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PERCUTANEOUS TRANSFORAMINAL ENDOSCOPIC LUMBAR DISCECTOMY (PTELD) FOR LUMBAR DISC HERNIATION: A PROSPECTIVE OBSERVATIONAL STUDY.

Orthopaedics

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ABSTRACT

Background- Lumbar disc herniation is spinal problem which is seen in both young and old age having symptoms of pain in back with pain and numbness in lower extremities leading to disability which affects activities of daily living. It is treated by one of mostly accepted PELS by spinal surgeons is PTELD. **Objective:** To evaluate clinical outcome of PTELD for the surgical treatment of symptomatic lumbar disc herniation based on Oswestry Disable Index(ODI),Visual Analog scale(VAS),MacNab Criteria. **Materials and Methods-** A prospective observational study was conducted at Bharthi Vidyapeeth Medical Collage and Hospital Sangli for a duration of one year from 2015-2016 among 30 cases of PTELD coming to our hospital. **Results-** In our study 53.3% were males and 47.7% were females. Mean age was 38.13+/-7.98 years with most of them i.e. 60.00% were between 31-40 years of age. Most of the lesions were at L4-L5 levels i.e.66.7%. A highly significant improvement in VAS score and ODI score was observed post-operatively at 1 month which sustained even after 3 months of surgery ($p<0.0001$). **Conclusion-** PTELD is less invasive, safe and effective in treating lumbar disc herniation.

KEYWORDS

Outcome, LDH, PTELD, Prospective Observational.

INTRODUCTION

Lumbar disc herniation (LDH) is a common cause of low back pain and sciatica. Epidemiological studies have demonstrated that intervertebral disc disease is increasing among all the populations including the young. This phenomenon may be due to the lack of physical activity, sedentary lifestyle , increasing car and air travel to name a few. Approximately 70-85% of people have experienced at least one episode of low back pain with or without leg pain during their lives and it is the second most common reason for doctor visits. For patients with LDH who do not achieve satisfactory recovery following conservative treatment, surgical intervention should be considered (1).

In the past, the standard treatment for this disease has been open disectomy .However, traditional open surgery results in considerable trauma in senior patients with prolonged bed rest (2). Currently, there are numerous surgical interventions for LDH (3). Kambin and Gellman introduced the percutaneous arthroscopic posterolateral extracanal approach for treating LDH (4)(5). Percutaneous transforaminal endoscopic lumbar discectomy (PTELD) is the most minimally invasive surgical method used to treat lumbar disc herniation (1). The procedure possesses the features and advantages of a minimally invasive treatment, including an extremely small incision, little bleeding, light damage to the surrounding tissue and rapid recovery . PTELD has little effect on the structure of the spinal canal, it does not affect spinal stability and forms only slight scar adhesions. PTELD is currently a central focus in spinal surgery research on minimally invasive treatments for lumbar disc herniation (1)(6).To ensure the safety of the neural structures, real time conscious patient interaction during the procedure is crucial. This procedure strictly proceeds under local anaesthesia and conscious sedation. Owing to its low level of invasiveness, postoperative back pain is minimal and patients generally enjoy faster functional recovery. The preliminary results of several studies have shown that PTED is effective in patients suitable to undergo this approach, and its clinical outcome is equivalent to traditional open surgery with the added benefit of reduced invasiveness (2)

Investigations on PTELD are underway. So this study is conducted to evaluate clinical outcome of (PTELD) for the surgical treatment of symptomatic lumbar disc herniation based on Oswestry Disable Index(ODI),Visual Analog scale(VAS),MacNab Criteria.

MATERIALS AND METHODS

A prospective observational study was conducted at Bharati Vidhyapeth Deemed university Medical college & Hospital for a duration of two years (Feb 2014 – Jan 2015).All cases of PTELD coming to our hospital during study duration were included. Sampling technique was convenient sampling. A total of 30 cases of (PTELD) belonged to age group of 20 to 50 years were included in this study.

Inclusion Criteria

1) Those who have given informed consent
2) Unilateral radiating leg pain that was more severe than axial back pain;
3) Failure of conservative management to relieve pain;
4) MRI scan of the lumbar spine confirming disc prolapse correlating to clinical presentation.

