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Original Research Article

OUTCOMES OF OPERATIVE VERSUS NON-OPERATIVE MANAGEMENT OF DEGENERATIVE LUMBAR SPONDYLOLISTHESIS: OUR EXPERIENCE IN PAKISTAN

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ABSTRACT

Background: Non-surgical methods are the first choice in the management of degenerative spondylolisthesis. However, limited data is available which gives a comparison between the outcomes of operative and non-operative management. Thus, the present study evaluates the outcomes of operative versus non-operative management of degenerative lumbar spondylolisthesis.
Materials and Methods: The selected patients (n = 197), were diagnosed with degenerative spondylolisthesis and received non-surgical treatment. The outcome variable was based on the choice of the patients to go for surgery or not. Various radiological and clinical assessments were made to evaluate the outcomes. Also, the data were analyzed by using statistical approaches.
Results: The non-operative group (65.2%, p-value=0.03) had more number of women than the operative group (34.8%, p-value=0.03). The non-operative group described improvement from pain (74.7% vs 54.7%, p-value = 0.002) for a prolong period of time than the operative group (148.7 vs 44.8 days, p-value = 0.00). Patients who informed relief in pain of more than 70% after the administration of epidural steroid injection had undergone surgery at a low rate as compared to those who described relief in pain less than 70% after the administration of epidural steroid injection (15.7% vs 42.6%, p-value = 0.000).
Conclusion: Nonsurgical interventions were more effective in the management of degenerative spondylolisthesis in comparison to that of surgical treatment.
Keywords: Degenerative spondylolisthesis; Surgical; Non-surgical treatment; Epidural Injection; Exercises.

INTRODUCTION

Degenerative spondylolisthesis occurs when one lumbar vertebra slides forward on another undamaged neural arch.[1,2] This condition primarily affects persons over the age of 50, as opposed to those of various ages. In terms of gender, this degenerative condition primarily affects women, particularly black women. According to evidence, the female to male ratio by which it affects patients is 6.1 to 1.[3,4] The L4 and L5 vertebrae are the most affected in this illness, and it seldom expands the space between the two vertebrae by more than 30%. Despite the fact that it is asymptomatic, people may feel symptoms associated with spinal stenosis.

In spinal stenosis, the soft tissue bones in the surrounding area encroach on the neural structure, which narrows the spinal canal.[3] As most of the patients who suffer from this disorder belong to the older age group, a vast number of people belong to 65 years of age undergo lumbar surgery because of this particular spinal issue.[4,5] In this case, patients usually complain about pain in the legs or hips while standing or walking and they feel comfort by sitting

or flexion of the lumbar region. In contrast to it, medical imaging techniques can diagnose spinal stenosis even in patients who presented with no symptoms. Hence, correlating imaging and symptoms is a critical task in clinical practice.[6,7]

The previously published literature described comparative results of operative and non-operative treatment in patients suffering from spinal stenosis.[8-10] However, their inclusion criteria involved patients with and without degenerative spondylolisthesis. Furthermore, these studies had significant limitations in terms of sample size, confirmation of results, and a lack of non-surgical control. This is why treatment protocols for patients suffering from symptomatic degenerative spondylolisthesis are not well defined. Although both surgical and non-surgical treatment options (administration of opioids and nonsteroidal anti-inflammatory agents, and exercise to strengthen muscles) are available for this disease. But non-surgical methods are the first choice in the management of patients suffering from degenerative spondylolisthesis. However, limited data is available in Pakistan which gives a comparison between the outcomes of operative and non-operative treatment regimens. Thus, the present study evaluates the outcomes of operative versus non-operative management of degenerative lumbar spondylolisthesis.

MATERIALS AND METHODS

Study setting: This research work was officially approved by the Research Committee of Bolan Medical Complex Hospital, Quetta Pakistan. The reason for selecting this hospital was that it was situated in the province of Pakistan and it was the best and the biggest hospital in Quetta for orthopedic care. According to the Pakistan Orthopedic Association (POA), it was the center of excellence for spine surgery, arthroplasty, and orthopedic care in Pakistan.

Study population and sample size: The collected spine database of all those patients was scrutinized who had been suffering from degenerative spondylolisthesis and undergoing non-surgical treatment at Bolan Medical Complex Hospital, Quetta Pakistan, Pakistan from March 2024 to March 2025. For this purpose, the profile of 265 patients was evaluated. Only 197 cases met our inclusion criteria out of the total. Among them, 115 were females, while 82 were males.

