

Operative Outcome of Instrumented Posterior Spinal Fusion with Free Bone Graft in Symptomatic Isthmic Lumbosacral Spondylolisthesis in Adults.

Sudipta Dasgupta¹, Abhilash Sarkar², Samares Naiya³, Abhijit Ghosh³, Rajatabha Biswas², Soumya Banerjee²

¹Associate Professor, Department of Orthopaedics, Burdwan Medical College, Burdwan.

²Junior Resident, Department of Orthopaedics, Burdwan Medical College, Burdwan.

³Assistant Professor, Department of Orthopaedics, Burdwan Medical College, Burdwan.

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ABSTRACT

Background: ISpondylolisthesis is defined as anterior or posterior slipping of one segment of the spine on the next lower segment. The mainstay of surgical treatment for adult patients with low-grade acquired spondylolytic spondylolisthesis is fusion, with or without decompression. Objectives: To study the safety, efficacy and functional outcome of surgical management of lumbo-sacral spondylolisthesis with pedicle screw fixation, and free bone grafting, and its associated complications. **Methods:** 10 adult patients with lumbosacral spondylolisthesis treated by instrumented posterior spinal fusion with free iliac chips bone graft and their followup with functional and radiological parameters. **Results:** Following operation 5 patients(50%) having excellent results & 2 patients(20%) have good results. **Conclusion:** Instrumented posterior fusion with free graft is a good option for symptomatic lumbosacral spondylolisthesis and also has added advantages of correction ofolisthesis, three column stabilization and early mobilization.

Keywords: Spondylolisthesis, lumbosacral, isthmic, free graft, posterior fusion

INTRODUCTION

Spondylolisthesis is defined as anterior or posterior slipping of one segment of the spine on the next lower segment. The prevalence of spondylolisthesis in the general population is approximately 5%. Male to female ratio in isthmic spondylolisthesis is 2:1.^[1] Patients usually present with a persistent dull low-back pain with or without radiculopathy, that aggravates with activity, low-back stiffness, tight hamstrings and intermittent neurogenic claudication. With more severe slips, the trunk becomes shortened and often leads to complete absence of the waistline. The imaging analysis begins with conventional radiology, with antero-posterior, lateral, and flexion– extension radiographs providing the most useful information. If an obvious pars defect is not visualized on the lateral views, an oblique radiograph may be helpful in demonstrating the defect as the collar of the

“Scotty dog.” CT and MRI are useful advanced imaging methods, particularly in the preoperative planning stage, for better defining both the bony and soft tissue anatomy, respectively. The initial treatment is conservative, with rest, hot/cold compressions, use of NSAIDs, muscle relaxants, physical therapy, core muscle strengthening exercises avoiding extension, and the wearing of a lumbosacral extension brace. The surgical outcome of lumbo-sacral spondylolisthesis is better than conservative according to literature in accordance with stable reduction and early amelioration of symptoms. The mainstay of surgical treatment for adult patients with low-grade acquired spondylolytic spondylolisthesis is fusion, with or without decompression. In this study, we have evaluated the operative outcomes of isthmic variety of spondylolisthesis by spinal fixation and posterior spinal fusion with free iliac chips bone graft.

Aims & Objectives

1. To study the safety, efficacy and functional outcome of surgical management of lumbo-sacral spondylolisthesis with pedicle screw fixation, and free bone grafting.
2. To study the complications associated with this treatment modalities.
3. To assess the radiological incorporation of bone graft.

Name & Address of Corresponding Author

Samares Naiya,
Assistant Professor,
Department of Orthopaedics,
Burdwan Medical College,
Burdwan.

MATERIALS AND METHODS

Study Area

Department of Orthopaedics and Radio-diagnosis in a tertiary care institute.

Study Population

Patients of lumbo-sacral spondylolisthesis, meeting the inclusion and exclusion criteria, attending the OPD and Emergency of our hospital.

Inclusion Criteria

- Presenting with persistent low back pain + neurological claudication despite 9 months to 1 year of conservative treatment.
- Development of a neurological deficit; sensory and/or motor.
- Diagnosed clinically and confirmed with imaging.

Exclusion criteria

- Spondylolisthesis with no neurological deficit and no functional disability.
- Patients with any other spinal pathology.
- Patients with any associated neurological involvement due to any other diseases.
- Patients who have had earlier surgeries on their spine.
- Patients unfit for surgery due to co-morbid medical conditions

Study Period: Approx 20 months

Sample Size: 10 Patients

Sample Design: Patients screened through the exclusion criteria and matching the inclusion criteria will be consecutively included in the study with their informed consent till the desired number of sample has been obtained.

