



Original Research Article

## **Role of Open Discectomy in the Management of Lumbar Disc Prolapse by Fenestration (Laminotomy) Method**

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### **ABSTRACT**

**INTRODUCTION** - Humans have been plagued by back and leg pain since the beginning of recorded history. Back pain, the ancient curse, is now appearing as a modern international epidemic. Up to 80% of people are affected by this symptom at some time in their lives. Impairments of the back and spine are ranked as the most frequent cause of limitation of activity in people younger than 45 years by the national center for health statistics.

**RESULTS** - This study consists of 20 cases of lumbar disc prolapse treated by Fenestration (laminotomy) and discectomy. The mean follow up was 8.2 months ranging from 6 to 13 months. There were 6 (30%) females and 14 (70%) males with a mean age of 39 years ranging from 20 to 60 years.

**METHODOLOGY**- 20 randomly selected patients who were admitted to Adichunchanagiri institute of medical sciences BG Nagara fulfilling the following criteria were included into this prospective study between September 2004 to September 2006.

**RESULTS** - This study consists of 20 cases of lumbar disc prolapse treated by Fenestration (laminotomy) and discectomy. The mean follow up was 8.2 months ranging from 6 to 13 months. There were 6 (30%) females and 14 (70%) males with a mean age of 39 years ranging from 20 to 60 years.

**DISCUSSION** - What low back pain lacks in lethality certainly makes up for in the wholesome misery it causes in modern industrialized societies. Low back disorders have become the most common musculo-skeletal disorder, with a major impact on the costs of health care and are a major source of disability.

**CONCLUSION** - Overall in our study we had a favorable outcome following open standard laminotomy and discectomy for lumbar disc prolapse.

**KEY WORDS:** Open Discectomy, Disc Prolapse, Laminotomy.

### **INTRODUCTION**

Humans have been plagued by back and leg pain since the beginning of recorded history. Back pain, the ancient curse, is now appearing as a modern international epidemic. Up to 80% of people are affected

by this symptom at some time in their lives. Impairments of the back and spine are ranked as the most frequent cause of limitation of activity in people younger than 45 years by the national center for health statistics. Inter-vertebral disc disease and

disc herniation are most prominent in otherwise healthy people in the 3<sup>rd</sup> and 4<sup>th</sup> decades of life. It accounts for a majority of case of low backache seen by an orthopaedician in clinical practice and is a major contributor of functional disability.

In 1934, Mixter and Barr Published their study which concluded that laminectomy with decompression and extraction of herniated lumbar disc could improve suffering caused by sciatic pain. Since then increasing number patients have been operated upon for this disorder. Open discectomy is now the “Gold standard” for operative intervention in patients with herniated lumbar discs whose conservative treatment has failed. However the outcome studies of lumbar disc surgery document a success rate of 51% to 89%, in spite of advances in investigations, operative technique and postoperative care. Therefore the need for appropriately presenting and reviewing this subject is important.

**Objectives**

1. To study the various signs and symptoms associated with disc prolapse.
2. To evaluate the indications for discectomy.
3. To evaluate the functional outcome of discectomy in lumbar disc prolapse.
4. To study the outcome of the surgical management of lumbar Inter-vertebral disc prolapse in adults by Fenestration (laminotomy) and discectomy.
5. To study the incidence of complications following Fenestration (laminotomy) and discectomy for lumbar intervertebral disc prolapse.

**METHODOLOGY**

20 randomly selected patients who were admitted to Adichunchanagiri institute of medical sciences B.G. Nagara fulfilling

the following criteria were included into this prospective study from September 2004 to September 2006.

**Inclusion criteria**

1. All cases of disc prolapse from L1-L2 level to L5-S1.
2. Case of disc prolapse with lumbar canal stenosis.
3. Cases with disc prolapse and lumbar spondylosis.

**Exclusion criteria**

1. Patients less than 20 years and above 60 years of age.
2. Cases with fracture spine (Traumatic)
3. Cases with space occupying lesions.
4. Cases of vertebral anomalies.
5. Cases of cord tethering syndrome.
6. Patients with spinal instability.

