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Endoscopic Treatment of Lumbar DISC Prolapses with Posterior Approachs

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Abstract

Introduction: Standard surgical technique is the posterior approach discectomy. The use of an endoscope allows the same entry port and surgical technique used on vertebral canal and disc while at the same time reducing the skin incision. *Aims*: Aimed to studyendoscopic lumbar discectomy for a surgeon naive to endoscopic surgery but trained in open microdiscectomy. *Materials and methods*: This was a prospective study done in department of neurosurgery in patients who had acute onset of symptoms like low back pain with sciatica which is unilateral and whose clinical examination showed signs of definitive radiculopathy and MRI showing sequestered disc prolapse at that corresponding level.We have done 40 cases of endoscopic discectomy using a conical freehand working channel . We divided the 40 cases into 20 each, the first 20 cases represent learning curve and the next 20 post learning curve. *Results*: Patients who had undergone endoscopic discectomy were 40 among them 26 patients were male and 14 patients were females. All patients were between 20-65 years of age and the mean was 39.57.The most common level operated was L4-L5(31) followed by L5-S1(08). We have operated double level in one patient at L4-L5 and L5-S1. Initial 20 cases the mean duration was 58.8 minutes and it was significantly reduced to 31.55 minutes in our last 20 cases. The mean duration for all 40 cases in our series was 45.17minutes. Mean blood was 18.1ml. Mean hospital stay in our first 20 cases was 3.75 days and in our last 20 cases it was 3 days. The mean hospital stay taking in to account of all 40 cases in our series was 3.37 days or 80.8 hours.our study the mean duration to return to work was 19 days.10% of cases had complications, among them one patient had nerve root injury, 2 patient had Dural tear, and in 1 patients pain dint subside and he underwent redo open laminectomy. In our study 85% patients had excellent outcome and 2.5 patients had poor outcome. *Conclusions*: Endoscopic discectomy is a minimally invasive procedure with less tissue disruption to achieve the results of the traditional surgery.

Keywords: Lumbar disc prolapses; Endoscopic discectomy; Mean blood loss.

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Introduction

Percutaneous lumbar nucleotomy as a minimally invasive procedure for lumbar disc herniation. Percutaneous lumbar disc surgery evolved including percutaneous using automatic disc removal devices, spinal endoscopy, and laser. These procedures used posterolateral or paraforaminal approach, and the indications for these producers have been limited to contained lumbar disc herniation's. Furthermore, they have not proven to be as effective as standard open lumbar discectomy, because of longer duration of surgery and some technical problems in inscribe all the different aspects of lumbar disc diseases.

Microendoscopic discectomy was done using endoscopeand tubular retractor system. The muscle retracting posterior approach reduces the siteapproch comorbidity and the endoscope may yield visualization beyond the confines of the tubular

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retractor. Most of the surgeons prefer the METRx whichconcede the surgeons to operate under direct vision through the microscope. However, once this endoscopic technique is mastered, the modularity of the endoscopic discectomy system allows for the development of expanded applications beyond lumbar nerve root decompression.[1]

Endoscopic discectomy is minimally invasive maneuver for lumbar disc surgery. The tubular retractor system allows muscle traumaor reduced tissue , and the endoscope can provide a wide and clearvisualization of the usable field beyond the confines of the tubular retractor. However, there is a steep learning curve associated with using the endoscopic operating system efficiently and safely.[2]

Surgeons have been doing regular laminectomy and discectomy for all kinds of lumbar disc prolapse, subsequently when the disc prolapse was on one side with the symptoms and sings presenting towards the same side surgery was refined to one side muscle dissection and followed by hemilaminectomy and discectomy. Subsequent development in microneurosurgery made incision smaller in size followed by fenestration / microdiscectomy using microscope. With the advent of endoscope in surgical fields surgeons were able to use this endoscope effectively in removing the disc.[3]

The use of endoscope allows the same entree port and the same surgical technique to be used on the vertebral canal and disc while at the same time reducing the skin incision and overall access port. The advantages of this technique are the same as those for microdiscectomy but early return to previous activity, reduced size of incision, reduced hospital stay isan added feature.

We have done 40 cases of endoscopic discectomy using a conical freehand working channel . We divided the 40 cases into 20 each, the first 20 cases represent learning curve and the next 20 post learning curve and compared our result with other published series.

Materials and Methods:

This was a prospective study conducted in department of neurosurgery in patients who had acute onset of symptoms as low back pain which is unilaterial with sciatica and whose clinical examination showed signs of definitive radiculopathy and MRI showing sequestered disc prolapse at that corresponding level were included in to study protocol.

