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ORIGINAL ARTICLE

Surgical Outcome of Midline Wide Excision for Lumber Spinal Stenosis in Elderly Patients

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ABSTRACT

Background: Lumbar spinal stenosis (LSS) is a prevalent degenerative condition in the elderly, often leading to significant pain and functional disability that requires surgical intervention. And, aim this study was to evaluate the functional outcomes, pain relief, and complication rates of surgical management by applying midline wide excision approach for lumbar spinal stenosis in elderly patients.

Methods: This study was conducted at Shaheed Ziaur Rahman Medical College Hospital, Bogura, from January 2023 to December 2024. A purposive sample of 47 patients aged 60 years and above with symptomatic LSS refractory to conservative management underwent midline wide excision. Primary outcomes were measured using the Oswestry Disability Index (ODI) and the Visual Analog Scale (VAS) for leg pain preoperatively and at 6 months postoperatively. Complications were recorded. Data were analyzed with paired t-tests.

Results: The study demonstrated significant improvements in primary outcomes. The mean ODI score decreased from 68.2 to 24.5 ($p<0.001$). The mean VAS score for leg pain improved from 8.1 to 2.3 ($p<0.001$). The overall complication rate was 12.8%, with dural tear and surgical site infection being the most common (4.3% each). The majority of patients (87.2%) reported good to excellent satisfaction.

Conclusion: Midline wide excision is a highly effective and safe procedure for elderly patients with lumbar spinal stenosis, providing significant functional improvement and pain relief with an acceptable complication profile. It is a recommended treatment for carefully selected patients in this demographic.

Keywords: Lumbar spinal stenosis, Midline wide excision, Surgical complications, Surgical outcome, Visual Analog Scale.

INTRODUCTION

Lumbar spinal stenosis (LSS) is a prevalent and debilitating degenerative spinal condition, representing the most common indication for spinal surgery in patients over 60 years of age [1]. It is characterized by the narrowing of the spinal canal, lateral recesses, or neural foramina, leading to the compression of neural elements. The classic clinical manifestation is neurogenic claudication, which includes pain, numbness, and weakness in the buttocks and lower extremities that is exacerbated by walking and relieved by forward flexion or sitting [2]. The primary patho-etiology is age-related degenerative changes, including ligamentum flavum hypertrophy, facet joint arthropathy, and sometimes disc bulging, which collectively reduce the available space

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for the cauda equina and nerve roots [3,4]. The global demographic shift towards an aging population has facet joint arthropathy, and sometimes disc bulging, which collectively reduce the available space for the cauda equina and nerve roots [3,4]. The global demographic shift towards an aging population has resulted in a steadily increasing prevalence of symptomatic LSS, making it a significant public health concern associated with substantial healthcare costs and a profound negative impact on the quality of life [5]. For affected individuals, the condition often leads to severe functional limitations, reduced mobility, and chronic pain, culminating in a loss of independence and a higher burden of comorbidities [6]. The management of LSS typically follows a stepwise approach, beginning with conservative measures such as physical therapy, analgesics, and Neurogenic vitamin. However, a substantial proportion of patients, particularly those with severe or progressive symptoms, do not achieve adequate relief and become candidates for surgical intervention [7]. Among the various surgical techniques, midline wide excision has been established as an effective procedure for moderate to severe LSS. This technique involves a central decompression by removing the spinous process, Interspinous ligament & clearance of lateral recesses, the partial lamina, and the medial portions of the hypertrophied facet joints, thereby achieving a comprehensive decompression of the central canal and lateral recesses [8]. While robust evidence from large-scale studies supports the superior efficacy of surgery over non-operative care in well-selected patients, the specific assessment of outcomes for the midline wide excision technique in the elderly population remains a critical area of clinical inquiry [9]. Elderly patients present unique challenges, including higher rates of medical comorbidities, osteoporosis, and diminished physiological reserve, which can potentially influence surgical risk, complication rates, and the overall benefit derived from the procedure [10]. In high-income countries, numerous studies have demonstrated that with careful patient selection, elderly patients can experience significant improvements in pain and function following decompressive surgery, with acceptable morbidity rates [11]. However, the generalizability of these findings to resource-limited healthcare settings, such as Bangladesh, is not well-established. The surgical management of elderly patients in such contexts faces additional hurdles, including late presentation, advanced disease severity, and limited access to advanced perioperative care, which may alter the risk-benefit calculus [12]. Furthermore, there is a relative paucity of prospective, institution-specific data from Bangladesh that can guide surgeons, patients, and policymakers in making informed decisions regarding specific techniques like midline wide excision. Existing literature from the region often focuses on disc disease, leaving a gap in the context of degenerative stenosis surgery in the elderly [13]. Therefore, it is imperative to generate local and regional evidence to evaluate the real-world effectiveness and safety of this common procedure. This study was designed to prospectively investigate the surgical outcomes, including functional improvement, pain relief, and perioperative complications, of midline wide excision for LSS in a cohort of elderly patients at a tertiary care hospital in Bangladesh. The findings aim to fill a critical knowledge gap and provide a valuable reference for optimizing the surgical management of this vulnerable population within the local context.