**RESULTS**

This study consists of 20 cases of lumbar disc prolapse treated by Fenestration (laminotomy) and discectomy. The mean follow up was 8.2 months ranging from 6 to 13 months.

There were 6 (30%) females and 14 (70%) males with a mean age of 39 years ranging from 20 to 60 years.

Light work was defined as lifting or pulling or pushing weight up to 8-10 kgs, occasionally lifting objects within this weight limit, walking or standing for 2 hours in an eight hour work day and retirement activities. Heavy work was defined as lifting, pushing or pulling 30 to 40 kg weight or greater or / and frequent lifting and/ or carrying weights up to 20 kgs during an 8 hour work day.

Table 1: Distribution of occupation.

| Occupation           | No. of cases | Percentage |
|----------------------|--------------|------------|
| Heavy manual worker  | 6            | 30%        |
| Farmer/agriculturist | 5            | 25%        |
| House wife           | 5            | 25%        |
| Merchants            | 2            | 10%        |
| Clerks / office work | 2            | 10%        |

Events, which precipitated, or the mode of onset of pain were analyzed. History of lifting heavy weight was present in 8 (40%) of the patients and 2 had a history of fall. 9 (45%) of patients had an insidious onset of symptoms and one case had onset of pain associated with bending activity.

Average durations of symptoms before surgery was 9.4 months, range from 1 month to 48 months. A majority of the cases came with complaints of low backache and radicular pain.

All patients had received a trail of conservative treatment in the form of bed rest and traction with no significant improvement. 20% (4 cases) had also received epidural injection of steroid with no improvement in symptoms.

On examination a positive straight leg raise was the most common finding followed by restricted spinal movements and neurological deficits. 16 (80%) patients had neurological deficits. L4-5 disc prolapse was the commonest in our study with 95% of the prolapse occurred at this level, followed by L5-S1 (30%). Multiple level disc herniation were seen in 8 (40%) of the patients.

**Surgical outcome**

Most of the cases, 18 out of 20 (90%) improved significantly and 2 cases (10%) had partial improvement of pain.

The postoperative functional and economical outcome after mean follow up of 8.2 months is given below (range 6-13 months).

Table 2: Improvement in motor power.

| Pre-operative Motor power | Post-Operative motor power |     |     | Total |
|---------------------------|----------------------------|-----|-----|-------|
|                           | 0/5                        | 4/5 | 5/5 |       |
| 0/5                       | 1                          | -   | -   | 1     |
| 2/5                       | -                          | 1   | -   | 1     |
| 3/5                       | -                          | 1   | 1   | 2     |
| 4/5                       | -                          | -   | 9   | 9     |
| Total                     | 1                          | 2   | 10  | 20    |

Out of 16 cases which had neurological deficit 3 did not improve after surgery. All 3 cases had > 6 months duration of the symptoms before undergoing surgery.

Improvement in neurological status was correlated with the duration of symptoms.

Table 3: Symptoms.

| Neurological status | Duration of symptoms |          | Total (Percentage) |
|---------------------|----------------------|----------|--------------------|
|                     | < 6 months           | 6 months |                    |
| Improved            | 7                    | 6        | 13 (81.2%)         |
| Not Improved        | -                    | 3        | 3 (18.8%)          |
| Total               | 7                    | 9        | 16 (100 %)         |

$(X^2 - 2.87, P = 0.09, NS)$

There was no statistically significant difference between the 2 groups.

The overcome according to the prolo scale was correlated and analyzed for the following variables.

1. Sex
2. Age
3. Occupation
4. Duration of symptoms
5. Neurological deficit
6. Type of prolapse
7. Change of preoperative prolo scale to postoperative prolo scale.