Study Design: Institution based prospective, longitudinal study

Study Tools: Imaging of lumbar spine like Skiagram, CT scan, MRI (with dye enhancement, if necessary) as per indication.

Methodology

- Required data was collected from patients attending OPD/ER, during their stay in hospital as inpatients, and during their follow-up.
- All patients included in study will be assessed clinically with physical examination and confirmed with radiology and MR imaging.
- Written and informed consent.
- Pre- op investigation and pre-anaesthetic check-up.
- Decompression, reduction of the defect, stabilization with pedicle screws and rods, and posterior spinal fusion with free iliac chips bone graft or bone harvested from lamina and spinous processes was performed.
- Mobilisation from day 3, walking was allowed on day 7 and stitch removal was done on day 14.
- Follow up visits every 6 weekly for 3 months and every 12 weeks thereafter till 1 year.
- On each visit clinical and radiological evaluation shall be done to assess the neurological status, pain, flexion and extension movements at spine and posterior spinal fusion.

- The functional results of surgical procedure will be analysed on the basis of Modified Japanese Orthopedic Association Score.^[2] Patients will be mainly assessed for low back ache, leg pain, gait, straight leg raising test, motor and sensory disturbances. The results of this treatment modality will be classified as achieved clinical success and not achieved clinical success.
 - Overall outcome will be evaluated by a point system taking post-operative functional score, bony fusion and patient satisfaction into consideration.
- Plan for Analysis of Data:** The clinical and imaging correlation of the patients will be analysed after application of appropriate significant statistical tests.

RESULTS

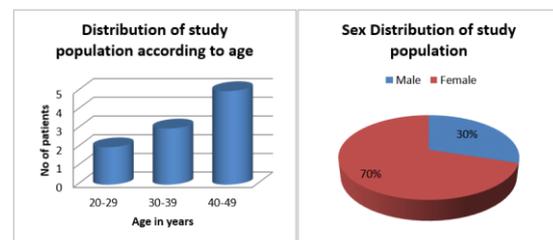


Chart 1& 2: Distribution of study population according to Age and Sex.

Table 1: Distribution of study population according to Radiological Grade.

Grade	No of Patients	Percentage
Grade I	2	20%
Grade II	6	60%
Grade III	2	20%
Grade IV	0	0%
Total	10	100%

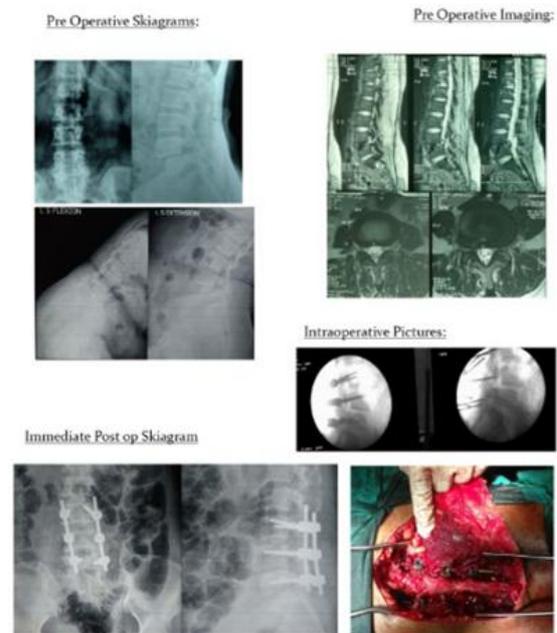


Figure 1: Pre-operative Imaging.

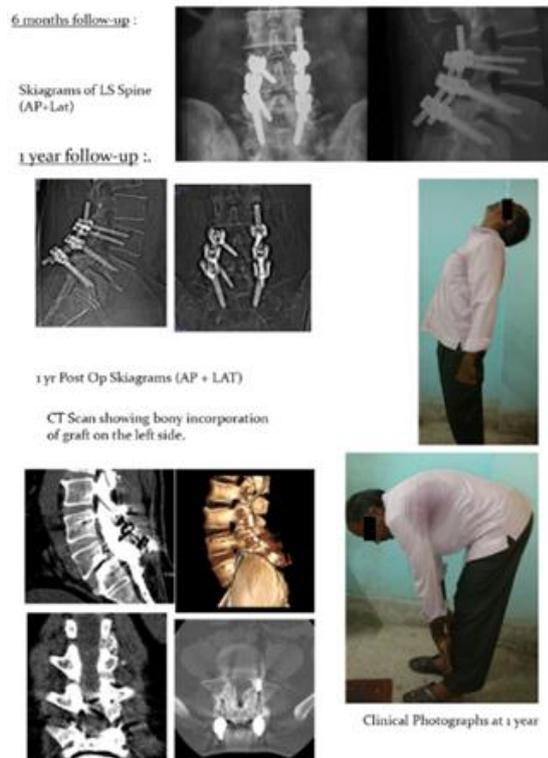


Figure 2: 6 months follow up.

