



International Journal of Orthopaedics Sciences

ISSN: 2395-1958

IJOS 2018; 4(3): 586-590

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www.orthopaper.com

Received: 11-05-2018

Accepted: 12-06-2018

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Percutaneous endoscopic discectomy: Gold standard technique for single level intervertebral disc prolapse

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DOI: <https://doi.org/10.22271/ortho.2018.v4.i3k.101>

Abstract

Introduction: DISC prolapse is a common problem seen in general population and 10% patients may require surgical intervention.

Objective: To determine functional outcome of patients operated by percutaneous endoscopic discectomy.

Methodology: Study Area: New Civil Hospital Surat.

Sample Size: 40

Scores used: VAS and Oswestry Disability Index

Results: Patients operated for Disc Herniation by percutaneous discectomy were followed up 1 month 3 months and 6 months postoperatively showing immediate pain relief, smaller incision size, almost no blood loss and earlier return to daily activities.

Conclusion: Endoscopic discectomy is a newer technique which is practised now a days for PIVD and it shows better results than conventional discectomy in terms of post op pain the amount of blood loss, post op ambulation and anesthesia given. It can now be said that percutaneous endoscopic discectomy is the GOLD standard surgical technique for single level disc prolapse.

Keywords: PIVD, disc bulge, endoscopic discectomy, disc prolapse

Introduction

The most common cause of back pain is Intervertebral Disc Prolapse with lumbar disc prolapse accounting for only 5% of low back pain problems.

In migrated or extruded herniations, phagocytosis of the herniated disc by the macrophages occurs, while, in contained herniations, dehydration of the herniated nucleus pulposus plays a major role in the reduction of the herniated disc size.

Not all patients with PIVD require surgical intervention. A decision for surgical intervention depends greatly upon the severity of symptoms of the patients which include low back pain, radiating pain, sensory and motor loss of functions.

Percutaneous Endoscopic Discectomy is a new technique for removing contained lumbar disc herniations and small non contained disc herniations through a posterolateral approach with the aid of specially developed instruments.

Aim

To determine functional outcome of patients operated by percutaneous endoscopic discectomy

Objectives

- To study the outcome of patients operated by percutaneous endoscopic discectomy
- To assess postoperative outcome of patients operated by endoscopic discectomy

Material and Methods

Study Population

Forty patients with low back pain with or without radiculopathy or neurodeficit were evaluated in the study. All the patients had disc prolapse on MRI and had received atleast 6 weeks of conservative treatment in the form of bed rest, analgesics and muscle relaxants.

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Study Area

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Study Type

Prospective

Sample Size

40 patients operated by percutaneous endoscopic discectomy.

Inclusion Criteria

- Patients having low back pain and unresponsive to conservative management for 6 weeks
- Patients having intervertebral disc bulge or disc herniation at a single level
- Patients having radiculopathy/nerve root compression, claudication and neurological deficits due to disc bulge or herniation at a single level
- Patients having unilateral leg pain/radiculopathy will be included as candidates for endoscopic discectomy

Exclusion Criteria

- Patients with infective pathology
- Patients who require instrumentation / with instability
- Vertebral fractures
- Radiological evidence of Facet Joint Arthritis
- Multiple level disc bulges

Equipment and Supplies

Percutaneous Endoscopic Discectomy

1. C – Arm Fluoroscope
2. Long Spinal Needle
3. Endoscopic spinal surgery system
4. Camera
5. Light source
6. Endoscopic Disc Removing Forceps
7. Xylocaine 2% Solution
8. Contrast Agent
9. Suture Material

Percutaneous endoscopic Discectomy

Patient positioning: Prone on a radiolucent table with C – Arm Fluoroscope. Level of the disc space is marked using the C – Arm Fluoroscope in both Anteroposterior and Lateral Views.

The entry point is infiltrated with local anesthetic and an 18 gauge spinal needle is inserted in the anteromedial direction at an angle of 30 degrees with the horizontal aiming for the anatomical disc center through the triangle of safety.

The three sides of the triangle are formed by the line with the outer margin of intervertebral foramen another line tangential to the pedicle and the hypotenuse coincident with the upper margin of the spinal nerve.

A guide wire is passed through the 18 gauge needle into the annulus and radiopaque dye is inserted and needle is removed. Serial dilators are passed over the guide wire and is engaged into the annulus and guide wire removed.

