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Review Article

CLINICAL OUTCOME OF PERCUTANEOUS ENDOSCOPIC LUMBAR DISCECTOMY AND OPEN LUMBAR MICRODISCECTOMY FOR LUMBAR DISC HERNIATION: A LITERATURE REVIEW

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ABSTRACT

Percutaneous endoscopic lumbar discectomy (PELD) is a new technique to the treatment of lumbar disc herniation (LDH), was introduced in 1986. This technique utilizes a tubular retractor system and advance endoscopic camera for visualization. Open lumbar microdiscectomy (OLM) utilize an operating microscope for visualization was described in late 1970s. This technique was considered as the gold standard procedure for the management of lumbar disc herniation. The purpose of this study to compare the advantage and disadvantage of the operative technique and clinical outcome reported in the literature for both percutaneous endoscopic lumbar discectomy and open lumbar microdiscectomy for the treatment of lumbar disc herniation.

Keywords: Percutaneous endoscopic lumbar discectomy, open lumbar microdiscectomy, lumbar disc herniation.

INTRODUCTION

Lumbar intervertebral disc herniation (LDH) is a common cause of lower back pain and back related leg pain for people. Around 70% to 85% of people suffer at least one episode of back pain with or without leg pain (1) . Chronic back pain and back-related leg pain are commonly associated with lumbar disk herniation (LDH). Epidemiologic studies reported that with the increasing aging population, the number of patients with LDH and degenerative disk disease has also increased (2, 3). After failure of conservative treatment [Like Nonsteroidal anti-inflammatory drug(NSAIDS), traction, Steroid injection, nerve root block, physiotherapy, and others], conventional open discectomy chosen in order to control the pain originated from LDH. Though with the technique advance in the past decades, open lumbar discectomy still regarded as a gold standard technique for LDH. However, they required prolonged hospital stay and recovery period (4). Lumbar disc herniation treated by open discectomy traditionally but there was disadvantage like muscle damage, the removal of the yellow ligament, nerve retraction. This can cause instability and scarring of the epidural space. However, they required prolonged hospital stay and recovery period (4, 5). So some new techniques with the help of modern devices such as microscopy, Optical fiber visualization has been introduced and gradually increase popularity, in order to reduce the disadvantage of open discectomy and reduce the surgical invasive. With the advance technology of minimally invasive surgery, percutaneous endoscopic discectomy surgery has gained increasing popularity in the treatment of lumbar disk herniation in the spine centers(6). Since Kambin and Sampson introduced the percutaneous posterolateral approach in 1986, Percutaneous endoscopic lumbar discectomy (PELD) has become popular over the past few years for the removal of herniated lumbar disc material(7).The concept of open lumbar microdiscectomy (OLM) introduced by Williams, which became gold standard of surgical treatment for LDH (1).However OLM surgery may results in muscle damage, partial laminectomy, removal of yellow ligament and nerve retraction. This may cause lumbar instability and scarring of epidural space, which become clinically symptomatic in 10% or more of patients (1, 5).

Method:

Relevant literature was identified by searching Pubmed, Google scholar, Cochrane library databases was performed for articles, including randomized trials, controlled study, prospective, retrospective and reviews, with the following key words for literature searches included “Lumbar disc herniation”, percutaneous endoscopic lumbar discectomy” “open lumbar microdiscectomy”, “treatment outcome”. To identify other relevant studies, we manually scanned reference lists from identified trials and review article.

RESULTS

Surgical indication for PELD and OLM:

Recently, many surgeons have developed various novel techniques and instruments that extended the indications of PELD and OLM for lumbar disc herniations. The Surgeon prefers to choose techniques according to indication of PELD and OLM for LDH. The indication of percutaneous endoscopic lumbar discectomy is

ideally suited for unilateral, one-level extruded discs and free fragments. 1) There is persistent radicular pain, numbness, or weakness, caused by disc herniation compromising root or roots (contained or, preferably, non-contained) confirmed by computed tomography (CT), magnetic resonance imaging (MRI), myelogram, or discogram (study correlating with clinical status), 2) positive tension or compression signs, or motor, sensory or reflex abnormalities are present, 3) the patient is not responding to conservative treatment 4) this technique is optimal with extruded discs and free fragments or 5) the patient is obese or in poor health so that open surgery would be an increased risk. (This is an additional consideration) (8).