We have excluded the patients with spondylolysis with listhesis with disc prolapse, lumbar canal stenosis with disc prolapse, old age with severe sings of degeneration (bone, disc, Ligamentum flavum). We have also excluded patients with bilateral symptoms and sings and MRI showing bilateral root compression. Hence our selection for endoscopic discectomy was a straight forward, unilateral sings or two level sequestrated and large contained discs.

Of the 40 cases operated, 39 were single level discs and one was a double level disc. In a span of 3 years from 2015 to 2018 we have done 40 cases of disc removal using endoscope. Among the cases which had met the Criteria for using the between 20-65 years. Clinically patients were examined to confirm the radicular involvement. We have reeled out the signs of Lumbar canal stenosis in the form of claudication and also ruled out lysis or listhesis clinically by absent low back pain in flexion, extension and step sign.

Ethics committee of this institution approval was obtained prior to the commencement of the study. The investigative procedures for all the patients included, X-ray lumbosacral spine AP, Lateral, MRI Lumbosacral spine and CT scan Lumbosacral spine. X ray lumbosacral spine had been useful to find out transitional vertebrae so as to help us to localize exactly during surgery. It had also been helpful to identify lysis, listhesis, or any other bony involvement. CT scan had been useful to rule out lumbar canal stenosis and MRI Lumbosacral spine to identify the sequestrated disc and root compression.

After obtaining anesthetic fitness, surgery was done under General anesthesia. We followed Destandau's procedure using Storz Endoscopic discectomy system. Each of the channels will not interfere with other as there is 6 degrees angulation of all channels

Procedure:

After localization of the disc, determination of the point of incision and direction of approach to the disc, a skin incision between 10 to 15mm is made, depending on the patient's corpulence. Transection of the aponeurosis using scissors and disinsertion of the paravertebral muscles is done. Insertion of the Endospine operating tube, retracting the obturator, cleaning the window using disc forceps, positioning of the working insert with introduced telescope and continuation of the intervention under video endoscopic control is followed.

The positioning of the endoscope close to the vertebral canal allows a panoramic view and the localization of the migrated fragments. Depending on the case, microdiscectomy is carried out using disc punch. The cavity is then irrigated, and haemostasis generally achieved simply by packing or by bipolar coagulation. After removal of the endoscopic instruments, careful haemostasis of the muscle masses can be carried out. Intracutaneous sutures are applied followed by water impermeable dressing allowing showering and immediate rehabilitation.`

Learning Curve

A learning curve must contain a starting point (normally the first case), a learning rate (with increasing performance on patient outcome), and an asymptote when the expert level (here, 90%) is reached.

We designed an algorithm to analyze the patient outcome and to determine the case number at which the "expert" rate of 90% of successful results was reached. We chose this rate of success, because the rate accepted as equivalent to the inventor's technique in the literature is 91.2%:[1,2]

$$\frac{Y=100\times[N-M(N)]}{N}$$

where Y =% successful results for N cases, N = number of cases (here, 1–40), and M(N) = the sum of fair and poor cases within N cases. It can be interpreted as a cutpoint within the total number of cases, T = 40. The algorithm runs iteratively for N = 1,2,3 … T, calculating for each N the success rate Y Res of all the cases following the dividing point N, while ignoring the cases previous to N and N itself.

$$Y_{Res}(N)= \frac{1-M_{Res}}{N_{Res}}$$

Where M Res = the sum of fair and poor cases after N, N Res = the sum of all cases after N, and Y Res = success rate as a percentage.

Results

In our series number of patients who had undergone endoscopic discectomy were 40. Among them 26 patients were male and 14 patients were females.

All patients were between 20-65 years of age and the mean was 39.57.The most common level operated was L4-L5(31) followed by L5-S1(08). We have operated double level in one patient at L4-L5 and L5-S1.

All patients were followed up regularly on 10 post-operative day, 1 month, 3 months and one year. Since the procedure is technically demanding, it took initial 20 cases to complete our learning curve and the next 20 cases we improved our technique, reduced operating time, reduced blood loss, and improved outcome. So we have compared our results in the first 20 cases and last 20 cases.

Mean hospital stay in our first 20 cases was 3.75 days and in our last 20 cases it was 3 days. Mean hospital stay in our last 20 cases was 3 days as one patient required resurgery as pain did not subside and had to stay in hospital for 12 days. If we exclude the patient who had resurgery our mean hospital stay drops to 2.52 days in the last 20 cases.

