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Evaluation of functional outcome of posterior instrumentation and bone grafting in degenerative and lytic listhesis in lumbosacral spine

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Abstract

Background: The spondylolisthesis with or without spondylolysis can occur in 5% to 8% of adult population. It is most commonly believed that spondylolysis does not exist from the birth. Its incidence is 4.4% to 5% at age of 6 years, increasing it to 6% at age of 18 years, which is quite similar to one observed in adulthood. To analyze functional outcome of the posterior stabilization by the pedicle screws with the decompression and the interbody fusion by the PLIF (Posterior Lumbar Interbody Fusion) technique in the adult using the Modified Oswestry Disability Index. In this study we aim to analyze correlation between degrees of the fusion with the functional outcomes.

Methods: This is a prospective study of 25 patients conducted in the Department of Orthopedics, D.Y. Patil Hospital, Kolhapur from August 2016 to June 2018. All the patients were evaluated with baseline anteroposterior, lateral and oblique radiographs of lumbosacral spine. MRI evaluation of all the patients was done to evaluate joint pathology, sacralisation/ lumbarisation, the condition of disc, neural canal and foramina stenosis and nerve root involvement. Pre and post-operative Modified Oswestry low back pain scores and Visual Analogue Score were assessed.

Results: Out of 25 patients of degenerative and lytic listhesis of lumbosacral spine, after surgery, radiculopathy was relieved in 23 (92%) cases. Preoperative mean Modified Oswestry low back pain score of lumbosacral spine degenerative and lytic listhesis patients was found to be 53.96 ± 11.5 and post-operative after 1.5 months, it was 30.48 ± 13.07 .

Conclusions: Score was reduced significantly after surgery (Posterior Instrumentation, Bone grafting and Decompression) showing major improvements in symptoms among patients.

Keywords: Lumbar spondylolisthesis, posterior lumbar interbody fusion, modified oswestry disability index

Introduction

Spondylolisthesis is the forward subluxation of cephaloid vertebra over a vertebra caudal to it. ⁽¹⁾⁽²⁾ The term 'spondylolysis' represents local bony defect in pars interarticularis of vertebra that can be unilateral or bilateral ^[3]. Lumbar spinal stenosis (narrowing of the central spinal canal, lateral recess or the neural foramen) is an important cause of low back and lower limb pain. Spondylolisthesis (anterolisthesis) can occur with defect in vertebral arch (spondylolysis spondylolisthesis) or without the defect in vertebral arch (non-spondylolysis spondylolisthesis). Spondylolisthesis with or without spondylolysis occurs in about 5% to 8% of adult population ^[4]. Spondylolysis is a type of stress fracture in the pars interarticularis of lumbar spines that is discovered accidentally in spine imaging. One of main reasons of spondylolysis is irregular sport activities in teenagers and adults that may result in pars interarticularis fracture. But as it has no specific sign, people might be afflicted for years. As this injury in afflicted individuals is not well diagnosed, breakout and occurrence of this disease in the general population are estimated to be at a low level. It is believed that spondylolysis does not exist as defect at birth. The incidence is 4.4% to 5% till the age of 6 years and increasing upto 6% at age of 18 years, which is similar to that observed in adulthood ^[5]. At first, the condition is asymptomatic, and by the time pain is experienced, 90% of the patients show a slippage of less than 30% ^[6].

Accordingly, results of some studies in the recent years represent a relationship between chronic LBPs and spondylolysis. Therefore, this injury in individuals afflicted with chronic LBP should be considered as a probable reason, and necessary diagnostic modalities should be performed. Chronic low back pain (LBP) is one of the most common chronic pains that people pay attention to. Also, it accounts for most referring to clinics and hospitals. Results of studies in the developed countries show that more than 85% of individuals experience back pain during their lifetime, that majority of them were treated without recognition analysis at the level of primary treatment services emergency cares and even in most people, this phenomenon was limited itself. Spondylolisthesis is considered as one of the etiologies for chronic LBPs in aged individuals. For this reason, in the approach toward patient afflicted with chronic LBP, it should be considered and analyzed. Spondylolisthesis has many types. In the most common classifying system, Wilts classification, spondylolisthesis is divided into six types based on etiology: dysplastic, isthmic, degenerative, traumatic, pathologic, and iatrogenic [7].

There are several types of lumbar surgeries have been described for surgical management of spondylolisthesis. Brantigan and Steffee developed a carbon-fiber-reinforced implant, which was the first interbody cage and achieved excellent outcomes [2].

