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ORIGINAL ARTICLE

Low Back Pain and Radicular Pain by Visual Analogue Scale (VAS) and Japanese Orthopedic Association (JOA) Score in Radiological Outcome in between Baseline Status to Postoperative Status

Md. Rashedul Hossain[1] | Md. Kamrul Ahsan[2] | Kazi Md. Rakibul Hasan[3] | Md. Shahidul Islam khan[4] | Molla Md. Abdullah Al Mamun[5]

Corresponding Author: Md. Rashedul Hossain

Abstract:

Background: Recurrent lumbar disc herniation (RLDH) is one of the most common spinal disorders following dise surgery. It is a major disabling condition as it impairs significantly with daily activities. But the management of recurrent lumbar disc herniation remains still controversial. Aim: To evaluate the low back pain and radicular pain by visual analogue scale (VAS) and japanese orthopedic association (JOA) score in radiological outcome in between baseline status to postoperative status.

Methods: This prospective interventional study was conducted in department of Orthopaedic Surgery, BSMMU, Dhaka from October 2017 to September 2019. A total of 22 cases of RLDH having the inclusion criteria were taken as sample after diagnosing clinically, radiologically and with MRI. Outcome of low back pain (LBP) and radicular pain was measured by visual analogue score (VAS) and overall clinical outcome by Japanese Orthopaedic Association (JOA) score. Statistical analysis was done by using statistical package for social science (SPSS-25). The results were expressed as frequency, percentage and mean ± SD. Level of significance was calculated at confidence interval of 95% and $p< 0.05$.

Results: Follow up period was at least 06 months. Age of patients ranges from 35-70 years with mean age 51.1±19.7 years; 68.2% were male and 31.8% were female. Heavy workers were 54.5%, light workers 18.2% and house wives 27.3% with L4-L5 level involvement in 54.5% patients and L5-S1 in 45.5% patients. 77.3% subjects had BMI >30 kg/m² and 22.7% had ≤30 kg/m² with mean BMI 31.2±1.5 kg/m². Pre and postoperative mean VAS score for LBP was 7.86±1.36 and 2.77±1.86 and that for radicular pain was 7.59±1.64 and 1.95 ±1.65 respectively. The pre and post operative mean JOA score was 9.36±2.25 and 24.95±2.06 respectively. 02 patient developed wound infection, 01 with dural tear and neurological deficit and 01 postoperative instability and all were treated accordingly. The outcome was measured following Hirabayashi et al. and graded following Fu et al as excellent in 06(27.2%), good in 14(63.7%) and fair in 02 (9.1%) patients. 20 (90.9%) patients were in the satisfactory group and 2(9.1%) patients were in the unsatisfactory group.

Conclusions: Revision discectomy is effective in patients with recurrent lumbar disc herniation with satisfactory rate up to 90.9%. Fusion with revision discectomy improves the postoperative low back pain, decreases the intraoperative risk of dural tear or neural damage and decreases the postoperative incidence of mechanical instability or re recurrence. In concluded that revision discectomy is an effective procedure with very satisfactory functional results for management of patients with recurrent lumbar disc herniation.

Key words: Radiological Outcome, Recurrent, Lumbar Disc Herniation.

[1]Assistant Registrar, Dept. Of Orthopaedics, Shahid Tajuddin Ahmad Medical College Hospital, Gazipur, Bangladesh
[2]Professor, Dept. of Orthopaedics, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh
[3]Consultant, Dept. Of Orthopaedics, Kaligonj Upozella Health Complex, Kaligonj, Bangladesh

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[4]Medical Officer, Dept of Orthopaedics , Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh
[5]Assistant Professor, Dept. Of Orthopaedics, Shahid Tajuddin Ahmad Medical College Hospital, Gazipur, Bangladesh