Inclusion and exclusion criteria of the study: All patients who had lumbar spine surgery and were diagnosed with scoliosis as well as grade 3 and 4 spondylolisthesis were excluded from the study. Inclusion criteria included all such patients who were diagnosed with degenerative spondylolisthesis and underwent non-surgical therapy. The non-surgical treatment protocol involved awareness campaigns for patients, and management of acute pain through medicines for 1 month, administration of epidural steroid injection for 1 to 2 months, and then exposure to exercise particularly core strengthening, high-intensity cardiovascular training, and stretching exercise. All the selected patients were strictly advised to do exercise without aggravating their pain. For this reason, they must determine a time by which they can easily perform exercises without feeling any pain. Therefore, the period of each session of exercise had not exceeded the duration decided by the patients. The patients who were unable to perform all exercises during the specific time of the session were allowed to break their exercise regimen in a few sessions during the whole day. As a result, they tried to perform all the exercises which were prescribed by their physical therapist at the end of the day [Table 1].

Table 1: Comprehensive elements of the non-surgical treatment regimen.

Comprehensive elements of the non-surgical treatment regimen		
Medical treatment and care	All the subjects were first examined by non-surgical physicians at baseline i.e. 1 month after the administration of epidural steroid injection; 2 months after the initiation of exercise program; and when required	
	Services provided by non-surgical physicians	Physical evaluation of patients
		Spread awareness among patients about the effectiveness of exercise in degenerative spondylolisthesis
		Management of pain through non-opioid drugs
		Administration of epidural steroid injections during acute pain. All patients received 2 to 3 such injections during the study period
		Referring all the patients to surgical unit who showed least recovery from 2 months of non-operative treatment regimen.
Comprehensive exercise program	Provided by physical therapists	Exercise program with the duration of 1 to 2 months
		Assessing patients according to the set objectives
		Conduct exercise program according to the need of individual patient.
	Patients were exposed to exercise at home without any help from healthcare professionals	
	Need of more sessions were felt during follow-up	

Radiologic and clinical assessment: The main predictor variables comprised gender, age, comorbidities, use of medicines, smoking habit, period of using epidural steroid injection, and the extent to which it had relieved pain. Charlson Comorbidity Index was utilized to calculate the scores related to comorbidities.[11] The investigators reported the self-reported pain relief in the form of percentages, while the time in which they were relieved from pain had been estimated during each of their follow-up visits. Afterwards, the mean pain relief was measured in percentages, and the period in which the pain was relieved after the administration of epidural steroid injection was calculated in days.

The outcome variable was dependent on patients' choice to go for operative treatment or not. The non-surgical intervention in degenerative spondylolisthesis was considered successful if a patient wouldn't opt for surgery after follow-up.

The issues related to instability were determined by evaluating the widening of the length of facet joints along with translation at the point of degenerative spondylolisthesis. The mean of widening of the facet joint was estimated on a scale named picture archiving and communication system (PACS). For this purpose, T2-weighted axial lumbar spine MRIs were employed [12]. To evaluate the translation, the distance between the posterior superior edge of the lower vertebra at the point of spondylolisthesis on extension and flexion lumbar region of spine X-rays and the inferior posterior edge of the upper vertebra; and the dissimilarity between the extension and flexion of the lumbar region of spine X-rays were evaluated [13].

Data analysis: The data was analyzed by employing SPSS v. 20. The clinic and demographic data were evaluated as percentages or standard deviation as appropriate. Comorbidity score, age, time for providing non-surgical treatment, translation, the percentage for relieving pain, time in which pain was relieved, and the number of administered epidural steroid injections were equated using t-test between the two groups. Both surgical and non-surgical groups were tested by employing independent samples t-test for continuous data or Chi-Square tests for proportions. All values of $p < 0.05$ were considered significant.

