Outcome of Percutaneous Endoscopic Interlaminar Lumbar Discectomy.

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ABSTRACT

Objective: To determine the outcome of percutaneous endoscopic interlaminar lumbar discectomy for prolapsed intervertebral disc in terms of pain reduction and functional disability.

Methods: This descriptive study was conducted in Department of Orthopaedics & Spine Surgery Hayat Abad medical complex Peshawar from 3rd October 2018 to 3rd December 2020.All patients with lumbar disc prolapse fulfilling the inclusion criteria were operated with percutaneous full endoscopic interlaminar lumbar discectomy. Post operative back pain and leg pain was assessed with Visual Analogue Scale(VAS) and functional disability with Oswestry Disability Index (ODI) questionnaire at 2nd week,3rd month and 6th months. Preoperative VAS and ODI was compared with post operative VAS and ODI and *P* value was calculated with independent-sample t test for statistical significance. *P* value <0.05 was considered significant.

Results: A total of 50 patients including 31 (62%) males and 19 (38%) females with a mean age of 37.10±7.95 years were included in this study. The VAS for back pain and leg pain improved from pre operative 4.68±2.01 and 7.44±1.47 to 0.90±1.61 and 0.74±1.30 respectively at 6th months follow up(*P* <0.05). The mean ODI score improved from pre operative 34.4±7 36±4 to 5.3±2 post operative at 6th month(*P* < 0.05).

Conclusion: Percutaneous endoscopic lumbar discectomy for prolapsed intervertebral disc is an effective alternative to open discectomy as it resulted in significant pain reduction and minimum functional disability in our patients.

Keywords: Discectomy, Endoscope, Lumbar disc herniation, Oswestry Disability Index, Visual analogue scale

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INTRODUCTION

Low back pain is one of the major causes of chronic incapacity in adults and affects 4% to 33% of the population at any given point.[1] Lumbar disc herniation is the cause of 90% neuropathic backache with a prevalence of 1 to 3%.[1,2] Major advancements have been made in recent years regarding the diagnosis and treatment of low back pain due to lumbar disc herniation.[2,3] In majority of cases low back pain and associated radiating pain to the lower limb is treated conservatively with anti-inflammatory medication, physiotherapy and epidural steroid injection and the pain usually resolves over a period of 6 weeks.[2,4] In 10 to 20% cases however pain persists despite conservative treatment and warrants surgical treatment.[4] For symptomatic lumbar disc herniation various surgical options exist including conventional open discectomy, micro discectomy and percutaneous endoscopic discectomy depending upon the equipment availability, surgeon's experience and preference.[5] Open discectomy first introduced by Mixter and Barr in 1934 is considered as the gold standard for the treatment of symptomatic lumbar disc herniation.[1,2,6,7] However because of the greater

soft tissue damage during open surgery various minimal invasive techniques have been developed.[6,8] The most commonly used minimally invasive procedures are endoscopic transforaminal and translaminar discectomies with a success rate of 60 to 95%.[7,9] Minimal invasive percutaneous endoscopic discectomy has the advantages of avoiding large skin incision, excessive soft tissues dissection and bone damage resulting in minimal blood loss, reduced hospital stay, and early return to work.[10-13].

The objective of our study was to determine the outcome of percutaneous endoscopic interlaminar lumbar discectomy in terms of pain reduction and functional disability.

METHODS

We conducted this descriptive study in Department of Spine Surgery Hayat Abad medical complex Peshawar from 3rd October 2018 to 3rd December 2020.All adults patients of either gender and all age with backache and radiating lower limb pain and unilateral radiculopathy due to lumbar disc prolapse of 6 weeks or more presenting to our OPD were included in this study. Patients with spine instability, central stenosis, epidural injection, previously surgically treated spine and patients with caudally or cranially migrated discs were excluded from the study. The study approval was taken from the Ethical Committee of our hospital. Informed written consent was taken from all study participants for surgery and publication of the results. In the included subjects complete history, physical examination and relevant investigations (radiographs, MRI) were taken. Pre operative pain was assessed with Visual Analogue Scale (VAS) and functional disability with Oswestry Disability Index (ODI) questionnaire.[14]

