

INTERLAMINAR ENDOSCOPIC DISCECTOMY: MINIMALLY INVASIVE PROCEDURE, A SERIES REPORTSomashekar¹, R. Yatish², J. N. Sridhara Murthy³, Ranganath⁴, Nikhil⁵, Lohith⁶**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: BACKGROUND: The upright posture of humans throws enormous stress on spine, particularly during flexion and is responsible for many structural causes of backache such as lumbar disc prolapsed. Various modalities of surgical management are available for intervertebral disc prolapsed, but posterior interlaminar endoscopic approach has minimal stripping of paraspinal muscles, enhanced visualization due to better magnification and illumination, shorter hospital stay, and faster recovery time. **METHODS:** Total of 64 patients with lumbar intervertebral disc herniation were operated between 2008 and 2013 with endoscopic discectomy after localization of symptomatic level. The results were evaluated by Oswestry Disability index score. **RESULTS:** At final follow-up results were, excellent 60%, Good 20%, Fair 16.7% and Poor in 3.3%. **CONCLUSION:** Open discectomy has been standard procedure of choice. Interlaminar endoscopic discectomy is a safe supplement for open discectomy which offers minimal trauma, better visualization intra operatively with less hospital stay and early mobilization and early return to work.

KEYWORDS: endoscopic discectomy, endospine.

INTRODUCTION: Back pain is the main reason for which people less than 45 years of age limit their physical activities.^{1,2} The upright posture of humans throw enormous stress on spine, particularly during flexion and is responsible for many structural causes of backache such as lumbar disc prolapse.³ The term disc prolapse is defined as extrusion of nucleus pulposus through a rent in annulus fibrosus.⁴

The problem of IVDP is of great importance in this part of world because of the fact that people in this part are subjected to various physical stress either due to their living habits, low socioeconomic status with manual work (labor), or are subjected to live or work in places with poor infrastructure.³

Open interlaminar approach access has been used for discectomy since the early 20th century. Even if good results are obtained with conventional disc surgeries, they may result in subsequent damage due to trauma.⁵ Endoscopic technique has become standard in many areas because of the advantages they offer intraoperatively and minimizing traumatization and its negative long term consequences.⁶

This study is taken up to use newly developed optics and instruments to achieve sufficient neuronal decompression as well as to study the advantages and disadvantages of minimally invasive procedure.⁶

MATERIALS AND METHODS: A total of 64 patients suffering from different type and level of lumbar disc herniation with radiculopathy and degenerative lumbar canal stenosis were operated between 2008 and 2013, 64 patients who met following inclusion criteria were evaluated.

Inclusion Criteria:

- Pain not responding to conservative management.
- Positive nerve tension signs.
- Pain and neurological symptoms increased during conservative care.
- Diagnosis confirmed with MRI (Figure-1).
- Disc involvement not more than 2 spaces.
- Both sexes are included.

Exclusion Criteria:

- Age less than 20 yrs and more than 60 yrs.
- Cases where symptoms and signs don't correlate with MRI images.
- Cases with infection of spine specific or nonspecific.
- Cases with tumors, listhesis, canal stenosis.
- Cases with central disc prolapse.

All these patients had fair trial of conservative treatment in the form of rest, medication (NSAID), activity modification, and physiotherapy (minimum 6 weeks) before they were advised to undergo surgery. There were 47 males and 17 females aged between 23 and 60 years. Onset of symptoms to surgery was between 3 months to 12 months. Levels operated upon included L2-L3 (n=0), L3-L4 (n=0), L4-L5 (n=38), and L5-S1 (n=26). 45 patients had radiculopathy on right side and 19 on left side. Results were evaluated as poor, fair, and good or excellent using Oswestry Disability index score by which improvement of neurological signs, subjective analysis and return to work are assessed.

Excellent: Pain: No pain with return to activity, SLRT: Patient could perform SLRT upto 90 degrees without any complaint, Neurological assessment: Total recovery of neurological deficits i.e. grade 5, Spinal movement: Patient able to perform full ROM without any pain, Patient has returned and performs pre-illness job without any pain, Patient is fully satisfied with the performed surgery and his symptoms are completely relieved. ODI score: Patients with ODI score less than 16.