MATERIAL AND METHODS

Study population

A prospective cohort study was conducted at the Spine unit of the Orthopaedic Department, Shaheed Ziaur Rahman Medical College, Bogura, Bangladesh, from January 2023 to December 2024. The study enrolled a purposive sample of 47 elderly patients (aged ≥60 years) diagnosed with symptomatic Lumbar Spinal Stenosis (LSS) refractory to conservative management.

Inclusion criteria

Patients were included if they had:

- Radiological confirmation of LSS (central canal and/or lateral recess stenosis) at one level from L1 to S1 level.
- Predominant symptoms of neurogenic claudication or radiculopathy for a minimum of 6 months.
- Failed an adequate course of structured conservative therapy, including adequate physiotherapy and analgesics with Neurogenic vitamins.

Exclusion criteria

- Presence of significant lumbar instability.
- Pressure of deformity requiring fusion.
- More than one level of involvement.
- Acute traumatic or pathological fractures.
- Severe medical comorbidities (ASA grade IV) render them unfit for major surgery.

Study procedure

All enrolled patients underwent midline wide excision for spinal stenosis. The procedure involved a posterior midline incision, subperiosteal dissection of the paraspinal muscles, and removal of the spinous process and Interspinous ligament, partial laminectomy of the upper and lower vertebrae at the affected levels. Bilateral decompression of the lateral recesses was achieved by undercutting and resecting the little bit hypertrophied facet joints, preserving stability with removing the Osteophytes while ensuring adequate neural decompression. Preoperative baseline data, including demographics, Oswestry Disability Index (ODI), and Visual Analog Scale (VAS) for leg pain, were recorded.

Patients were followed up at 6 months postoperatively to reassess the ODI and VAS scores. Perioperative and postoperative complications were meticulously documented.

Data analysis

The collected data were analyzed using IBM SPSS Statistics version 23.0. Descriptive statistics were presented as means and standard deviations for continuous variables. The primary outcomes (ODI and VAS scores) were compared using paired sample t-tests. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The study successfully analyzed data from 47 elderly patients who underwent midline wide excision for lumbar spinal stenosis. The cohort had a mean age of 62 ± 4.8 years, with a near-equal gender distribution of 48.9% males and 51.1% females. The majority of patients (57.4%) had a known history of hypertension, making it the most common comorbidity, followed by diabetes mellitus (31.9%) and ischemic heart disease (12.8%). Most procedures were performed at a single level, with L4-L5 being the most frequently operated level, accounting for 61.7% of cases. The primary outcomes demonstrated significant improvements following surgery. The mean Oswestry Disability Index (ODI) score, which reflects functional disability, decreased dramatically from a preoperative value of 68.2 ± 8.1 to a postoperative value of 24.5 ± 10.3 at the 6-month follow-up. This improvement was statistically highly significant. Similarly, for pain assessment, the mean Visual Analog Scale (VAS) score for leg pain improved substantially from 8.1 ± 1.1 preoperatively to 2.3 ± 1.5 postoperatively, which was also a statistically significant change. A sub-analysis of functional outcomes was conducted based on the number of surgical levels. Patients who underwent single-level surgery started with a slightly lower mean preoperative ODI and achieved a marginally better postoperative score compared to those who had two-level surgery. However, the magnitude of improvement, calculated as the mean change in ODI, was not significantly different between the two groups. The same pattern was observed for VAS outcomes, where both groups experienced significant pain reduction without a statistically significant difference in the extent of improvement between them. The overall perioperative and postoperative complication rate was 12.8%. The most frequent complications were dural tear and surgical site infection, each occurring in 4.3% of patients. Other observed complications included postoperative urinary tract infection and Paravertebral muscle Stiffness. Minor dural tears were managed by fat graft and other repaired intra-operatively, subsequent sequelae, and surgical site infections were managed successfully with antibiotics and wound care. There was no mortality in this cohort. Finally, patient satisfaction was assessed at the final follow-up. The vast majority of patients (87.2%) reported a good to excellent outcome. A smaller proportion (10.6%) reported a fair outcome, while only one patient (2.1%) reported a poor outcome, which correlated with a postoperative complication.



