FUNCTIONAL OUTCOME OF LUMBAR FENESTRATION DISCECTOMY IN PATIENTS WITH INTERVERTEBRAL DISC PROLAPSE TREATED AT A TERTIARY CARE CENTRE IN SOUTH INDIA

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ABSTRACT

BACKGROUND

This study was conducted to assess the extent of functional and neurological recovery and complications following conventional fenestration discectomy in patients with lumbar intervertebral disc prolapse in the age group of 20-60 years.

MATERIALS AND METHODS

A prospective case series study was done at Department of Orthopaedics, Government Medical College, Thiruvananthapuram on 25 patients who satisfied the inclusion criteria. The patients were subjected to a thorough clinical assessment, MRI scan of the lumbosacral spine, preoperative assessment using PROLO economic and functional scale followed by fenestration discectomy. Functional outcome was evaluated by PROLO economic and functional rating scale during each postoperative visit at 6 weeks, 3 months, 6 months and 1 year. Outcome was expressed using mean and proportions as appropriate. Paired 't' test was also used to compare mean pre and postoperative PROLO scores.

RESULTS

88% of the patients had a good outcome at the end of one-year follow-up. The mean PROLO economic scores improved significantly from a preoperative score of 1.96 to 3.76 (3 months), 4.24 (6 months) and 4.44 at the end of 1 year ($p < 0.001$). The mean PROLO functional scores also improved significantly from a preoperative score of 1.84 to 3.72 (3 months), 4.28 (6 months) and 4.36 at the end of 1 year ($p < 0.001$). Only 4 patients developed one or the other complication following surgery.

CONCLUSION

Fenestration discectomy is safe, less time consuming with lesser blood loss and results in less postoperative morbidity. PROLO scale appears to be a useful tool for evaluation of functional outcome of lumbar fenestration discectomy.

KEYWORDS

PROLO Economic and Functional Score, Lumbar Fenestration Discectomy, IVDP, Functional Outcome.

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BACKGROUND

Back pain as a presenting complaint accounts for only 2% of patients seen by general practitioners, but constitutes 60% of patients attending Orthopaedic Outpatient Department.⁽¹⁾ Among chronic conditions, back problems are the most frequent cause of limitation of activity in persons less than 45 years of age. A very common cause of back pain is lumbar intervertebral disc prolapse characterised by radicular pain and other symptoms depending on the site and degree of herniation. This was found to be the most important cause for loss of working hours in young and middle aged individuals. Discectomy is a spinal surgical procedure commonly done for symptomatic lumbar disc herniation. Mixer and Barr performed the first lumbar discectomy by a laminectomy and transdural approach in 1934.

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Semmes described the hemilaminectomy approach with retraction of the dura to remove the disc. Discectomy via a laminectomy was the popular approach for a long time. However, this method went into disrepute as it involved removal of a large amount of normal bone, muscle tissue and sometimes facet joints resulting in iatrogenic instabilities to the spine and failed back syndromes.⁽²⁾ Hence, conventional laminectomy and discectomy has been replaced by bone-sparing techniques like limited laminectomy or fenestration discectomy which produces similar results but with lesser postoperative morbidity. It is less time consuming with lesser blood loss and does not compromise spine stability.

Thus, through this study, we aim to assess the extent of functional and neurological recovery and complications following fenestration discectomy in patients with lumbar intervertebral disc prolapse in the age group of 20-60 years.

MATERIALS AND METHODS

A prospective case series study was done at Department of Orthopaedics at Government Medical College, Thiruvananthapuram during 2010-2012 on 25 patients in the age group of 20 to 60 years who satisfied the inclusion criteria.

Inclusion Criteria

Patients with backache and/or radicular pain which showed no signs of improvement with conservative management of 3

months, progressive neurological deficits, definite neurological deficits with MRI proved single level disc herniation were included in the study.

Exclusion Criteria

Patients who had other associated spinal pathology, multiple level disc involvement, previous history of spine surgery or any evidence of lumbar stenosis were excluded.