The indications of open lumbar microdiscectomy includes unilateral radicular symptoms with leg pain more severe than back pain, positive straight leg raise test, other signs of root dysfunction, and failure to improve after a minimum of 6 weeks of conservative therapy. An abnormal electromyography (EMG) corresponding to the level of the abnormal disc provides additional support for performing this procedure. Recently, the microsurgical technique is increasingly being used for the treatment of recurrent herniated discs, far lateral discs and foraminal stenosis (9).

Surgical Technique:

In both groups, PELD and OLM, all operations followed a standard pattern suggested in the previous literature (10).

Percutaneous endoscopic lumbar discectomy (PELD):

The process of PELD was performed under local anesthesia with the patient in prone position on a radiolucent table with lateral-dorsal approach (7). Patient was kept conscious state during whole procedure to monitor any changes in the sign and symptoms during operation (11). After infiltration of the entry point with local anesthesia (LA), an 18 gauge spinal needle was introduce under fluoroscope guidance (10).The main target point of the needle was the medial pedicular line on the anteroposterior view and posterior vertebral line on lateral view (5, 10). After inserting spinal needle, discography was perform using methylene blue, which stains nucleus pulposus blue and help to identify pathological fragment. Following further step the 0.8mm guide wire was inserted through spinal needle and spinal needle was removed (7, 12). A linear incision about 8mm long was made at entry point and an obturator was introducing by a twisting maneuver along with the guide wire. There are two major pathways for discectomy, which are intradisc Yeung endoscopic spine system (YESS) and the intracanal transforaminal endoscopic surgical system (TESSYS). A bevel-ended working cannula was inserted into the disc along the obturator, followed by the removal of obturator and guide wire (5). After an endoscope was inserted through working cannula , the blue stained disc was removed using endoscopic forceps and the herniated disc material, fibrotic scar tissue were released and removed (13). After completing the whole procedure, endoscope was removed and sterile dressing was applied with a 1-point suture (5).

Open lumbar microdiscectomy (OLM):

The process of OLM was introduced by William which is standard of surgical treatment for LDH (1). OLM was performed under general anaesthesia with the patient in prone position on radiolucent Wilson frame

and Jackson table (10). The skin incision was made generally about 2-4 cm in posterior mid line over spinus process and paravertebral muscle was dissected (14). In the next step under microscopic view partial laminectomy and medial facetectomy less than one third of the total facet joint was done using high speed drill and ligamentum flavum was removed over area of exposure (7).Then the instruments were placed to the thecal sac and traversing nerve root to be exposed. The nerve root was gently retracted and epidural dissection was done. The herniated disc fragment was removed with pituitary forceps and kerrison rongeurs, reverse angle curettes and ring curette (14, 15). After confirming the decompression of nerve root, the retractor was removed and wound closure was performed using 1:0, 2:0, and 4:0 absorbable suture (vycryl) (5, 15).

Comparison of PELD and OLM:

In both of this procedure, there are some differences. In process of PELD, paraspinus muscle is handled and instrument is used for visualization. In PELD paraspinus muscle were not detached from spinus process and instruments (are spinal needle, guide wire, obturator and working cannula) are advanced between the tip of the spinus process. Where as in OLM process the paravertebral muscle was being dissected from spinus and lamina. The results in less trauma to the muscle hence lead to less post-operative incisional pain. The other difference includes use of operating endoscope versus operating microscope for excellent visualization.

Comparison of clinical outcome: PELD versus OLM:

In 9 studies, which include 5 retrospectives and 4 prospective studies. I reviewed, the surgical satisfaction is higher in the PELD than OLM for LDH, because of operating time, hospital stay, intra-operative bleeding time and time unit return to work were significant shorter in the PELD than the OLM but there is no significant difference in leg pain in both group but improvement of back pain is higher in PELD than the OLM post-operatively as shown below in the table 1(A & B). In 2008 prospective randomized control study, Ruetten.S et al (16), reported 178 patients with full endoscopic or microdiscectomy with 2 year follow up. According to the visual analogue scale (VAS) and, Oswestry Disability Index (ODI) around 82% patient where significant improvements in leg pain, back pain and daily activity in both groups. There is no significant difference in result. At the same time, there are full endoscopic discectomy (FED) have brought significant advantage in the following area: back pain, rehabilitation, complication and traumatization. Thus this study is a safe alternative to open microdiscectomy. This studies result that is similar to other two published literature in the year 1993 Mayer et al (17) and 2009 Ruetten. S et al (18). In 2007 Kim M-J et al (19), in this retrospective study 902 patient with LDH, in which 295 and 607 patients underwent PELD and microdiscectomy respectively and range of follow up 18-36 months. In this study, reviewed outcome is satisfactory; the result is 84.4% in PELD which is comparable to the successful outcome 85% of the microdiscectomy. Hence based on this result PELD can be reasonable alternative to open microdiscectomy for LDH. In 2017, Lee J-S et al (20), in his retrospective study, 83 patient who underwent revision surgery, in PELD group 35 and OLM group 48 patient respectively for recurrent LDH, with 12-54 months range of follow up period. During this period according to VAS and ODI significant improvement in symptoms were noticed in result from both groups, but found no significant difference in both group. Even though both groups have favorable results, PELD can be an

alternative to OLM for the treatment of recurrent LDH. This study is similar to retrospective study published in 2009 by Lee D.Y et al (10). Choi K.C et al (7), include 43 patient in which 20 and 23 patient underwent PELD and OLM respectively for large lumbar disc herniation (LLDH) with 24-37 months range of follow up. The author reports, in both groups, post operatively significant improvement of leg and back pain although there was no significant difference in improvement of leg pain but improvement in back pain was significantly higher in PELD than OLM. The advantages of PELD include improvement of back pain, rapid recovery, disc height preservation and less trauma to muscle. Therefore, PELD is ideal treatment for LLDH (large lumbar disc herniation. In 2016, Gibson J.N et al (21), prospective randomised control trial reports 140 patients of LDH with radiculopathy which is taken 70 patients in Transforaminal endoscopic discectomy (TED) and 70 patients in OLM and underwent TED and OLM with 2 years of follow up. An author concludes that the outcome significantly improved in both group. Beside short hospital stays and less leg pain during 2 years following TED, there is little disappointment by repeated MRI and revision of surgery. As TED can perform under local anesthesia and short hospital stay which makes the TED ideal for the treatment of LDH. In 2016, Ahn S.S et al (5), in retrospective matched cohort study total 66 patient of age 20-25 years were taken in which 32 and 34 patient in PELD and OLM respectively with 1 year of follow up period. As per this study VAS and ODI shows improvement in back pain, leg pain and radiological result is same in both group. The author also reports the advantage of PELD include procedure perform under local anesthesia, operative time, hospital stay and return to work time is shorter than OLM. Hence the PELD seems to be good choice for LDH in Young patients.

Author/ year	Study Design	Sample Size	OUTCOME										F/U
			PELD										
			Number	Op-time (min)	Blood Loss	Hosp Stay (Day)	VAS				ODI		
							Pre-op		Post-op		Pre-op	Post-op	
							Leg	Back	Leg	Back			
Mayer/ 1993	PRS	40	20	40.7±11.3	–	–	4.55±0.99	19	8.23±1.3	10 (47%) imp	–	–	2 yrs
Kim M.J/2007	Retrospective	902	295	53.0±13.0	Neg	–	–	–	–	–	–	–	18-36 months
Ruetten.S/ 2008	PRS	178	91	13-46	Neg	–	–	–	85% imp	–	–	–	2 yrs
Lee D.Y/2009	Retrospective	54	25	45.8±11.1	–	0.9±0.5	8.4±1.7	7.0±2.8	2.9±2.5	2.9±2.4	61.6±22.1	20.7±15.9	25-41 months
Ruetten.S/ 2009	PRS	161	81	28-57	Neg	–	–	–	76.5% imp	–	–	–	2 yrs
Choi K.C/2016	Retrospective	43	20	67.0±12.0	Neg	1.5±1.1	7.5±1.1	6.9±1.4	1.7±1.2	2.0±0.6	61.6±13.9	12.5±7.5	2 yrs
Gibson J.N.A/2016	PRS	140	70	61±16	–	0-2	6.2±2.8	5.7±2.7	1.9±2.6	2.5±2.5	44±83	18±17	2 yrs
AhnS.S/ 2016	Retrospective	66	32	48.66±6.45	Neg	7.50±2.63	7.53±0.92	4.41±0.98	2.06±0.84	2.50±0.62	24.9±2.28	9.63±2.31	1 yrs
Lee J-S/2017	Retrospective	83	35	–	–	–	8.2±0.63	4.94±0.91	2.23±0.65	2.23±0.65	44.17±2.76	15.31±2.97	12-54 months

Table 1A: Comparison of clinical outcomes of PELD and OLM for lumbar disc herniation.