Figure 1: Gender distribution of participants.

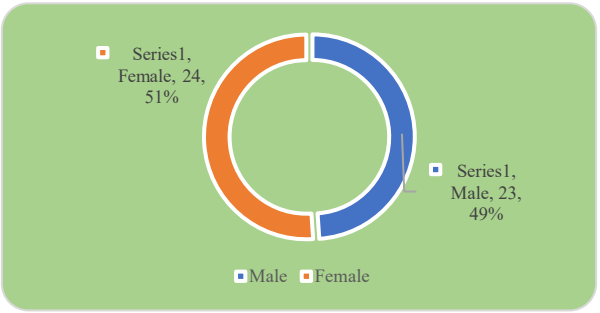


Figure 2: Comorbidities distribution.

Table 1: Surgical and operative details

Characteristic	n (%)
Number of surgical levels	
Single Level	32 (68.1%)
Two Levels	15 (31.9%)
Levels operated	
L3-L4	8 (17.0%)
L4-L5	29 (61.7%)
L5-S1	10 (21.3%)
Operative time & blood loss (Mean ± SD)	
Operative time (minutes)	118.5 ± 24.7
Estimated blood loss (ml)	285.5 ± 75.8

Table 2: Comparison of preoperative and postoperative functional and leg pain outcomes

Measure	Operative stage		p-value
	Pre	Post	
	(Mean ± SD)		
ODI	68.2 ± 8.1	24.5 ± 10.3	<0.001
VAS (Pain)	8.1 ± 1.1	2.3 ± 1.5	<0.001

ODI: Oswestry Disability Index, VAS: Visual Analog Scale; Data analyzed using Paired Samples t-test

Table 3: Subgroup analysis of outcomes based on the number of surgical levels

Outcome	Level		p-value
	Single (n=32)	Two (n=15)	
	Mean ± SD		
Preop. ODI	67.1 ± 7.8	70.5 ± 8.5	0.178
Postop. ODI	23.1 ± 9.5	27.5 ± 11.4	0.154
ODI Change	44.0 ± 9.2	43.0 ± 10.1	0.734
VAS Change	5.7 ± 1.4	5.8 ± 1.6	0.821

Data analyzed using an Independent Samples t-test

Table 4: Postoperative complications (n=47)

Complication	n	%
Dural tear	2	4.3%
Surgical site infection	2	4.3%
Urinary tract infection	1	2.1%
New neurological deficit	1	2.1%
Total	6	12.8%

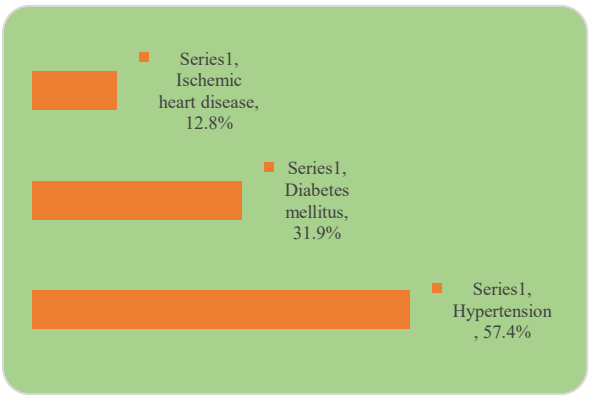


Figure 3: Patient-reported satisfaction at 6-month follow-up.

