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Original Research Article

Comparative Clinical Outcomes of Lumbar Discectomy Across Different Age Groups

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Abstract:

Background: Lumbar disc herniation (LDH) is one of the leading causes of lower back pain and radiculopathy, often necessitating surgical management when conservative treatments fail. Age-related variations in surgical outcomes remain an important area of clinical interest.

Objective: To compare the clinical outcomes of lumbar discectomy in two different age groups—patients younger than 60 years and those aged 60 years or older.

Materials and Methods: A retrospective observational study was conducted involving 50 patients who underwent single-level lumbar discectomy at the Department of Neurosurgery, KIMS, KIIT University, Bhubaneswar, between January 2024 and December 2024. Patients were divided into two groups: Group 1 (<60 years, n = 30) and Group 2 (≥60 years, n = 20). Outcome measures included Visual Analog Scale (VAS) for pain, Oswestry Disability Index (ODI) for functional disability, and SF-12 for quality of life. Follow-up assessments were conducted at 6 weeks, 6 months, and 1 year postoperatively.

Results: Both groups demonstrated significant reductions in VAS and ODI scores, along with improvements in quality-of-life measures following surgery ($p < 0.05$). Younger patients showed marginally greater improvements in pain and disability scores compared to older adults. However, clinical success was observed in both groups with no significant differences in overall satisfaction. Postoperative complications were slightly higher in the older group but did not affect long-term recovery.

Conclusion: Lumbar discectomy is an effective and well-tolerated intervention for LDH across age groups. Age alone should not be a limiting factor in surgical decision-making. Personalized preoperative evaluation and consistent surgical protocols are crucial for optimized outcomes.

Keywords: Lumbar Disc Herniation, Discectomy, Age Groups, Clinical Outcomes, Oswestry Disability Index, Quality of Life.

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Introduction

Lumbar disc herniation (LDH) is one of the most prevalent spinal disorders affecting millions globally, with significant socioeconomic implications due to its impact on individuals' functional capacity and quality of life [1]. Characterized by the displacement of intervertebral disc material causing compression on nerve roots, LDH often results in intense lower back pain, sciatica, and in severe cases, neurological deficits. Physiotherapy, analgesics, and epidural steroid injections are the most "commonly suggested conservative methods of treatment but surgical procedures are required when symptoms remain or increase, particularly those with cauda equina syndrome or profound motor weakness. The surgery generally includes discectomy, microdiscectomy, and laminectomy up to highly technological minimally invasive surgery. Although the effectiveness of such procedures has been researched on extensively, the influence of the age of the patient in determining the short-term and long-term clinical outcomes is an aspect of clinical and academic concern. Due to the aging population of the world, the age-specific reaction to lumbar disc herniation surgery is becoming more important in order to customize the treatment plans [2].

Another factor that significantly affects the presentation and prognosis of lumbar spine disorders is age. The acute disc extrusion can be seen in young patients who have experienced trauma or heavy lifting and the degenerative changes which are chronic and related to loss of elasticity and age-associated dehydration of the disc. Such physiological variations may have great influence on the outcomes of surgery such as recovery,

recurrence and functional ability after surgery [3,4]. Moreover, elderly patients are often comorbid with conditions like osteoporosis, cardiovascular disease or diabetes, both of which can make the surgery process and the rehabilitation challenging. Conversely, younger people generally exhibited a quicker postoperative recovery owing to the fact that they are generally in good physical condition. However, there are heterogeneous evidence on whether younger patients are obliged to have better outcomes than their older counterparts in the literature. Therefore, the assessment of clinical outcomes in various age groups is important not only to improve the counseling and management of expectations in patients, but also to better the procedures of surgery and rehabilitation.

