



Management Of Spondylolisthesis By Pedicular Screw Rod System And Interbody Fusion With Bone Grafting : A Case Series

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Abstract

Aim: To study the efficacy of pedicular screw rod system and posterior interbody fusion with bone autograft in spondylolisthesis and to study the complications associated with this treatment modality.

Methodology: 30 patients with low back pain who were diagnosed to have single level Lumbar spondylolisthesis by Roentgenogram were admitted in MGM Hospital and college. They were treated with posterior lumbar interbody fusion and bone grafting from DECEMBER 2017 TO JULY 2019. Patients were taken for study after obtaining their consent. Post operatively the patients were evaluated for six months using Oswestry Disability Score. Change in pre-operative and post-operative ODI score of each patient were analyzed to assess the functional recovery of the patient

Results: In this study 30 patients admitted in MGM Hospital and research center, Navi Mumbai who will be treated with posterior lumbar interbody fusion and bone grafting for patients with single level Lumbar spondylolisthesis and assessed on the basis of Oswestry Disability Score for 6 months. 19 patients were L4-L5 PIVD, 7 L5-S1 PIVD and rest L2-L3 and L3-L4 PIVD. Out of the 30 patients 11 were male and 19 were female. Pre op mean ODI score was 54% which decreased to 17% post operatively. P-value was less than .05

Conclusion: In this study, we have concluded that 30 patients with single level lumbar spondylolisthesis who failed to respond to conservative management were treated with posterior lumbar interbody fusion and bone grafting gives significant subjective symptomatic relief according to Oswestry Disability Score and return to normal activities.

Keywords: Spondylolisthesis, Bone grafting, Interbody fusion

Introduction

Spondylolisthesis is the subluxation of a vertebral body over another in the sagittal plane and is a relatively frequent mechanism of intervertebral instability.

Spondylolisthesis can be caused by ligamentous laxity, a defect in the pars interarticularis, previous surgery, or may be traumatic and occurs in up to 5% of the general population and affects all ages. Vertebra slips out of normal position and the affected vertebra most commonly slip forward causing narrowing of the openings where the nerves pass through, causing pressure on the nerves.

The surgical treatment of spondylolisthesis is indicated for cases of neurogenic claudication, intractable radicular pain, severe low back pain, presence of neurological symptoms, and failure of conservative management, radiological instability, progressive worsening of the listhesis, Meyerding grade III and IV listhesis, and spondyloptosis.

The ideal surgical treatment for spondylolisthesis remains controversial. The primary goal of spinal fusion is to remove pain-generating tissues and to alleviate the patient's pain by stabilization of one or more motion segments. The last four decades have

witnessed an increased understanding of spinal biomechanics, bone fusion techniques, development of different spinal instrumentation devices, advances in refinement of approaches to the spine, and evolution of minimally invasive methods; all these have made it possible to stabilize virtually every segment of the spine successfully, regardless of the offending pathology. Hence, the use of spinal instrumentation has increased. The main question in spine surgery is “When to fuse” and “How to fuse”. Surgical management of degenerative low back pain is perhaps the most controversial issue in spine surgery and the large number of current techniques and approaches speaks to a lack of consensus on the subject. Spinal fusion has been developed as a final course of progressive intents, which are designed to stabilize spine movement, reduce pain, and to moderate further degenerative change. The goals of surgical treatment for lumbar spinal stenosis include relief of leg and back pain. Although decompression is a standard treatment regimen for the surgical treatment of lumbar spinal stenosis, additional fusion after extensive decompression can be required in many cases. In particular, a facetectomy is needed for decompression of the foraminal stenosis in many cases. Thus, for cases of lumbar foraminal stenosis, a combination of neural decompression and spinal fusion can be performed to achieve the goals of surgical treatment. However, these surgeries are accompanied by substantial complications in patients with multilevel lumbar foraminal stenosis.

Lumbar spinal fusion with pedicular screw and rod system is a common surgical treatment used in disc degeneration, which is related to chronic lower back pain and other spinal disorders, such as disc herniation, spondylolisthesis, facet arthropathy, and spinal stenosis. Since spinal arthrodesis was first reported 9 decades ago, various techniques have been developed for lumbar spine fusion. Posterior lumbar interbody fusion has the advantages that these are the purely dorsal approach thus avoiding the risks associated with an anterior approach. Posterior lumbar interbody fusion construct reduces the postoperative segmental mobility and permits better graft incorporation. Posterior spinal decompression, stabilization and fusion are associated with acceptable postoperative complication rate when done under fluoroscopic guidance. Outcome is related more to the preoperative neurological deficit

and etiology of the indication for surgical stabilization. The availability of intraoperative fluoroscopy and improved access to varieties of spinal titanium implants has revived posterior spinal stabilization techniques with their distinct advantages. Fusion operations in the lumbar spine have become well established over the last two decades.. [1]