Table - 4: Correlation with occupation (Economic score).

| Economic Score | Occupation |       | Total Cases (20) |
|----------------|------------|-------|------------------|
|                | Light      | Heavy |                  |
| E - 3          | 1          | 1     | 2                |
| E - 4          | 7          | 1     | 8                |
| E - 5          | 3          | 7     | 10               |
| Total          | 11         | 9     | 20               |

Table - 5: Correlation with occupation (Functional score).

| Functional Score | Occupation |       | Total Cases (20) |
|------------------|------------|-------|------------------|
|                  | Light      | Heavy |                  |
| F - 3            | -          | 2     | 2                |
| F - 4            | 6          | 3     | 9                |
| F - 5            | 5          | 4     | 9                |
| Total            | 11         | 9     | 20               |

Table - 6: Correlation with occupation (Total score).

| Total Score    | Occupation |           | Total Cases (20) |
|----------------|------------|-----------|------------------|
|                | Light      | Heavy     |                  |
| Poor (5)       | -          | -         | -                |
| Moderate (6,7) | 1 (9.1%)   | 1 (11.1%) | 2                |
| Good (8,9,10)  | 10 (90.9%) | 8 (88.9%) | 18               |
| Total          | 11         | 9         | 20               |

$X^2 = 0.02 (P = 0.89, NS)$

Out of 11 patients engaged in Heavy work only 1 had a moderate outcome and 9 had good outcomes, 1 out of the 9 patients who had light work, had a moderate outcome. The difference was statistically not significant between the 2 groups (P = 0.89, NS).

Table 7: Correlation with neurological deficit (Total score).

| Total Score    | Neurological deficit |          | Total Cases (20) |
|----------------|----------------------|----------|------------------|
|                | Yes                  | No       |                  |
| Poor (>5)      | -                    | -        | -                |
| Moderate (6,7) | 2 (12.5%)            | -        | 2                |
| Good (8,9,10)  | 14 (87.5%)           | 4 (100%) | 18               |
| Total          | 16                   | 4        | 20               |

$$X^2 = 0.56 (P = 0.45, NS)$$

Both the patients with moderate outcome had neurological deficit. There were no moderate outcomes among those who had no neurological deficit. The difference between the 2 groups was however not significant statistically ( $X^2 = 0.56$  P = 0.45, NS).

## DISCUSSION

What low-back pain lacks in lethality certainly makes up for in the wholesome misery it causes in modern industrialized societies. Low-back disorders have become the most common musculo-skeletal disorder, with a major impact on the costs of health care and are a major source of disability.

One must recognize that low-back pain is a symptom that has many causes, the commonest being a protruded intervertebral disc. The origins of disc related sciatica with its clear morphologic and clinical neurologic findings were not recognized until the 20<sup>th</sup> century. After Mixter and Barr in 1934 described disc protrusions and showed the effectiveness of surgery in its management, there has been an increasing enthusiasm to solve sciatica problems surgically by disc excision.

However, the results of good outcome after lumbar disc excision vary in

literature from 51 to 89 percent. There are a considerable number of failed back surgeries too which may require revision surgery. The recurrence rate for lumbar disc excision varies from 6% to 11% in various studies.

This implies that there are many factors, which influence the outcome of lumbar disc surgery. Therefore emphasis should be laid on proper patient selection. For a great majority of patients with sciatica due to disc prolapse, conservative treatment provides satisfactory relief from symptoms. In evaluating disc disease, the natural history should be taken into account which reveals the surgery plays only a Palliative role in its management. Lumbar disc herniation shows a favorable response to conservative treatment even in the presence of some neurological deficit.

Hence and surgical intervention without appropriate conservative therapy leads to unnecessary surgery and also to poor outcome. However a protracted conservative regimen in the presence of the severe radicular symptoms should be avoided since this increases morbidity and reduces the chance of successful outcome. A longer preoperative interval in patients with chronic sciatica was associated with a less predictable outcome.

It is therefore the clinicians' task to properly select for surgery, the patients with appropriate indications, who are expected to have symptomatic relief from the surgery with limited risk and least possible expense.

