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Cross Sectional Study Of Radiological And Functional Outcome Of Reduction Screws In Spondylolisthesis.

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ABSTRACT

Functional outcome following instrumental spinal surgery for spondylolisthesis in physically energetic patients is crucial. The present study was undertaken to The aim of this study is to assess the functional and radiological outcome of reduction screws in spondylolisthesis. This Cross-sectional study was done in Department of Orthopaedics, Tirunelveli medical college Hospital in the year 2022. In this study total of 20 patients were operated on for low-grade spondylolisthesis by posterior stabilization using a pedicular screw rod system and posterior lumbar interbody fusion. All the patients were followed up till 6 months after surgery and functional outcomes were noted. Assessment of this series it was observed that, 57.5% of the patient had excellent outcome, 37.5% had a good outcome and 97.5% of the study population had satisfactory outcome (improvement in clinical results). There was a significant improvement in pain intensity, walking, lifting, standing, sleeping after surgery. The mean ODI difference between preoperative and post-operative at 6 months follow up was 36.12% (16.75). In the outcome, 62.5% of the patient consisted of severe disability and 32.5% were with moderate disability (total-95%) while postoperative 87.5% were with a minimal disability and only 2.5% of the study population had worsened i.e crippled. The study concluded that surgery in form of decompression with instrumentation and posterior lumbar interbody is a safe and effective method to treat spondylolisthesis.

Keywords: Spondylolisthesis, Radiculopathy, Posterior, Pedicular screw, Fusion, Functional outcome

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INTRODUCTION

Chronic low back pain (LBP) affects the physical function and quality of life of a large number of individual and one of the causes of back pain is spondylolisthesis. In this condition one vertebra (usually L5) becomes misaligned anteriorly (slips forward) concerning the vertebra below. However, the incidence of spondylolisthesis is 5-6% in white males and 2-3% in females, the most common level is a lumbosacral junction (L5-S1) in 82% and lumbar 4-5(L4-5) in 11% [1]. Spondylolisthesis is classified into five types based on anatomy and aetiology: Dysplastic, Isthmic, Degenerative, traumatic, pathological and iatrogenic spondylolisthesis). This condition has to be differentiated from, spondylolysis which can be present as a defect in the pars interarticularis without slippage. Meyerding grading is used to determine the slip [2]. Various surgical techniques of spinal fusion surgery have been developed to remove pain-generating tissues and to decrease the patients' pain by stabilization of one or more motion segments. However ideal surgical treatment for spondylolisthesis remains controversial [3]. Spinal fusion with pedicle screw fixation is significantly more effective in reducing both LBP and radicular pain, providing immediate stability of the column, improving the rate of fusion, and leading to reestablishment of physiological lordosis [4]. Most of the patients with LDS clinically have no or very few symptoms that do not affect their normal activities of daily living. Those patients become symptomatic mostly give an appropriate response to conservative treatment but surgical intervention is sometime necessary in refractory cases [5].

MATERIALS AND METHODS

This Cross-sectional study was done in Department of Orthopaedics, Tirunelveli medical college Hospital in the year 2022. In this study total of 20 patients were operated on for low-grade spondylolisthesis by posterior stabilization using a pedicular screw rod system and posterior lumbar interbody fusion.

Inclusion criteria

- Patients to be enrolled in this study are those with
 - Spondylolisthesis Grade II and
 - Spondylolisthesis Grade III
 - Spondylolisthesis Grade IV
- Age – between 10 and 70 years
- Both male and female patients included

Pain with instability not relieved by 6 months of conservativemanagement

Exclusion criteria

- Spondylolisthesis Grade I
- Spondyloptosis
- Extensive epidural scarring
- Arachnoiditis/ any local infection at the incision site
- Osteoporotic bones
- Any decompensated medical conditions like cardiac failure, hepaticfailure, Renal failure etc.

Evaluation of the patient with history and physical examination. A physical examination is performed to document the exact site of the patient's pain and tenderness, any palpable step, the patient's baseline peripheral neurologic examination, and to detect any unrecognized weakness, neurologic impairment.

Radiological evaluation by x-ray AP, Lateral, stress views and MR. Patients received pre operative intravenous ceftriaxone 1 gram before surgery. After General Anesthesia patient was turned into prone position with two transverse pillows, one below chest and the other one underneath the pelvis so that abdomen freely hanging. Eyes were protected with cotton pads and shoulders were placed in 60 deg abduction over arm boards. Reduction screw by cantilever and Lever reduction technique. After induction with general endotracheal anesthesia, the patient was positioned prone on a table with all pressure points well padded. The patient was positioned on the table with the hips at maximum extension to

help the initial positional reduction. Accurate positioning should be must to reverse the deformity. Intraoperative radiographs were obtained after positioning to check the amount of reduction obtained.

RESULTS

Average mean slip % was reduced from 46.1% to 13.05 % . with all cases reduced to Grade 1 or complete correction. Average slip angle was improved from 9.7 degrees to 2.6 degrees There was no incidence of progression of slip or implant failure at a follow up period of 6 months. 3 of our patients had the complaints of radicular pain postoperatively for a period of 6-8 weeks which then settled down in due course. One patient we encountered screw pull out intraoperatively in High grade spondylolisthesis (GRADE III). One patient have neurological deficit post operatively. B/L Extensor hallucis Longus Grade 2/5 were also near normal 4/5 after physiotherapy and nerve stimulation. The operating time was calculated from the start of surgical incision to wound closure. The average operating time was found to be 4.5 hrs The average Blood loss in our series was about 500 ml. All patients were followed up for an average period of 6 months and the results were analysed. Functionally by VAS score and modified Oswestry Disability index Radiologically by the correction of % slip and slip angle. One patient didn't turn up for follow up. The % slip was corrected completely in 2 patients, corrected to Grade 1 in 18 patients. Postoperative period was uneventful and noticed no infection. The average lumbar spine movements was at least 90% of that of the normal and pain free. All patients regained 90% of their pre morbid level of independence. The VAS scale showed improved from 7.1 to 3.2 and modified ODI score showed improvement from 23 to 7 post operatively