We in our study, managed spondylolisthesis in adults with posterior stabilization by pedicle screws with decompression and interbody fusion by posterior lumbar interbody fusion (PLIF) techniques. In addition to routine clinical and radiological outcome evaluations, we have correlated interbody fusion with patient's functional outcome, by using the standard scoring system.

Materials & Method

This is a prospective study of 25 patients conducted in the Department of Orthopedics, D.Y. Patil Hospital, Kolhapur from August 2016 to June 2018.

Inclusion criteria

All those patients above 15 years having degenerative and lytic listhesis in lumbosacral spine.

Exclusion criteria

Traumatic listhesis of spine
Patients with anesthesia opinion as unfit
Patients with immunosuppressant
Immuno-compromised patient.

All the patients were evaluated with baseline anteroposterior, lateral and oblique radiographs of lumbosacral spine. MRI evaluation of all the patients was done to evaluate joint pathology, sacralisation/ lumbarisation, the condition of disc, neural canal and foramina stenosis and nerve root involvement. Pre-operative Modified Oswestery low back pain scores and Visual Analogue Score were assessed. Detailed observations with regard to complications encountered if any during the intraoperative, postoperative periods and during follow up visits were noted. Posterior Instrumentation was done in all 25 cases adequate decompression is achieved along with bone graft from lamina along with pedicle screw fixation. Various Poly-axial and Mono-axial Implants were used. Functional outcome was assessed using the Modified Oswestry Disability Index (ODI) and visual pain analog score (VAS). Post-operative

radiculopathy was assessed along with immediate radiographic evaluation. Follow up was done at 1.5 months and 6 months and the outcome was assessed using Modified Oswestery low back pain scores and Visual Analogue Score (VAS) score. The correlation between the degree of fusion and the patient's functional outcome during the final follow up was analysed.

Results

25 patients with degenerative and lytic listhesis in lumbosacral spine were included in our study. The mean age of patients was 61.24 ± 12.55 years and ranging from 33 to 78 years, out of which 9 (36%) were males and 16 (64%) were females, showing higher prevalence in females with male to female ratio of 1:1.8.

Out 25 patients of degenerative and lytic listhesis of lumbosacral spine, in 13 (52%) cases radiculopathy was seen in left lower limb, in 7(28%) cases radiculopathy was seen bilaterally and in 5 (20%) cases radiculopathy was seen in right lower limb with 15 (60%) patients having symptoms for > 1 year and only 10 (40%) patients with symptoms \leq 1 year.

In our study the commonest level involved was L4- L5 with 19 cases, 76% of the total cases followed by L5- S1 level (4 cases, 16%), L2-L3-L4 level (1 case, 4%) and L3-L4-L5 (1 case, 4%) as shown in Figure 1.

Out of 25 patients of degenerative and lytic listhesis of lumbosacral spine, after surgery, radiculopathy was relieved in 23 (92%) cases. Difference between 2 groups was statistically significant as seen in Table 1.

Preoperative mean Modified Oswestery low back pain score of lumbosacral spine degenerative and lytic listhesis patients was found to be 53.96 ± 11.5 and post-operative after 1.5 months, it was 30.48 ± 13.07 . Score was reduced significantly after surgery (Posterior Instrumentation, Bone grafting and Decompression) showing major improvements in symptoms among patients. The post-operative 6 months was 18.56 ± 6.42 , showing significant improvements of symptoms among patients. (Table No. 2)

Before and after decompression, VAS scores are compared. Mean preoperative VAS score was 7.48 and mean post-operative after 1.5 months VAS score was 3.28. Score was reduced significantly after surgery (Posterior Instrumentation, Bone grafting and Decompression) showing major improvements in symptoms among patients. (Table No. 3)

After surgery, post-operative complications were seen only in 4 patients. In one patient there was annular disc bulge seen at upper level which was relieved by Dissectomy done after 2 months of decompression surgery and instrumentation. In one patient there was foot drop seen and gotrelieved with physiotherapy. In another patient, there was Post-operative weakness of left lower limb which was relieved with physiotherapy. In another patient there was migration of rod was seen. (Figure 2)

In our study no intra-operative or postoperative deaths were seen. No superficial or deep infections were noted. No CSF leak encountered during surgery. And no vascular injury encountered during surgery.

Discussion

In our study, we have included 25 patients of degenerative and lytic listhesis in lumbosacral spine.

Age and Sex wise distribution of the patients

The mean age of patients was 61.24 ± 12.55 years and ranging from 33 to 78 years.

Out of 25 patients of degenerative and lytic listhesis of lumbosacral spine, 9 (36%) were males and 16 (64%) were females, showing higher prevalence in females with male to female ratio of 1:1.8.