Better investigative modalities CT/MRI have led to more accurate diagnosis of disc lesions. They have revolutionized the diagnosis of spinal disease by the accurate visualization of all structures within the neural canal. In addition, it offers the opportunity to outline the neural foramen and extra-foraminal areas and thus guide the surgeon in planning a precise surgical correction, preventing unnecessary

exploration of uninvolved levels. Results of lumbar disc surgery are excellent when there is agreement between clinical presentation and imaging studies.

In our study we used the prolo functional and economic rating system to evaluate our results. This scale was used, as it is a simple scale which assesses the patient's outcome both subjectively and objectively. It evaluates both the functional as well as the economic status of the patient and is useful in comparing the preoperative to the postoperative status. It helps in correlating the results to various factors that may influence the outcome such as sex, age, duration of symptoms, occupation etc.

In studies by Pappas al and Richards Davis the prolo scale has been used to assess the outcome. Both are retrospective studies. In our study 20 patients were followed up for a mean of 8.2 months ranging from 6 to 13 months.

**Patient population**

In our study 70% of the cases were males and 30% females.

| Sex    | Pappas et al | R. Davis | Present study |
|--------|--------------|----------|---------------|
| Male   | 61%          | 64%      | 70%           |
| Female | 39%          | 36%      | 30%           |

Males were affected more commonly than females which were in accordance with the studies by Pappas and Richard Davis who also had a male preponderance.

In our study the average age of the patient was 39 years range from 20 to 60 years. Richard David had a mean age of 42 years range from 16 to 77 years in his study. Pappas' et al had a mean age of 42 years in the males and 43 years in females ranging from 15 to 83 years.

In our study 55% were engaged in strenuous work and 45% in light work. In the Davis study 38% did strenuous work, 47% were employed in sedentary work and 15% were housewives.

The event or precipitating factor that accounted for most of the cases was inappropriate lifting of weight (40%). 10% had a history of fall and in 1 patient onset was associated with bending. In 45% of cases no event could be determined. In Pappas et al study, lifting weight was the event in 31.4% of cases followed by falls (10.2%), sport injuries (10%) and automobile accidents (6.1%). In 40.5% of cases no event could be determined.

The L4-5 level was the most commonly involved one in our study. We had a higher percentage of multiple disc prolapse in our patient population which was comparable to that in that in the series of S. K. Gupta et al.

| Level of prolapse | Richard Davis | Pappas et al | Gupta et al | Present study |
|-------------------|---------------|--------------|-------------|---------------|
| L1-2              | 0.2%          | -            | -           | -             |
| L2-3              | 0.9%          | 2%           | -           | -             |
| L3-4              | 4.4%          | 9%           | -           | -             |
| L4-5              | 46.7%         | 49%          | 35.2%       | 55%           |
| L5-S1             | 47%           | 40%          | 22.3%       | 5%            |
| Multiple levels   | 0.8%          | -            | 44.5%       | 40%           |

The mean postoperative economic score was 4.04 in our study as compared to 4.5 and 4.6 in the studies of Pappas et al and Richard Davis respectively. Similarly the mean postoperative functional outcome in our study was 4.35 as compared to 4.08 and 4.5 reported by Pappas et al and Richard Davis respectively.

| Prolo scale           | Pappas et al | R. Davis | Present study |
|-----------------------|--------------|----------|---------------|
| Mean economic score   | 4.5          | 4.6      | 4.4           |
| Mean Functional score | 4.08         | 4.5      | 4.35          |

Scores of 8, 9 and 10 indicate good outcome in the prolo scale. In our study we had 6 (30%) of cases each with score of 8, 9, and 10. Comparison with other studies is given below.