Annulus is then fenestrated using a malate and obturator is further advanced. Working channel is then slid over the obturator confirmed in C – Arm and dilator is removed. Endoscope is then introduced in the working channel and disc is approached and herniated disc is removed using a disc removing forceps.

After the disc is removed endoscope is removed and suturing is done. Aseptic dressing is then applied.

Observations

Age and Sex Distribution

A total of forty patients were taken in the study operated by percutaneous endoscopic discectomy technique. Amongst these 40 patients, 21 were males and 19 were females.

The sex ratio in the study was almost the same for both sexes. Patients according to their age groups were divided in to groups ranging from 10-20 years to 60 – 70 years.

There were a total of 3 patients in the age group of 10 to 20 years. A total of 7 patients in age group of 20 – 30 years, 10 patients were present in both 30 to 40 years and 40 to 50 years of age group and age groups 50 – 60 and 60 – 70 years had 6 and 4 patients respectively.

This shows us the predominance of disc herniations in age group of 30 to 40 and 40 to 50 years.

Type of Anesthesia

Both local anesthesia and General anesthesia were used in the study.

The type of anesthesia given for the patients undergoing endoscopic discectomy were dependent on the amount of pain the patient would be able to tolerate and also on the personal choice of the patient.

In a total of 40 patients, 9 patients were operated under general anesthesia and 31 patients were operated under local anesthesia.

Blood Loss

The minimum blood loss was 4 ml and maximum blood loss was 20 ml. The average blood loss for patients operated by endoscopic discectomy was 8.75 ml with a standard deviation of 4.56 and median of 8.

Size of Incision

The incision size for patients operated by Endoscopic discectomy was only about 1 cm.

Post-operative pain

Patients operated by endoscopic discectomy technique had almost no post-operative pain.

It was also observed that patients operated by endoscopic discectomy could be discharged the same day.

Post-Operative Complications and Wound Infection

Forty patients having disc herniations were operated using endoscopic discectomy technique.

Out of these there was 1 patients who had post operative complication or wound infections.

One of the patient being operated by endoscopic discectomy under general anesthesia was suspected to have a nerve root damage and had to be switched over to open discectomy for nerve root exploration.

This patient ultimately developed a foot drop.

Discussion

The study was carried out over a period of 2 and a half years in the subjects after thorough evaluation of their clinical signs and symptoms, clinical examinations and investigations (radiological, hematological and biochemical).

In the general population, incidence of disc herniations and radiculopathy appears to be equally distributed between men and women. Workers exposed to heavy work, especially twisting and lifting, have a higher incidence of disc prolapse. Females though being more vulnerable to these abnormal forces, still account for a lesser number, as major work force

is still dominated by the male population.

Hard labor and heavy work is an important predictor of recurrent LDH. Manual labor, including repetitive lifting or vibration, has been previously shown to be predictors of recurrent LDH ^[1]

Heavy work was significantly higher in patients with recurrent herniation in one study ^[2] and predicted its occurrence. However, in the study of Meredith and coworkers (2010) being a manual laborer was not significantly associated with recurrent LDH.

The male to female ratio in the study was 1:1 which shows no significant predominance related to the sex of the patients.

The age group of the patients were divided into six groups ranging from 10 to 20 years of age to 60 to 70 years of age. It was seen that disc herniations were most common in age groups between 30 to 40 and 40 to 50 years of age.

Age and sex differences are demonstrated as risk factors of LDH ^[3, 4]

Young age and male gender are defined as risk factors for LDH recurrence (Suk *et al*, 2001; Cinotti 1999). However, some other studies reported that sex and age were not associated with higher rates of recurrence (Suk *et al*, 2001; Cinotti 1998). In the studies considering open discectomy or microdiscectomy, age and gender were not significantly different between recurrence (rLDH) and non-recurrent LDH groups (Meredith, 2010; Moliterno, 2010).

It is at this age at which the disc is on its way to degeneration through a decrease in its water content. Under the age of 30 the resilience of the disc protects it from herniation, but over the age of 50 years the disc develops some degree of inherent stability through fibrous changes that occur with loss of turgor.

However there are so many exceptions to these epidemiological observations that they serve little more than general guidelines.

09 patients were operated under general anesthesia and 31 people were operated under local anesthesia.

