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Orthopaedics

CLINICAL AND FUNCTIONAL OUTCOMES OF TUBULAR DISCECTOMY: A STUDY OF 60 CASES

Dr Himanshu N Parmar	MS Orthopaedics Assistant Professor of Orthopaedics, P.D.U. Medical College, Rajkot, Gujarat.
Dr Jay V Turakhiya*	MS Orthopaedics Assistant Professor of Orthopaedics, P.D.U. Medical College, Rajkot, Gujarat. *Corresponding Author
Dr Kushal C Zala	MS Orthopaedics Senior Resident in Orthopaedics, P.D.U. Civil Hospital, Rajkot, Gujarat
Dr Kunjal J Patel	MS Orthopaedics Junior Resident in Orthopaedics, P.D.U. Medical College, Rajkot, Gujarat.
Dr Anant Prajapati	MS Orthopaedics Senior Resident in Orthopaedics, P.D.U. Civil Hospital, Rajkot, Gujarat

ABSTRACT **Objectives:** Various types of minimally invasive techniques have been developed for the treatment of lumbar disc herniation. The original laminectomy was refined into microdiscectomy and now into tubular discectomy and endoscopic discectomy. This study aimed to evaluate the immediate postoperative to 6 months outcomes of patients undergoing tubular discectomy using a simple tubular dilator system and 2.5x binocular loupe. **Materials and Methods:** 60 patients were operated with tubular discectomy at PDU Hospital, Rajkot which is a tertiary level center between June 2021 to December 2021. They were studied for the following data: Baseline characteristics, Visual analog scale (VAS) for leg pain and post operative back pain, Modified Oswestry Disability Index (ODI) scores, length of hospital stay, time taken to return to work, duration of surgery, intra- and post-operative complications, and reoperation rates. **Results:** The VAS score for leg pain, post-operative back pain, and Modified ODI scores showed improvement during the 6 Months after Surgery. Mean ODI score improved from 64.18 to 24.04 at 1 month and 19.38 at 6 months follow-up and Mean VAS score improved from 8 to 3.23 at 1 month and 2.72 at 6 months follow up .Time taken to return to work and mean hospital stay was shorter. The mean duration of surgery was shorter with less blood loss. **Conclusion:** This study revealed that the rate of recovery is significantly faster for tubular discectomy , Shorter hospital stay, less blood loss with fewer complications.

KEYWORDS :

INTRODUCTION

Sciatica or lumbosacral radiculopathy is usually caused by disc herniation.[1] Mixter and Barr first described the relationship between lumbar disc prolapse and radicular pain. Surgery is offered to patients with lower back pain with unilateral radicular pain that is refractory to conservative treatment.[2],[3],[4] The open surgical technique has been described since the early 20th century. Since its introduction, alternative methods for operating disc pathologies have been developed.[5],[6],[7],[8],[9] Typically performed for a herniated disc, Tubular discectomy relieves the pressure on a spinal nerve root by removing the material causing the pain. During the procedure, a small part of the bone over the nerve root and/or disc material under the nerve root is taken out. Newer techniques were developed to achieve less tissue trauma in a fast and efficient way. With the introduction of the microscope, the original laminectomy was refined into microdiscectomy. Microsurgical discectomy could be used in all types of disc herniations. It did not prolong the operation time, and the overall rate of complications was not increased. Microdiscectomy gained progressive popularity, as it achieved an equivalent success rate to open discectomy.[10]In recent times, the evolving enthusiasm surrounding minimally invasive techniques in spinal surgery resulted in the evolution of various percutaneous procedures.[5],[11]

Subsequently, other minimally invasive techniques are involved. In 1997, Foley and Smith [12] introduced the minimally invasive technique of transmuscular tubular discectomy (TD) which is a procedure that combines spinal endoscopy and the techniques used in Microdiscectomy. The advantages of minimally invasive techniques include a smaller incision, less perioperative pain, early ambulation, short hospital stay, and early return to work.[13],[14]However, Tubular discectomy has a learning curve in which proper placement of dilators, recognition of anatomy, and the use of instruments through the tubular retractors are some of the challenges that must be overcome.[15],this study aimed to evaluate the outcomes including clinical effectiveness, complication rate, and return to work in patients undergoing Tubular discectomy. We also aim to evaluate, analyze, and quantify the learning curve, complication rates, and clinical results of tubular discectomy.