**Total Good outcome**



| Scores | Pappas et al | R. Davis | Present study |
|--------|--------------|----------|---------------|
| 8      | 16.2%        | 10%      | 30%           |
| 9      | 33.2%        | 19%      | 30%           |
| 10     | 26.9%        | 60%      | 30%           |

In our study we achieved 90% good outcome and 10% moderate outcomes. We had no poor results as compared to Pappas et al and R. Davis who had 6.4% and 3.3% poor results respectively which was described as a total prolo scale of < 5.

| Outcome  | Pappas et al | R. Davis | Present study |
|----------|--------------|----------|---------------|
| Good     | 77.3%        | 89%      | 90%           |
| Moderate | 15.5%        | 7.7%     | 10%           |
| Poor     | 6.4%         | 3.3%     | -             |

In our study selection of cases for surgery was done meticulously using the inclusion criteria which included well-defined indications for surgery. There was also excellent correlation between clinical findings and investigations in all our patients. All patients were advised to properly about change of life-style, spinal exercises and need to modify their occupation if necessary. These factors may have accounted for the higher percentage of good outcome.

50% of our patients have gone back to their original occupation and 40% are doing the same job but with limitation. The average preoperative functional and economic score were 1.75 and 2.4 respectively, which changed to 4.35 and 4.4 respectively after surgery. The mean total score improved from 3.9 before surgery to 8.75 postoperatively, similar details in the other studies are not available.

In our study there was a low incidence of complications (15%), with 1 case of superficial wound infection and 2 cases of paralytic ileus with urinary retention as compared to Richard Davis study and Pappas et al who had a complication rate of 4.1% and 10.8% respectively. We had no cases of Dural tear and CSF leak.

| Complications                         | Pappas et al | R. Davis | Present Study |
|---------------------------------------|--------------|----------|---------------|
| Wound Infection                       | 45           | 25       | 1             |
| Dural tear/CSF leak                   | 6            | 6        | -             |
| Discitis                              | 3            | -        | -             |
| Paraplegia                            | -            | 4        | -             |
| Pseudomeningocele                     | 3            | -        | -             |
| Arterial                              | 2            | -        | -             |
| Small intestine injury                | 1            | -        | -             |
| Pulmonary complications               | 6            | -        | -             |
| Paralytic ileus and urinary retention | -            | 5        | 2             |

### *Various factors were correlated with the outcome*

**1. Sex:** In our study we found that the female sex was associated with a less favorable outcome. Weber in his study found that the female gender was associated with poor outcomes. Richard Davis however found that the housewives had a statistically higher economic and total score. MattiHurme et al found that the activities of daily living (ADL) indices were worse in women than in men.

**2. Age:** The two cases with moderate outcomes were seen in patients < 40 years of age in our study. However the outcome of patients < 40 years of age was statistically not significantly different from the other group. MattiHurme et al found that age older than 40 years was associated with poor outcome. Weber found that age was not predictive of outcome.

**3. Occupation:** We found no significant difference in outcome between who were engaged in strenuous work and light work. Richard Davis in his study found that housewives and people engaged in light work had statistically higher total and economic prolo score than those who did strenuous work.

**4. Duration of symptoms:** In our series both the cases which had moderate outcome had a preoperative duration of symptoms of > 6 months. The statistical difference was however not significant between those with less than 6 months and more than 6 months duration of symptoms. A. Naylor in his

study found that a longer preoperative duration of symptoms was associated with a less favorable outcome following surgery.

**5. Neurological deficit:** Surgical outcome was not significantly affected with absence or presence of neurological deficit in our study.

**6. Type of Prolapse:** The type of prolapse had no significant effect on the outcome following lumbar disc surgery in our study. Morgan – Hough et al had found that protrusions were more likely to require revision surgery compared to extruded or sequestered discs.

In our study 13 (81.2%) of patients with neurological deficit, before the surgery, improved. Surgery did not cause or aggravate any neurological deficit on our study. 92.3% of patients with motor deficit improved after surgery and 76.9% of them had normal muscle power on postoperative follow up. This compared to Blaauw et al who reported normal muscle in 75% of patients who had muscle weakness preoperatively.

In our study 40% of patients with absent or diminished ankle jerk improved following surgery and 28.6% of patients with sensory dysfunction did not improve following surgery. Blaauw et al in their series found that 60% of patient with diminished or absent reflexes improved postoperatively. 14% of their patients with sensory dysfunction did not improve following surgery.