The type of anesthesia used in endoscopic discectomy technique depended upon the choice of the patient. There are some patients who tend to get anxious when told to opt for local anesthesia and hence choose general anesthesia as an option.

Patients undergoing general anesthesia are more prone to complications of general anesthesia which is not so the case in local anesthesia which is why local anesthesia is a better option when there is a choice.

In endoscopic discectomy technique under local anesthesia another advantage is that when discectomy is done sometimes the patient gets immediate pain relief which can be confirmed if the patient is under local anesthesia. The leg movements and ankle plantarflexion and dorsi flexion can also be assessed if the patient is under local anesthesia.

Most studies report that performing this procedure under local anesthesia with constant intraoperative feedback from patients is important in reducing the risk of neural damage. (Krugluger *et al*, 2001; Kambin & Brager, 1987).

A small study of 22 patients by Huang *et al*, 2005 remarked on a significantly reduced operative stress in the MED group as evidenced by a significantly lower serum C-reactive protein postoperatively. In line with the other studies included in this review the MED group had a longer operative time but

smaller incision size and less operative blood loss.

Garg *et al*, 2011: This RCT compared OD to MED for patients with sciatica unresponsive to at least 6 weeks conservative treatment. There were 112 patients and although no primary outcome measure was identified, the ODI was assessed. Despite significantly longer operative and anaesthetic times, the patients who received MED had a significantly shorter hospital stay and a smaller amount of intraoperative blood loss.

Incision size in patients operated by endoscopic discectomy was around 1 cm. Also patients operated by endoscopic discectomy had less post operative pain.

Minimally invasive surgery has attracted growing attention because of the reduction in postoperative pain, earlier mobilization and shorter recovery. It allows smaller incisions and less tissue trauma comparing to standard open microdiscectomy (Sinkemani *et al*, 2015)

Advocates of Minimally invasive discectomy highlight many of its potential benefits, including a smaller incision and less paraspinal muscle injury which may lead to reduced postoperative pain, a shorter hospital stay, and a faster recovery ^[5]

With microscopically assisted procedures, such as microscopically assisted percutaneous nucleotomy (MAPN), immediate postoperative pain relief was reported in 75% of cases ^[6]

Patients undergoing endoscopic discectomy were analysed for post operative pain relief on the basis of VAS score and Oswestry Disability index over a follow up of 1 month, 3 months and 6 months.

There are several studies which have been conducted taking into consideration these scores As mentioned above a study by Teli *et al*, 2010 and Huang *et al*, 2005 have taken into consideration these scores.

Righesso *et al*, 2007 conducted a study comparing open discectomy with minimally invasive discectomy taking into consideration VAS score.

Results

A total of forty patients operated by endoscopic discectomy were evaluated on the basis of anesthesia given, the size of the incision, Blood loss during surgery, post-operative complications and infections and for post-operative pain relief over a period of 1 month, 3 months and 6 months respectively using VAS score and Oswestry Disability index

The results were as follows

- Patients operated by Endoscopic Discectomy had minimal amount of blood loss
- Patients operated by Endoscopic Discectomy could be operated under local anesthesia
- Endoscopic discectomy requires an incision as small as 1 cm
- One patient operated by Endoscopic discectomy sustained a nerve root injury which led to foot drop

Oswestry Disability Index

Mean and Standard deviations were calculated for the values of Oswestry Disability index taken pre operatively, at 1 month, 3 months and 6 months and the values were as under:

Table 1

	Surgery code	N	Mean	SD	P Value by sample t test
PREOP	Endoscopic	40	26.85	3.28	0.39
1 Month Followup (Odi)	Endoscopic	40	17.30	5.12	0.152
3 Months Followup (Odi)	Endoscopic	40	14.00	3.85	0.137
6 Months Followup (Odi)	Endoscopic	40	13.30	3.85	0.424

According to the above results the Mean Pre-operative ODI for Endoscopic discectomy was 26.85. The p- Value calculated by 2 independent sample t test was found to be 0.39 which is not significant.

The mean 1 month follow up Oswestry disability index were found to be 17.30 for Endoscopic discectomy. P- value calculated by 2 independent sample t test was found to be 0.152 which is not significant.