Exclusion Criteria

1) Evidence of central canal stenosis on CT or MRI scan,
2) Significant motor deficit;
3) Cauda Equina Syndrome with Bowel and bladder involvement;
4) Radiological evidence of segmental instability;
5) Infection, tumour or fracture associated with the disc prolapse.

Ethics Statement: Data collection was started after approval from the ethics committee of our institution and written informed consent was obtained from all patients.

Outcome Analysis

Patients were evaluated using the visual analogue scale (VAS) for leg and back pain preoperatively, immediate post-operatively, at 1 month and 3 months after the procedure. The Ostwestry Disability Index (ODI) score were evaluated preoperatively, at 1 month and 3 months.

Surgical Technique

All procedures were performed under local anaesthesia. Patient were sedated with either fentanyl and midazolam or with awake state anaesthesia utilizing propofol infusion.Patients were positioned prone on a radiolucent table. A 9 inch high frequency image intensifier was used intraoperatively. The midline was marked along the tips of spinous processes while ensuring that the left and right pedicles were equidistant from the midline in PA view of the spine. Skin puncture were made depending upon the measurements taken in individual patient. Using PA & Lateral fluoroscopic guidance, a 18 gauge spinal needle were advanced towards the intervertebral disc, avoiding both

the traversing and the exiting nerve roots. Disc entry was done at medial pedicular line in L4-L5 and L5-S1 and mid pedicular line in L1-L2, L2-L3 & L3-L4 on Postero- Anterior fluoroscopic projection and Posterior vertebral line in Lateral fluoroscopic projection. Confirmation of intradisc placement of the needle tip was achieved by discography (using a mixture of indigo carmine dye and radiopaque contrast [Omnipaque] with 0.5 ml cefazoline).The indigo carmine dye stained the degenerated disc material blue, thus aiding removal of degenerated disc during the procedure.A guide wire was then inserted through the spinal needle after removal of the stylet. A 7mm skin incision was made to enable the passage of the endoscope sheath. A 6.4 mm cannulated dilator was inserted gently over the guide wire taking care that the guide wire does not advance.Annular fenestration was done by gently tapping the dilator with a mallet. A 7.5 mm OD working sleeve was introduced over the dilator. A 6.4 mm, 30 degree, spinal endoscope with integrated working channel of 3.7 mm, camera, light source and irrigation port were introduced through the working sleeve. Discectomy was performed using graspers through the sleeve and through the endoscope working channel guided by fluoroscopy and endoscopic camera picture. Constant gravity flow saline irrigation through the sheath and scope was used to reduce bleeding during the procedure as this induced clouding of the operating field. Herniated disc material was then removed using 3.0 mm diameter graspers, punches and Roungers inserted through the 3.7 mm working channel of the endoscope, under direct endoscopic visualisation.Patient communication was maintained throughout the procedure to ensure nerve root safety and relief of radicular pain. Either a 4.1/ 1.7 MHz radiofrequency Generator and Triggerflex bipolar probe (Elliquence Inc, USA) or a side firing Holmium- YAG laser probe was used to shrink soft tissue to improve operating field visualisation and disc clearance. The end point of the procedure was visualisation of spontaneous dural pulsation, dural cough impulse or relief of radicular pain as reported by the patient. Patients were given peri-operative antibiotics and two doses of injectable antibiotics post operatively. They were discharged the next day after 24 hrs with 05 days of oral antibiotics and NSAIDS to take care operative pain.

Statistical Analysis

All the data were entered and analyzed by using open epi info 7.1 version and SPPS 20. Descriptive variables were explained in number and percentages. One way ANOVA test was used to see the difference of preoperative, Immediately postop, at 1 and 3 month postop VAS score and Tukey HSD ("Honestly Significant Difference") post-hoc test was applied to see the difference within these group. To see the difference of ODI between preoperative and postop 1 and 3 months one way ANOVA and within these group Tukey HSD post-hoc test was applied. p-value of < 0.05 was taken as significant.