PELD: percutaneous endoscopic lumbar discectomy, OLM: open lumbar microdiscectomy, f/u: follow up, op-time: operative time, min: minute, hosp stay: hospital stay, VAS: visual analogue scale, ODI: Oswestry Disability Index, pre-op: preoperative, post-op: postoperative, imp: Improvement (the difference between preoperative and postoperative score), neg: negligible, yrs: year, PRS: Prospective Randomized Study.

Author/ year	Study Design	Sample Size	OUTCOME										F/U
			OLM										
			Number	Op-time (min)	Blood Loss(ml)	Hosp Stay (Day)	VAS				ODI		
							Pre-op		Post-op		Pre-op	Post-op	
							Leg	Back	Leg	Back			
Mayer/ 1993	PRS	40	20	58.2±15.2	_	_	4.2±0.98	20	7.67±1.9	15 (25)% imp	_	_	2 yrs
Kim M.J/ 2007	Retrospective	902	607	64.6±28.7	Neg	_	_	_	_	_	_	_	18-36 months
Ruetten.S/ 2008	PRS	178	87	34-72	5-235	_	_	_	79% imp	—	_	_	2 yrs
Lee D.Y/ 2009	Retrospective	54	29	73.8±25.7	_	3.8±1.4	8.6±1.7	5.4±3.7	3.5±3.1	3.1±2.5	63.1±22.3	18.2±15.4	25-41 months
Ruetten.S/ 2009	PRS	161	80	32-79	15-275	_	_	_	73% imp	_	_	_	2 yrs
Choi K.C/ 2016	Retrospective	43	23	136.7±53	200.9± 86.9	7.2±3.5	7.3±1.1	6.1±1.0	2.3±0.8	3.7±1.0	66.1±11.1	20.2±7.2	2 yrs
Gibson J.N.A/2016	PRS	140	70	65±36	_	0-9	5.8±2.6	4.6±2.7	3.5±3.1	3.0±2.8	42±15	22±20	2 yrs
Ahn S.S/ 2016	Retrospective	66	34	53.71±8.49	15-167	15.65±4.80	7.50±0.93	4.74±1.08	2.32±1.01	2.91±0.67	25.00±2.49	10.68±2.67	1 yrs
Lee J-S/ 2017	Retrospective	83	48	_	_	_	8.15±0.65	5.15±0.90	2.52±1.25	2.85±1.09	44.98±2.37	16.98±4.13	12-54 months

Table1B: Comparison of clinical outcomes of PELD and OLM for lumbar disc herniation.

PELD: percutaneous endoscopic lumbar discectomy, OLM: open lumbar microdiscectomy, f/u: follow up, op-time: operative time, min: minute, hosp stay: hospital stay, VAS: visual analogue scale, ODI: Oswestry Disability Index, pre-op: preoperative, post-op: postoperative, imp: Improvement (the difference between preoperative and postoperative score), neg: negligible, yrs: year, PRS: Prospective Randomized Study.

DISCUSSION

Open lumbar microdiscectomy was a gold standard surgical procedure for treatment of lumbar disc herniation. However open microdiscectomy required large incision for optimal vision. During the surgery, the paravertebral muscle retracted partial laminectomy, yellow ligament and facet joint removed. This surgery may cause scarring and instability of spine, which became clinically symptomatic in 10% or more patient (1, 5). Percutaneous endoscopic discectomy was introduced in 1986 (22). When compared with open microdiscectomy, potential advantage of PELD include: (a). Can perform under local anesthesia (b). Less trauma to muscle (c). Rapid recovery and (d). Low cost (7, 17). A review of the comparison between PELD and OLM reveals that PELD was superior(23).Thus it is necessary to compare the clinical effectiveness and safety of these two procedures for treatment of LDH. We reviewed the effectiveness of Procedure by evaluating improvement in pain, functional score, operative time and hospital stay and also safety by evaluating complication and recurrence of LDH in these two procedures. Many author mention that in PELD, shorter operating time, less blood loss, shorter hospital stay which results from less resection of muscle, ligament and lamina in this technique when compare to OLM. Many studies reported similar surgical outcome. Above mention studies, I found, in these studies PELD less traumatic surgical procedure. Hence significant short term benefit to the patients. Firstly, short hospital stays and early return to work could benefit to economy cost and secondly most of patient suffer from LDH are old people and with medical co-morbidities, suggest short

operating time and less bleeding important factor for reduce post-operative complication and recovery. In these review, the functional outcome similar in both PELD and OLM group regarded as VAS and ODI score. So we can conclude PELD and OLM effective procedure in the treatment of LDH.