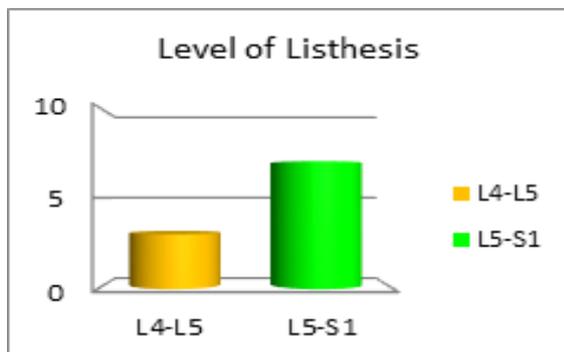


Chart 3: Distribution of study population according to Level of listhesis

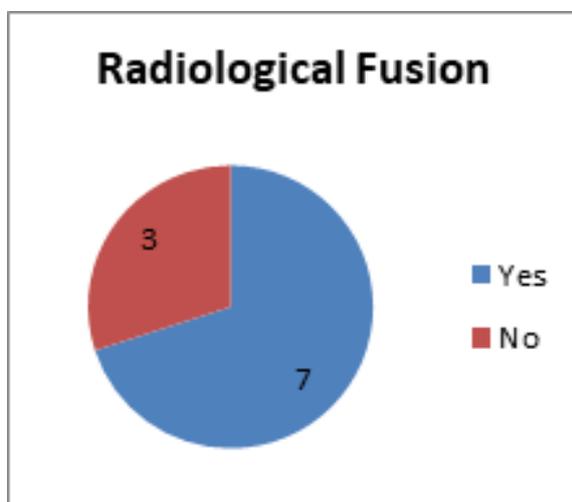


Chart 4: Distribution of Radiological fusion at 1 year.

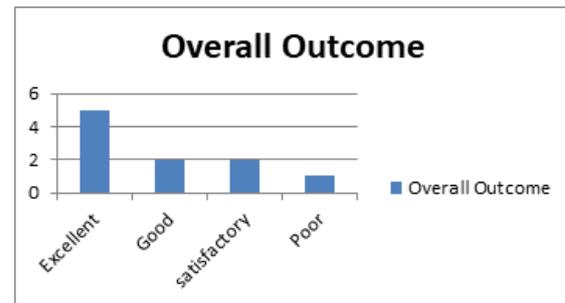


Chart 5: Overall outcome.

Table 2: Distribution of functional score of the patients with Free Graft.

Functional score	Time Period			
	A presentation	At 3 month	At 6 month	At 1 year
Mean±s.d.	13.40±3.97	22.80±4.09	24.60±3.21	27.00±1.00
Median	12	21	23	27
Range	10 - 20	18 - 28	21 - 28	26 - 28

Mean functional score increased over time period.

Table 3: Distribution of study population according to complications.

Complication	Number of patients	Percentage
Pseudarthrosis	3	30
Misplaced screws	1	10

DISCUSSION

As far as surgical management of spondylolisthesis is concerned, the goal of decompression is to relieve the radicular symptoms and neurogenic claudication. The goal of fusion is to relieve back pain from degenerated disc and/or facet joint by elimination of instability. The result of in situ arthrodesis has been reported to be excellent even after long term follow up.^[3,4] Biomechanical studies have shown that the stabilisation provided by postero-lateral or anterior interbody fusion is superior to that of pure posterior fusion.^[5]

Out of 10 patients in our study, 3 were males and 7 were females. Ratio of male: female in our study is 1:2.33. This is contrary to an epidemiological study by Kalichman and Hunter which showed the male to female ratio for adult isthmic spondylolisthesis to be 2:1.^[1] This discrepancy may be due to our small sample size.

The average age of our patients was 36.6 years (Range 25-45 years). According to Campbell's Operative orthopaedics, patients requiring surgery are of younger age, which is consistent with the findings of other authors.^[6]

According to Campbell's operative orthopaedics, most patients with lytic acquired spondylolisthesis present with low grade deformities (less than 50% slip); 90% to 95% involve the L5-S1 level with 5% to 8% at L4-L5. Low grade slips are much more common than those of more than 50% by a ratio of

10:1. In our study, there were 7 cases with L5-S1 slip (70%) and 3 cases (30%) with slip at L4-L5. There was a single case of Grade III listhesis compared to 9 cases of Grade I & II which is in accordance with the literature.^[6]

Low back pain and sciatica were the most common symptoms and was present in all the cases, followed by hamstring tightness in 70% of the cases.