DISCUSSION

The principal finding of this prospective cohort study is that midline wide excision provides statistically significant and clinically meaningful improvements in functional disability and pain for elderly patients with lumbar spinal stenosis, with an acceptable safety profile in a tertiary care setting in Bangladesh. The observed reduction in mean ODI scores from 68.2 to 24.5 represents a dramatic improvement in quality of life, effectively moving patients from a state of severe disability to one of moderate disability, allowing for greater independence [14]. Similarly, the marked decrease in VAS scores for leg pain underscores the procedure's efficacy in alleviating the primary symptom that motivates surgical intervention. Our findings are consistent with the established international literature on surgical management of LSS in the elderly. Large-scale studies and systematic reviews have consistently demonstrated the superiority of decompressive surgery over continued non-operative management in patients with severe symptoms [9,15]. For instance, the outcomes from the Spine Patient Outcomes Research Trial (SPORT) showed sustained benefits from surgery in mixed-age populations, and subsequent analyses have confirmed that these benefits extend to carefully selected octogenarians [16,17]. The mean improvement in ODI and VAS scores in our cohort aligns closely with values reported in similar studies for open decompressive techniques, suggesting that the technical success and patient-reported outcomes of midline wide excision are transferable across diverse healthcare systems [11,18]. The complication profile observed in our study, with an overall rate of 12.8%, is comparable to those reported in other series focusing on open decompressive procedures in the elderly. Dural tear, our most common intraoperative complication, is a well-known risk in spinal stenosis surgery, particularly in techniques involving extensive bony and ligamentous removal, due to the adherence of the dura to the hypertrophied ligamentum flavum and the presence of epidural fibrosis [19]. Our rate of 4.3% falls within the widely reported range of 1-10% for primary decompressive procedures. Similarly, the 4.3% rate of surgical site infection is considered acceptable for a clean procedure in a developing country context, where infection rates can be higher than in high-income nations [12,20]. The absence of mortality and major life-threatening complications reinforces the notion that age alone should not be a contraindication for this definitive decompressive procedure. A notable finding from our subgroup analysis was that the number of surgical levels did not significantly impact the degree of functional improvement or pain relief. Patients undergoing two-level midline wide excision, while starting with slightly worse baseline disability, achieved a comparable magnitude of improvement (mean ODI change) to those having single-level surgery. This suggests that the decision on the extent of decompression should be guided by the radiological and clinical findings rather than fear of diminished returns in more extensive cases, a conclusion supported by other investigators [21]. The midline wide excision technique, by providing a wide and direct visual field, allows for thorough and controlled decompression across multiple levels, which is crucial for achieving a satisfactory clinical outcome. When contextualizing our results, it is crucial to consider the specific challenges of a resource-limited setting. Late patient presentation and advanced disease at the time of surgery are common, potentially leading to a more disabled preoperative cohort [22]. Despite this, our outcomes were robust, highlighting the resilience of the elderly population and the transformative potential of timely and adequate surgical intervention. The high patient satisfaction rate of 87.2% further validates the real-world effectiveness of the midline wide excision

procedure in this context. This technique, being less reliant on expensive implants and advanced technology, presents a viable and cost-effective surgical strategy for achieving definitive neural decompression in such settings.

CONCLUSION

Midline wide excision is a highly effective and safe intervention for elderly patients with symptomatic lumbar spinal stenosis, leading to significant and clinically meaningful improvements in functional disability and pain. Despite the challenges of a resource-limited setting, the procedure yields excellent patient-reported outcomes with an acceptable complication rate. Careful patient selection is paramount. These findings support the continued and confident use of this definitive surgical strategy in this growing patient population.

RECOMMENDATION:

Based on these findings, we recommend midline wide excision as a primary surgical treatment for carefully selected elderly patients with symptomatic lumbar spinal stenosis. Future multi-center studies with longer follow-up and cost-effectiveness analyses are encouraged to strengthen these conclusions.

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