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Comparison of open v/s microscopic tubular discectomy at single level lumbar or lumbosacral spine in prolapsed inter vertebral disc patients

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Introduction: Clinical outcomes of using microscopic tubular discectomy for lumbar or lumbosacral disc herniation were evaluated by comparison with open discectomy.

Materials and Methods: As per study criteria 32 patients with low back pain with unilateral radicular pain was included in this study. After admission of patients a detailed, careful history was taken. Patient was assessed clinically to evaluate general condition; vitals were recorded and spine examination was done and radiological assessment was also done.

Result: This study includes total 32 patients undergone microscopic discectomy (16pt) and open discectomy (16 pt). In this study results showed that using tubular microdiscectomyfor lumbar or lumbosacral disc herniation was more effective than open discectomy in improving visual analogue scale score (VAS) ($p<0.05$) and Oswestry Disability Index (ODI) ($p<0.05$).

Conclusion: Based on our study it was found that tubular microdiscectomy group has better outcomes than open discectomy group in terms of visual analogue scale score (VAS) and Oswestry Disability Index (ODI). current research suggests that tubular microdiscectomy can achieve clinical results similar to those of open discectomy.

Keywords: PIVD, Microdiscectomy, Tubular microdiscectomy, Open discectomy

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Introduction

Low-back pain is the leading cause of disability worldwide. It is the second most common symptom-related reason for seeking care from a primary care physician.[1] While low back pain rarely indicates a serious disorder, it is a major cause of pain, disability, and social cost. The lifetime prevalence is over 60%. The costs associated with low back pain include the direct cost of medical care and the indirect costs of time lost from work, disability payments, and diminished productivity.[2] The extent of chronic low back pain among Indian population is alarmingly high, with approximately 79% of women between 20 to 50 years suffering from chronic pain. Lower back pain alone affects around 80% of women compared to 59% of men.[3]

Intervertebral disc (IVD) degeneration is a major contributing factor for discogenic low back pain (LBP), causing a significant global disability.[4] It is a common joint disease of all orthopedic diseases. It is mainly caused by degenerative changes of the lumbar intervertebral disc; external forces; or nerves, horsetails and other nerves.[5] The PIVD consists of an inner core proteoglycan-rich nucleus pulposus (NP) and outer lamellae collagen-rich annulus fibrosus (AF) and is confined by a cartilage end plate (CEP), providing structural support and shock absorption against mechanical loads. Thus, changes to degenerative cascades in the PIVD cause dysfunction and instability in the lumbar spine.[6]

Patients exhibit back pain, lower limb radiation neuralgia and neurological dysfunction.[5] The relationship between lumbar disc prolapse and radicular pain was first described by Mixter and Barr. Mixter and Barr in 1932, described lumbar discectomy by which an L2 to S1 exploratory laminectomy led to removal of a "mass one centimeter in diameter" that was "pressing on the left fifth nerve root and displacing the cauda equina to the right". In 1934, they first published the surgical treatment of lumbar disc herniation (LDH). [6] However, first discectomy was done by Oppenheim and Fedre Krause in 1906 though the first publication was done by Mixter and Bar.[7]

Surgical treatment is well known to be beneficial for patients with LDH who fail to respond to conservative care.[8] Surgery is offered to patients with persistent leg pain that is refractory to conservative treatment. The open surgical technique has been described since the early 20thcentury. Since its introduction, alternative methods for operating disc pathologies have been developed.[9] With the continuous progress of microsurgery, the surgical techniques of LDH treatment have been developed rapidly. Later in 1977, Caspar and Yasargil first applied the conventional microdiscectomy (CMD) to the surgical treatment of LDH. [10, 11]

Newer techniques were developed with the objective of achieving less tissue trauma in a fast and efficient way. [9] The minimally invasive technique of transmuscular tubular discectomy (TD) was introduced in 1997 by Foley and Smith which is a procedure that combines spinal endoscopy and the techniques used in microdiscectomy.[12] Hence, with the introduction of the microscope, the original laminectomy was refined into microdiscectomy (MD).[9]

Material and method

The study was conducted at the Department of Orthopaedics at R.D. Gardi Medical College, Ujjain. This study was completed within two years after receiving approval from the ethics committee. This is a prospective observational study.