Surgical Technique

All the surgeries were performed by the same team following a uniform standard surgical technique for percutaneous full endoscopic interlaminar lumbar discectomy. The patient was placed prone on radiolucent operation table and the surgery was performed under general anaesthesia. The interlaminar space (L4-L5 or L5-S1) was identified with fluoroscopy. After scrubbing and draping a 5 to 10 mm skin incision was made lateral to the inter-laminar window in its centre. An outer obturator was inserted on the lateral part of this inter-laminar window with a beveled working sheath inside and directed towardes Ligamentum Flavum. We introduced endoscope (German Richard wolf) for direct visualization. A small hole is made in between the lamina with a burr and Ligamentum Flavum is incised to gain access to the spinal canal.A dissector was used through the Ligamentum Flavum along the Pedicle and the nerve root was mobilized medially. Constant irrigation was used for better visualization. The working sheath was placed on the herniated disc and with a round headed long pin the Annulus Fibrosis was penetrated and pushed inside the Nucleus Pulposus. Subsequent discectomy was done through this Annulotomy hole and complete decompression was ensured once the nerve root had been observed freely in the irrigation fluid. At the end of surgery free disc fragments, active bleeding and dural tear was checked.

All these post operative patients were reviewed in OPD at 2nd week, 3rd month and 6th months. Postoperative pain was assessed with Visual Analogue Scale (VAS) and functional disability was calculated using Oswestry Disability Index (ODI)[14] questionnaire and was graded as Minimal disability (score 0-20%), Moderate disability (score 21-40%), Sever Disability (score 41-60%), Crippled (score 61-80%) and Bed bound (score 81-100%).

The data was analyzed with SPSS version 28. Quantitative data was represented as mean and standard deviation while qualitative data was represented as frequency and percentages. Preoperative VAS and ODI was compared with post operative VAS and ODI and *P* value was calculated independent-sample t test for statistical significance. $P < 0.05$ was considered significant.

RESULTS

We operated 50 patients with percutaneous full endoscopic lumbar discectomy. Male patients were 32 (62.0%) and female 19 (38.0%). The mean age was 37.10±7.95 years. The L5-S1 disc prolapse was noted in 25 (50.0%) patients, L4-L5 in 24 (48.0%) and L4-L5,S1-S2 in 1 (2.0%) patient. The mean duration of percutaneous full endoscopic lumbar discectomy was 54.70±20.98 minutes. The outcome of percutaneous endoscopic lumbar discectomy is shown in table I.

Table I: Outcome of percutaneous endoscopic lumbar discectomy for prolapsed intervertebral disc.

Outcome	Pre-operative		Post-operative					
			2nd week		3rd Month		6th Month	
Visual Analogue Scale (VAS)	Back Pain	Leg Pain	Back Pain	Leg Pain	Back Pain	Leg Pain	Back Pain	Leg Pain
	4.68±2.01	7.44±1.47	1.92±1.56	1.68±1.34	1.36±1.61	1.12±1.18	0.90±1.61	0.74±1.30
Oswestry Disability Index (ODI)	34.4±7		19.7±3		11.2±5		5.3±2	

The back pain and leg pain as per VAS was improved from per operative 4.68±2.01 and 7.44±1.47 to post operative 0.90±1.61 and 0.74±1.30 respectively(*P* 0.002).The ODI improved from pre operative 34.4±7 to 5.3±2 post operatively at 6th months.(*P* 0.01). No significant difference was found in VAS and ODI for gender, duration of symptoms and level of disc prolapse($P > 0.05$). Our complication rate was 8%(n=4). Conversion to open discectomy was done in 1(2%) patient. Recurrent symptoms at 2 weeks in 1(2%) patient was treated with open discectomy while 1(2%) patient had fusion surgery at 6th months. Neurological deficit and foot drop was documented in 1(2%) patient which was resolved completely at 6th months. No dural tear was noted in our series.