This research paper aims to examine and compare clinical results of lumbar disc herniation surgery in dissimilar age groups with special attention to such parameters as the pain relief, functional recovery, complication rates, and recurrence [5]. Special attention is paid to the investigation of the impact of age-related physiological and pathological differences on the recovery patterns and the levels of postoperative satisfaction. The proposed study is set to bridge the gap in knowledge by presenting empirical data with the help of the highest quality clinical measurement instruments, i.e., the Visual Analog Scale (VAS) of pain, the Oswestry Disability Index (ODI) of functional outcome, and radiographic assessments, when necessary [6]. The results will give a more subtle insight to clinicians on the role of age in surgical prognosis, leading to the optimization of patient selection and distinctive postoperative care plans. In addition, comparing clinical outcomes with demographic and surgical factors, this study will determine possible predictors of success or complications, which can be useful in the optimization of surgical standards and patient counseling activities [7].

Since the rate of spinal disorders among older adults is on the rise because of the rise in life expectancy and a sedentary lifestyle, the knowledge that I learned during this study will be useful in developing evidence-based practices to deal with lumbar disc herniation among the various age groups [8]. Another aim of the paper is to give evidence to the rising trend of patient-centered care in orthopedic and neurosurgical practice, where interventions are designed based on the specifics of the disease, but also on the particular characteristics of the patient, such as age, comorbidity, and potential of postoperative rehabilitation. This study will produce a better understanding of the advantages and disadvantages of lumbar disc herniation surgeries when comparing the outcomes in younger and older patients in systematic ways. Ultimately, the study aims to contribute to the broader discourse on geriatric spine surgery, enhance clinical decision-making, and promote improved quality of life for patients of all ages suffering from lumbar disc herniation.

Materials and Methods

Study Design: This retrospective cohort research used clinical data of patients who have suffered lumbar discectomy due to symptomatic single-level lumbar disc herniation between January 2024 and December 2024.

Study Area and Location: The study was conducted in the Department of Neurosurgery, Kalinga Institute of Medical Sciences (KIMS), KIIT University, Bhubaneswar, India from January 2024 to December 2024.

Patient Population and Sample Size: The study identified 50 patients who were identified using pre-defined inclusion and exclusion criteria. Patients were divided into two age-related groups: Group 1 (younger) of patients at age < 60 years and Group 2 (older) of patients at age 60 years and above. All of the eligible, non-urgent lumbar discectomy cases treated in KIMS over the specified period were considered eligibility criteria and included in this sample.

Inclusion and Exclusion Criteria: Patients fulfilled the following criteria: (1) scheduled, non-urgent lumbar discectomy; (2) persistent, non-reactive radicular pain and functional disability at least three months; (3) single-level herniated lumbar disc the cause of which was not reducing to conservative treatment (physiotherapy, analgesics, epidural steroid) (4) 12 months post-surgery follow-up. Patients with a history of prior spinal surgery, multi-level disc disease, urgent surgery indications like cauda equina syndrome or severe neurological deficit and cases related to accidents at work were excluded.

Surgical Technique and Perioperative Care: A standard open/microdiscectomy technique was used by one experienced neurosurgeon on all procedures to ensure consistency in procedures. The main procedures were recognition of the level of the surgery, midline incision, limited laminotomy, ligamentum flavum removal, the nerve root exposure, and the herniated disc fragment removal. There were standardized care policies in the postoperative care, such as an early mobilization as tolerated and the commencement of supervised strengthening exercises six weeks postoperative.

Outcome Measures and Follow-Up: The clinical outcomes were evaluated with the help of reviewing patient charts and follow-up records. Assessment was made before the start of the operation and at 6 weeks, 6 months and 12 months after the operation. The following were the main outcome measures: (1) back and leg pain measured with the Visual Analog Scale (VAS); (2) disability measured with Oswestry

Disability Index (ODI); and (3) quality of life and patient satisfaction measured with SF-12 questionnaire on a 0100% scale. Perioperative complications and reoperations data were also gathered.

Statistical Analysis: Continuous variables, including VAS, ODI and SF-12 scores were reported as mean and standard deviation and were compared using unpaired two-tailed t-tests between the groups. The categoric variables like sex and type of occupation were presented as frequencies and percentages and compared under chi square tests. To make within-group comparisons between time points, the one-way ANOVA with the post-hoc test of Tukey was applied. The statistical significance was defined to be p 0.05. All the analyses had been carried out by MedCalc Statistical Software (Version 18.0).