Introduction

Recurrent lumbar disc herniation is a major cause of surgical failure following lumber disc surgery. It is a significant problem, as scar formation may lead to increased morbidity after traditional posterior operation and so diagnosis and also differentiation from fibrous tissue is sometimes difficult. The optimal surgical technique for treating recurrent lumbar disc herniation is controversial. Adequate facililities, equipments and highly expertise spine surgeons are there in my hospital who are familiar with revision discectomy with or without fusion for treatment of patients with recurrent lumbar disc herniation. Several important prognostic factors are influencing the outcome of discectomy. These included herniation level, technique and amount of discectomy, smoking, revision surgery, obesity, Lasegue's test, duration of sciatica, anxiety and depression [1]. It seems that factors such as age, gender and severity of preoperative muscular weakness have no significant effect on prognosis [2]. Diagnosis of the cause of recurrent back pain is still difficult. Many causes of recurrence of back pain after surgery have been recorded; recurrent disc herniation and postoperative fibrosis are the two major ones. It is important to distinguish these two entities as disc herniation may require re-operation, whereas postoperative fibrosis does not. MRI imaging appeared to be the examination of choice in the investigations of spine and disc diseases especially in recurrent disc prolapse. MRI with contrast (Gadolinium enhanced MRI) may differentiate post operative fibrosis from recurrent herniation [3]. Treatment options of first-time disc herniation include observation combined with aggressive medical management (Pharmacological and physical therapies), chymopapain, intradiscal electrothermal coagulation therapy, laser-assisted decompression, minimally invasive microdiscectomy and endoscopic discectomy, fenestration and discectomy, laminotomy and discectomy, laminectomy and discectomy. Surgical options for revision discectomy includes either via a conventional or invasive technique, with or without instrumented spinal fusion for recurrent disc herniation. But discectomy with fusion by Transforaminal Lumbar Interbody Fusion (TLIF) or Posterolateral Fusion (PLF) has more chance of increased intraoperative blood loss, operative time, duration of post operative hospital stay, use of postoperative opoids, and implant related cost [4] but reduces chance of post operative back pain and instability [5]. When determining the optimal approach, factors including surgeon preference, presenting symptoms, presence of axial low back pain, radiographic evidence of instability or deformity and number of prior herniations must be considered [6]. Studies focusing on revision surgery for recurrent disc herniation have demonstrated variable outcomes. Many recent reports have shown clinical results comparable to primary discectomies, while early studies demonstrated even worse outcomes following revision discectomy. As far our knowledge no study was carried out to evaluate the results of revision discectomy in recurrent lumbar disc herniation at BSMMU, Dhaka or any other institution in Bangladesh. Therefore, on the basis of this background, the present study has been designed to evaluate the results of revision discectomy in recurrent lumbar disc herniation. The findings of this study may be helpful to provide evidence based information to the physician as well as patient groups about safety and satisfactory outcome of revision discectomy in management of recurrent lumbar disc herniation.

Materials and Methods

This prospective interventional study was conducted in department of Orthopaedic Surgery, BSMMU, Dhaka from October 2017 to September 2019. A total of 22 cases of RLDH having the inclusion criteria were taken as sample after diagnosing clinically, radiologically and with MRI. Outcome of low back pain (LBP) and radicular pain was measured by visual analogue score (VAS) and

overall clinical outcome by Japanese Orthopaedic Association (JOA) score. Statistical analysis was done by using statistical package for social science (SPSS-25). The results were expressed as frequency, percentage and mean ± SD. Level of significance was calculated at confidence interval of 95% and $p< 0.05$.

Inclusion criteria:

1. Patients with recurrent low back pain at previously operated disc level with radiculopathy, 6 months after surgery with positive MRI findings.
2. Patients with recurrent low back pain at previously operated disc level with neurological deficit, 6 months after surgery with positive MRI findings.

Exclusion criteria:

1. Patient with recurrent disc prolapse at levels other than L_4 to S_1
2. Patients with spondylolysthesis.
3. Reoperation for infections, discitis.
4. Patients with low back pain without radiation in legs.
5. Patients with inflammatory diseases, prior fracture in spines at same level, deformity due to generalized disc degeneration or other structural deformity, extensive myofascial pain and herniation at a different level.
6. Patients with prior records of surgery in spine other than those with primary discectomy at the same level and with surgery due to multilevel herniation.
7. Patients with other pathology such as infection, tumor.