Overall in our study we had a favorable outcome following open standard laminotomy and discectomy for lumbar disc prolapse. A comparison of our results to those of micro discectomy technique is given below.

The below table shows that results with open standard laminotomy and discectomy are comparable to the results of studies which have used micro discectomy techniques.

| Authors  | Good/Excellent | Moderate | Poor/Failure |
|--|----------------|----------|--------------|
| Ebeling et al (Micro discectomy)                       | 73%            | 19%      | 9%           |
| R.Silvers (Micro discectomy)                           | 95.5%          | 3%       | 1.5%         |
| Caspar et al (Micro discectomy)                        | 74%            | 18.1%    | 7.9%         |
| Present study (Fenestration laminotomy and discectomy) | 90%            | 10%      | -            |

## CONCLUSION

Several conclusions can be drawn from our study. The standard laminotomy and discectomy is an extremely useful and effective surgery for treatment of lumbar disc prolapse. Consistently good results (90%) in our study could be attributed to proper selection of cases and a meticulous surgical protocol. The indications for surgery mentioned earlier must be strictly adhered to the results of lumbar discectomy are good when there is agreement between clinical presentation and imaging studies as was seen in our study.

The use of the knee-chest position is beneficial as it provides direct access to the disc. It opens up the disc space and decreases epidural venous congestion by decompressing the abdominal cavity. Adequate decompression is essential and can be assessed on table by the return of pulsations of the cord. Using a suction system allows drainage of the hematoma and thus reduces the risk of infection.

There was no serious complication in our study. Serious complications can be avoided in this procedure and recurrent herniations reduces if the above guidelines are strictly followed.

The female sex was associated with a less favorable outcome in our study as compared to males. The variables which were found to have no correlation with the outcome were age, occupation, duration of symptoms, neurological deficits and type of prolapse.

The functional economic outcome rating scale of prolo appears to be a useful tool for evaluating of disc surgery. Widespread use of this scale will allow different studies and procedures to be compared more objectively to improve the outcome of disc surgery. In addition to the total postoperative score, change of the postoperative score as compared to the score as compared to the preoperative score is also a useful indicator of outcome. The only limitation of this study was a small sample size.

In our study we achieved results comparable to that achieved with micro discectomy. Microsurgical techniques may have some advantages in terms of a less invasive approach; shorter hospital stay etc. but one must understand the demands, requirements and limitations of this technique. It also has a long learning curve and it technically more demanding procedures in terms of surgical skills of the surgeon and equipment required and thus is available only in multi-specialty hospitals in cosmopolitan cities in India. Also standard laminotomy and discectomy is more cost-effective than microsurgical discectomy.

Therefore for the Indian scenario standard open laminotomy and discectomy

is still the “Gold standard” in operative treatment of lumbar disc prolapse.

#### REFERENCES

1. Wood, George W. Lower back pain and disorder of intervertebral disc chapter-60, Campbell Operative Orthopaedics., Vol.III, 9<sup>th</sup>Edn.,Edt. Canale S. Terry, Missouri; Mosbey, 1998: 3014-3015pp.
2. MixterWJ, Barr JS. Rupture of the intervertebral disc with involvement of the spinal canal. N Engl J Med, 1934; 211: 210-215.
3. ErricoTJ, Fardon DF, Lowell TD. Open discectomy as treatment for herniated nucleus pulposus of the lumbar spine. Spine 1995; 20(16): 1829-33.
4. JungeAJ, Dvorak, Ahrens S. Predictors of lumbar disc surgery outcomes. Spine 1995; 20(4): 460-468.
5. Pappas TE, Harrington T, Sonntag VKH. Outcome analysis in 654 surgically treated lumbar disc herniations. Neurosurgery 1992; 30(6): 862-866.
6. Davis RA. A long-term outcome analysis of 984 surgically treated herniated lumbar discs. J Neurosurgery 1994; 80: 415-421.
7. Naylor A. The late results of laminectomy for lumbar disc prolapse: A review after ten to twenty-five years. J Bone Joint Surg Br 1974; 56B: 17-29.

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