Functional score (modified Japanese Orthopaedic Association score) which shows the morbidity of the patients improved significantly after operation. In our study of the 10 patients treated by instrumentation and free graft, only two (20%) had functional score less than 25.

In our study, after 1 year, bony fusion was achieved in 7 of 10 patients operated by instrumentation and bone grafting i.e. 70%.

Herkowitz and Kurz, in 1991, showed outcomes are improved with the addition of in situ fusion regardless of whether there is a solid roentgenographic fusion.^[7]

Kwon and Albert showed in their literature review that using rigid pedicle screw constructs improves fusion rates in patients with acquired lytic spondylolisthesis. They found a 90% fusion rate with the use of rigid pedicle screw instrumentation and a 77% fusion rate in uninstrumented cases.^[8]

The overall result is evaluated by a point system taking post-operative functional score, bony fusion and patient satisfaction into consideration.

There were five (50%) cases with excellent results in instrumented fusion with free graft. Two patients had good result (20%). One had occasional episodes of LBP that was relieved on taking rest and did not require medication. 20% had fair result. Among them, one had pseudarthrosis and suffered from episodes of back pain for which she was on intermittent medication. One pedicle screw at L3 level was misplaced, but as there was no worsening of symptoms or neurodeficit, the screw was kept in situ and planned for removal at a later date.

In 1998, Bakshi showed 48% excellent, 39% good, 9% fair and 4% poor result (pseudarthrosis, slippage of bone graft) with sacrospinalis muscle pedicle graft without instrumentation.^[9]

Thus, a good fusion rate was obtained with instrumented fusion using free graft. But these benefits come with a risk of implant related complications like infection and misplacement of screws. However, the addition of instrumentation has enabled some degree of correction of listhesis and, improved of stability of mobile segment, leading to less morbidity and early mobilization of the patient.

CONCLUSION

Surgical intervention is a good option for patients of isthmic spondylolisthesis not responding to

conservative management. Patients with isthmic spondylolisthesis can be appropriately managed using a number of techniques. In our study, radiological fusion was achieved in 70% of the cases. Functional score of patients also improved significantly. Thus rigid pedicle screw constructs improves fusion rates in patients with acquired lytic spondylolisthesis. Posterior instrumentation also has the added advantages of correction of listhesis, three column stabilization and early mobilization, which leads to reduced morbidity of the subjects. Nevertheless, the clinical outcome did not entirely correlate with the radiographic evaluation. Further randomized controlled studies with a larger sample size are warranted for better evaluation of this procedure.

REFERENCES

1. Kalichman L, Kim DH, Li L, Guermazi A, Berkin V, Hunter DJ (2009) Spondylolysis and spondylolisthesis: prevalence and association with low back pain in the adult community-based population. *Spine (Phila Pa)* 34:199-205.
2. Japanese Orthopaedic Association (JOA). Japanese Orthopaedic Association Assessment Criteria Guidelines Manual. 1996, pages 46-49.
3. Harris IE, Weinstein SL (1987) Long-term follow up patients with grade III and IV spondylolisthesis. Treatment with or without posterior fusion. *J Bone Joint Surg [Am]* 69: 960-969
4. Johnson JR, Kirwan EO'G (1983) The long term results of fusion in situ for severe spondylolisthesis. *J Bone Joint Surg [Br]* 65: 43-46
5. Lee CK, Langrana NA (1984) Lumbosacral spine fusion. A biomechanical study. *Spine* 9: 574-581
6. Gardocki, R.J., & Camillo, F.X. (2013). Other Disorders of the Spine. In ST. Canale, & JH. Beaty (Eds.), *Campbell's Operative Orthopaedics* (12th ed., Vol. 2, pp. 2010-2018) Philadelphia, PA: Elsevier/Mosby.
7. Herkowitz HN, Kurz LT. Degenerative lumbar spondylolisthesis with spinal stenosis. A prospective study comparing decompression with decompression and intertransverse process arthrodesis. *J Bone Joint Surg Am* 1991 Jul;73(6):802-08.
8. Kwon BK, Berta S, Daffner SD, et al. Radiographic analysis of transforaminal lumbar interbody fusion for the treatment of adult isthmic spondylolisthesis. *J Spinal Disord Tech* 2003; 16:46-76.
9. Bakshi DP, Sacrospinalis muscle-pedicle bone graft in posterolateral fusion for spondylolisthesis, *Int Orthop*. 1998;22(4):234-40.

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