Written informed consent was obtained from all patients before enrolling them for the study. The patients admitted in the department of orthopaedics coming with a complain of lower back pain with radicular symptoms. were enrolled for this study as per the following exclusion and inclusion criteria.

Inclusion criteria was patients with unilateral back pain with radicular symptoms (pain, paresthesia weakness), lumbar or lumbosacral single level prolapsed intervertebral disc patients, patient not responding to conservative treatment for 6weeks and patients above 20years of age and of both genders.

Exclusion criteria was age less than 20 years, revision surgery, infection and bleeding disorders, more than one level involvement or bilateral symptoms, patients who are not fit for surgery, patient with dynamic instability and patients with congenital narrow canal, multilevel disc herniations, cauda equina syndrome, spondylolisthesis, central canal stenosis, pregnancy, and severe somatic or psychiatric diseases As per study criteria 32 patients with lower back pain with radicular symtoms was included in this study.

After admission of patients a detailed, careful history was taken. Patient was assessed clinically to evaluate general condition; vitals were recorded and detailed spine examination was done.

Radiological assessment was done to identify the level of herniation and preoperative routine investigation was done. By chit system 16 patients were placed in group A underwent microscopic tubular discectomy and remain 16 into group B underwent open discectomy.

Clinical outcomes were evaluated by Oswestry disability index (ODI) scores and visual analog scale (VAS) scores for leg and back pain. Back and leg VAS and ODI scores were assessed before surgery (preoperative), at the 6 weeks from surgery (postoperative), and subsequently at 1year.

Figure 1: A and B, pre op and post op SLRT

Figure 2: Intra op image of open discectomy from L4, L5

Figure: 3 A and B pre op and post op SLRT

Figure 4: A and B Microscopic tubular, discectomy, intraop image & disc material removed from L4L5

Results

Table 1: Comparison of mean ODI score of study subjects in two groups at different time intervals

Time -Intervals	Group	Mean	Std. Deviation	t value	p value
Pre-Op	Group A (microscopic discectomy)	39.00	12.52	2.451	.024*
	Group B (Open discectomy)	30.88	4.36		
6Weeks (post-op)	Group A (microscopic discectomy)	15.19	5.80	5.581	<0.001*
	Group B (Open discectomy)	15.94	3.21		
1yr (post-op)	Group A (microscopic discectomy)	3.43	0.77	5.226	< 0.0001
	Group B (Open discectomy)	10.37	5.25		

Table 1 shows comparison of mean ODI score of study subjects in two groups at different time intervals results revealed that preop mean ODI score was found 39.00 in group A and 30.88 in group B it was found **statistically significant** (P=0.024), At 6 weeks mean ODI score was found 15.19 in group A and 15.94 in group B it was found **statistically significant** (P<0.001) and after 1 year mean ODI score was found in 3.43 in group A and 10.37 in group B it was found **statistically significant** (P<0.0001) (Graph 4).

Table 2: Comparison of mean VAS score of study subjects in two groups at different time intervals

Time -Intervals	Group	Mean	Std. Deviation	t value	p value
Pre-Op	Group A (microscopic discectomy)	8.56	4.25	0000	1.000
	Group B (Open discectomy)	8.56	0.62		
6Weeks (post-op)	Group A (microscopic discectomy)	4.87	2.52	2.24	0.03*
	Group B (Open discectomy)	6.31	0.60		
1yr (post-op)	Group A (microscopic discectomy)	0.75	10.62	4.92	<0.001*
	Group B (Open discectomy)	2.37	1.14		

Table 2 shows comparison of mean VAS score of study subjects in two groups at different time intervals results revealed that preop mean VAS score was found 8.56 in group A and 8.56 in group B it was found **statistically non significant** (P=1.000), At 6 weeks mean VAS score was found 4.87 in group A and 6.31 in group B it was found **statistically significant** (P=0.03) and after 1 year mean VAS score was found in 0.75 in group A and 2.37 in group B it was found **statistically significant** (P<0.001) (Graph 2).

Discussion

Clinical outcomes were evaluated by Oswestry disability index (ODI) scores and visual analog scale (VAS) scores for leg and back pain. Back and leg VAS and ODI scores were assessed before surgery (preoperative), at the 6 weeks from surgery (postoperative), and subsequently at 1year.