The most common type of spondylolisthesis found in patients less than 50 years of age is the isthmic type. “Biomechanical stress”, such as repetitive mechanical strain, causes a fatigue fracture of the pars interarticularis that allows the defective vertebra to move forward in relationship to the vertebra below. The pars in degenerative spondylolisthesis remains intact, with the forward slippage caused by arthritic changes in the zygapophyseal joints. No matter what the aetiology is, patients usually present with a persistent dull low-back pain with radiculopathy, which increases with activity and decreases with rest, low-back stiffness, tight hamstrings and intermittent claudication. The initial treatment is conservative, with rest, use of NSAIDs, physical therapy and the wearing of a body brace. Surgical intervention is only performed when there is failure of conservative treatment for at least 3 months. Operative management for Lumbar Spondylolisthesis is commonly performed via a posterior decompression with interbody fusion and reduction of the slipped vertebra with spinal instrumentation[2,3].

The present study was conducted to review our experience with posterior lumbar fusions for the management of spondylolisthesis and the main aim was to study the efficacy of posterior pedicular screw rod system and posterior interbody fusion in terms of functional outcome, to study the complications associated with this treatment modality and to compare the efficacy and complications with the available literature.

MATERIAL AND METHODS -

This thesis was progressed after receiving the IRB approval - 2018/SC/1/44

30 patients with low back pain who were diagnosed to have single level Lumbar spondylolisthesis disc by Roentgenogram were admitted in MGM Hospital and college. They were treated with posterior lumbar interbody fusion and bone grafting from DECEMBER 2017 TO JULY 2019. Patients were

taken for study after obtaining their consent. Post operatively the patients were evaluated for minimum of six months using Oswestry Disability Score. Change in pre-operative and post-operative ODI score of each patient were analyzed to assess the functional recovery of the patient as

Excellent- Change in ODI score of more than 40%

Good Change in ODI score between 20-40%

Poor-Change in ODI score less than 20%.

INCLUSION CRITERIA :

Patients age between 20-75 years

Both genders

Patients with radiological diagnosis of spondylolisthesis .

No response to conservative management for 3-6 months.

Upto grade III spondylolisthesis

EXCLUSION CRITERIA :

Isolated PIVD, LCS and Cauda equine

Double level listhesis

Failed back syndrome

Metaststic disease

Patients who did not have a regular follow up for a minimum period of 6 months.

Patient Selection:

Patients with low back pain admitted in MGM Hospital and research center were examined

clinically and radiologically. We documented the clinical signs and symptoms like positive straight leg raise test, parasthesia, neurologic claudication, sensory and motor impairment and loss of bowel and bladder control. Patients managed conservatively for 3 months were subjected to plain radiographs of lumbar spine- anteroposterior and lateral views and magnetic resonance imaging of lumbar spine. Patients with signs of lumbar spondylolisthesis on MRI were selected and correlated clinically with the patients complaints. These patients were selected for posterior lumbar interbody fusion and bone grafting at MGM Hospital and research center, Navi Mumbai.

Preoperative preparation with blood investigation- CBC, Prothrombin time, serological status, blood group, renal function test, liver function test, chest x ray, ECG and 2D ECHO (age more than 50 yrs). These investigations are reviewed by anesthesiologists in view of patient's general fitness for surgery. Patient is taken up for the surgery with informed written consent stating intra-operative and post-operative complications. Pre-operative intravenous antibiotic prophylaxis with 1.5 gram cefuroxime is given 30 mins prior to the incision.

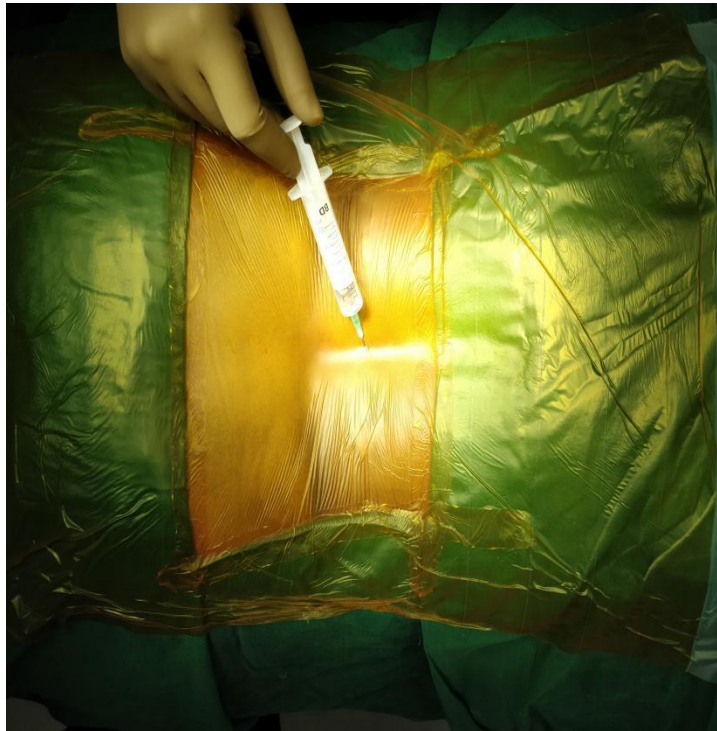
Patient positioning:

Patients is placed genupectorally with abdomen free and comfortable chest support. Head is in the axis of the trunk, or slightly turned with eyes free, on a head ring. Shoulders 90 degree abduction and elbow 90 degree flexion. Lumbar spine kyphosis is given to make inter-laminar space more accessible. The freedom of the abdomen and compression of lateral cutaneous nerve of thigh are checked.



Draping:

Patient scrubbed with 7.5% Povidone Iodine and cleaned by Sterillium. Painting done with 5% Povidone Iodine. Patient draped with 6 long sheets from incision site to periphery. Iodine wrap applied over the operative field and local anesthetic with adrenaline injected around the incision.



Operative procedure:

The assistant faces the surgeon, who stands at the

herniated side. Incision site is determined under image intensifier guidance and palpation of spinous process and interspinous process. Line joining two posterior

superior iliac spine is used as a reference line.

Exposure:

A 4-5 cm incision is made from one spinous process to the other. The skin is pulled back using a Beckman retractor. The aponeurosis is incised using a cautery, and the multifidus is released from the spinous process on one side, using a Cobb bone curette, until the bone is visible. The muscle is retracted using a self retaining mastoid retractor on the lateral side of the joint. The interlaminar space is identified and its relationship to spinous process is established. Attachment of interspinous ligament at the superior spinous process is removed along with part of inferior spinous process with a spinous process cutter. The attachment of ligamentum flavum is identified at the inferior margin of interlaminar space. Tracing this, soft tissue and lamina over ligamentum flavum is removed with a nibbler or Kerrison punch. The ligamentum flavum is exposed.

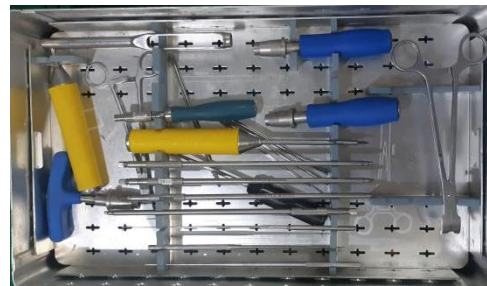
We performed the Posterior Lumbar Interbody Fusion through a midline posterior approach, the patients underwent wide decompression with removal of the posterior elements, including the spinous process, interspinous ligament, lamina, hypertrophic ligamentum flavum, and medial facet joints. We routinely checked the tension of bilateral nerve roots and performed foraminal decompression if there was tightness of the roots. After insertion of pedicle screws, the disc space was gently distracted between

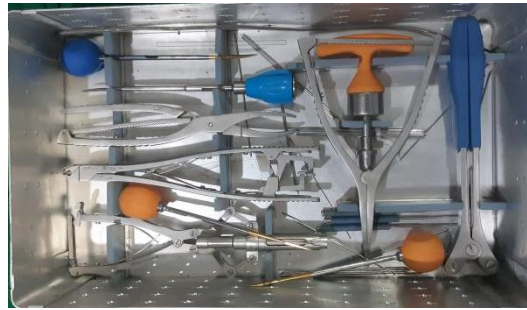
the adjacent pedicle screws by a lamina spreader.

The disc space was entered through a posterolateral approach using nerve retractors to displace the theca sac and nerve root medially and inferiorly. After radical discectomy with end-plate preparation by pituitary rongeurs and curettes, graft materials were placed and impacted into the anterior disc space for the interbody fusion.

Different interbody cages were used. Like titanium cage (Aaxter Corp, Taipei, Taiwan), PEEK cage (Stryker Corp, Kalamazoo, MI), having anterior tilting angles of 0°, 40°, and 80°. We placed morselized host bone in the anterior aspect of the disc space followed by insertion of artificial cages, which also were packed with morselized local bone graft in the empty space. The cage position was at least 5 mm from the posterior cortical margin and was routinely confirmed by portable radiograph or C-arm fluoroscopy. After the proper position was obtained, gentle compression force was applied over the adjacent screws to achieve firm contact between end plates and grafted materials. Pedicle screw fixation was carried out after inserting the cage to secure the stability and to improve the bony union immediately after surgery. Standard wound closure was performed following haemostasis. The postoperative care and rehabilitation protocols were the same for both groups^[4].

INSTRUMENTS -





Post-operative advise:

Restriction of activities like sitting on the ground, squatting, bending forward, lifting weight below waist or above head.