MATERIALS AND METHODS

This prospective study included 60 patients with lumbar disc herniation with symptoms of unilateral radicular pain admitted in the Department of Orthopedics, PDUMC Rajkot. Inclusive criteria were Patients between the ages of 18 and 60 years with unilateral lower limb radicular pain due to single level lumbar disc herniation, lasting more than 6–8 weeks and refractory to conservative treatment. Exclusion criteria were patients with bilateral lower limb radiculopathy, congenital narrow canal, multilevel disc herniations, cauda equina syndrome, central canal stenosis .[2],[17]A prospective study was carried out on patients admitted and operated at PDU hospital, Rajkot which is a tertiary level center between June 2021 and December 2021 revealed 60 cases. Of these, 38 were female cases and 22 were male cases which were studied over 6 months To evaluate the learning curve, operative time period, complication, and failure, rates. Once the patient is admitted age, sex, comorbidity, duration of symptom ,pre procedure blood investigations, x-rays and MRI were done. The surgery is performed utilizing general anesthesia. Preoperative single shots of intravenous antibiotics are given.

Patients are positioned in the Prone position with special padding and supports. 18 gauge needle is inserted 1 to 1.5 cm away from the midline (1 cm in L4-L5,1.5 cm in L5–S1), in lateral view needle should be placed at pathological disc level, after confirmation of level we put 22-28 mm skin incision on paraspinal skin and subcutaneous tissue. first of all 4 m,m ST pin is inserted at the center of the affected disc under C-ARM guidance until the tip of the ST pin touches the junction of the inferior border of the superior lamina and facet joints. Over that ST pin, we sequentially introduce multiple dilators with a diameter of the last dilator would be 22 mm, over that dilator we introduce handheld tubular retractors. Discectomies were then performed with aid of an operating microscope by performing a unilateral laminotomy, removing the overlying ligamentum flavum, mobilizing the affected nerve root, and removing herniated disc material . The total surgery time is approximately 1 hour. After the operative procedure Case will be followed for 15 days,1 month , 3 months and 6 months for pain relief.Data analysis was done using Visual Analog Scale (VAS) and Modified Oswestry Disability Index (ODI) score. Follow-up data were obtained during follow-up outpatient department visits, and physiotherapy records. The variables that were analyzed included length of hospital stay, estimated blood loss, and operating time, time

to return to work. The variables that were recorded for complications included cerebrospinal fluid (CSF) leak, residual disc requiring reoperations, infection, and neurological injury.

RESULT:

In this study, 60 patients were operated with Tubular discectomy and clinical and functional outcome were assessed with Visual analog scale (VAS) and Modified Oswestry disability index(ODI). There was Excellent relief in the postoperative back pain and other disabling complaints on 15 days follow up in 52 patients. There was further improvement in the symptoms on 1 month follow up with Mean modified ODI of 24.04 and Mean VAS of 3.23 which further improved at 3months and 6 months follow up. At 6 months Mean ODI score is 19.38 ,which is less then 20 suggestive of minimal disability and Mean VAS score is 2.72 which is less then 3 suggestive of minimal pain. Among the other 8 patients, 6 patients had moderate relief of symptoms at 1 month follow up, in which there was further improvement with help of physiotherapy and life style modifications. And other 2 patients reported minimal to no pain relief at 1 month follow up which may require further investigation and follow up.

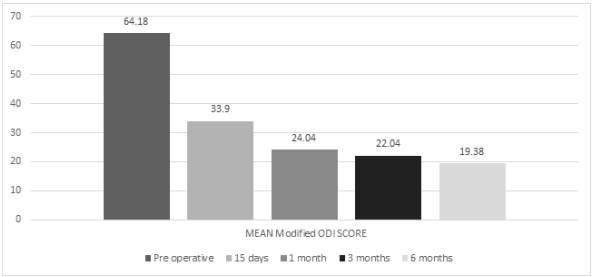
Tubular discectomy group

Table 1: Table suggests the Mean modified ODI score and its standard deviation of 60 patients at pre-operative and follow up at 15 days, 1 month,3 months and 6 months.

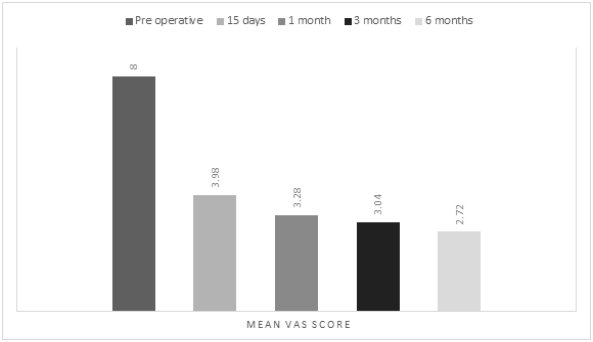
	Preoperative	15 days	1 month	3 months	6 months
Mean Modified ODI score	64.18	33.9	24.04	22.04	19.38
Standard deviation(SD)	7.12	10.25	14.16	15.09	15.38

Table 2:Table suggests the Mean VAS scale and its standard deviation(SD) of 60 patients at preoperative and follow up at 15 days, 1 month,3 months, and 6 months.