Similar findings were seen in a study by Layegh M *et al* on 'Prevalence of Spondylolysis and Spondylolisthesis in Patients Afflicted with Chronic Back Pain', in which the mean age of patients was 41.9 ± 14.1 years. The maximum and minimum ages were 78 and 15 years, respectively. Out of all patients, 40% were male and 60% individuals were females and male to female ratio was 1:1.5. More female preponderance was seen.

Radiculopathy

Out 25 patients, in 13 (52%) cases radiculopathy was seen in left lower limb, in 7(28%) cases radiculopathy was seen Bilateral and in 5 (20%) cases radiculopathy was seen in right lower limb.

Harish Murthy and TVS Reddy *et al.* [8] in their study on 'Short term clinical and functional outcome after posterior lumbar inter body fusion in cases of lumbar canal stenosis by using RODI score assessment' found that all 30 patients had back pain, whereas leg pain present in 86.7% patients. 80% patients had only a single level involvement while 20% patients had multi-level involvement.

Duration of Symptoms

Out of total 25 cases, most common symptom was low back-ache, present in all patients.

15 (60%) patients in our study had symptoms for > 1 year and only 10 (40%) patients with symptoms \leq 1 year.

Similarly in a clinico-etiological study by Vatsal DD *et al.* [9] on spondylolisthesis in north Indian population, the duration of symptom was <1 year in 25% patients and >1 year in 75% cases.

Levels of the Spine involved and Level of Posterior Instrumentation

In a study by Layegh M *et al.* on 'Prevalence of Spondylolysis and Spondylolisthesis in Patients Afflicted with Chronic Back Pain', the most common level of involvement in spondylolisthesis among patients in this study was L4-L5, and the level of L2-L3 had the least common of involvement same as our study.

Radiculopathy relieved

Out of 25 patients of degenerative and lytic listhesis of lumbosacral spine, after surgery, radiculopathy was relieved in 23 (92%) cases.

Modified Oswestery low back pain scores

A. Preoperative versus Post-operative after 1.5 months Scores

Preoperative mean Modified Oswestery low back pain score of lumbosacral spine degenerative and lytic listhesis patients was found to be 53.96 and post-operative after 1.5 months, it was 30.48. Score was reduced significantly after surgery (Posterior Instrumentation, Bone grafting and Decompression) showing major improvements in symptoms among patients.

B. Preoperative versus Post-operative after 6 months Scores

Preoperative mean Modified Oswestery low back pain score of lumbosacral spine degenerative and lytic listhesis patients

was found to be 53.96 ± 11.5 and post-operative after 6 months, it was 18.56 ± 6.42 . Score was reduced significantly after surgery showing major improvements of symptoms among patients.

C. Post-operative after 1.5 months versus Post-operative after 6 months Scores

Post-operative after 1.5 months mean Modified Oswestery low back pain score of lumbosacral spine lytic listhesis patients was found to be 30.48 ± 13.07 and post-operative after 6 months, it was 18.56 ± 6.42 . Score was reduced significantly after 6 months showing gradual improvements of symptoms among patients.

Same findings were seen in a study by Boktor J *et al* [10] on 'Lumbar fusion for lytic spondylolisthesis: Is an interbody cage necessary?' they found that ODI (Oswestry Disability Index) score improved significantly from mean 61.1 ± 6.2 preoperatively to 14.2 ± 11.3 at 12 months postoperatively $P < 0.001$.

Pre and post-operative VAS score

VAS Score

Before and after decompression, VAS scores are compared. Mean preoperative VAS score was 7.48 and mean post-operative after 1.5 months VAS score was 3.28. Score was reduced significantly after surgery (Posterior Instrumentation, Bone grafting and Decompression) showing major improvements in symptoms among patients.

Findings were comparable with the study by Boktor J *et al* on 'Lumbar fusion for lytic spondylolisthesis: Is an interbody cage necessary?' they found that back pain VAS decreased from mean (SD) 6.4 (0.96) preoperatively to 1.5 (1.3) at 12 months postoperatively $P < 0.001$.

Post-operative complications

After surgery, post-operative complications were seen only in 4 patients. In one patient there was annular disc bulge seen at upper level of the operated site which was relieved by Dissectomy done after 2 months of decompression surgery. In one patient there was foot drop but no obvious root injury was observed during surgery. So possibility was due to traction of nerve root during rod fixation. In another patient, there was Post-operative weakness of left lower limb which was relieved with physiotherapy. In another patient rod slippage was seen.