RESULTS

Table 2: Comparative analysis of the patients who opted surgery and who didn't undergo surgery after non-surgical interventions

S.No.	Variables	Non-Surgical Group (n=124)	Surgical Group (n=73)	P value
1.	Age (years)	66.8±12.7	66.5±12.4	0.378
2.	Gender (%)			
	Male	65.2	34.8	0.03
	Female	56.1	43.9	0.02
3.	No. Of ESI	2.1±1.7	1.9±1.1	0.081
4.	Smokers	35.4	40.1	0.486
5.	Duration of non-surgical treatment (days)	1016.58±78.42	861.44±233.56	0.000
6.	Comorbidity score	1.7±2.2	1.4±1.2	0.228
7.	Duration of pain relief (days)	148.7±19.9	44.8±68.9	0.000
8.	Widening of facet joint (mm)	1.3±1.2	1.0±1.5	0.605
9.	Pain relief (%)	74.7±25.1	54.7±35.6	0.002
10.	Translation (mm)	0.7±1.5	0.5±1.2	0.579

This research comprised 197 individuals who were receiving non-surgical therapy for degenerative spondylolisthesis at Bolan Medical Complex Hospital, Quetta Pakistan from 2024 to 2025. Among them, 115 were females, while 82 were males. After non-surgical therapy, 124 individuals with degenerative spondylolisthesis chose not to have surgery, whereas the remaining 73 had to have surgery. All these patients had similar smoking habit, age, widening of facet joint, comorbidity scores, and translation at the point of degenerative spondylolisthesis and number of epidural steroid injections. The non-surgical group (65.2%, p-value=0.03) had more number of females than the surgical group (34.8%, p-value=0.03). The non-surgical group described better relief from pain (74.7% vs 54.7%, p-value = 0.002) for a prolong period of time than the surgical group (148.7 vs 44.8 days, p-value = 0.00). Patients who informed relief in pain more than 70% after the administration of epidural steroid injection had undergone surgery at low rate as compared to those who described relief in pain less than 70% after the administration of epidural steroid injection (15.7% vs 42.6%, p-value = 0.000). Opioid drugs were more frequently administered in the surgical group as compared to that in the non-surgical group (57.5% vs 26.4%, p-value = 0.001). However, no significant difference was found in the non-surgical and surgical groups about the use of drugs related to neuropathic pain and non-steroidal anti-inflammatory drugs (NSAIDs) (41.5% vs 36.8%, p-value = 0.583; 33.9% vs 32.3%, p-value = 0.917). The follow-up time of the surgical patients' group was lowered than that of the non-surgical patients' group (861.44±233.56 vs 1016.58±78.42; p-value = 0.000) [Table 2].

DISCUSSION

Degenerative spondylolisthesis can be treated by both non-surgical and surgical interventions. There is a lack of previously published literature on the issue of non-surgical treatment of spondylolisthesis. Thus, this study determines the outcomes of surgical versus non-surgical treatment of degenerative lumbar spondylolisthesis. It was evident from this study that non-surgical treatment of degenerative lumbar spondylolisthesis was more effective as compared to than surgical treatment. The results further revealed that those patients who received an epidural injection for more than 5 months were able to recover 70% from pain as well as they hadn't undergone surgical procedures. While those patients who received an epidural injection for 1 month were able to recover

50% from pain as well as they had to undergo surgical procedures. In addition, the study found no link between age, segmental instability, smoking habit, comorbidities, or gender and the requirement for surgical operations in individuals with degenerative spondylolisthesis. According to the findings, just 21.6 percent of patients required surgery following non-surgical therapy. This corresponds to studies that found 49 percent,[14] and 32.51 percent.[15] In many studies, non-surgical interventions were reported as less successful than that surgical interventions.[14,16,17] This might be because of the reason that in those studies patients with degenerative spondylolisthesis only received a few components of the non-surgical therapy. Another study narrated that less than 20% of such patients had to undergo surgical procedures after non-surgical interventions with epidural steroid injections, oral analgesics, and exercise.[18] These findings were in contrast to our results where patients who underwent non-surgical treatment of degenerative spondylolisthesis were those who least required surgical procedures. This was because of the reason that patients in the present study received epidural analgesia injections for about 1 to 2 months along with an exercise program.

