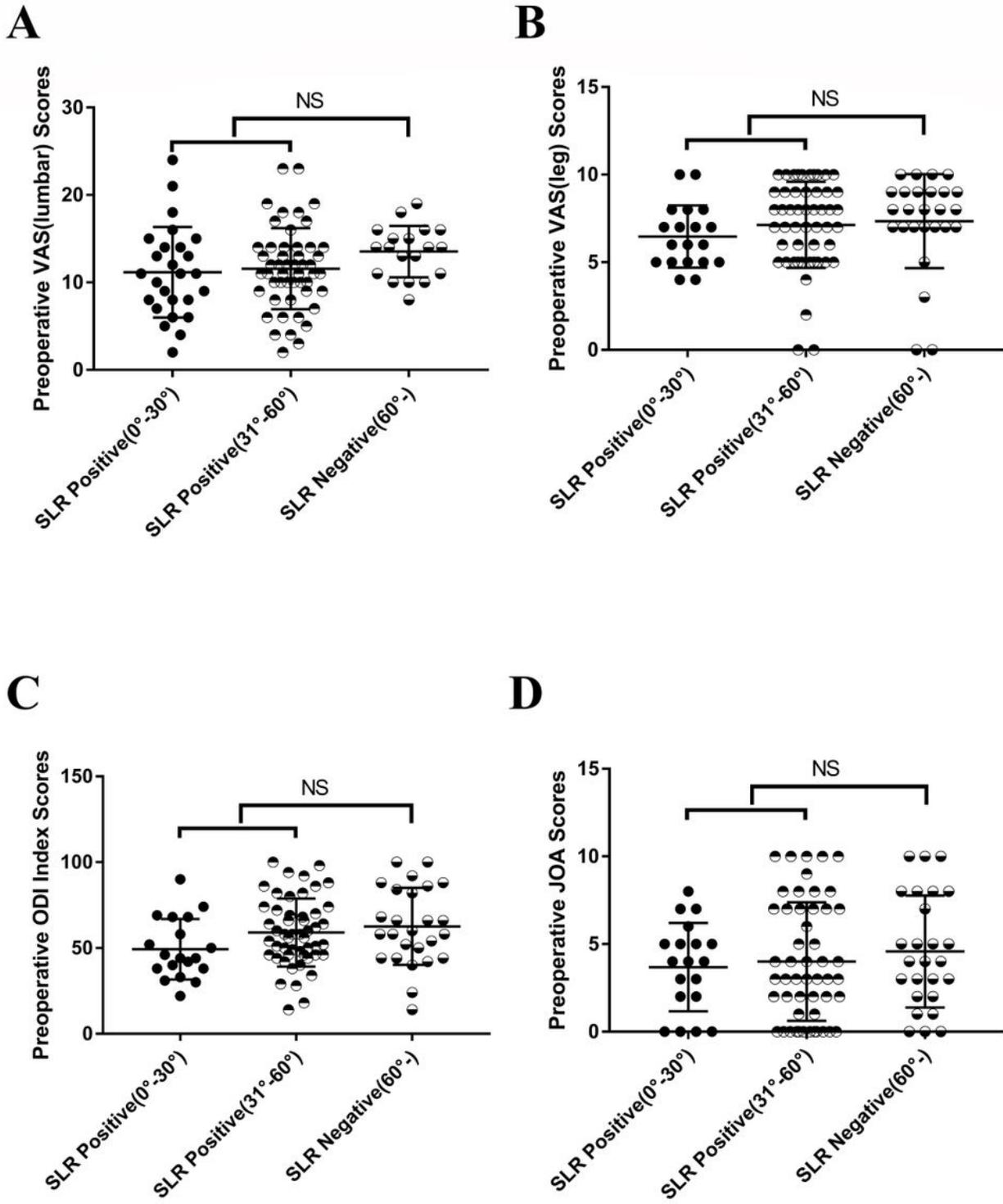


Figure 2

(A-D) The relationship between SLR and the VAS(lumbar/leg), ODI and JOA scores.

