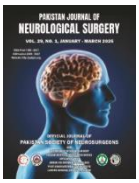

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Original Research

Surgical Outcomes of Lumbar Spine Procedures; A Prospective Cohort Study in A Tertiary Care Hospital

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ABSTRACT

Objective: To know about the surgical results of lumbar spine procedures performed at MTI Hayatabad Medical Complex and Naseer Teaching Hospital Peshawar.

Material and Methods: This prospective cohort study was carried out in the Neurosurgery department at Nasser Teaching Hospital and MTI Hayatabad Medical Complex, from 1st January 2020 to 25th January 2024. We included 267 patients, consisting of both genders, that is, male and female, with the ages ranging from 17 years to 72 years. The Lumbar spine procedures included in our study were; Laminectomy, Partial laminectomy, Discectomy, Right and Left Fenestration, all the rest of the lumbar spine procedures were excluded. The surgical outcome was assessed using a VAS score for grading pain before the procedure and 6 months after the procedure.

Results: The study revealed that the average age of the patients was 41.87 years, with a standard deviation of 12.827 years. The youngest patient was 17 years old, and the oldest was 72 years. In terms of gender distribution, males accounted for 46.1% (123 out of 267), while females made up 53.9% (144 out of 267). The most commonly affected site was the L4-L5 level, observed in 133 patients (49.8%), followed by the L5-S1 level, which affected 105 patients (39.3%).

Conclusion: The results indicate that such surgeries can significantly improve patient outcomes in terms of pain relief.

Keywords: Lumber spine procedure, Laminectomy, Discectomy, fenestration, surgical outcomes.

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INTRODUCTION

According to 2016 statistics annually around 900,000 Americans undergo different spinal surgery, while in Canada the rate is around 30,000 per year.[1] In 2012 and 2015 a study was

conducted on the estimation of the cost per spinal surgical procedure according to that study per surgical procedure costs 4500-30,000 US dollars depending upon the surgical procedure.[2,3] In the United States, it can account for about 90 billion US dollars for spinal procedures per year.[4]

Complaints about lower back pain are among the most frequently reported issues in outpatient care settings; in life, approximately 80% of the whole population experiences such type of complaint, the degeneration of the discs has been reported as one the most common causes of lower back pain.[5,6] In 90% the level of herniation is L4-L5 or L5-S1, the commonest cause reported for herniation is the degeneration of the spine[7]. The male-to-female ratio of intervertebral prolapsed discs is 2:15 and according to literature the most common group to be affected is the late 30s and early 50s.[8] In herniated discs, the first line of management is always conservatively followed by medical treatment, in conservative management usually, and watch policy is usually followed for 6-8 weeks with proper posture, pain killer, and physiotherapy, if the conservative and medical treatment fails then surgical management would be considered.[9,10,11,12] In herniated discs, the two most common procedures are laminectomies and discectomies[13]. The outcome of decompression surgery in herniated discs has been reported as 75% back pain reduction.[14]

Another major cause of lower back pain is lumber stenosis, 4-11% of patients who come with complaints of lower back pain in outdoor settings are because of lumber stenosis.[15] In spinal stenosis cervical and lumbar parts of the spine are the commonest parts to be involved but they can involve the whole spine.[16,17] The first line of management will always be a medical treatment when it fails then a surgical procedure should be done, the commonest surgical approach for spinal decompression in spinal stenosis is conventional laminectomy, however different approaches such as laminotomy with medial facetectomy, laminectomy with or without and other fusion can be followed.[18,19,20] The outcome of decompression surgery in lumber stenosis has been reported as more than 80% back pain reduction.[18,20]

MATERIAL AND METHODS

This prospective cohort study was conducted in the Neurosurgery Department at Nasser Teaching Hospital and the MTI Hayatabad Medical Complex from January 1, 2020, to January 25, 2024. Patient data was collected anonymously after obtaining consent, with full approval from the hospital administration.

Inclusion Criteria

The total number of included patients was 267, consisting of both genders, male and female, with the ages ranging from 17 years to 72 years.

The lumber spine procedures aforementioned include the following procedures;

i. Laminectomy
ii. Partial laminectomy
iii. Discectomy
iv. Right and Left Fenestration

The surgical outcome was assessed using a VAS score for grading the pain.

The VAS score was assessed by printing a 10 cm line on a piece of paper, with two endpoints, that is 0, representing no pain, and 10, representing unbearable/severe pain. The patients were then asked to rate the current level of their pain by marking a point on the line. This was then measured and graded using a ruler (1 millimeter = 1 unit of the graduated scale).

The VAS score was obtained before the surgery and 6 months after the surgery to assess the surgical outcome.

Exclusion Criteria

All the patients who had a spine disease at a level other than the Lumbar and sacral level were

excluded from the study.