These studies had variable complication after surgery, which include dural tear, nerve injury, discitis, dysesthesia, hematoma, infection, *Cerebrospinal fluid* (CSF) leakage and so on. When PELD compared with OLM, PELD magnifies the operative field with high resolution camera that help surgeon to identify and protect nerve tissue. According to published literature table 2. In PELD group has lower complication rate than OLM group. Kim M-J et.al (19) reports, in PELD , 3 patients dural tear, 4 patients dysesthesia,2 patients discitis and in OLM group 6 patients dural tear,2 patients dysesthesia,2 patients diskitis,1 patient infection and 1 patient hematoma. As well as re-operation rate is 28(9.5%) patients in PELD group and 38(6.3%) patients in OLM group. In 2009 Ruetten et.al (18) reports in PELD 1 patient dural tear,3 patients dysesthesia and 1 patient transient urinary retention, where as in OLM group 2 patients dural tear,7 patients dysesthesia,2 patients transient urinary retention,1 patient haematoma,2 patients delay wound healing and 2 patients infection. As well as 3 patients in PELD and 2 patients in OLM which required revision surgery. In previous year 2008, Ruetten et.al (16) reports 3 patients dysesthesia in PELD group and in OLM group 5 patients dysesthesia, 2 patients post-op bleeding,1 patient delay wound healing,1 patient infection and 3 patients urinary retention. Whereas no serious complication seen in both groups like dural tear, nerve injury and discitis. As well as recurrence occur in 6 cases in PELD and 5 cases in OLM. All patients were re-operated in same technique. Gibson J.N.A et.al (21) reports 2 patients in PELD had headache post operatively may be due to dural tear and CSF leakage that last within 12 hours with bed rest and 4 patients had mild dysesthesia which settle in 2-4 weeks. Whereas, 1 OLM patient had persistent foot drop. Revision surgery was required in 5 cases in PELD and 2 cases in OLM, in which 4 patients had recurrence and 1 patient had re-herniation in PELD group and 2 patients in OLM group had revision surgery without any known pathology. Choi K-C et.al (7) reports no serious complication in both groups. In PELD group 1 case underwent revision surgery and 1 case experience recurrence and in OLM group 1 case went anterior lumbar interbody fusion (ALIF) due to instability. Mayer H.N et.al (17) reports 1 patient had mild paresthesia. In PELD group 3 patients had unsuccessful surgery. Hence patients underwent revision open microsurgery. In OLM group 1 patient had re-operation and subsequently develop spondylodiscitis. Ahn S-S et.al (5) reports complication occurred in 4 patients in PELD group and 4 patients in OLM group. In PELD 2 cases dysesthesia,1 patient headache,1 patient pseudocyst.In OLM group 2 cases dysesthesia ,1 patient Dural tear, 1 patient epidural hematoma where as in PELD, 2 patients had incomplete disc removal. No patient underwent re-operation due to patient's preference and managed with conservative treatment. Reherniation at 12 months occurs in 1 patient in PELD and 1 patient in OLM. Patient in the PELD group managed with conservative treatment and the patients in OLM group underwent revision surgery with OLM technique. Lee D.Y et al (10) reports in PELD 1 patient persistent leg pain due to residual disc fragment. In OLM, 2 patient dural rear and 1 patient voiding difficulties and dysesthesia. As well as second recurrence in 1 patient PELD and 3 patients in OLM. 1 patient from each group underwent mini transforaminal

lumbar interbody fusion (TLIF) for second recurrence and other 2 patient managed conservatively. Lee J.S et al (20) reports no patient with dural tear and OLM had 7 patient as well as 1 patient infection and 1 patient hematoma. In PELD 1 patient with surgery related neurologic symptoms and OLM had 4 patients. Whereas second recurrence occurred in 2 patients from PELD and 7 from OLM in which repeated PELD was conducted for PELD and fusion surgery for OLM.