The patients were selected on the basis of the inclusion and exclusion criteria. The patients were diagnosed clinically and radiologically. After taking informed consent, detail history and physical examination of each patient was performed. Plain radiographs and MRI of lumbo- sacral spine was performed in all patients. MRI with contrast was performed in suspected cases of fibrosis. All necessary investigations for surgery were performed before operation. A structured case record form (Appendix IV) was used to interview and collect data. Patients were interviewed and case record form was filled up by the interviewer. Outcome of low back pain and radicular pain after revision surgery was measured and compared by using visual analogue score (VAS) (Appendix V) and overall clinical outcome by Japanese Orthopaedic Association (JOA) score (Appendix VI). These results were classified into a four grade scale: Excellent ≥90%, good 75- 89%, fair 50-74%, and poor ≤49% [7]. All the data was compiled and sorted properly and the quantitative data was analyzed statistically by using Statistical Package for Social Science (SPSS-25). The results were expressed as frequency, percentage and mean ± SD and level of significance was calculated at confidence interval of 95% and $p<0.05$.Paired Student's t-test was performed to compare continuous variables between the groups and Z proportion test was performed to compare the proportion between the groups.

Statistical analysis: All the data were compiled and sorted properly and the quantitative data were analyzed statistically by using Statistical Package for Social Science (SPSS-25). The results were expressed as frequency, percentage and mean ± SD and level of significance was calculated at confidence interval of 95% and $p<0.05$.Paired Student's t-test was performed to compare continuous variables between the groups and Z proportion test was performed to compare the proportion between the groups.

Operational Definition (Recurrent lumbar disc herniation): Recurrent lumbar disc herniation (RLDH) is defined as disc herniation at a previously operated disc level at lumbar spine, regardless of ipsilateral or contralateral herniation, in patients who experienced a pain-free interval of at least 6 months after surgery [5].

Results

Table 1: Patient with regard to preoperative data (n=22)

Age (Years) Mean±SD	51.1±9.7	p-Value
Male: Female	15:7	-
Time interval	17.18±8.47	-
BMI (kg/m²)	31.2±1.5	-

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Low back pain (Preoperative: Postoperative)	7.86±1.36: 2.77 ±1.86	<0.001
radicular pain(Preoperative: Postoperative)	7.59±1.64: 1.95± 1.65	<0.001

Results were expressed as mean ± SD. Paired Student's 't' test were performed to compare pre and final postoperative follow-up. Level of significance was calculated at p value <0.05. n- study subjects.

In this study, out of 22 patients 8 (36.4%) were 35-45 years of age, 8 (36.4%) were 46- 55years, 4 (18.2%) were 56-65 years and 2 (9.1%) were 66-70 years old. The mean (± SD) age of the patients was 51.1±9.7 years and the youngest and the oldest patients were 35 and 70 years respectively. Among 22 subjects, majority of the study subjects 15 (68.2%) were male and only 7 (31.8%) were female. In this study, interval between primary discectomy and RLDH was 6-12 months in 8 (36.4%) patients, 13-24 months in 10(45.45%), 25-36 months in 3(13.64%) and >36 months in 1(4.55) patient with mean interval 17.18±8.47 months. The mean (±SD) BMI of the study subjects was31.2 (±1.5). Pre and postoperative mean (±SD) VAS score was 7.86±1.36 and 2.77±1.86 respectively. This indicated a significant difference between the two groups. Pre and postoperative mean (± SD) VAS score was 7.5911.64 and 1.95+1.65 respectively. This indicated a significant difference between the two groups.

Table 2: Assessment of the study population by JOA Score [5] (n=22)

Clinical criteria	Pre-operative JOA	Post-operative	Mean differences Between groups	95% CI	P value
Low back pain	0.23± 0.42	1.82± 0.65	1.59	1.11-2.07	<0.001
Leg pain and/or tingling	0.27± 0.45	2.00± 0.60	1.73	1.25 -2.21	<0.001
Ability to walk	0.41± 0.49	2.27± 0.62	1.86	1.38-2.34	<0.001
Straight leg raising test	0.36± 0.48	1.86± 0.34	1.50	1.02-1.98	<0.001
Sensory disturbance	0.77± 0.42	1.73± 0.45	0.96	0.69-1.22	<0.001
Motor disturbance	0.50± 0.50	1.86 ± 0.34	1.37	0.27 2.45	<0.001
Restriction of daily activities	7.36+0.88	13.41± 0.72	6.05	4.96-7.14	<0.001
Urinary bladder function	-0.55± 1.16	0.00± 0.00	0.55	0.05-1.05	0.032
Total JOA score	9.36± 2.25	24.95± 2.06	15.59	14.50-16.67	<0.001