For Oswestry disability index (ODI), the patient checks the statement of the index and decides which most closely resembles their situation. Each question is scored on a scale of 0–5 with the first statement being zero and indicating the least amount of disability and the last statement is scored 5 indicating most severe disability.

The scores for all questions answered are summed, then multiplied by two to obtain the index (range 0 to 100). Zero is equated with no disability and 100 is the maximum disability possible.[10] The comparison of the average ODI scores of the study subjects in two groups at different time intervals was statistically significant with lower values in the open discectomy group.

The preoperative average ODI score was 39.00±12.52 in group A (microscopic tubular discectomy) and 30.88±4.36 in group B (open discectomy) (p=0.024); at 6 weeks, the average ODI score was 15.19±5.80 in group A (microscopic tubular discectomy) and 5.94±3.21 in group B (open discectomy) (P<0.001).

After 1 year, the average ODI score was 3.43±0.77 in group A (microscopic tubular discectomy) and 10.37±5.25 in group B (open discectomy) (p<0.0001). **Zhang et al[11]** pooled analysis included four randomized controlled studies with a total of 523 patients they reported ODI score of tubular microscopic disectomy was more better than conventional discectomy patients.

Gupta P12 they operated 130 patients with open discectomy and 120 patients with microscopic tubular discectomy there was great reduction in ODI score in microscopic tubular discectomy patients as compare to pateints underwent open discectomy at 4weeks but at 1 month both are comparable. **Yasseen MA13** divided patient in two groups total of 40 patient with single level lumbar disc herniation. 20 patients underwent open discectomy and 20 patients underwent microscopic tubular discectomy.

The study reported statistically significant decrease in mean total ODI score was recorded in microscopic discectomy as compare to open discectomy. **Hamawandi SA et al14** out of 60 patients (group A = open discectomy & group B = microdiscectomy) the ODI preoperatively and postoperatively through all periods of assessment in both groups A and B, there is significant deference which means that both methods of treatment are effective in achieving excellent functional improvement for patients with symptomatic lumbar disc herniation.

The difference of the VAS score between the open discectomy group and microscopic tubular discectomy treatment group was found to be statistically significant post- operatively with lower values in the open discectomy group. The mean VAS score was found 8.56 in group A (microscopic tubular discectomy) and 8.56 in group B (open discectomy) pre-op (p=1.000), post-op at 6 weeks was 4.87 in group A (microscopic tubular discectomy) and 6.31 in group B (open discectomy) (p=0.03) and after 1 year was in 0.75 in group A (microscopic tubular discectomy) and 2.37 in group B (open discectomy) (p<0.001).

Gupta P12 they operated 130 patients with open discectomy and 120 patients with microscopic tubular discectomy there was greater reduction in VAS score in microdiscectomy as compare to open discectomy but at 1 month both are comparable. **Hamawandi SA et al14** out of 60 patients (group A = open discectomy & group B = microdiscectomy) they reported that there was significant difference in post-operative VAS score between open discectomy and microscopic discectomy patients. **Li, Xianbo MDa et al15** the pooled analysis where 8 randomized controlled trials and 2 retrospective studies were included and 804 patients were evaluated. they reported no significant difference between conventional discectomy and tubular microscopic discectomy. **Overdevest GM et al16** double-blind randomised controlled trial done where 325 patients with a symptomatic lumbar disc herniation were randomly allocated to tubular discectomy (166 patients) & conventional microdiscectomy (159 patients). Mean differences for VAS leg pain and back pain were 0.2 (95% CI -5.5 to 6.0) and 0.4 (95% CI -5.9 to 6.7), respectively. 77% of patients allocated to conventional discectomy reported complete or near-complete recovery of symptoms compared with 74% of patients allocated to tubular discectomy (p=0.79). **Hermantin FU et al17** out of 30 patients they reported that patients managed with open laminotomy and discectomy used narcotics for a longer duration postoperatively than patients managed with microdiscectomy.

Conclusion

To conclude, our study found visual analog scale (VAS) for pain & Oswestry Disability Index (ODI) scores were better in microscopic tubular discectomy than open discectomy. Thus, both the methods are safe and effective and surgeon needs to decide taking into consideration patient associated factors.

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