Good: Pain: Occasional, infrequent, mild in nature, tolerable and does not repeat with activities causing pain, SLRT: Able to perform SLRT upto 60-70 degrees without any pain, Neurological assessment: Marked neurological recovery, power of muscles recovered to near normal and patient not experiencing any subjective loss of sensation, Spinal movements: Terminal restrictions of movement but painless, Returned to job and performs satisfactorily but avoids extreme spinal movements and careful with regard of lifting weight, Subjective analysis: Patient is satisfied with regard to relief of symptoms during working and daily living activities, ODI score: Patient with ODI score more than 16 and less than 20.

Fair: Pain: Partial recovery of pain but notices pain on strenuous work, SLRT: Patient can perform SLRT between 50 to 70 degrees with little difficulty, Neurological assessment: Minimal improvement both motor and sensory, Spinal movements: Movements restricted and painful in terminal degrees, Patient resuming to light job which does not involve extreme spine movements and lifting weight., Subjective analysis: Partially satisfied, ODI score: Patient with ODI score more than 20 and less than 24.

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Poor: Pain: Unrelieved/persisting/worsening, SLRT: Restricted to pre-surgical status, Neurological assessment: No signs of recovery/worsening, Spinal movements: Gross restriction and painful, Unable to get back to his/her pre-illness job, Subjective analysis: Unhappy, ODI score: Patient with ODI score with more than 24.

Under G.A patient positioned prone in knee chest position (Figure-3a) ensuring that the abdomen is free for movement thus preventing pressure over the inferior vena cava and pelvic veins. Lateral radiograph is taken using C-arm with localization device placed at the level of disk prolapsed, then marking is done using marker and scratch made on the skin using needle over the marking(Figure-3b). Back is painted and draped, 0.5 to 1 cm away from midline an incision is made on the side of the disc prolapsed measuring about 1.5 to 2 cm.

Paraspinal muscles dissected at the side of incision. Then by sub-periosteal dissection the muscles are stripped from the spine and laminae of the vertebrae from medial to lateral on the side of spinous process. Hemostasis is secured by packing of pre-contoured gauze packs with tie. Then trocar and cannula inserted through the incision. Then working insert is introduced which acts on triangulation technique. Once the working device is inserted there are 4 channels with different diameters to insert suction, lens, working instrument and root retractor (Figure-), 4 mm tube for suction, 4 mm tube for scope, 4 mm width channel for root retractor, 8 mm tube for surgical instrument, 12 degree angle working instrument and scope.

Using Kerrison's punch muscles obstructing the field can be removed. Once ligamentum flavum reached and identified, rent is made using trephine. Then using the punch yellow ligament can be removed and if required part of lamina can be removed. After dura and root are clearly visible, insert root retractor to retract the dura and root. Then Pattis is kept in situ for retraction and root retractor to be removed. Once a clear view of disc is obtained (Figure-2), a rent is made using the trephine.

In case of excess pressure created due to disc protrusion the disc material extrudes through the rent made. Then insert the disc forceps and the disc material is removed. Once the disc material is removed, thorough wash and suctioning is to be done. Muscle and subcutaneous tissue is sutured.

The patient is allowed to turn in bed to select a position of comfort. Pt can be mobilized after 24 hours of surgery. One dose of IV antibiotics is given prior to and after surgery for 1 day. Patient is discharged the next day without any L-S belt and spine flexion/ extension exercises are advised. Patient called for suture removal on 12th post- operative day. These patients were followed up at 2 weeks, 6 weeks, 3, 6, 12, and 24 months. Patients were followed up for minimum of one year.

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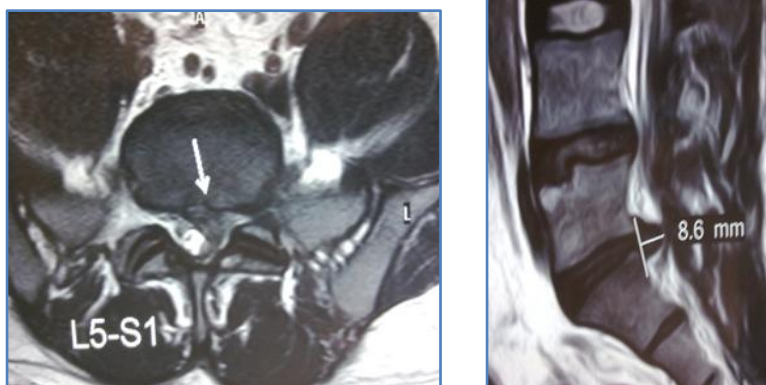