RESULTS

Table 1. Age And Gender Wise Distribution Of The Study Subjects

Age Group	Male		Female		Total
	n	%	n	%	n(%)
< 30	2	6.67	2	6.67	4(13.34%)
31-40	10	33.33	8	26.67	18(60.00%)
41-50	4	13.33	4	13.33	8(26.66%)
Total	16	53.3%	14	46.7%	30(100.0%)
Mean Age - 38.13 +/- 7.98					

Table 1 shows mean age of the study subjects was 38.13+/- 7.98 years with most of them were between 31-40 years of age (60%). Majority were males i.e 53.3% and 47.7% were females,

Table 2- Distribution Of The Subjects Based On Level Of Lesion

Level of Lesion	N	%
L4-L5	20	66.7%
L5-S1	10	33.3%
Total	30	100.0%

Table 2 shows Most of the lesions were at L4-L5 levels (66.7%).

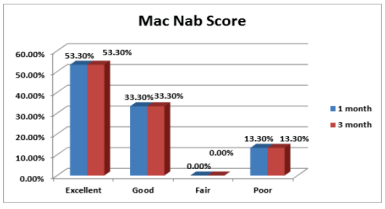

Fig 1. Distribution of the Subjects Based on MacNab Score

Fig.1 shows Bar diagram shows outcome of patient satisfaction by MacNab score. Over half of the subjects (53.3%) had excellent score i.e. No pain and no restriction of activity followed by good score i.e. 33.30% at 1 month and 3 months respectively. Only 13.3% had poor score i.e. no improvement/ insufficient improvement to enable increase in activities and further operative intervention was required (poor outcome). No one had fair score.

Table 3. (A) Distribution of the Subjects Based on VAS Score

VAS	Mean	SD
Pre-op	7.13	1.06
Immediate post-op	1.53	2.13
Post-op (1 month)	1.93	2.96
Post-op (3 month)	2.67	2.84

One Way ANOVA (F value=35.70) P value < 0.0001* (*Highly Significant)

Table 3.(A) shows that there was highly significant difference in VAS score between all groups i.e from preoperative, immediately postoperative , at 1 month and at 3 months postoperatively.

Table 3(B)

	Diff	95%CI	p value
Preoperative*Immediate Post-op	-5.60	-7.1 to - 4.00	<0.0001*
Preoperative*Post-op 1 month	-5.20	-6.79 to -3.60	<0.0001*
Preoperative*Post-op 3 month	-4.46	-6.05 to-2.8	<0.0001*
Immediate post-op* Post-op 1month	0.40	-1.19 to 1.99	0.91
Immediate post-op* Post-op 3 month	1.14	-0.45 to 2.73	0.25
Post-op 1 month* Post-op 3 months.	0.74	-0.85 to 2.33	0.62

*Highly Significant

Table 3(B) shows Tukey HSD ("Honestly Significant Difference") post-hoc test shows there was after applying Post HOC analysis highly significant difference was noted within preoperative and Immediate post-op, post-op 1motnh and post-op 3months respectively(p <0.0001) while no difference was noted within Immediate post-op and post-op 1 month and post-op 3 month respectively. Also no significant difference within post-op 1 month and post-op 3 months. A highly significant improvement in VAS score was observed post-operatively which sustained even after 3 months of surgery.

Table 4. (A)Distribution of the Subjects Based on ODI Score

ODI (%)	Mean	Median	SD	p- value
Pre-op	48.29	44	10.7	< 0.0001*
Post-op (1 month)	9.57	2.5	18.7	
Post-op (3 month)	8.8	0.0	19.79	

One Way ANOVA (F value=53.62) P value < 0.0001

Table 4.(A) shows that After applying one way ANOVA there was highly significant difference in ODI score between all groups i.e from preoperative, at 1 month and at 3 months postoperatively(p<0.0001)

Table 4 (B)Tukey HSD ("Honestly Significant Difference") Post-hoc test

	diff	CI	P value
Preoperative*post-op 1 month	-38.72	-49.11 to -28.32	<0.0001*
Preoperative*post-op 3month	-39.49	-49.88 to -29.09	<0.0001*
Post-op 1 month * post-op 3 month	-0.77	-11.16 to 9.62	0.98

*Highly Significant

Table 4(B) shows there was after applying Post HOC analysis highly significant difference was noted within preoperative ,post-op 1month and post-op 3 months respectively (p <0.0001) while no significant difference within post-op 1 month and post-op 3 months. A highly significant improvement in ODI score was observed post-operatively which sustained even after 3 months of surgery (p <0.0001).