Mean duration of surgery in the first 20 cases was 58.8 minutes and in our last 20 cases it was 31.55 minutes. Mean blood loss during the first 20 cases was 21 ml and in our last 20 cases was 15.35 ml.

Modified Macnab's criteria[4]

Excellent: free of pain; no restriction of mobility & return to normal work.

Fair: some improved functional capacity; still unemployed and or handicapped.

Poor: continued objective symptoms of root involvement; additional operative intervention needed at index level irrespective of operative time of length of post op stay.

34 patients had excellent outcome, 4 patient had good outcome, 1 patients had fair outcomes and 1 patient had poor outcome.

Learning curve has been averaged and the shaded box (cases 67–85) is placed where the learning curve oscillates around the 90%-successful line. Any case taken from this area could represent the end of the learning curve.

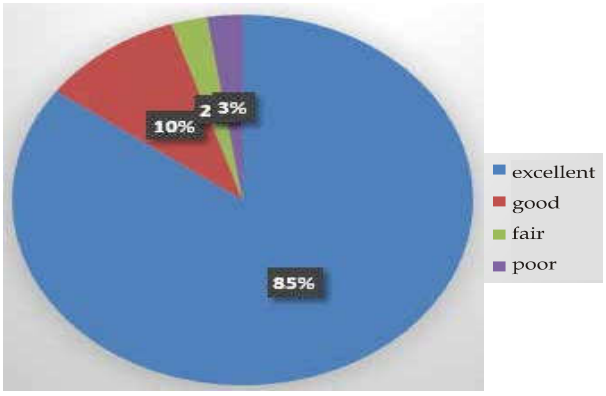
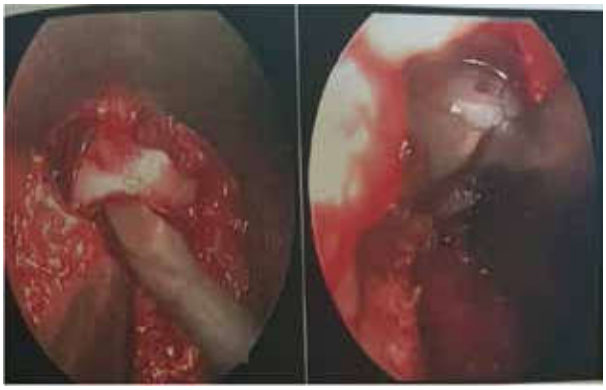


Fig. 2: Cases in present study

a) Nerveroot is visualized after discectomy



b) Dura is retracted laterally to visualize the extruded disc

c) Removal of disc with punch and cottonoid is to contrl epidural bleed

d) Representative MRI picture

Fig.1: According to modified Macnab'scriteria out come in study

Discussion

Endoscopic discectomy is one of the treatment modality for lumbar disc disease and it is an alternate for traditional microscopic lumbar discectomy. We have compared the following results with other published series. Mean operative duration, Blood loss during surgery, Mean hospital stay, Time taken to return to work, Learning curve, Complications, Revision surgery and Reoccurrence.

The mean operative duration in Wu X et al.[5], series was 75 +- 26 minutes in their early 220 patients and it was significantly reduced to 49+-21 minutes in their last 653 patients. In Nakagawa Y et al.[6], series the mean duration for MED was 95.3 minutes. Zhang C et al.[7], reported 64.77+-17.83 as mean duration. Amit J et al.[8], reported 70 min as mean duration. In our series in the initial 20 cases the mean duration was 58.8 minutes and it was significantly reduced to 31.55 minutes in our last 20 cases. The mean duration for all 40 cases in our series was 45.17minutes.

The mean blood loss in Wu X et al.[5], series was 44ml and in Nakagawa Y et al.[6], was 67.5 ml. In Zhang C et al.[7], series it was47.5+-11.62 ml. In our series the mean blood loss in the initial 20 cases was 21 ml and it was significantly reduced to 15.35 ml in our last 20 cases. We have used adrenaline soaked gauzes during paraspinal muscle separation and we kept adrenaline soaked gauzes for few minutes before placing the Endoscopic discectomy system. The mean blood in all 40 patients in our study was 18.1 ml.

The mean hospital stay in Wu X et al., series was 4.8

days and in Perez-Cruet MJ et al.[9], series it was 7.7 hours. In our series, the mean hospital stay in our first 20 cases was 3.75 days and in our last 20 cases it was 3 days. The mean hospital stay taking in to account of all 40 cases in our series was 3.37 days or 80.8 hours.