The pre and post-operative means (SD) low back pain (JOA) score was 0.23±0.42 and 1.82± 0.65 respectively. This indicated a significant difference between the two groups, with an estimated mean difference of 1.59 (95 % CI 1.11 to 2.07). Again, the pre and post-operative means (± SD) leg pain (JOA) score was 0.27± 0.45 and 2.00± 0.60 respectively. This indicated a significant difference between the two groups, with an estimated mean difference of 1.73 (95 % CI 1.25 to2.21). Moreover the pre and post-operative means (SD) ability to walk (JOA) score was 0.41±0.49 and 2.27± 0.62 respectively. This indicated a significant difference between the two groups, with an estimated mean difference of 1.86 (95 % CI 1.38 -2.34). Again, the pre and post-operative means (+SD) straight leg rising score was 0.36±0.48 and 1.86± 0.34 respectively. This indicated a significant difference between the two groups, with an estimated mean difference of 1.50 (95 % CI 1.02 to 1.98). Furthermore, the pre and post-operative means (± SD) sensory disturbance score was 0.77±0.42 and 1.73± 0.45 respectively. This indicated a significant difference between the two groups, with an estimated mean difference of 0.96 (95 % CI 0.69 to 1.22). The pre and post-operative means (±SD) motor disturbance score was 0.50± 0.50 and 1.86± 0.34 respectively. This indicated a significant difference between the two

groups, with an estimated mean difference of 1.37 (95 % CI 0.27 to 2.45). The pre and post- operative means (± SD) restriction of daily activities score was 7.36± 10.88 and 13.41±0.72 respectively. This indicated a significant difference between the two groups, with an estimated mean difference of 6.05 (95 % CI 4.96 to 7.41). The pre and post-operative means (SD) urinary bladder function score was -0.55± 1.16 and 0.00± 0.00 respectively. This indicated a significant difference between the two groups, with an estimated mean difference of 0.55 (95 % CI 0.05 to 1.05).

Table-3: Distribution of study population according to postoperative complications (n=22)

Parameters	Study subjects n (%)
No complications	18 (81.82%)
Postoperative instability	1 (4.55%)
Dural tear & transient neurological deficit	1 (4.55%)
Superficial wound infection	2 (9.09%)

Results were expressed as frequency and percentage.

In this study, only 4 (18.18%) patients developed postoperative complications. Among them, 1 (4.55%) patient developed postoperative instability, 1 (4.55%) patient developed dural tear & transient neurological deficit and 2 (9.09%) patients developed postoperative superficial wound infection.

Table-4: Pre & postoperative radiological outcome (signs of instability) in x-ray, hospital stay, recovery rate and surgical outcome (n=22)

Sign of instability preoperative	N (%)
Yes	0(0.0%)
No	22 (100%)
Sign of instability post-operative	
Yes	1(4.55%)
No	21 (95.45%)
Hospital Stay	
<5 Days	17 (77.3%)
≥5 Days	5(22.7%)
Recovery Rate	
Excellent	06 (27.2%),
Good	14 (63.7%)
Fair	2 (9.1%)
Poor	0(0.0%)
Surgical Outcome	
Satisfactory	20 (90.9%)
Unsatisfactory	2 (9.1%)

During preoperative period and also in post-operative follow up, X-ray lumbo-sacral spine Antero-posterior, Lateral and Flexion-Extension view was done in all patients to evaluate signs of instability. Preoperatively, no patients had features of instability but during postoperative period 01 patient developed post-operative instability at operated level (L4-L5) which was Mayerding grade-I Spondylolysthesis and did not progress at final follow-up. In this study, majority (77.3%) of the study subjects need hospital stay after operation was <5 days. Only 5(22.7%) study subjects need hospital stay ≥5 days after operation. The outcome of the subjects was graded according to the recovery rate and graded as excellent 06 (27.2%), good 14 (63.7%) and fair in 2 (9.1%) patients. Poor score

was not found in any population at final follow up. To determine the surgical outcome of the study, excellent and good grades were treated as satisfactory, fair and poor grades were treated as unsatisfactory. So, a total number of 20 (90.9%) patients were in the satisfactory group and only 2 (9.1%) patients were in the unsatisfactory group.