A

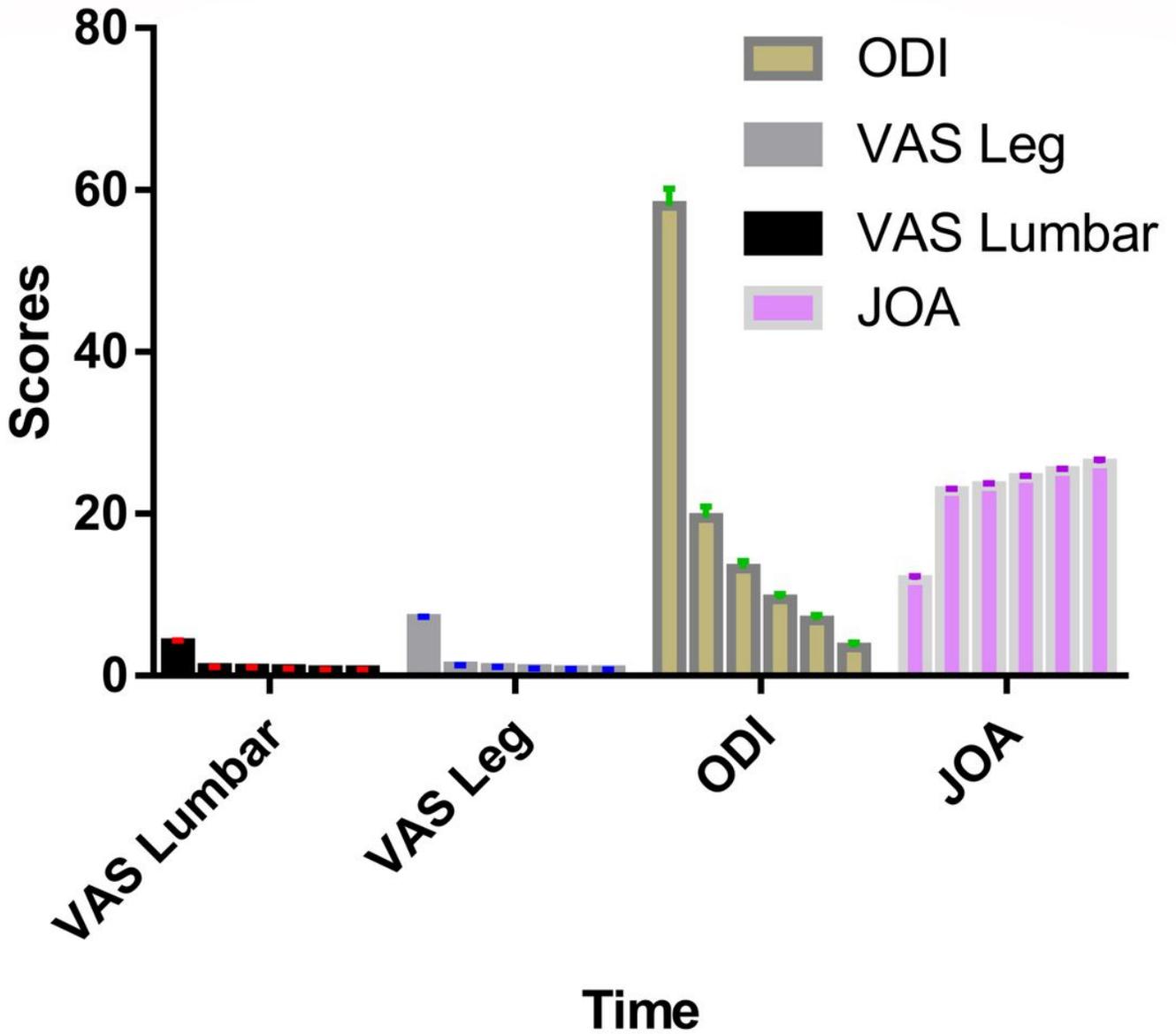
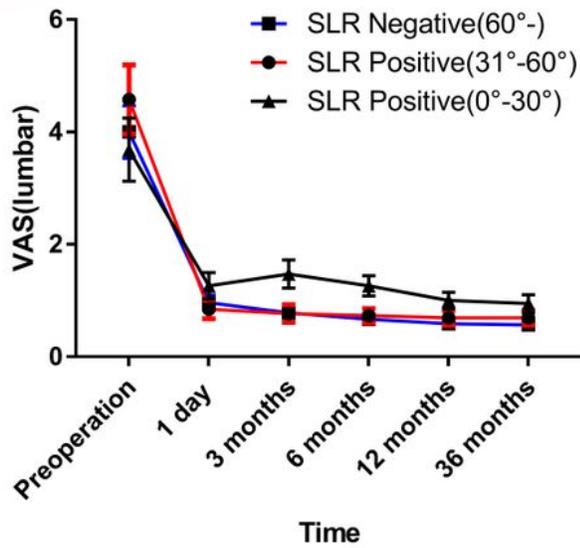
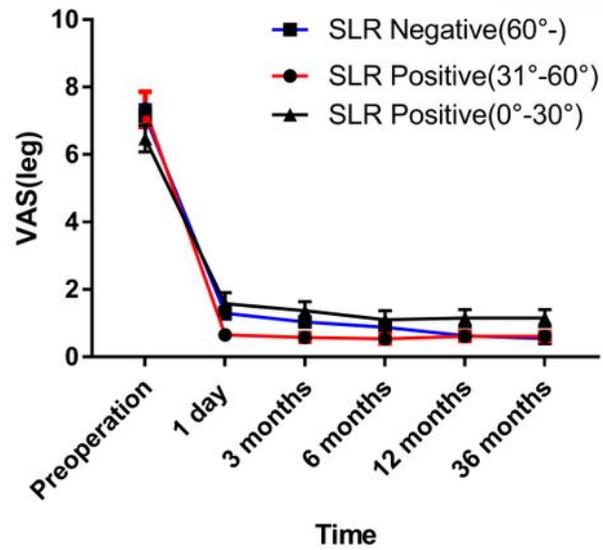
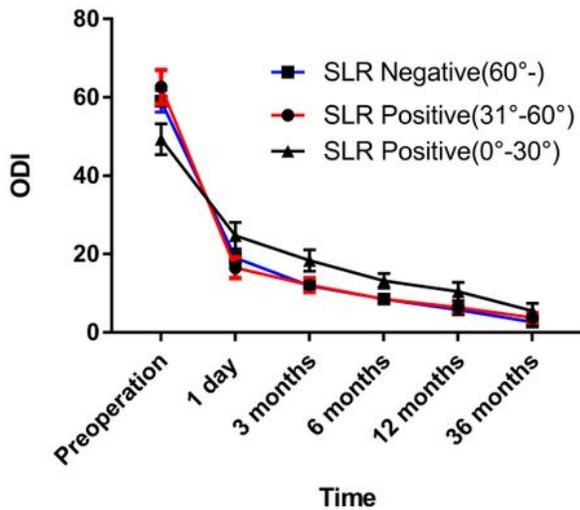
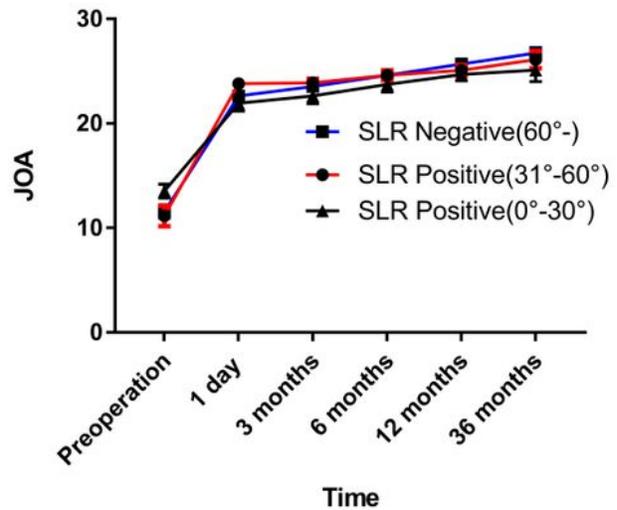


Figure 3

(A) The VAS(lumbar/leg), ODI and JOA scores in total samples, preoperatively, at 1 day, 3, 6, 12, 36 months postoperatively. Abbreviations: VAS, The Visual Analogue Scale score; ODI, OSWESTRY Disability Index; JOA, Japanese Orthopaedic Association score.

A**B****C****D****Figure 4**

(A) The VAS(lumbar) scores at 1day, 3, 6, 12, 36 months postoperatively, related to SLR; (B) The VAS(leg) scores at 1day, 3, 6, 12, 36 months postoperatively, related to SLR; (C) The ODI scores at 1day, 3, 6, 12, 36 months postoperatively, related to SLR (D) The JOA scores at 1day, 3, 6, 12, 36 months postoperatively, related to SLR; Abbreviations: VAS, The Visual Analogue Scale score; ODI, OSWESTRY Disability Index; JOA, Japanese Orthopaedic Association score.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [MandatoryArticleSlides.pptx](#)