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A prospective study on surgical management of lumbar spondylolisthesis with pedicle screw fixation and posterolateral fusion

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ABSTRACT

Background: Spondylolisthesis is a subluxation of vertebral body over another in sagittal plane. Incidence of Spondylolisthesis in general population is 5-7%. No matter what the etiology is, patients usually have significant functional disability. Few studies have investigated the long term effect of pedicle screws fixation and posterolateral fusion on functional outcome. Objectives of this study were assessment of lumbar spondylolisthesis, the results of posterolateral fusion using autogenous bone graft from iliac crest and stabilization by pedicle screws fixation systemand to evaluate the clinical and radiological assessment of symptoms improvement and fusion rates of this procedure and functional outcome.
Methods: A total of 30 patients of lumbar spondylolisthesis who are operated upon with posterior stabilization using Pedicle Screws fixation and postero lateral fusion satisfying inclusion and exclusion criteria and followed up between February 2015 and January 2017.
Results: The study included 30 patients; aged between 21 to 60 yrs with a mean age of 46 yrs. Average follow up was 17 months. Functional outcome assessment with Kirkadly-Willis criteria showed 90% of excellent to good outcome.
Conclusions: We found in our study that posterolateral fusion with Pedicle Screws fixation minimizes dislocation, achieves adequate decompression, corrects the sagittal axis, and accomplishes fusion. We successfully achieved solid fusion with good mechanical alignment in majority of the patients.

Keywords: Spondylolisthesis, Pedicle screw fixation, Postero lateral fusion

INTRODUCTION

Spondylolisthesis is defined as anterior or posterior slipping of one segment of the spine on the next lower segment.

The term Spondylolisthesis first coined by Killian in 1854 who first described this condition as a separate entity. It is derived from the Greek 'Spondylo' means spine and 'Listhesis' means to slip or slide down.[1]

Spondylolisthesis is a common cause for lower-back pain, radiculopathy, and neurogenic claudication among the adult population.[2] Chronic pain affects function and quality of life of large number of individuals. "Back-problems" is among the most common cause of medical and socioeconomic problems in the world today.[3]

The commonest level involved is L5 – S1 (89%). The displacement is a result of loose posterior locking mechanism which in turn leads to instability with symptomatic thecal sac and nerve root compression. In a pars interarticularis defect, the facet joints no longer resist anterior translation shear motion. A bilateral pars defect may lead to spondylolisthesis, which implies that anterior displacement of the vertebral body at the

spondylolytic level occurs over the subjacent vertebral body.[4] There are different types of spondylolisthesis. Wiltse et al. performed the first systematic classification according to etiology, differentiating between congenital, isthmic, degenerative, pathological and iatrogenic.[5]

The mainstay of treatment is conservative, but patients who failed to respond should be considered for surgical treatment which accounts to 15% of the total.[6] The purpose of the surgical treatment is to reduce low back pain and radiating pain, to relieve the neurologic symptoms, and to improve the posture and gait byeliminating the instability of the lumbosacral region.

Decompression and spinal fusion with or without instrumentation are the mainprinciples of surgery. Decompression results in gross segmental instability, calling for a fusion. Arthrodesis in the form of posterolateral fusion positively affects symptomatic lumbar spondylolisthesis. Even though there are several instrumentation systems available, pedicle screw fixation in conjunction with fusion provides many advantages, such as excellent control and fixation of the three column spine, efficient slip reduction, restoration of sagittal alignment and better control of the spine in corrected position.[7]

It also enhances the rate of posterior fusion and early ambulation of the patient. The choice of surgery depends on the patients complaints, grade of slip and surgeons know how, it is important to choose the ideal surgery for the given patient to obtain a successful result.[8]

The main goals of posterior instrumentation are to give stability to the segment and to contain displacement.