Fig. 1: MRI of L-S spine showing IVDP at L5-S1 level

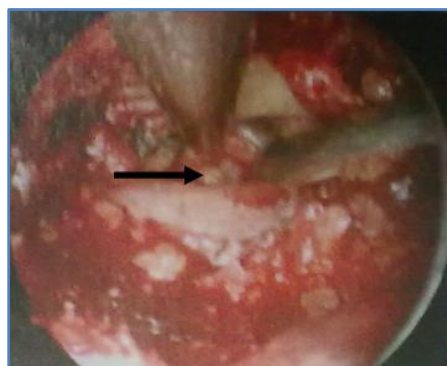


Fig. 2: Intraoperative picture showing disc bulge



Fig. 3(a): position for surgery

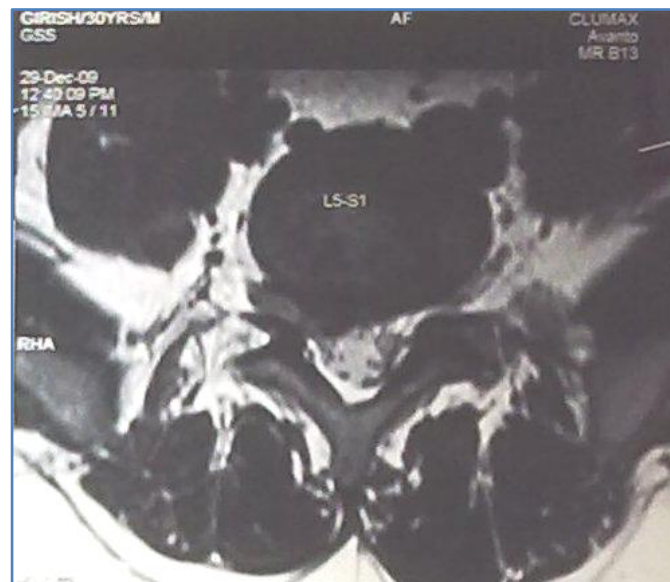
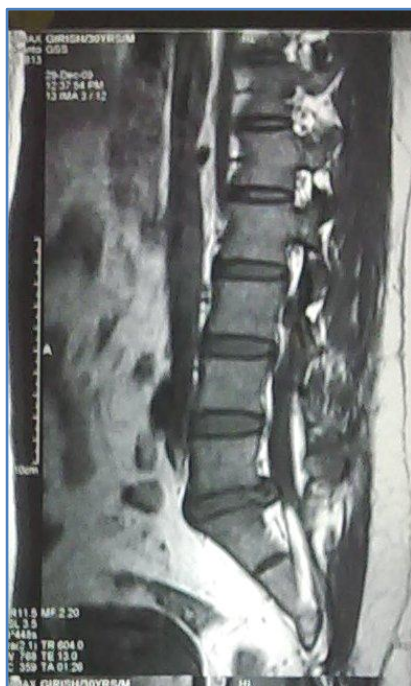


Fig. 3(b): marking the level using lateral view of L-S spine using image intensifier

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Fig. 4: Working insert



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RESULTS: In our study all the 64 patients who met the inclusion criteria were operated with endoscopic discectomy. There were 47 males and 17 females aged between 18 and 60 years. Onset of symptoms to surgery was between 3 months to 12 months. Levels operated upon included L2-L3 (n=0), L3-L4 (n=0), L4-L5 (n=38), and L5-S1 (n=26), L4-L5 disc prolapse was the commonest level of lumbar disc prolapse. Patients were discharged after one day of hospitalization and followed up at 2 weeks, 6 weeks, 3, 6, 12, and 24 months, patients were followed up for minimum of one year showed results with Excellent in 60%, Good in 20%, Fair in 16.7% and Poor in 3.3%. In the study of Choi G. and Lee S.H. (2006) showed pre-op mean ODI score of 57.43 and post-op mean of 11.52. In our study pre-op ODI mean is 57.2 and post-op mean of 16.6. In our study mean time for return to work was 34 days. Complications encountered were intraoperative dural rupture in 4 patients which needed no intervention.