The average days taken to return to work in Wu X et al.[5], series was 15 days and in Perez-Cruet MJ et al.[9] series it was 17 days. DestandauJ 10, who has reported the largest MED series in the world, reported 4 weeks as the average duration taken to return to work. In Amit J et al.[28], it was 21 days. In our series the mean duration to return to work was 19 days.

In Wu X et al.[5], series 5.3% of the patients had significant medical complications and 20 patients underwent redo surgery. Perze-Cruet MJ et al.[9], reported 5% of the patients in his early cases had significant medical complications. In Nakagawa Y et al.[6], series 4% of the patients had complications and 12 patients underwent redosurgery. DestandauJ 10, reported 10.6% of his patients had significant medical complications and 44 patients underwent redosurgery. Amit j et al.[8], had reported a complication rate of 5 %. In our series 10% of cases had complications, among them one patient had nerve root injury, 2 patient had Dural tear, and in 1 patients pain dint subside and he underwent redo open laminectomy.

The Endoscopic discectomy procedure requires a steep learning curve and it required 20 cases for us to complete it with 15% conversion rate. Nakagawa Y et al.[6], reported in their series as it required 30 cases for them to complete the learning curve.

In the outcome assessment according to Modified macnab criteria In Wu X et al.[5], series 74% patients had excellent outcome, 19% patients had good outcome, 3% had patients had fair outcome, 4% patients had poor outcome. In Perez-Cruet MJ et al.[9], series 77% outcome and 3% patients had poor outcome. Ranjan A et al.[11] reported in their series as 71.6% patients had excellent outcome, 20.7% patients has good outcome, 4.7% patients had fair outcome and 2.8% patients had poor outcome. In DestandauJ 10, series 95.3% patients had excellent outcome, 0.58% patients had good outcome, 0.09% patient had fair outcome and 3.89% patients had poor outcome. In Amit J et al.[8], series 78% patients had excellent outcome, 13% had good outcome, 5% had fair outcome and 4 % had poor outcome. In our series 85% patients had excellent outcome, 10% patients had good outcome, 2.5% patients had fair outcome and 2.5 patients had poor outcome.

Based upon Sasaoka R et al.[12], Chao Z et al.[13] , Huang TJ et al.[14], and Schick U et al.[15], series the magnitude of tissue damage and surgical trauma response in MED are significantly lower than traditional lumbar disc surgeries. Sasani M et al.[16], reported as the MED procedure can be considered as a safe alternative for extraforaminal disc migration. Le H et al.[17], and Isaacs RE et al.[18], reported as it is also a treatment modality for recurrent lumbar disc herninations.Perez-Cruet MJ et al.[9], retorted a reoperation rate of 3%. Amit j et al.[8], reported a reoperation rate of 4% and in our series reoperation rate is 2.5%.

An advantage of percutaneous endoscopic lumbar discectomy is that local anesthesia can be used as was described by Choi et al.[19] The benefits of local anesthesia are reduced morbidity compared with general anesthesia and the ability of surgeons to continually communicate with the patient, thus avoiding the risk of nerve damage during insertion of the working sheath.[19,20]

These complications are notunusual because of high cervical epidural pressure on meninges due to huge amounts of saline irrigation fluid.[21] Minimal instrumentation and injury to the ligamentum flavum is a wherewithal benefit of endoscopic discectomy. About 5–12 % of failed back syndrome is caused by epidural fibrosis in patients who underwent lumbar disk surgery.[22] Reduced trauma to the ligamentum flavum appears to limit epidural fibrosis.[23] In standard open microscopic discectomy, about the same amount of the ligamentum flavum is removed as with laminotomy.

Conclusion

Endoscopic discectomy is a minimally invasive procedure with less tissue disruption to achieve the results of the traditional surgery. It has a learning curve but once expertise the results of this procedure are acceptable, safe and effective. Early mobilization of the patient on the same day is feasible. Intra operative blood loss is negligible, no drain required, post-operative pain is less due to less tissue dissection, Hospital stay is less, Can be done as day care surgery, early return to work is possible, hospital expenditure is minimized, no postoperative orthosis required, education in morbidity and innovative and offer alternative to more extensive procedures Endoscopic discectomy is also considered as an alternative procedure for extraforaminal disc herniations. Endoscopic discectomy in properly trained hands is an additional efficient armamentarium in the management of lumbar disc disease. Endoscopic procedure is being

extended to resection of spinal cord tumours also.

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