METHODS

This study comprising of 30 patients with spondylolisthesis who were treated with postero lateral fusion with pedicle screw fixation during the period of February 2015 to January 2017. There were 10 male patients and 20 female patients in the study at a ratio of 1: 2. The mean age of the patients in the study was 46 years.

All the patients were radiographically evaluated with plain roentgenograms-standing roentgenograms (flexion and extension). Percentage of slip was graded according to Meyerding's grading.[9]

Inclusion criteria

Inclusion criteria were all patients with lumbar spondylolisthesis between 21-60 years which requires surgical stabilization; both sexes; patients diagnosed with spondylolysis and lumbar spondylolisthesis with failed conservative treatment and operated with posterior stabilization using Pedicle Screws fixation and postero lateral fusion.

Exclusion criteria

Exclusion criteria were patients of age less than 21yrs and more than 60 yrs; patients with Grade – V spondylolisthesis; patients who did not have a regular follow up for a minimum period of six months; patients with any other spinal pathologies.

The major indications for surgery were persistent / recurrent back or leg pain, severe neurogenic claudication leading to a significant reduction in quality of life, failure of conservative trial of treatment, worsening neurological deficit with bowel / bladder involvement.

After thorough investigation and obtaining fitness for surgery from both the medical and anaesthetic teams, all 30 patients with spondylolis-thesis underwent Postero lateral Fusion with bone grafting from ipsilateral iliac crest and posterior spinal instrumentation with Pedicle Screw and rod system under general anaesthesia.

Post-operative management

No support is necessary at any time after surgery. Immediately on the third post-operative day the patient is made ambulant. Sutures removed on the 12th day. Most of the patients were relieved of the symptoms on the 3rd day. The patient is discharged with the advice not to lift heavy weights for six months.

Examination of the patient in post-operative period

The patient is advised regular check up to two years at regular intervals. The patients were examined for improvement of SLR and relief of the symptoms and for further slip Functional outcome was assessed by using Kirkardly-Willis criteria.[10]

RESULTS

Among the 30 total patients, there were16 grade-I patients, 10 grade-II patients, 4 grade-III patients. 18 patients had lysthesis at L4-L5 level, 12 patients had lysthesis at L5-S1 level.

29 out of 30 patients (97%) had obtained bony fusion while 1 patient did not. The average time for bony fusion was 5.5 months with the earliest being 4 months and the latest 9 months.

All the 30 patients had low back pain; radicular pain present in 20 patients; neurological deficits present in 6 patients; claudication pain present in 12 patients; no involvement of bowel and bladder in any patients. Low backache, claudication pain and radicular pain relieved in all patients after surgery. Neurological improvement was seen in 6 out of 6 patients. Sensory improvement was seen in 2 out of 2 patients.

Overall outcome has been graded into excellent, good, fair, poor depending on Kirkaldy- Willis criteria.

Table 1: Pre- operative meyerding's grade of slip.

Grade	No of patients
Grade-1	16
Grade-2	10
Grade-3	4
Grade-4	0

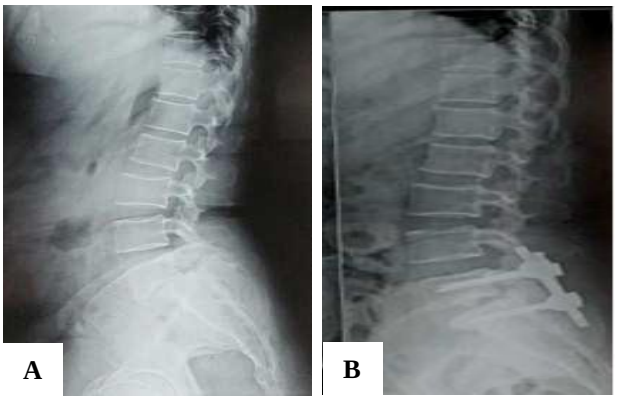

Figure 1 (A, B): Pre-operative and post-operative x-rays.

Table 2: Kirkaldy-Willis criteria.