Ethical Considerations

The study was conducted only after obtaining clearance from the Human Ethics Committee, Government Medical College, Thiruvananthapuram and written informed consent from the study participants.

Procedure

After obtaining written informed consent from the patients in the local vernacular language, the patients were subjected to a thorough history taking and complete physical examination. The subjective symptoms and objective signs were recorded in a proforma. An MRI scan of the lumbosacral spine was taken in all patients for confirmation of diagnosis.

Variables included in the study were sociodemographic variables like age, sex, the kind of occupation/work the patient was engaged in, outcome as assessed using PROLO economic and functional rating scale, and complications following surgery.

The occupation of patients was classified into light and strenuous work. Light work included lifting, pulling or pushing weights up to 8-10 kg, occasional lifting and/or carrying objects within this weight limit, walking or standing for 2 hours in an 8-hour work day, retirement activities and household work. Strenuous work was defined as lifting, pushing or pulling weight of 30-40 kg or greater and frequent lifting and/or carrying weight up to 20 kg during an 8-hour work day.

Preoperative assessment using PROLO economic and functional scale was done for all patients. After detailed clinical evaluation, the patient was subjected to the routine preoperative investigations like X-ray L-S spine, Blood routine, RFT, FBS, PPBS, Chest X-ray and ECG.

All the patients were operated upon either in the prone position or in knee-chest position, care being taken to see the abdomen was free so as to prevent undue engorgement of the epidural veins and thus decrease the extent of intraoperative blood loss. The level of the lesion was confirmed intraoperatively under C-arm guidance. A vertical midline incision measuring 5 cm was made after localising the level of the disc. The paraspinal muscles were retracted and the interlaminar space was exposed. Only the ligamentum flavum was excised without removing any part of the lamina. The cord was retracted, the disc herniation identified and discectomy was carried out using pituitary rongeurs. The entire disc at that level was removed. The cord and the roots were confirmed to be decompressed and lying freely in their respective canals. The wound was then closed in layers and dressing done.

After treatment: Intravenous antibiotics were given routinely for 3 days, the suction drain was removed within 48 hours, and the patient was mobilised on the second postoperative day. Suture removal was done on the 10th postoperative day. Patients were explained the different methods

of taking care of the back and were advised against doing any strenuous activity for the first 6 weeks after which the patient was gradually encouraged to get back to his previous level of activity. Back strengthening exercises were taught from 3rd week onwards.

Follow-up: Regular follow-ups at the tenth postoperative day, 6 weeks, 3 months, 6 months and later at 1 year after surgery were done. During these visits, patients were assessed for the presence of back pain or radicular pain, signs of root or cord compression and the neurological status of the patient.

PROLO Economic Functional Rating scale⁽³⁾⁽⁴⁾ was used to determine the outcome. PROLO scores were assessed during each follow-up visit. The total score represented the sum of individual functional and economic scores.

PROLO Economic- Functional Rating scale

This scale is used to determine the outcome following spinal surgeries and it is a sum of the scores given for the economic and functional status of the patients. Both economic and functional subscales are graded from 1 to 5. On summing the scores, a total score 5 or less was considered to be a poor outcome, a score of 6 or 7 was considered as a moderate outcome and a score of 8 to 10 was recorded as a good outcome.

Economic Status

- E1- Completely invalid.
- E2- No gainful occupation (including ability to do housework/continue retirement activities).
- E3- Able to work but not at the previous occupation.
- E4- Working at the previous occupation part-time or on a limited basis.
- E5- Working at previous occupation with no restrictions of any kind.

Functional Status

- F1- Total incapacity (or worse than preoperative).
- F2- Mild-to-moderate level of back pain and/or sciatica (or pain same as preoperative but able to perform all daily tasks of living).
- F3- Low level of pain and able to perform all activities except sports.
- F4- No pain, but patient has had one or more recurrences of low back pain or sciatica.
- F5- Complete recovery, no recurrent low back pain, able to perform all previous activities, including sports where applicable.

Final Score Grading

- 5 or less: Poor.
- 6-7: Moderate.
- 8-10: Good.