The mean 3 month follow up Oswestry disability index were found to be 14.00 for Endoscopic discectomy. P- value calculated by 2 independent sample t test was found to be 0.137 which is not significant.

Finally mean 6 month follow up ODI was found to be 13.30 for endoscopic discectomy and p – value was 0.424 which is not significant.

It was found that the Mean Oswestry index considerably dropped over 1 month, 3 months and 6 months when compared to the preop Oswestry disability index which indicated pain relief and also that patients resumed their normal life activities after discectomy.

Table 2

	Endoscopic
Pre operative	26.85
At 1 month	17.30
At 3 month	14.00
At 6 month	13.30

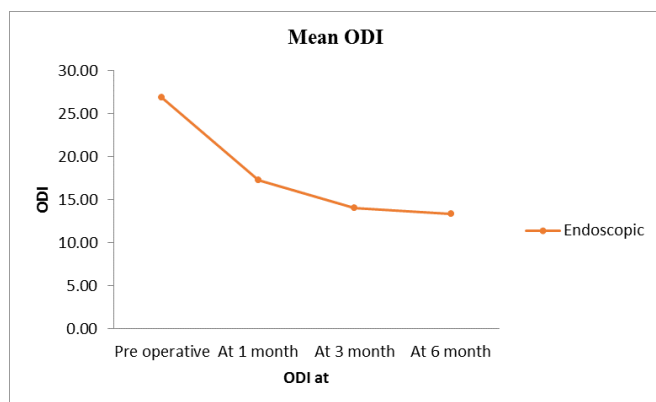


Chart 1

Vas Score

Minimum, Maximum and Median values for VAS score were calculated along with their p-values

Table 3

	Endoscopic			p-value
	Min	Max	Median	
Pre-operative	5	8	7	0.779
At 1 month	4	8	6	0.108
At 3 month	1	7	4	0.862
At 6 month	1	6	3	0.883

For endoscopic discectomy the minimum VAS score was 5, the maximum was 8 and the median was 7. P-value calculated

by Mann-Whitney U test was 0.779 which was not significant.

At one-month minimum VAS score was 4 maximum was 8 and median was 6. P-value was 0.108 which was not significant.

At three months minimum VAS score was 1 maximum score was 7 and median was 4. P-value was 0.862 which was not significant.

At six months follow up minimum VAS score was 1, maximum was 6 and median as 3 for endoscopic discectomy. P-value was 0.883 which was not significant.

Table 4

	Endoscopic
Pre operative	7
At 1 month	6
At 3 month	4
At 6 month	3

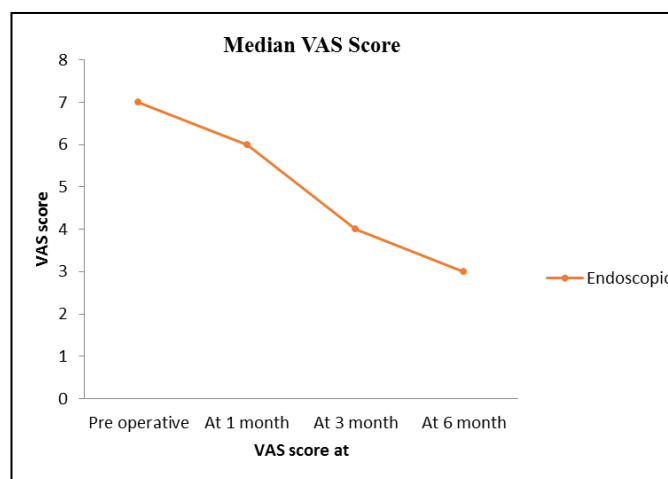


Chart 2

Conclusion

It was concluded from the above study that taking into consideration the VAS score and Oswestry Disability index there was significant pain relief in patients operated by percutaneous endoscopic discectomy.

Endoscopic discectomy is a better technique taking into consideration the size of incision, lesser blood loss during surgery, can be performed under local anesthesia, duration of hospitalization is shorter and faster recovery to daily activities due to smaller incision size and postoperative pain and less chances of post-operative wound infection.

For multiple level disc bulges with single or bilateral limbs radicular pain along with spinal canal stenosis the conventional open discectomy still remains the Gold Standard treatment option.

With advances in equipment and techniques, percutaneous endoscopic discectomy has become the gold standard surgical procedure for single level disc bulge with unilateral leg pain.

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