Table 1: Age Distribution

Age	Frequency	Percentage
10-19	1	5
30-39	3	15
40-49	5	25
50-60	7	35
>60	4	20
Grand Total	20	100
Mean	49.75	
SD	12.06506484	

Table 2: Diagnosis

Diagnosis	Frequency	Percentage
L3-L4	1	5
L4-L5	16	80
L5-S1	3	15
Grand Total	20	100

Table 3: Percentage Of Slip

Slip %	Pre-Op	Post-Op
Mean	46.1	13.05
SD	10.031	5.8262

Table 4: Percentage Of Slip Angle

Slip Angle	Pre-Op	Post-Op
Mean	9.795	2.675
SD	4.3223	2.3907

Table 5: Pre-Op Grade

Pre OP Grade	Frequency	Percentage
Grade II	15	75
Grade III	5	25
Grand Total	20	100

Table 5: Post -Op Grade

Post OP Grade	Frequency	Percentage
Complete correction	2	10
Grade I	18	90
Grand Total	20	100

DISCUSSION

Degenerative spondylolisthesis is most frequent in women over the age of 50 years, typically occurs at L4-L5 level. L4-L5 level is affected six times more often than any other levels. [6] Spondylolisthesis is four times more likely above a sacralized L5 segment [7]. Degenerative spondylolisthesis is present in 10% of women over 60 years of age. In our study, 90% of the patients affected are women. 85% of the spondylolisthesis occurs at L4-L5 level. Biomechanically, kyphosis of the lumbo-sacral junction leads to compensatory mechanisms with increased lumbar lordosis and straightening of the pelvic tilt with secondary involvement of the hip and knee joints affecting the posture and gait of the patient due to anterior shift of the gravity line. [8] Many surgical techniques have been suggested ranging from laminectomy to complete reduction and fusion; Destabilizing a spondylolisthesis by laminectomy without instrumentation will lead to progression of the slippage and an increase in pain [9]. Posterior in-situ arthrodesis in children has also been described without laminectomy [10]. Deformity progression is very common following in-situ fusion, with increased risk with larger initial slip angles [11]. According to SDSC classification, in-situ fusion can be done in balanced pelvis and reduction can be achieved in unbalanced pelvis [12]. In-situ fusion can be combined with trans-vertebral sacral fixation using screws or fibular graft which provides additional anterior column [13]. This may reduce the progression of slip and pseudoarthrosis. In-situ fusion may be considered in high grade spondylolisthesis when it is associated with balanced pelvis (low pelvic tilt), sagittal balanced spine, and large transverse process of L5, without significant radicular symptoms or neurological symptoms [14]. Advantages of In-situ fusion are Lower risk of neurological deficit, shorter operative time and blood loss. Reduction places the fusion mass in a biomechanical advantage of compression rather than tension, resulting in lower pseudoarthrosis rates [15]. Reduction maneuver increases the surface areas in contact, providing a larger fusion bed. Reduction of slip improves the sagittal alignment, improving the cosmetic deformity. Improvement in gait pattern and reduction in the hamstring spasm and correction of pelvic retroversion [16]. Higher chance of neurological injury. Various reduction techniques have been proposed. Edwards initially reported a gradual instrumented reduction technique, with a posterior-only arthrodesis, without the need for an anterior procedure and showed excellent correction of the deformity and good clinical outcome with one pseudoarthrosis and one neurological deficit in his series of 25 patients [17]. Harms, in his series of 112 patients, reported excellent results with the technique of decompression, distraction, reduction, and posterior lumbar interbody fusion in 50 patients. Shufflebarger et al described the results using the same technique of wide decompression of the L5 nerve roots via Gill laminectomy, temporary distraction via sacral alar hooks and proximal lumbar hooks, lumbosacral discotomy, anterior decortications and grafting, and placement of bilateral titanium mesh cages packed with morselized autograft [18]. Though the usual techniques described are essentially open, a recent report by Tian et al showed posterior reduction and monosegmental fusion of L5-S1 assisted by intraoperative 3 dimensional navigation as an effective technique for managing high-grade dysplastic spondylolisthesis [19]. The computer-assisted navigation system provided real-time 3- dimensional images, giving surgeons the chance to dynamically select screw entry points and directions [20]. In addition, the osteotomy procedures were performed under the navigation system to identify the position and direction of the bone drill in their series [21]. Our study focuses on the progressive, single stage, posteriorly performed reduction by using reduction screws, which had a long tab helps in alignment of the rod and reduction by lever reduction / Cantilever technique [22]. In our study we achieved complete correction in two patients and reduced to Grade 1 in other patients. Slip angle was significantly reduced. Patients were followed in regular intervals and there was no progression of the slip [24]. In lever reduction technique by

reduction screws encountered no complications and Cantilever reduction technique we encountered one case of screw pull out and one temporary neurological deficits in achieving reduction which was improved later [25].

CONCLUSION

The described progressive reduction technique by reduction screws followed by interbody fusion proved effective in managing spondylolisthesis and improving functional outcome of patients. In conclusion, we would suggest this technique by reduction screws can be ideal because it can be reproducible and safe in bringing the reduction easier.

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