DISCUSSION: Armstrong has recorded the progressive nature of pathologic process that occurs in lumbar disc lesions. Degenerative lesions of the lumbar discs pass through three-stage cycle of changes taking place over period of many months of years, Stage of nuclear degeneration (Stage of dysfunction), Stage of instability, Stage of fibrosis (Stage of stabilization). Once these changes have started, the disc can never again become normal.

The cycle is terminated finally only by the establishment of a firm fibrous ankylosis of the intervertebral joint at the site of the involved disc. Pathological staging of disc Herniation presented by Eismont & Currier in 1989, Stage I-Protrusion: Progressive degeneration associated with dehydration, desiccation and bulging, which starts in nucleus pulposus through a weakened annulus fibrosus usually in a posterior or posterolateral direction.

Stage II-Prolapse: Is a rupture of nucleus pulposus through the annulus fibrosus but not through the posterior longitudinal ligament. Stage III-Extrusion: Is a rupture of the nucleus pulposus through the annulus fibrosus and the posterior longitudinal ligament. Stage IV-Sequestration: Is a fragmentation of the extruded segments and fragments through both the annulus fibrosus and the posterior ligament, free to move within the spinal canal. Lumbar disc prolapse may manifest itself with predominantly mechanical or orthopedic signs or neurological signs or both, caused due to the disc herniation itself or the stretching of the sciatic nerve (sciatica) respectively.

Most common symptoms include pain in the low back region with or without Radiation of pain (Sciatica), stiffness of the back, weakness in the lower limbs, altered sensation in lower limbs, bladder and bowel disturbances. On examination there may be tenderness over corresponding spinous process, motor and sensory deficit of corresponding affected nerve root, there is associated diminution or complete loss of the reflex tendon jerks in which the affected root is concerned and nerve tension signs like Straight leg raising test, Lasegue test, Bragaurds Sign, Bowstring sign may be positive.

In an effort to reduce surgery associated morbidities, the operative microscope and microsurgical techniques were developed in mid 1960s by Yasargil.⁷ Various surgical modalities are available for management of intervertebral disc prolapsed, Prolapsed lumbar disc excision, Chemonucleolysis, Percutaneous Disc Surgery Arthroscopic Discectomy, Percutaneous Laser Discectomy, Micro-discectomy/Posterior limited discectomy.

The operative microscope and microsurgical techniques were developed in mid-1960's by Yasargil and Kravenbuhl,^{8,9} and These techniques revolutionized spine surgery leading to smaller

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incisions, less blood loss, increased visualization of site of pathology, decreased hospitalization, shorter postoperative recovery, and earlier return to activities compared with previous operative interventional techniques.

The results of microdiscectomy also range from 85 to 98%.^{10,11,12} Katayama et al.¹³ compared the results of open vs. gold standard microdiscectomy and observed no difference between the surgical outcomes in both the groups but microdiscectomy gave better lighting, magnification, and therefore decreased the length of incision and tissue invasion.

Microdiscectomy also allowed the patients to return to early work with lesser use of narcotic medication. Microendoscopic discectomy (MED) combines standard microsurgical technique with an endoscope, enabling the surgeons to address all types of disc herniations, including decompression of nerve root and lateral recess.

Age Incidence: Most of the patients in the age group of 30-50years are more prone for disc prolapse as the herniated nucleus pulposus is more likely to occur because the disc is on the way of degeneration through decrease in its water content at this decade.

In our series the maximum age incidence was 60years and minimum being 23 years with a mean of 36.40.

Age in years	Number of patients	%
21-30	20	40.0
31-40	25	40.0
41-50	16	13.3
51-60	3	6.7
Total	6	100.0

Table 1: Age distribution of patients studied

Mean - 36.40

Sex Incidence: In our study the incidence of low back pain appears to have affected men more than women.