Results

A total of 50 patients who underwent lumbar discectomy between January 2014 and December 2017 at the Department of Neurosurgery, KIMS, KIIT University, Bhubaneswar, India, were included in this study. Patients were divided into two age groups: Group 1 (< 60 years, n = 30) and Group 2 (≥ 60 years, n = 20). The mean age was 48.3 ± 7.9 years for Group 1 and 66.8 ± 4.4 years for Group 2. The male-to-female ratio was 1.3:1 in Group 1 and 1:1 in Group 2. The most common level involved was L4–L5 in both groups.

Baseline Characteristics of Study Population: At baseline, younger patients demonstrated slightly higher levels of physical activity and a lower burden of comorbidities compared to older patients. The mean duration of symptoms before surgery was observed to be almost identical in both groups. Basic demographic and clinical characteristics are displayed in Table 1.

Table 1: Baseline Characteristics of Patients in Both Age Groups

Parameter	Group 1 (<60 years) (n=30)	Group 2 (≥60 years) (n=20)
Mean Age (years)	48.3 ± 7.9	66.8 ± 4.4
Gender (M/F)	17 / 13	10 / 10
Symptom Duration (months)	6.5 ± 2.1	6.2 ± 1.8
ASA Score (1 / 2)	20 / 10	8 / 12
Common Herniation Level	L4–L5 (60%)	L4–L5 (55%)
Presence of Comorbidity (%)	23%	65%

Preoperative pain scores (VAS) and disability measures (ODI) were comparable between the two groups. Both groups demonstrated significant improvement in all postoperative follow-up evaluations. At 12 months postoperatively, younger patients reported a slightly greater reduction in pain and disability compared to older patients. A detailed outline of the pre- and postoperative mean values is shown in Table 2.

Table 2: Comparison of Clinical Outcomes (VAS and ODI) at Different Time Intervals

Outcome Measure	Timepoint	Group 1 (<60) (Mean ± SD)	Group 2 (≥60) (Mean ± SD)
VAS Score (Back Pain)	Pre-op	7.8 ± 0.9	7.5 ± 1.1
	6 Weeks	3.4 ± 1.0	4.1 ± 0.8
	12 Months	1.9 ± 0.6	2.7 ± 0.8
VAS Score (Leg Pain)	Pre-op	8.1 ± 0.8	7.9 ± 1.1
	6 Weeks	3.2 ± 0.9	4.0 ± 1.0
	12 Months	1.5 ± 0.5	2.3 ± 0.7
ODI Score (%)	Pre-op	64.0 ± 7.2	62.7 ± 8.1
	6 Weeks	35.5 ± 6.8	42.0 ± 7.3
	12 Months	22.1 ± 5.4	30.2 ± 6.9

Both age groups reported statistically significant improvement in both VAS and ODI scores at each follow-up interval ($p < 0.05$). The younger age group (<60 years) showed greater improvement at 12 months for back pain (reduction by 75.6%) and leg pain (reduction by 81.5%) compared to the older group (65.8% and 70.8%, respectively). Similarly, disability reduction was also more pronounced in Group 1 at final follow-up.

Quality of Life (SF-12) Scores: Health-related quality of life was assessed using the SF-12 questionnaire. Mean SF-12 scores improved significantly in both age groups from preoperative values to the 12-month follow-up (Table 3). Younger patients demonstrated comparatively higher postoperative functional scores than their older counterparts.

Table 3: Comparison of SF-12 scores Between Groups

Timepoint	Group 1 (<60) (Mean ± SD)	Group 2 (≥60) (Mean ± SD)
Pre-operative	42.5 ± 6.9	39.7 ± 8.4
6 Months	71.4 ± 8.1	63.5 ± 9.1
12 Months	83.0 ± 7.3	74.8 ± 8.6

A statistically significant improvement in SF-12 scores was noted in both groups at all postoperative timepoints ($p < 0.001$). At 12 months, younger patients had an average increase of 40.5 points, whereas older patients showed an increase of 35.1 points from baseline.