In our study no intra-operative or postoperative deaths were seen. No superficial or deep infections were noted. No CSF leak encountered during surgery. And no vascular injury encountered during surgery.

In a study by Sakthivel RN *et al.* [11] on Adult Spondylolisthesis, out of 42 patients one patient in posterolateral fusion group had acquired postoperative surgical infections which were treated with culture specific antibiotics.

In a study by P Devkota *et al.* [12] on Posterior lumbar interbody fusion of spondylolisthesis, out of total 72 patients, no patient had complications like cerebrospinal fluid (CSF) leakage or permanent neurological deficient after the operation.

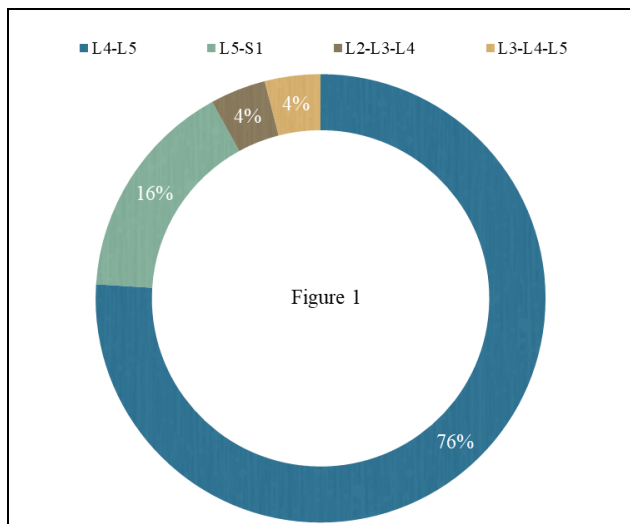


Fig 1: Shows the involvement of spinal level

Table 3: Pre and post-operative VAS score

Pre-operative (Mean)	Post operative after 1.5 months (Mean)	T value	P value
7.48	3.28	18.78	<0.01

Conclusion

In our study there was good correlation between fusion and functional outcomes. Should be conducted. Score was reduced significantly after surgery (Posterior Instrumentation, Bone grafting and Decompression) showing major improvements in symptoms among patients. A long term study with a larger patient population with a detailed assessment of the “Modified Oswestery low back pain scores”

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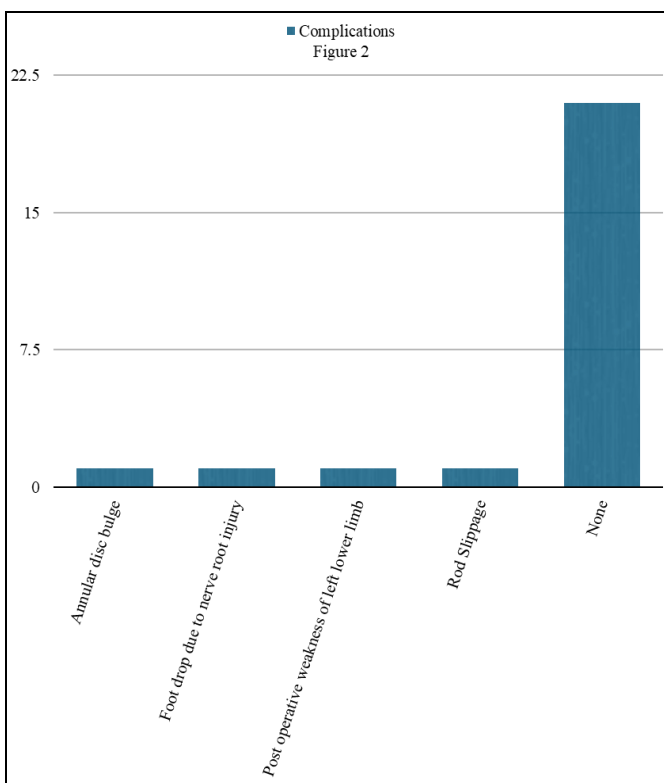


Fig 2: Shows complications

Table 1: Patients with radiculopathy

Radiculopathy relieved	Frequency	Percentage (100%)	P value
YES	23	92	<0.01
NO	2	8	
Total	25	100	

Table 2: Pre and post operative ODI score

	Mean (SD)	T value	P value
Pre-operative mean ODI (SD)	53.96 (±11.5)	7.45	<0.01
Post-operative after 1.5 months Mean ODI (SD)	30.48 (±13.07)		
Pre-operative mean ODI (SD)	53.96 (±11.5)	15.53	<0.01
Post-operative after 1.5 months Mean ODI (SD)	18.56 (±6.42)		