All other spine procedures except for the ones mentioned in the inclusion criteria were excluded.

Sample Size

As there were no prior estimates available for the frequency of lumbar spine procedures in Pakistan, the sample size was calculated using a sample size calculator. A prevalence of 50% was assumed for cases diagnosed with the condition. The estimated minimum required sample size was determined to be 267, with a margin of error of ±6% and a confidence level of 95%.

Sampling Technique

Non-probability convenience sampling technique.

Data Collection

The data for this research was collected from the hospital's database after obtaining consent from both the patients and the hospital administration. If either party declined to provide consent, their data was excluded from the study, and the refusal was documented without any further attempts to seek approval.

Both hospitals involved in the study were assured of complete confidentiality, with their responses kept anonymous and accessible only to the principal research team. Participating hospitals also reserved the right to withdraw from the study at any time. No monetary or other incentives were offered to participants for their involvement in the research.

The study received ethical approval from the committee of MTI Hayatabad Medical Complex, Peshawar, under approval number 1888.

Data Analysis

The collected data will be entered into SPSS software (version 23.0) and carefully reviewed to identify and correct any discrepancies or missing information. All variables were then coded for analysis. Means and SD were computed and given in tables while for preliminary analysis chi-square test was used to determine any significance. A P-value less than 0.05 was considered significant.

RESULTS

Gender Distribution

This study consists of 267 patients of which the mean age of patients is 41.87 ± 12.827 with the 17-age reported minimum while the maximum age reported in this study is 72. The frequency of males was 123 (46.1%) and 144 (53.9%) were females.

Table 1: Level of the spine involved.

Site	Frequency	Percentage
L2-L3	4	1.5%
L3-L4	10	3.7%
L3-L4, L4-L5	5	1.9%
L4-L5	133	49.8%
L4-L5, L5-S1	10	3.7%
L5-S1	105	39.3%

According to our study, the most common level for degenerative disc disease in the Lumbar spine was at the L4-L5 vertebrae, A total of 133 patients out of 267 (49.8%) had the pathology at the L4-L5 level. This was followed by L5-S1 level, affecting a total of 105 patients out of 267 (39.3%). Disc degeneration at the rest of the levels

Table 2: Pre-operative pain score.

VAS Scale	Frequency	Percentage
1	0	0
2	0	0
3	2	0.7%
4	8	3.0%
5	45	16.9%
6	147	55.1%
7	40	15%
8	25	8.4%
9	0	0
10	0	0

in the lumbar spine had significantly less occurrence.

Table 3: Post-operative pain score.

VAS Scale	Frequency	Percentage
1	0	0
2	7	2.6%
3	161	60.3%
4	80	30%
5	12	4.5%
6	5	1.9%
7	2	0.7%
8	0	0
9	0	0
10	0	0

Table showing the number of procedures performed, with the most common type being Laminectomy, followed by Left Fenestration/ Discectomy.

Table 4: Type of surgery performed.

Surgery	Frequency	Percentage
Laminectomy	87	32.6%
Laminectomy + Discectomy	32	12.0%
Left Fenestration	10	3.7%
Left Fenestration/Discectomy	57	21.3%
Partial Laminectomy	13	4.9%
Partial Laminectomy + Discectomy	12	4.5%
Partial Laminectomy + Dural Repair	1	0.4%
right Fenestration	4	1.5%
Right Fenestration/ Discectomy	51	19.1%

Correlation of post-op pain with another variable:

Table 5: Correlation between variables in terms of p-values.

Variable		Post-Op pain						Chi-square	p-value
		2	**3**	**4**	**5**	**6**	**7**		
Pre-Op pain	**3**	1	1	0	0	0	0	98.171	<0.001 (significant difference)
	4	3	5	0	0	0	0		
	5	0	32	12	1	0	0		
	6	2	93	44	6	2	0		
	7	1	5	14	5	1	0		
	8	0	11	10	0	2	2		
Procedure	**Laminectomy**	0	51	30	5	1	0	87.188	<0.001 (significant difference)
	Laminectomy + Discectomy	1	19	9	0	2	0		
	Left Fenestration	1	5	3	2	0	0		
	Left Fenestration/Discectomy	2	30	17	4	1	0		
	Partial Laminectomy	1	12	3	0	0	0		
	Partial Laminectomy + Discectomy	1	8	5	0	0	0		
	Right Fenestration	0	2	2	0	0	0		
	Right Fenestration/Discectomy	1	33	11	1	0	2		
	Partial Laminectomy + Dural Repair	0	0	0	0	1	0		

Table 6: Surgical outcomes.