Statistical Analysis

The data was entered into MS Excel V8 and was analysed using Epi info Statistical software package. The proportion of patients with poor/moderate and good outcome was assessed. Paired 't' test was used to compare mean pre and post-operative PROLO scores. The different complications seen were expressed in percentages.

RESULTS

Majority (80%) of the patients were males. The mean age of the participants was 40.6 years. The mean age of the male patients was 40.75 years (range 32 - 54 years). The female patients had a mean age of 40 years (range 28 - 58 years). 56% of the patients were engaged in strenuous work. The mean duration of back pain in the patients studied was 9.64 months with a minimum of 3 months to a maximum of 36 months. 96% of them had radiating pain. 52% of the patients had taken epidural steroid injections for the relief of back pain, but this relief was only temporary. (Fig 1)

Figure 1. Type of Conservative Treatment Availed

Clinical Signs	Frequency	Percentage
Spine list	10	40
Sciatic scoliosis	7	28
Paraspinal muscle spasm	17	68
Restricted spinal movements	22	88
Positive SLR	24	96
Motor deficits	20	80
Sensory deficits	19	76
Ankle jerk diminished/absent	7	28
Sphincter involvement	1	4

Table 1. Clinical Findings in the Study Subjects

Motor deficits were graded as per MRC grading. 80% of the patients had motor deficits of which majority (68%) had mild motor deficits. One of the patients had cauda equina syndrome. In this patient, we could not restrict the procedure to fenestration discectomy and hence had to do laminectomy. The patient improved well after the procedure. L4-L5 was the most common disc space involved.

PROLO Economic Score	Frequency	Percentage
E1	1	4
E2	24	96
PROLO Functional Score		
F1	5	20
F2	19	76
F3	1	4
Total PROLO Score		
2	1	4
3	4	16
4	19	76
5	1	4

Table 2. Preoperative PROLO Scores

Preoperatively, the mean PROLO Economic score was calculated to be 1.96, the mean PROLO functional score was 1.84 while the mean total PROLO score was 3.80. 96% of the patients had a preoperative PROLO score < 4.

One patient developed dural tear which was repaired using free fat graft. The patient who developed superficial skin infection was a known diabetic. Inadequate disc removal occurred in one patient which resulted in the patient presenting with cauda equina features. Subsequently, he underwent laminectomy and discectomy. (Fig 2)

Figure 2. Complications Following Fenestration Discectomy

PROLO economic and functional outcome scale was used for assessing the clinical and functional outcome of the patients following fenestration discectomy. It was seen that patients showed an improvement in the PROLO scores as early as 6 weeks after the surgery (Table 3). Maximum improvement in the score was noticed during the period 6 weeks to 3 months after the surgery (Table 3&4, Fig 3 &4). 83% of the patients were relieved of their major symptom of back pain and radiating leg pain. One of the patients was lost to follow-up after 6 months. His PROLO score at 6th month follow-up was taken as his final PROLO score for outcome analysis at the end of 1 year also (Table 5 &6). Majority of the patients maintained a good duration of follow-up. The mean duration of follow-up was 9 months with a minimum of 6 months and a maximum of 1 year.

PROLO Scores	No. of Patients	Percentage
PROLO Economic Score		
E2	6	24
E3	17	68
E4	2	8
PROLO Functional Score		
F2	8	32
F3	16	64
F4	1	4

Table 3. Postoperative PROLO Scores at 6 weeks

PROLO Scores	No. of Patients	Percentage
PROLO Economic Score		
E2	1	4
E3	5	20
E4	18	72
E5	1	4
PROLO Functional Score		
F2	1	4
F3	6	24
F4	17	68
F5	1	4

Table 4. Postoperative PROLO Scores at 3 Months

PROLO Scores	No. of Patients	Percentage
PROLO Economic Score		
E2	1	4
E3	2	8
E4	12	48
E5	10	40
PROLO Functional Score		
F3	2	8
F4	14	56
F5	9	36

Table 5. Postoperative PROLO Scores at 6 months

PROLO Scores	No. of Patients	Percentage
PROLO Economic Score		
E3	3	12
E4	8	32
E5	14	56
PROLO Functional Score		
F3	1	4
F4	14	56
F5	10	40