Most of the studies reported beneficial impacts of exercise programs in degenerative spondylolisthesis.[19-23] Another study revealed that a focused exercise program, particularly for multifidus and abdominal muscles, had a strong impact on the patients with spondylolisthesis as compared to that generalized exercises which included gym, swimming, and walking.[22] Likewise, in a randomized study, the patients were divided into two groups namely a specific exercise group and a control group. In the latter group, patients only received medical treatment instead of exercise therapy. The results declared that patients receiving specific exercise for spondylolisthesis experienced less recurrence of this disease as compared to the other group [24]. In one study, patients with degenerative spondylolisthesis were treated with non-surgical treatment. Among them, nearly 70% of the patients underwent physical therapy, while half of them had been administered with epidural steroid injections, one-fourth of the patents opted for the chiropractic management, more than 60% of them were administered with NSAIDs and less than half of them were exposed to opioids before enrolling them in the study. In the same study among 212 patients who received non-surgical treatment after the enrollment, 40% of patients had taken physical therapy, less than 50% of them had been injected with epidural injections, while 50% and 30% of them had taken NSAIDs and opioids respectively. It is obvious that not all patients had been given with nonsurgical treatment that was defined as usual care and the patients did not receive the non-surgical intervention. They reported that patients with degenerative spondylolisthesis who underwent surgery had shown an improvement in pain, functionality, and disability at follow-up than those who had non-surgical treatment.[16] Nonetheless, they failed to have a non-surgical protocol for patients with chronic dislocation. In another prospective irregular trial, patients with this illness who underwent surgery had a lot of improvement in pain and incapacity at 2 years of follow-up than patients who had the exercise program alone as well as back and abdominal muscles strengthening and postural training.[17]

The necessary limitations of this research work are, (i) the results can't be generalized to the whole country because of the small sample size, (ii) a retrospective study on the prospective data and practical analysis, psychiatric analysis, and body mass index (BMI) weren't accessible in our spine database, (iii) the total number of patients within the surgical cluster was beyond the number of patients within the exercise group, (iv) they may not conclude that their exercise program was optimum. Since we intended to present data of patients with dislocation who received non-surgical treatment at the Spine Center from 2015 to 2018, this research work is a milestone for the future researchers. We tend to terminate that the selected patients with dislocation did higher than anticipated as a result of the excellent non-operative management of this disease that they received. Our non-surgical treatment program involves patient oriented awareness campaign, and pain management with drugs supported by a 1 to 2 months exercise program comprised of the high-intensity cardio workout, strengthening of core, and the muscle stretching trainings and the upholding of exercise program at home. All the selected participants were tutored to exercise while not increasing their pain and verify the period of the exercise session they may do while not intensifying their pain. The patients carried out their exercises during several sessions throughout the day rather than doing all the exercises in one session if doing all the exercises at identical times enhanced their pain. We tend to advocate the use of non-surgical treatment in patients with dislocation since we tend to show it attenuated the necessity for surgery. We tend to determine that age, gender, comorbidity, smoking habit, and segmental instability failed to affect the outcomes of non-surgical treatment. The 2 strongest predictors of treatment impact during this disorder were reported as patient expectations and baseline satisfaction with symptoms. The best treatment impact variations were determined between patients who anticipated a high and low chance of success with surgery. Our non-surgical treatment additionally enclosed patient tutoring, which has the possibility to affect the patient's expectations and satisfaction. It's been shown that patients who had instability did higher with medical procedure treatments than with surgical treatments. We tend to fail to see this impact in our results. Opioid use was considered as a poor prognostic issue for the attainment of better medical procedure treatments and not related to poorer surgical outcomes. We tend to additionally found that non-surgical treatment was additional probably to fail in the patients with dislocation who needed opioids.

CONCLUSION

The study concluded that non-surgical treatment was best suited for degenerative spondylolisthesis. These findings were far better than that of previously published literature. This might be because of the reason that patients were administered with analgesic injections which had lowered their intensity of pain. Moreover, patients were exposed to an exercise regimen that had increased their muscle strength and flexibility. Besides this, awareness programs about the importance of exercise in degenerative spondylolisthesis had also played a significant role in this context. The study recommended that the patients with degenerative spondylolisthesis should be managed with exercise because it will lower the need for surgery among such patients. It was revealed that the patients who received an epidural injection for 1 month were able to recover 50% from pain as well as they had to undergo surgical procedures. The study suggested the exposure of nonsurgical treatment among those patients who didn't require opioid therapy or reported 70% recovery from pain after epidural injection. Thus, nonsurgical interventions are more effective in the management of degenerative spondylolisthesis as compared to that of surgical treatment.