Postoperative Complications and Reoperations: Postoperative complication rates were slightly higher in the older group (15%) compared to the younger group (10%). The most common complications were superficial wound infections and transient sensory deficits. Only two patients in the younger group and one in the older group required reoperation due to recurrent disc herniation within the first year.

Table 4: Postoperative Complications

Complication	Group 1 (<60)	Group 2 (≥60)
Superficial infection	2 (6.6%)	2 (10%)
Transient sensory deficit	1 (3.3%)	1 (5%)
Recurrent disc herniation	2 (6.6%)	1 (5%)
Total	3 (10%)	3 (15%)

Although the frequency of complications was higher in older patients, the difference was not statistically significant ($p = 0.320$). Reoperation rates were similar between the groups, indicating that age did not strongly influence the likelihood of early recurrence.

Overall Interpretation of Key Findings: The clinical outcomes suggest that lumbar discectomy is an effective surgical option for managing symptomatic lumbar disc herniation in both younger and older adults. However, younger patients showed slightly superior outcomes in terms of pain reduction, disability improvement, and quality of life metrics. Statistical analysis confirmed significant improvement from baseline in both groups across all measures, with the most prominent gains occurring within the first 6 weeks post-surgery. The observed differences in outcomes may be explained by age-related diminished healing capacity, higher comorbidity burden, and reduced physiological reserve in older patients. However, the notable improvements in the older group suggest that properly selected elderly patients can still benefit greatly from surgical intervention.

Discussion

The present study sought to evaluate and compare the clinical outcomes of lumbar discectomy between younger (<60 years) and older (≥60 years) patient groups treated at the Department of Neurosurgery, KIMS, KIIT University, Bhubaneswar. Our results are related to the knowledge base of age variation in response to lumbar spine surgeries with the emphasis made on the variations in pain relief, functional recovery, and patient satisfaction as the context of the rising cases of spinal degenerative conditions in the elderly population.

The findings revealed that the scores of the visual analog scale (VAS) pain and Oswestry Disability Index (ODI) scores were significantly better in both age groups at 6-month and 1-year follow-up, which indicates that lumbar discectomy is highly effective in the relief of sciatic and back pain derived out of disc herniation. These results are also in line with the earlier literature that has reported high level of pain and disability reduction after discectomy regardless of the age of patients [9,10]. The large changes in the elderly patients who are traditionally viewed as being at higher risk of developing postoperative complications because of comorbidities and degenerative changes with age support the value of the procedure as a potential form of treatment.

The increased risk of perioperative and postoperative complications of older adults undergoing spinal surgery has been already discussed in several studies. As noted by Clloyd et al., age alone is not a predictive factor that influences adverse outcomes; instead, pre-existing comorbidities and the complexity of the operations make a more conclusive factor [11]. It is in line with our finding that, with the two groups of patients, who were properly screened to comorbid risks and were subjected to single-level discectomy with a standardized postoperative program, there were few complications and satisfactory recovery, in general.

In the comparison of the degree of pain relief, this study resulted that despite the older group having a slightly higher mean improvement in VAS scores than the younger group, the elderly group also had significant and clinically meaningful recovery. This is consistent with previous researchers who had a similar result in an earlier study by Arinzon et al., who found that the similarity of the results of older

and younger patients receiving lumbar decompression is noted when both surgical protocols and preoperative selection criteria are standardized [10].

Another interesting finding was that the scores of satisfactions among the elderly were slightly lower than the scores of the younger patients. Although both the groups rated their quality of life higher after the operation, this difference can be explained by age-related factors in general, including slower functional recovery, less mobility, or more psychological concerns in older adults as reported in the past literature [12]. This coincides with the findings of Parker et al in which even after their patients had better clinical outcomes, they self-reported less of both physical capacity after surgery and emotional satisfaction [13].

