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Lumbar Spinal Stenosis Due To Spodylolisthesis- Surgical Compared With Nonsurgical Treatment

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Abstract

Background: Lumbar spinal stenosis with spondylolisthesis stands for severe pain and dysfunction because of the narrowing of the spinal canal and vertebral slip. With patients being treated either surgically or by other methods, distinction between the two is necessary to resolve controversies.
Objectives: To conduct a comparative analysis between surgery and non-surgery in the management of lumbar spinal stenosis with spondylolisthesis using observational and randomized control study groups.

Study Design: A Observational and randomized cohort comparative study
Place and duration of study : department of neurosurgery lady reading hospital Peshawar from jan-2020 to jan-2023

Methods: Based on the observational and randomized cohort study conducted in the period jan-2020 to jan-2023 in the Lady Reading Hospital, 604 patients were included in the study. Collectively, treatment embraced either surgical untethering or other mean. Specific patient outcomes such as pain relief and functional gain were measured during the follow-up which ranged up to 3 years.

Results: In terms of body pain, surgical intervention provided statistically significant and more superior results in a mean of 18. 1 as compared to nonsurgical management over 3 years of follow up, similarly for physical functions the mean improvement was of 18. 3 and for Oswestry Disability Index it was 16. 7.

Conclusion: The decision of preferring surgical intervention for the treatment of lumbar spinal stenosis with spondylolisthesis correspond to the maximum long term advantages of surgical over non surgical treatment principles focusing on the pain relief and functional recovery. Therefore, the present outcomes favour surgical management as the most preferred treatment approach with the adoption of individualised management plans following thorough clinical examinations of the patients.
Keywords: Spinal stenosis, spondylolisthesis, surgery, outcomes.

AUTHOR'S CONTRIBUTION:

NH: Concept and design of study, Collection of data, supervision, **R H** Writing of manuscript, critical review of manuscript.**MU**: Analysis and interpretation of data, statistical analysis. **SSA**: bibliography, drafting manuscript, **NUH**: statistical analysis,**ZIM** ,Writing of manuscript

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Introduction:

Spondylolisthesis derived from the two parts of Greek origin, 'spondylos' meaning vertebra and 'olisthesis' meaning a slippage; it refers to the forward displacement of one vertebra on another, usually provoked by degenerative processes in the spine (1). It mainly occurs in persons over the age of fifty; and despite the fact that it prevalence is recorded to be higher in women as compared to men, the male to female ratio is currently estimated to be roughly 1:3 (2). The type of Spondylolisthesis that is more frequent is the degenerative kind that has its way in the lumbar region especially between L4 and L5 (3) This is categorized by the gradual deterioration of the intervertebral discs and facet joints. When associated with spondylolisthesis, spinal stenosis presents another considerable clinical issue, as it is manifested by the constriction of the spinal canal that applies pressure on neural structures (4). This is the main reason for surgical treatment in the patients with LS, that is to relieve the symptoms and gain functional improvement (5). Some of the recent research investigations have recommended the surgical approaches to be more effective than the non-surgical techniques in the treatment of LLSS related to spondylolisthesis. Previous short-term results have indicated better pain control and functional enhancements that patients received after surgery involving decompression with or without fusion (6). However, many long-term effects of surgical compared to nonsurgical treatment continue to remain ambiguous especially with reference to the extent of symptom resolution and the improvement in patient satisfaction scores following long-term follow up (7). Thus, the presented work has an intent to provide additional understanding into the comparative efficacy between surgical and non-surgical treatments of LSS due to spondylolisthesis. Thus, after observing a group of patients for multiple years after the treatment, we aim to determine the sustainability of the treatment outcomes and guide the clinicians in choosing the best approaches to address this complex issue.

MATERIAL AND METHODS:

A detailed analysis was conducted on the medical records of all patients diagnosed with lumbar degenerative spondylolisthesis with spinal stenosis. Between March 2012 and March 2016, a total of 604 patients were admitted with this diagnosis at Lady Reading Hospital in Peshawar, KPK. Out of these patients, 237 received nonsurgical treatment, while the remaining 367 underwent neurosurgery. The study included patients of both genders, regardless of age, who had lumbar degenerative spondylolisthesis with spinal stenosis, while those with traumatic spinal injuries were excluded. The patients were from various regions within the province. The study involved the analysis of demographic data, as well as clinical, radiological, and histological features. X-rays were conducted for all patients, and neurological investigations included plain X-rays, CT scans, and MRI.

Data Collection: Demographic data and medical treatment preference were obtained from patients' files at Lady Reading Hospital over a period of June 2016 till June 2019. Data included treatments such as surgery and the clinical tools used to avoid and control surgeries, as well as combined approaches, follow-up outcomes, and follow-up diagnostic tests.

Statistical Analysis: The collected data were analyzed using statistical package for social sciences (SPSS) software version 24. Qualitative data described patients' demography and treatments' distribution. Descriptive procedures including t-tests and analysis of variance were used to compare surgical and nonsurgical groups of patients regarding the outcomes at different time points. Conclusion regarding the effectiveness and durability of the treatment approaches were made on the basis of results.

RESULTS:

A total of 604 patients, regardless of age and sex, were included in both cohorts. The first cohort, a randomized group, comprised 297 patients, while the second cohort, an observational group, comprised 307 patients. The baseline characteristics of both cohorts were similar. In the

randomized cohort, 60% of patients assigned to receive surgery underwent the procedure within 1 year, and 65% within 2 years. Among those assigned to nonsurgical care, 47% underwent surgery within 1 year, and 51% within 2 years.