In these 9 studies, total 1667 patient of LDH in which 669 patients underwent PELD and 998 patients underwent OLM surgery for LDH. I found, the complication rate 0.047% and recurrence rate 0.028% in PELD and in OLM complication rate 0.061% and recurrence rate 0.016%. The complication rate little higher in OLM compare to PELD as well as PELD had quite higher recurrence and reoperation rate than the OLM as shown in the (table 2) due to steps of learning curve of PELD and underestimate the concurrent pathology of LDH (19). However, there is no significant difference in complication, recurrence and reoperation rate between two groups.

Author	S. S	PELD					OLM				
		Nu.	TCN	complication	TRN	Recurrence & Re-operation	Nu.	TCN	Complication	TRN	Recurrence & Re-operation
Mayer H.M /1993	40	20	1	1 pts mild paresthesia.	3	3 pts unsuccessful surgery & went revision surgery.	20	_	_	-	1 pts re-operation subsequently develops spondylodiscitis.
Kim M.J/ 2007	902	295	9	3 pts dural tear, 4 pts dysesthesia & 2 discitis.	-	Re-operation rate 28(9.5%) case.	607	12	6 pts dural tear, 2 dysesthesia, 2 discitis, 1 infection & 1 hematoma.	-	Reoperation rate: 38(6.3%).
Ruetten S/ 2008	178	91	3	3 pts dysesthesia.	6	6 case recurrence & re-operated in same technique	87	12	5 pts dysesthesia, 2 pts post operative bleeding, 1 pts delay wound healing, 1 pts infection & 3pts urinary retention.	5	5 case recurrence and re-operated in same technique.
Lee D.Y/ 2009	54	25	1	1 persistent leg pain	1	Recurrence 1 case & underwent revision mini TLIF surgery.	29	3	2 pts dural tear, 1 pts voiding difficulty & dysesthesia.	3	3 pts recurrence & 1 pts underwent TLIF.
Ruetten S/ 2009	161	81	5	1 pts dural tear, 3 dysesthesia & 1 transient urinary retention.	-	3 pts required revision surgery.	80	16	2 pts dural tear, 7 dysesthesia, 2 transient urinary retention,1 haematoma,2 pts delay wound healing & 2 pts infection.	-	2 pts required revision surgery.
Choi K.C/ 2016	43	20	-	_	1	1 pts revision surgery & 1 pts experience recurrence	23	-	_	-	1 pts went ALIF.
Gibson J.N.A/2016	140	70	6	4 pts mild dysesthesia & 2 pts headache.	5	5 case revision surgery in which 4 pts recurrence & 1 pts re-herniated.	70	1	1 pts persistent foot drop.	-	2 case revision surgery.
Ahn S-S/ 2016	66	32	6	2 pts dysesthesia, 1 headache, 1 pseudocyst & 2 pts incomplete disc removal.	1	1 pts re-herniation.	34	4	2 pts dysesthesia, 1 dural tear & 1 epidural hematoma.	1	1 pts re-herniation & underwent revision surgery.
Lee J.S/2017	83	35	1	No dural tear, 1 pts surgery related neurologic symptoms.	2	Second recurrence 2 pts and underwent repeated surgery.	48	13	7 pts dural tear, 1 infection, 1 hematoma & 4 pts surgery related neurologic symptoms.	7	Second recurrence 7 pts & underwent revision surgery.
_	=1667	=669	=32	_	=19	_	=998	=61	_	=16	_

Table 2: Comparison of complication, re-occurrence and re-operation rate between PELD and OLM for LDH. S.S: Sample size, Nu: Number, TCN: Total complication number, TRN: Total Recurrence number, PELD: percutaneous endoscopic lumbar discectomy, OLM: open lumbar microdiscectomy, LDH: lumbar disc herniation, pts: patients, TLIF: Transforaminal lumbar interbody fusion, ALIF: anterior lumbar interbody fusion, pts: patients.

CONCLUSION

There is similar favorable functional outcome from PELD and OLM for the treatment of LDH. But comparatively PELD are superior to OLM for less blood loss, short hospital stay, short operative time, mean disability period, usually less complication and less traumatization. Therefore, PELD is a feasible alternative for OLM in the treatment of LDH. The case study is limited, need to study more cases and need long -term results for standardization of technique.

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