This study also took into consideration the phenomenon of postoperative lower back pain and segmental instability which usually result in the failure back surgery syndrome (FBSS). Schaller pinpointed segmental instability to be a key factor leading to the frequent presence of pain following microdiscectomy, particularly in elderly persons who suffer degenerative alterations in the spine [14]. Although we could not find explicit instances of FBSS, larger studies that have a longer follow-up might provide better results on the impact that age has on the risk and presentation of this complication.

A clustering of the patients in both age groups showed evidence of mild recurring disc herniation at follow-ups. Nevertheless, the symptomatic recurrence rate necessitating treatment was lower than some of the reported literature, which could be explained by the single surgeon protocol and the standardized postoperative exercise regimen used. According to Lebow et al., up to 12 percent of patients had recurrence after discectomy and a considerable number of them were identified only by imaging [15]. Our study results were relatively more ample, which could be explained by strict inclusion criteria and more rigid follow-up.

Regarding implications regarding resources, lumbar disc herniation and surgery to treat the latter add significantly to the healthcare cost, especially within the elderly population. U.S. based researches calculate a high direct cost of healthcare of chronic back pains when conserved and surgical approaches of managing this pain are applied indicating the importance of implementing effective and timely interventions [16]. In health economics sense, the evidence in this study favor the perception that lumbar discectomy when applied with proper indications among the younger and older patients, could provide a cost effective and clinically viable approach in the management of lumbar disc herniation related disability.

We also find the same results at the randomized controlled trial by Peul et al., who had compared early surgical intervention with long-term conservative treatment in the case of lumbar disc herniation. The findings of their study supported the rapid recovery and excellent pain relief in surgically treated patients regardless of their age during the 2-year follow-up [17]. This adds more credence to the importance of surgical management as one of the preferred treatment methods in the event of failure of conservative interventions.

Nevertheless, there are a number of limitations of this study that should be admitted. The study is retrospective and the study design is single center, which restricts the extrapolation of findings. Also, the sample size and the period of follow-ups are rather small and might fail to provide sufficient data on long-term complications or recurrence rates [18]. Moreover, patient satisfaction scores as subjective measures can be affected by personal psychological or cultural factors which are not included in this analysis.

In spite of these constraints, our results substantiate the idea that age is not a single determinant to be used in deciding whether to undergo a lumbar discectomy. Lumbar discectomy is associated with high clinical outcomes both in younger and older adults, careful patient selection, standardized surgical procedures, and organized postoperative rehabilitation. It is advisable that these results be confirmed in future multicenter prospective studies using bigger cohorts and that future research should carry out more parameters like health economics, quality of life in the long run, and predictors of unfavorable results. This paper confirms that lumbar discectomy is a safe and effective treatment" of single level lumbar disc dislocation in the young and old adults and has significant pain relieving, functional restoration, and quality of life enhancement. Surgical management is not contraindicated by age, and a properly designed perioperative pathway will maximize the outcomes regardless of the age group.

Conclusion

This retrospective research study indicates that lumbar discectomy is a viable and efficient surgical procedure in the treatment of symptomatic single-level lumbar disc herniation in younger and older patients. Patients of the two age groups had substantial postoperative changes in the level of their pain, their functional ability, and their happier lives, despite their differences in physiological reserve and comorbid conditions. The fact that older adults show slightly lower levels of satisfaction might be due to the fact that they may have more general age-related factors, and not necessarily the outcome of surgery. This is because based on the similar benefits that are realized in the age groups,

age is not a restrictive factor in the determination to do lumbar discectomy. Rather, comprehensive preoperative evaluation, standardized surgical methods and postoperative rehabilitation are quite important in maximizing outcomes across all patients. It is suggested that future prospective studies with greater sample sizes and longer follow-up periods should be done to further prove these results and determine long-term rates of recurrence, cost-effectiveness, and quality-of-life outcomes.

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