DISCUSSION

Percutaneous endoscopic interlaminar lumbar discectomy causes less tissue trauma than open discectomy resulting in minimum post operative analgesia,shorter hospital stay and early return to job.[13,15] It can be used to treat recurrent disc herniation.[15] In our study significant pain reduction and improvement of disability index was noted at 6th months follow up.Similar to our study Hsu HT and colleagues[16] treated 3 patients with disc prolapse above the level of L5 S1 with Percutaneous endoscopic interlaminar lumbar discectomy and noted that post operatively VAS improved from 6.6 to 1.3 and ODI from 20.3 to 3.Although their sample size was very small but they concluded that symptoms were immediately relieved and patients achieved early ambulation after percutaneous endoscopic interlaminar lumbar discectomy. These authors however advocated that surgeons intended to master percutaneous endoscopic interlaminar lumbar discectomy must first expert themselves in open discectomy and then practiced percutaneous endoscopic interlaminar lumbar discectomy on cadavers before applying this technique on their patients. Chori[17] was of the opinion that Percutaneous endoscopic interlaminar lumbar discectomy had a steep learning curve and the initial 10 cases must be done under the supervision of an experience endoscopic spine surgeon. Hua et al[18] treated 84 patients with endoscopic discectomy and noted a significant improvement in mean VAS and ODI at one year follow up. Excellent results were noted as per MacNab criteria in 92.6% patients who were operated for L5-S1 level and 90% for L4-L5 level surgery. Lee JS [19] treated 80 patients with endoscopic lumbar discectomy and documented improvement in mean preoperative VAS leg 7.91±0.73 and back 5.15±0.7 to 1.15±0.62 and 1.19±0.75 post operatively respectively.Excellent or good outcome was noted in 77(96.25%) patients as per MacNab's criteria. Son and colleagues treated [20] 27 patients of L5-S1 disc prolapse with Percutaneous endoscopic interlaminar lumbar discectomy and 29 with open mini discectomy.No difference in surgical outcome and complication rate was noted between the two except that the learning curve of the endoscopic group was more difficult than in the open group. Endoscopic group however had significantly less operative time than open group.

Table II: Recurrence rate of percutaneous endoscopic interlaminar lumbar discectomy as reported by national and international studies.

S. No	Name of Author	Year of publication	Recurrence rate
1	Kim HS[21]	2019	7%
2	Si Yin[22]	2018	4.2%
3	Hua W[18]	2018	1.2%
4	Lee JS[19]	2016	2.5%
5	Nasir H[23]	2016	2.8%
6	Passacantilli E[24]	2015	5%
7	Sencer A[25]	2014	3.8%
8	Hsu HT[16]	2013	13%
9	Ruetten S[26]	2008	6.6%
10	Our study	2020	2%

The recurrence rate in our study was 2% which is comparable to other national and international studies. (Table II) Zhu et al[27] collected the data of 10120 endoscopic lumbar discectomy surgeries performed by 6 spine surgeons in 3 hospitals and noted that 2 patients had hematoma, 20 had infection and recurrence was 4.7% to 6%. Lee et al[28] had demonstrated that patient selection was an important predictor for failure in percutaneous endoscopic interlaminar lumbar discectomy and patients with central discs herniations compromising the canal and those with higher migrations were more likely to had failed surgery.

Our study had the limitations of descriptive design, small sample size and short follow up period. We recommend further randomized trials with larger sample size and longer follow up to confirm the usefulness of percutaneous endoscopic interlaminar lumbar discectomy.

CONCLUSION

Percutaneous endoscopic lumbar discectomy for prolapsed intervertebral disc is an effective alternative to open discectomy as it resulted in significant pain reduction and minimum functional disability in our patients. We achieved favorable outcome with percutaneous endoscopic lumbar discectomy but we recommend that extreme care must be taken to protect and preserve the important surrounding structures during this procedure.

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