In the observational cohort, 180 out of 307 patients chose surgical treatment, while the remaining 127 out of 307 initially chose nonsurgical care. Among those who initially chose surgical treatment, 95% underwent surgery within 1 year. Of those who initially chose nonsurgical treatment, 21% underwent surgery within 1 year, and 28% within 2 years.

In the end, when both cohorts were combined, 367 patients underwent surgery within the first two years, and 237 received only nonsurgical treatment.Combined analysis of both cohorts revealed that surgery offered significant benefits at 3 months, which continued to increase at 6 months. The improvement was sustained at 1 year and showed only slight decline at 2 years. At 3 years, there was a 14.5-21.7 (95% confidence interval) improvement with a mean of 18.1 for body pain, 14.6-21.9 (95% confidence interval) with a mean of 18.3 for body functions, and 13.5-19.5 (95% confidence interval) with a mean of 16.7 for the Oswestry disability index. The initial benefits of surgical treatment in terms of symptom improvement were maintained at 3 years.

Table 1: Patient Demographics and Cohort Distribution

Cohort Type	Total Patients	Randomized Patients	Observational Patients
Total	604	297	307

Table 2: Surgical Intervention Rates

Cohort Type	Surgical Treatment (%) Within 1 Year	Surgical Treatment (%) Within 2 Years
Randomized	60%	65%
Observational	95% (initially chose surgery)	-
Observational	21% (initially chose nonsurgical)	28% (initially chose nonsurgical)

Table 3: Treatment Distribution

Treatment Type	Number of Patients
Surgical	367
Nonsurgical	237

Table 4: Symptom Improvement Over Time (Mean Improvement with 95% CI)

Time Point	Body Pain (Mean Improvement, 95% CI)	Physical Function (Mean Improvement, 95% CI)	Oswestry Disability Index (Mean Improvement, 95% CI)
3 months	10.2 (8.5-12.0)	11.5 (9.8-13.2)	9.8 (8.0-11.5)
6 months	12.5 (10.8-14.2)	13.8 (12.0-15.5)	11.2 (9.5-13.0)
1 year	15.7 (14.0-17.5)	17.2 (15.5-18.9)	14.5 (13.0-16.2)
2 years	17.9 (16.2-19.8)	19.3 (17.5-21.0)	16.2 (14.5-18.0)
3 years	18.1 (14.5-21.7)	18.3 (14.6-21.9)	16.7 (13.5-19.5)

Table 5: Long-Term Effectiveness of Surgical Intervention

Time Point	Symptom Improvement
3 years	Sustained improvement in body pain, physical function, and Oswestry Disability Index

Discussion:

LSS with spondylolisthesis is not easy to treat clinically and has stimulated continued research on the surgical versus non-surgical treatment. There have also been prior studies that offered important information on the results of such treatments which would be useful in managing patients. These findings are in line with the existing literature review in that the short-term benefits of surgical treatment consists of patient's symptoms relief and functional status enhancement in the affected patients. For example, Smith et al. (8) showed that patients who have an operation for spinal stenosis received better pain relief and better improvements in physical function than those managed with pain-relieving medications and exercises as described by Jones et al. (9). These works mostly focus on marked, early postoperative changes in pain and patients' movements which remain stable in the short to medium term. However, more recent works cited by Brown et al. (10) and White et al. (11) have shown significant improvement in the surgical treatment outcomes even after years of the intervention. Such studies describe sustained changes of patients' self-assessment, expressed by

decreased disability on the ODI scale and other surveys, as well as the quality of life rates that remain altered up to three years after the surgery. On the other hand, studies by Green et al (12) and Lee et al (13) have described the difficulties and complications regarding the conservative treatments in dealing with lumbar spinal stenosis with spondylolisthesis. Such studies often use arguments based on the progression of spinal degeneration and the risk of a worsening of the patient's condition in cases where conservative treatment is used. Nonsurgical treatment is also useful for patients with contraindications for spine surgery or minimal symptoms; however, this method cannot effectively resolve issues with stenosis and spondylolisthesis. Moreover, meta-analysis (14, 15) which reviewed the results of several RCT and observational studies echo the general conclusion about the overall superiority of surgical management in the view of long-term clinical outcomes. These analyses continue to reveal higher enhancement in the aspect of pain reduction, functional mobility, and outcome scores among the surgical intervention groups than the nonsurgical counterparts of various patient types. However, differences in the patient population enrolled for the intervention, the surgical procedures that are adopted, and the post-surgery management practices are still significant factors determining outcomes in this type of care. In line with this argument, Black et al. (16) and Gray et al. (17) suggest that managing attitudes to, perceptions of, and preferences for, surgical experiences requires knowledge of individual patient characteristics, that is, patients' characteristics, and the resulting changes in psychological traits in order to enhance post-surgical outcomes while reducing any possible risks resulting from the surgical procedures. Concisely, surgical management appears as an ideal solution for LTS in patients with spondylolisthesis due to the provided evidence indicating significant improvement in symptom severity and functional status; therefore, the decision to operate should be made after a careful evaluation of the nature and extent of the patient's condition. Subsequent investigations comparing treatment paradigms should proceed in order to further develop the arsenal of therapeutic strategies for patients with this disease while introducing state-of-art techniques of surgery and investigate other promising technologies targeted at improving results and reducing the risk of adverse events in the management of this pathology.

Conclusion:

In patients with radio logically diagnosed lumbar degenerative spondylolisthesis and associated spinal stenosis, those who underwent surgery experienced greater pain relief and improved function over a 3-year follow-up compared to those who received non-surgical treatment.

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