Table 6. Postoperative PROLO Scores at the end of 1 year

Figure 3. Change in Mean PROLO Economic Score after Fenestration Discectomy

Figure 4. Change in Mean PROLO Functional Score after Fenestration Discectomy

On applying paired 't' test, the observed difference between the mean preoperative and postoperative PROLO economic and functional scores at all durations of follow-up was found to be statistically significant with a p value of <0.001. This indicates that the economic and functional outcomes of lumbar IVDP patients significantly improved with fenestration surgery. (Table 7)

PROLO Economic Scores	Mean	p Value
Pre op	1.96	0.001
Post op at 1 year	4.44	
PROLO Functional Scores		
Pre op	1.84	0.001
Post op at 1 year	4.36	
Table 7. Comparison of Mean Scores Pre and Post-op		

Grading of Outcome

17 out of 25 patients (68%) had a good PROLO outcome score even at the end of 3 months after surgery. Further improvement in scores was continued to be observed till the end of the follow-up period with 88% of the patients reporting a good PROLO outcome score at 1 year (Fig 5).

Figure 5. Clinical Outcome after Fenestration Surgery

DISCUSSION

Lumbar disc disease is one of the common conditions encountered by orthopaedic surgeons. Though the lumbar disc disease does not contribute to mortality, it contributes to morbidity and economic loss due to the number of work hours lost.⁽⁵⁾

The endpoint of assessment of any therapeutic modality is functional outcome because that is what matters to the patients. Lumbar disc disease is a benign condition and pain is the predominant factor limiting the activities of the patient, hence it is anticipated that after the therapy, the patients should have good functional outcome and go back to pre-morbid state. The fact is that the good outcome varies from 49-90% in various studies which implies that there should be many factors which influence the outcome like patient selection, a period of conservative therapy before considering surgery, etc.⁽⁶⁾

Any scientific study needs an objective evaluation of results. There are many assessment scales like Loon's outcome criteria,⁽⁷⁾ Oswestry disability questionnaire,⁽⁸⁾ etc. which may not be suitable for our population. In this study, we have selected PROLO scale to assess the patients' outcome both subjectively and objectively due to its ease of administration. This scale has two Likert type subscales- functional and economic.⁽³⁾

It has been found that the mean economic outcome score in our study is 4.44 which is similar to the study by Pappas et al⁽⁹⁾ and Davis RA⁽¹⁰⁾ who reported a score of 4.5 and 4.6 respectively. Similarly, the functional outcome score in this study is 4.36 as compared to 4.08 and 4.5 reported by Pappas et al and Davis RA. Patients were available for follow-up for a mean period of 9 months with a range of 6 months to 12 months. It is seen that the observed difference between the mean preoperative and postoperative PROLO Economic and functional scores at any duration of follow-up was found to be

statistically significant ($p < 0.001$) when paired 't' test was applied.

Total PROLO scores calculated were graded into good (score 8-10), moderate (score between 4 and 7) and poor (score < 5) categories. 88% of the patients in our study reported a good PROLO score following surgery while only 75% and 89% patients demonstrated a good score in other studies.⁽⁹⁾⁽¹⁰⁾ In our study, there were no patients who reported a poor outcome following fenestration discectomy at the end of a one year follow-up while this percentage ranged from 3-7% in other similar studies. The inclusion of more patients with a low preoperative PROLO score in our study probably accounted for the difference in the outcome as compared to other studies. Similar information about preoperative PROLO score is not available in other studies. Only 4 out of the 25 patients operated upon developed one or other complication.

CONCLUSION

We thus conclude that fenestration discectomy which is less time consuming with lesser blood loss and with less postoperative morbidity is a safe procedure compared to extensive laminectomy and discectomy. Patient selection plays an important role in predicting the outcome following fenestration surgery. It is a much cheaper alternative to surgeries like microlumbar discectomy and endoscopic discectomy. PROLO scale appears to be a useful tool for evaluation of clinical and functional outcome of lumbar disc surgery by fenestration technique.

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