DISCUSSION

In our study mean age of the study subjects was 38.13+/- 7.98 years with most of them were between 31-40 years of age (60%) and Most of the lesions were at L4-L5 levels (66.7%) followed by L5-

S1(33.3%).While Kang Q et al(7) also noted that the highest incidence of LDH at L4-5 and L5-S1 segments, with a 95% prevalence. LDH is a common and frequently occurring disease of the spine and is the most common cause of lumbocrural pain. Traditional concepts consider that LDH is a highly occurring disease in middle-aged and elderly populations. In recent years, due to the lifestyle changes of people, the incidence of LDH in young people has increased (7)(8) The main causes are increased pressure, pregnancy, contorted waist position, sudden weight-bearing, catching cold and dampness based on the retrogression of intervertebral disk(9)(10) .

Percutaneous Transforaminal Endoscopic Lumbar Discectomy (PTELD) is a minimally invasive technique for the treatment of lumbar foraminal or extraforaminal disc herniations .In PTELD, the posterolateral approach can be used to avoid the disadvantages of posterior open discectomy that are associated with its surgical route. We found that the success of PTELD was determined mostly by the ability of the endoscope and associated instruments to safely reach the target disc hernia, which is in the posterior part of the intervertebral disc and/or the epidural space. The location of the skin entry point is one of the most crucial key factors of a successful PTELD.

In present study, we assessed the outcome of patient satisfaction by MacNab score and ODI score was used for quantifying disability for low back pain. Over half of the subjects (53.3%) had excellent score followed by good score i.e. 33.30% at 1 month and 3 months respectively. Only 13.3% had poor score .No one had fair score.

Zhou Y et al (8) noted the postoperative MacNab score was excellent and good rate was 94.44% which was higher that our study. Kang Q et al (7) noted that the total percentage of excellent and good rates was 83.5%.Which was less than our study. Hua W et al(11) noted according to the MacNab classification system, 90.0% of the patients in the interlaminar group and 93.3% of the patients in the transforaminal group achieved an excellence/goodrating

In our study Visual analogue scale (VAS) taken for leg and back pain evaluation. We found that there was highly significant difference in VAS score between all groups and after applying Post HOC analysis highly significant difference was noted within preoperative and Immediate post-op, post-op 1motnh and post-op 3months respectively($p < 0.0001$) .A highly significant improvement in VAS score was observed post-operatively which sustained even after 3 months of surgery.

Zhou Y et al (8) also found differences in back pain and leg pain VAS scores before and after the operation were statistically significant ($P < 0.01$). Differences in back and leg pain VAS scores among 2 days, 6 months, and 12 months postoperatively were statistically significant ($P < 0.01$), while differences in back and leg pain VAS scores between 6 and 12 months postoperatively were also statistically significant ($P < 0.01$). Kang Q et al (7) also noted significant difference of VAS score before surgery with post-op 1 month and post-op 3 months and with las followup($p<0.05$). BAI J et al (12) noted VAS and JOA scores were identified within both groups from preoperative to 12 months following surgery ($P<0.001$). VAS and JOA scores were significantly improved in the PTEN group compared with the open surgery group at 1 week after surgery ($P<0.001$), but there was no significant difference between groups prior to and at 12 months following surgery. Hua W et al (11) noted mean postoperative VAS and ODI scores were significantly improved compared with the preoperative scores ($P<.05$). ODI score was taken and we found that there was highly significant difference in ODI score between all groups ($p<0.0001$) ,after applying Post HOC analysis highly significant difference was noted within preoperative ,post-op 1month and post-op 3 months respectively ($p <0.0001$). A highly significant improvement in ODI score was observed post-operatively which sustained even after 3 months of surgery ($p <0.0001$). Hua W et al (11) noted mean postoperative VAS and ODI scores were significantly improved compared with the preoperative scores ($P<.05$).

PTELD transforaminal approach achieves minimal traumatization, rapid rehabilitation, less intraspinal adhesions, and facilitation of revision operations (13)(14).While in the transforaminal approach group, full-endoscopic visualized foraminoplasty and discectomy were performed under visualization to guarantee complete decompression, ensure minimal traumatization, and prevent iatrogenic nerve injuries (15)(16)(17).

CONCLUSION

TPELD is less invasive than conventional posterior open discectomy. In experienced hands, TPELD is safe and comparably effective in treating LDH. To avoid the sequelae of posterior open discectomy, TPELD should be adopted as the first surgical treatment of choice.

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