Gender	Number of patients	%
Male	47	73.4
Female	17	26.6
Total	64	100.0

Table 2: Gender distribution

Neurological Signs of Presentation: In our series motor with sensory deficits were more with 50.0% compared with only motor deficits only with 43.75% and only sensory deficit in 0%. In our study 20% of patients presented with sluggish or absent ankle reflex seen in L5-S1 disc lesions.

Neurological signs of presentation	Number of patients (n=64)	%
Motor with sensory	32	50.0
Motor Deficit only	28	43.75

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Sensory only	0	0
Ankle Reflex Change	12	18.75
Knee Reflex Change	0	0

Table 3: Neurological signs

Level of Disc Prolapsed: In our series level of lesion was L4-L5 in 38 patients which is 59.4% and L5-S1 lesion in 26 patients which is 40.6%.

Level of Disc prolapse	Number of patients (n=64)	%
L4-L5	38	59.4
L5-S1	26	40.6

Table 4: Level of Disc prolapse

Complications: In our series only 6.25% of patients had complications with dural puncture, for which no intervention was necessary.

Complications	Number of patients (n=64)	%
Absent	60	93.75
Present	4	6.25

Table 5: Complications

CONCLUSION: Open discectomy has been standard procedure of choice. Interlaminar endoscopic discectomy is a safe supplement for open discectomy which offers minimal trauma, better visualization intra operatively with less hospital stay and early mobilization and early return to work. But need expertise. Surgery is just an incident in the management while protection and rehabilitation of back is as important as surgery.

REFERENCES:

1. Bratton R L. Assessment and management of acute low back pain. Am Fam Physician 1999; 60: 2299-308.
2. Lively M W. Sports medicine approach to low back pain. South Med J 2002; 95:642-6.
3. R. Prasad, M.F Hoda, M.M. Dhakal, K. Singh, A. Srivastava, V. Sharma. Epidemiological characteristics of lumbar disc prolapse in a tertiary care hospital. The Internet Journal of Neurosurgery.2006.Vol 3 No 1.
4. Hardy.R.W (Jr) (Ed). Lumbar disc disease 2ndedn. New York, Raven press, 1993.
5. M. Takahashi, H. Haro, Y. Wakahayashi, T. Kawa-uchi, H. Komori, K. Shinomiya. The association of degeneration of the intervertebral disc with 5a/6a polymorphism in the promoter of the human matrix metalloproteinase-3 gene. J Bone Joint Surg [Br] 2001;83-B:491-5.
6. Sebastian Ruetten, Martin Komp, Harry Merk, Georgios Godolias. Use of newly developed instruments and endoscopes: full-endoscopic resection of lumbar disc herniations via the interlaminar and lateral transforaminal approach. Journal of Neurosurgery: Spine 6:6, 521-530. Online publication date: 1-Jun-2007.

ORIGINAL ARTICLE

7. Dino Samartzis, Francis H.Shen, Mick J.Perez-cruet, Greganderson. Minimally invasive spine surgery: a historical perspective. *Orthopaedic Clinics of North America* 38(2007) 305-326.
8. Imhof HG, von Ammon K, Yasagril MG. Use of the microscope in surgery of the lumbar disc hernia. *Aktuelle Probl Chir Orthop.* 1994;44:15-20. [PubMed]
9. Yasagril MG, Krayenbuhl H. The use of binocular microscope in Neurosurgery. *Bibl Ophthalmol.*1970;81:62-5. [PubMed]
10. Findlay GF, Hall BI, Musa BS, Oliveira MD, Fear SC. A10 year follow up of the outcome of lumbar microdiscectomy. *Spine.* 1998;23:1168-71. [PubMed]
11. Koebbe CJ, Maroon JC, Abla A, El-Kadi H, Bost J. Lumbar Microdiscectomy: A historical perspective and current technical considerations. *Neurosurg Focus.* 2002;13:E3. [PubMed]
12. Maroon JC. Current concepts in minimal invasive discectomy. *Neurosurgery.* 2002;51:S137-45.[PubMed]
13. Katayama Y, Matsuyama Y, Yoshihara H, Sakai Y, Nakamura H, Nakashima S, et al. Comparison of surgical outcomes between macro discectomy and microdiscectomy for lumbar disc herniation. A prospective randomized study with surgery performed by same surgeon. *J Spinal Disord Tech.*2006;19:344-7. [PubMed].

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