Grade	Description
Excellent	Free of pain; no restriction of mobility; able to return to normal work and activities.
Good	Occasional nonradicular pain; relief of presenting symptoms; able to return to modified work.
Fair	Some improved functional capacity; still handicapped and/or unemployed.
Poor	Continued objective symptoms of root involvement; additional op intervention needed at index level, irrespective of repeated op or length of postop follow up.

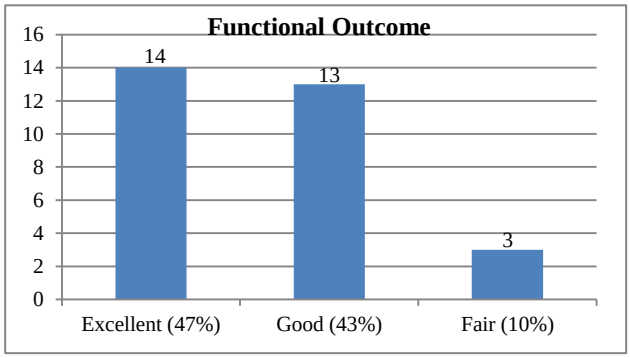

Figure 2: Functional outcome based on Kirkaldy-Willis criteria.

With respect to patient return to work, following the Kirkaldy- Willis criteria and taking the result of excellent and good as a satisfactory, the rate of success in the present work was 90% excellent to good.

In our study, 2 of the 30 patients had dural tear and was trackled by placing free fat graft and water tight closure of all layers.

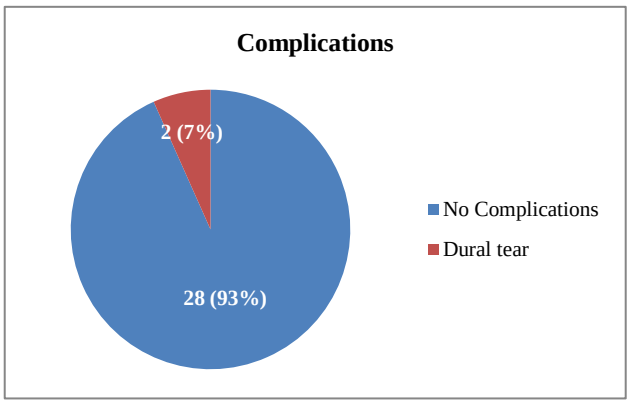

Figure 3: Complications.

DISCUSSION

The average age incidence seen in our study is 46years and is similar to the studies done by Kim et al (41.3 years), Lee at al (48 years), Madan and Boeree et al (44.4 years).[11-13]

The female [20 patients] to male [10 patients] ratio in our study was 2:1 which is almost similar when compared to the studies done by Kim et al (3:1) and Madan and Boeree et al (2.5:1).[11,13]

This is possibly due to the fact that female patients have a significantly higher amount of strain on their back due to the mechanical nature of household work. The most commonly involved level in our series is L4 – L5.

In our study we have 97% of solid fusions which was more when compared to the Kim et al(95%), Lee et al (81%), and Madan and Boeree et al (87.5%).[11-13]

We did not encounter any case of superficial infection when compared to Kim et al (nil), Lee et al (nil) and Madan and Boeree et al (2.5%).[11-13]

There was no evidence of implant loosening when compared to the studies of Kim et al (5%) and Lee et al (5%).[11,12]

In our study patient's perception of their quality of life also improved markedly after surgery. There were 90% [27 patients] of excellent to good results which is almost the same when compared to the study of Kim et al (90%) and Madan and Boeree et al (81%).[11,13]

CONCLUSION

We found in our study that posterolateral fusion with pediclescrew fixation minimizes dislocation, achieves adequate decompression, corrects the sagittal axis, and accomplishes fusion. We successfully achieve solid fusion with good mechanical alignment in majority of the patients.

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Ethical approval: The study was approved by the institutional ethics committee

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