Discussion

Revision of spinal surgery is more challenging than primary surgery due to the indistinct anatomical planes and perineural scarring Although early reports documented less satisfactory outcomes with revision discectomy, more investigations which controlled for confounding factors such as foraminal stenosis and adjacent level herniations showed that results are more comparable with those for primary disc surgery. The results of current study demonstrate that mean (±SD) age of the patients was 51.1 (9.7) years with the youngest and the oldest patients were 35 and 70 years of age respectively. The recurrent lumbar disc herniation occurs in adult aged population. Almost similar to the findings observed by the various investigators from different countries [4, 8]. Majority of the study subjects 15 (68.2%) were male and only 7(31.8%) were female which was similar to the findings of Khayat et al; Mashhadinezhad et al [4, 9]. In this study, 12 (54.5%) subjects had recurrent lumbar disc herniation at L4-L5 spine and 10 (45.5%) at L_5-S_1 spine. Khayat et al [4] found that L4-L5 was the most affected level for recurrent lumbar disc herniation which is similar to my findings. As sharp change of direction of curvature of spine at L_4-L_5, no hooking effect as in L_5-S_1 and when sacralization present, it is the last most mobile segment; which explains the cause of commonest occurrence at this level. Regarding recurrence time of herniation to primary surgery, mean recurrence period was 17.18±8.47 months which was almost similar to the findings of El Shazly et al; Mashhadinezhad et al[5, 9] and many other authors. In present study, postoperative VAS score for low back pain and radicular pain was significantly lower than that of preoperative VAS score. However, post-operative low back pain, leg pain and/or tingling, ability to walk and straight leg raising test, sensory disturbance, motor disturbance, daily activities JOA scores and urinary bladder function JOA score was significantly improved than that of preoperative JOA score. This finding was in agreement with the study of many researchers of different countries [4,5,10,11]. In present study, majority (77.3%) of the study subjects need <5 days hospital stay after operation. Only 5(22.7%) study subjects need hospital stay ≥5 days after operation. 01 patient with dural injury and transient neurological deficit needed 10 days, 02 patient with superficial wound infection needed 11 days and 10 days accordingly, 01 patient needed 07 days for post-operative low back pain who later on developed post-operative instability in subsequent follow up and 01 patient needed 05 days of post-operative hospital stay for reduction of back pain. %). These findings were similar to the study of El Shazly et al; Mashhadinezhad et al [5,9]. Only few patients developed postoperative instability (4.55%), dural tear and transient neurological deficit (4.55%) and superficial wound infection (9.09%). These findings were similar to the study of Khattak et al; El Shazly et al and Mashhadinezhad et al [5,8,9]. During preoperative period and also in post-operative follow up, X-ray lumbo-sacral spine Antero-posterior, Lateral and Flexion-Extension view was done in all patients to evaluate signs of instability. Preoperatively, no patients had features of instability but during postoperative period 01 patient developed post-operative instability at operated level (L4-L5) which was Mayerding grade-I Spondylolysthesis and did not progress at final followup. The patient complains mild intermittent dull low back pain which was managed by occasional analgesics and activity modifications and advised for further follow-up. These findings were similar to the study of Khattak et al [8]. In present study, final outcome was determined by excellent and good according to recovery rate assessing from JOA score and treated as satisfactory, while fair and poor grade was treated as unsatisfactory. Majority (90.9%) of the study population was found as satisfactory group at the end of the final follow-up period which is almost similar to the findings observed by the various researchers of different countries [4,6,9,10,11].

Conclusions

Revision discectomy is effective in patients with recurrent lumbar disc herniation with satisfactory rate up to 90.9%. Fusion with revision discectomy improves the postoperative low back pain, decreases

the intraoperative risk of dural tear or neural damage and decreases the postoperative incidence of mechanical instability or re-recurrence. In concluded that revision discectomy is an effective procedure with satisfactory functional results for management of patients with recurrent lumbar disc herniation.

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