	Preoperative	15 days	1 month	3 months	6 months
Mean VAS score	8	3.68	3.23	3.04	2.72
Standard deviation(SD)	0.89	1.53	1.66	1.72	1.85



Graph 1: suggests the Mean modified ODI score of 60 patients at preoperative and follow-up at 15 days,1 month,3 months, and 6 months.



Graph 2: suggests the Mean VAS score of 60 patients at pre-operative and follow up at 15 days, 1 month,3 months, and 6 months.

In this study according to Modified ODI score by calculating the pre-operative and 6 months follow-up score the t–value is 18.43 and p-value is < 0.00001 and the result is significant at p-value <0.05. According to the VAS score by calculating the pre-operative and 6 month follow up score the t–value is 19.93 and p-value is <0.00001 and the result is significant at a p-value of <0.05.

Perioperative factors

Average surgical time was longer in early tubular discectomy cases (125 min) but decreased over time. Average blood loss was significantly less (50 ml). The length of the incision as measured from the surgical scar was an average of 1.5 to 2 cm. In last 10 of our patients, the Average hospital stay was 1 to 2 days.

Complications

The main perioperative complication was a dural tear. There were five cases which is less than 10 percent and difference was not significant. Postoperative complications encountered were mainly residual disc and wound infection. A residual disc requiring reoperation was seen in 1 patient. Wound infection was observed in 1 case. There was no case of wound hematoma or urinary tract infection.

DISCUSSION

Tubular discectomy is a minimally invasive approach for treatment of lumbar disc herniation. Various surgical techniques have been used for lumbar disc herniation and tubular microdiscectomy is a recently advanced surgical technique. This study described the clinical and functional outcome of tubular microdiscectomy.

Study design

This study is a prospective study of 60 cases, it includes data collected at the time of admission, discharge, and recent follow-up.

Perioperative factors

We observed significantly less operative time, blood loss and the number of IITV shoots.[15],[18],[27],[28]

Outcome

The study proved equal efficacy in reducing radicular pain as highlighted by other surgical techniques such as open discectomy and microdiscectomy [15],[18],[27],[28],[31] However, there was a greater reduction in postoperative back pain in tubular discectomy. The reason could be less tissue trauma due to dilation and thus preservation of the paraspinous muscles.[34] An Electromyography study done by Schick is a proof of the phenomenon.[30] Brock [33] reported less consumption of post operative analgesic in patients operated by transmuscular technique. Return to work was faster in Tubular discectomy, and the value became significant as our experience in the technique increased. Hospital stay in tubular discectomy was less (Avg 2 to 3 days).

Complications

Perioperative complications, the majority of which constituted dural tears and postoperative complications, mainly residual disc were more in tubular discectomy but decreased as we gained experience (1.85% in tubular discectomy. Various studies have reported the occurrence of dural tear in 4–20% in tubular discectomy [35],[36] . We also encountered a higher number of residual disc requiring revision surgeries and dural tears in our earlier cases, but as the experience of tubular endoscopic discectomy went through, the percentage started decreasing.[37] The management of dural tears, on the other hand, is simple in Tubular discectomy cases as they did not require any closure or application of fibrin glue. We kept such patients on bed for 3 days. None of our patients complained of a headache or postoperative meningocele. Soon after the tubular retractor is removed (within 5–10 min), the tissues fall back, and the small gap is closed so well that there is no space for CSF to accumulate.

Learning curve

Tubular discectomy techniques involve overcoming a steep learning curve.[16],[37] In this study, we have tried to analyze our learning curve by comparing our first 34 cases with the late 26 cases. Mcloughin et al.[38] and Wang et al. concluded that 15 cases are required to achieve the learning curve in endoscopic discectomy. However, Mcloughin in his study had only evaluated operating time and Wang observed the operating time and complications. In our study, we have considered operating time, blood loss, hospital stay, return to work, peroperative and postoperative complications in Tubular discectomy. There was a significant reduction in operative time, blood loss, time to return to work and less hospital stay. The incidence of residual disc decreased with experience. In our late cases, The field of view through the endoscope is limited which makes it difficult to expose and decompress the nerve root.[12],[14],[16] As we gained experience, even residual discs, initially operated by open or endoscopic discectomy were managed through tubular access.

CONCLUSION

The technique of Tubular discectomy for symptomatic lumbar radiculopathy is a safe and an effective procedure and is better in terms

of reduced postoperative back pain, blood loss, shortened hospital stay, and faster return to work. There is, however, a significant experience-related learning curve in terms of complication rate and operative time. To avoid these complications, it is recommended to have extensive experience in conventional open procedure before attempting this technique. Meticulous attention must be paid toward accurate anatomic positioning, careful dissection, and manipulation of the nerve root and disc material, and hemostasis. Despite the learning curve, tubular discectomy is an effective option in the treatment of lumbar disc herniation in the appropriately selected patient.

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