Surgical outcomes	Frequency	Percentage
Normal	233	87.3%
DVT	2	0.7%
Infection	9	3.4%
Not improved	23	8.6%

233 patients out of 267 (87.3%), assessed after the procedure reported improvement in their symptoms. While 23 patients out of 267 (8.6%) reported no improvement after the procedure. 11 patients out of 267 (4.1%) suffered from surgical

compilations i.e. DVT and surgical wound infection.

DISCUSSION

One of the most frequent operations carried out in the field of spine surgery is the decompression of the spinal nerves as a result of a degenerative disease process. The procedure's safety and post-operative short-term effectiveness, however, are currently being studied. The main aim of this study was to assess the surgical outcomes of lumber spine procedures. According to the analysis of this study, the mean age observed in this study is 41.87+12.827. In this study, the minimum age reported is 17 while the maximum age was 72. Females were reported more with lower back ace as compared to males in this study.

The present study shows the relationship between post-op pain with the type of surgery being performed with a p-value <0.01, which is also been observed in our study with a P value of 0.000 showing a strong significance.[5] A similar study was conducted in back 2019 at Lahore General Hospital according to that study 91.3% were reported as normal after performing spine procedures while in our study 87.3% were reported as normal.[21] Another study was conducted to find the primary outcomes in patients who went through spinal procedures over 4 years in 16 Norwegian public hospitals according to this study the primary good outcomes success rate was 69.5% which is quite low from our study which is 87.3%, reason can be the management of a patient as in Pakistan patient can get an appointment for their surgery very quickly as compare to other international countries.[22]

In Cheng-Min Shih's study published in 2023 on surgical outcomes of lumber spine procedure, he reported 73% of his patients reported good outcomes or normal after several follow which is also quite much lower than our results.[23] Another study was conducted in 2022 to find the relationship between postoperative pain and lumber spine procedure according to that study there is no such relationship between post-operative pain and the pathology for which a patient is being operated on with a P value of 0.817 and in our study, it also shows the same result with a P value of 0.869.[24] gender shows significance with post-operative lumber spine procedure with a P value of <0.001 conducted in 2021 while our study shows no significance with a P value of 0.663, in this study, they also mentioned there is no significance between post-operative pain and the pathology for which the patient being operated which shows the similar result with our study with a P value of 0.869.[25] A meta-analysis published by Amoroso K[26] in 2023 reported the most common complication in the spinal procedure as no improvement (2.5%) followed by surgical wound infection (0.9%). This study data was taken from the American College of Surgeons for quality purposes. The vast difference between our results is the use of a high-standard instrument and a strict quality-checking system of their hospital. When it comes to comparing endoscopic with open procedure a study was conducted by Jitpakdee,[27] in 2023 in their study they reported 16.5% of cases that were not improved with endoscopic while in our study which was open procedure 8.6% cases not improved. The factors that play a role in the success of surgery are age, disease type, and previous surgery. The other factor that shows the difference between the endoscopic and spinal procedures is the field area. Another review reported 7.7% of complications in spinal procedures.[28] The study conducted by Halicka M,[29] on the most important predictors in the success of spinal procedures were the type of pathology, age, previous surgical spinal interventions, and duration of hospital stay.

CONCLUSION

This prospective cohort study conducted in a tertiary care hospital provides valuable insights into the surgical outcomes of lumbar spine procedures. The results indicate that such surgeries can significantly improve patient outcomes in terms of pain relief, functional improvement, and quality of life. The study highlights the importance of careful patient selection, preoperative planning, and postoperative care in achieving optimal results. Additionally, the findings underscore the need for ongoing research to refine surgical techniques and enhance recovery protocols. It is suggested that future research should include larger sample sizes and extended follow-up periods to confirm these results and investigate other factors that may affect surgical outcomes.

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Additional Information

Disclosures: Authors report no conflict of interest

Institutional Ethical Review Board Approval: The study complies with the ethical review board requirements.

Human Subject: Consent was obtained by all patients/participants in this study.

Conflict of Interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following:

Financial Relationships: All authors have declared that they have no financial relationship at present or within the previous three years with any organizations that might have an interest in the submitted work.

Other Relationships: All authors have declared that no other relationships or activities could appear to have influenced the submitted work.

Data Sharing Statement: For data sharing, interested researchers can contact the corresponding authors.

AUTHORS CONTRIBUTIONS

Sr.#	Author's Full Name	Intellectual Contribution to Paper in Terms of:
1.	Ayaz Ahmad	1. Study design and methodology.
2.	Mushtaq	2. Paper writing.
3.	Imran khan	3. Data collection and calculations.
4.	Safia Bibi	4. Analysis of data and interpretation of results.
5.	Muhammad Mujtaba	5. Editing and quality insurance, drafting, and Paper writing.
6.	Aurang Zeb	6. Literature review and referencing.