REFERENCES

1. Tosteson, A.N., et al., Comparative effectiveness evidence from the spine patient outcomes research trial: Surgical vs. non-operative care for spinal stenosis, degenerative spondylolisthesis and intervertebral disc herniation. Spine, 2011. 36(24): p. 2061.
2. Ahmad, S., et al., The outcome of decompression alone for lumbar spinal stenosis with degenerative spondylolisthesis. European Spine Journal, 2017. 26(2): p. 414-419.
3. Bailey, C., Quality of life and slip progression in degenerative spondylolisthesis treated non-operatively. 2017.
4. Evans, N. and M. McCarthy, Management of symptomatic degenerative low-grade lumbar spondylolisthesis. EFORT open reviews, 2018. 3(12): p. 620-631.
5. Jain, S., et al., Changes in standing and walking time after multimodal physical rehabilitation in low grade degenerative lumbar spondylolisthesis: a non-randomised pilot study. Physiotherapy Theory and Practice, 2022: p. 1-11.
6. Ilyas, H., I. Udo-Inyang, and J. Savage, Lumbar spinal stenosis and degenerative spondylolisthesis. Clinical Spine Surgery, 2019. 32(7): p. 272-278.
7. Nimmons, S.J., A.K. Simpson, and A.E. Park. Decompression alone for the treatment of degenerative lumbar spondylolisthesis. in Seminars in Spine Surgery. 2020. Elsevier.
8. Singh, T.G., et al., Evaluation of surgery in degenerative spondylolisthesis: A non randomized controlled trial. 2020.
9. Patino, J.D. and J. Lafuente, Degenerative spondylolisthesis, in Spine Surgery. 2019, Springer. p. 81-86.
10. Mikhail, C.M., J.E. Dowdell III, and A.C. Hecht. Adult lumbar spondylolisthesis: Interspinous devices. in Seminars in Spine Surgery. 2020. Elsevier.
11. Ong, K.L., et al., Perioperative outcomes, complications, and costs associated with lumbar spinal fusion in older patients with spinal stenosis and spondylolisthesis. Neurosurgical focus, 2014. 36(6): p. E5.
12. Lattig, F., et al., Lumbar facet joint effusion in MRI: a sign of instability in degenerative spondylolisthesis? European Spine Journal, 2012. 21(2): p. 276-281.
13. Dupuis, P.R., et al., Radiologic diagnosis of degenerative lumbar spinal instability. Spine, 1985. 10(3): p. 262-276.
14. Weinstein, J.N., et al., Surgical versus nonsurgical treatment for lumbar degenerative spondylolisthesis. New England Journal of Medicine, 2007. 356(22): p. 2257-2270.
15. Matsunaga, S., K. Ijiri, and K. Hayashi, Nonsurgically managed patients with degenerative spondylolisthesis: a 10-to 18-year follow-up study. Journal of Neurosurgery: Spine, 2000. 93(2): p. 194-198.
16. Weinstein, J.N., et al., Surgical compared with nonoperative treatment for lumbar degenerative spondylolisthesis: four-year results in the Spine Patient Outcomes Research Trial (SPORT) randomized and observational cohorts. The Journal of Bone and Joint Surgery. American volume., 2009. 91(6): p. 1295.
17. Möller, H. and R. Hedlund, Surgery versus conservative management in adult isthmic spondylolisthesis: a prospective randomized study: part 1. Spine, 2000. 25(13): p. 1711-1715.
18. Simotas, A.C., et al., Nonoperative treatment for lumbar spinal stenosis: clinical and outcome results and a 3-year survivorship analysis. Spine, 2000. 25(2): p. 197.
19. Kalichman, L. and D.J. Hunter, Diagnosis and conservative management of degenerative lumbar spondylolisthesis. European Spine Journal, 2008. 17(3): p. 327-335.
20. Sinaki, M., et al., Lumbar spondylolisthesis: retrospective comparison and three-year follow-up of two conservative treatment programs. Archives of physical medicine and rehabilitation, 1989. 70(8): p. 594-598.
21. Gramse, R., M. Sinaki, and D. Ilstrup. Lumbar spondylolisthesis: a rational approach to conservative treatment. in Mayo Clinic Proceedings. 1980.
22. O'Sullivan, P.B., et al., Evaluation of specific stabilizing exercise in the treatment of chronic low back pain with radiologic diagnosis of spondylolysis or spondylolisthesis. Spine, 1997. 22(24): p. 2959-2967.
23. Ferrari, S., C. Vanti, and C. O'Reilly, Clinical presentation and physiotherapy treatment of 4 patients with low back pain and isthmic spondylolisthesis. Journal of Chiropractic Medicine, 2012. 11(2): p. 94-103.
24. Hides, J.A., G.A. Jull, and C.A. Richardson, Long-term effects of specific stabilizing exercises for first-episode low back pain. Spine, 2001. 26(11): p. e243-e248.