Avoid jerky movement and travelling on uneven surface.

Do not sit without applying the lumbo-sacral belt.

Follow up:

Complaints of back pain, radiculopathy and claudication if any

Patient called for follow up at 1 month, 3 months and 6 months and ODI score was taken each time but the functional results were formulated by using ODI score taken at 6 months.

Patients were advised to return to their near normal activities after 6 to 8 months post-operatively along with discontinuation of lumbo-sacral belt.

3. RESULTS

In this study of 30 patients with single level lumbar spondylolisthesis were admitted in MGM Hospital and Research Center, Kamothe, Navi Mumbai and surgically treated with Posterior lumbar interbody fusion and bone grafting after the failure of conservative management.

Out of 30 patients, 10 (33%) patients were in their 3rd to 5th decade of life with others ranging from 40 to 76 years.

In our study, out of 30 patients 11 (37%) patients were female and 19 (63%) were male.

Out of 30 patients in our study 13 (43%) patients presented at more than 7 months. 12 (40%) patients presented between 4-6 months and 5 (16.7%) patients within 3 months of complaints .

Out of 30 patients pre-operatively, 21 patients (70%) presented with severe disability, 7 patients (23%)

crippled and 1 patients (3%) were bed ridden or according to ODI score.

Out of 30 patients post-operatively, 23 (76%) patients had minimal disability, 6 patients (23%) had moderate disability according to ODI score. 1 patients were lost during follow up.

In our study according to change in ODI score at the end of 6 months of follow up 13 patients (43.33%) had excellent results, 13 patients (43.33%) had good and 3 (10%) had poor results .

4.DISCUSSION -

Lumbar spondylolisthesis is one of common causes of low back pain and radiculopathy which may be mild discomfort to complete restriction of day to day activities. Patients are treated conservatively depending upon the severity of disability and physiological needs of the patient. They are treated conservatively with bed rest, physiotherapy and Non-steroidal anti-inflammatory drugs but some patients fail to respond to conservative management and demand operative management. Lumbar spinal fusion and instrumentation is a medical emergency only when there is progressive neurological deficit and/or Cauda Equina syndrome. In this study, we have made an attempt to test the efficacy of lumbar instrumentation in patients with single level lumbar spondylolisthesis . Patients were pre-operatively and post-operatively evaluated by Oswestry Disability Index and change in ODI score i.e subjective relief of symptoms, was calculated to determine the efficacy of surgery as excellent, good or poor.

These results were compared with following other studies -

CHING-HSIAO ET AL at Department of Orthopaedic Surgery, Tao-Yuan General Hospital, Taoyuan, Taiwan^[5]

NOBORU HOSONO ET AL at Osaka Kosei-nenkin Hospital, Japan and published in J. Neurosurg.: Spine / Volume 9 / November 2008^[6]

HIROYUKI HAYASHI ET AL^[7]

K .T. SUH ET AL^[8]

Age distribution -

In our study cases were of same age group as other studies . there was no correlation between age and functional recovery of patient .

STUDY	
CHING-HSIAO ET AL	42
NOBORU HOSONO ET AL	67.5
HIROYUKI HAYASHI ET AL	61.8
T. SUH ET AL	53
OUR STUDY	57.36

SEX DISTRIBUTION -

There is male preponderance in our selected sample population. This reflects on the occurrence of Lumbar Spondylolisthesis more in males owing to their more active lifestyle.

STUDY	SEX DISTRIBUTION	
	FEMALE	MALE
CHING-HSIAO ET AL	10	32
NOBORU HOSONO ET AL	89	151
HIROYUKI HAYASHI ET AL	16	21
T. SUH ET AL	71	20
OUR STUDY	19	11

DURATION OF FOLLOW-UP -

In our study , ODI score was taken at the end of 6 months post operatively. 1 out of 30 patients were lost during the follow up.

STUDY	DURATION OF FOLLOW UP (MONTHS)
CHING-HSIAO ET AL	28.6
NOBORU HOSONO ET AL	12
HIROYUKI HAYASHI ET AL	121
T. SUH ET AL	24
OUR STUDY	6

MEAN CHANGE IN ODI -

STUDY	MEAN CHANGE IN ODI
CHING-HSIAO ET AL	33.3
NOBORU HOSONO ET AL	-
HIROYUKI HAYASHI ET AL	-
T. SUH ET AL	42
OUR STUDY	37.37

LEVEL OF INSTABILITY -

STUDY	L3-L4	L4-L5	L5-S1
CHING-HSIAO ET AL	7	32	3
NOBORU HOSONO ET AL	18	220	2
HIROYUKI HAYASHI ET AL	-	45	-
T. SUH ET AL	-	31	60
OUR STUDY	2	19	7

COMPLICATION -

CHING SHAO ET AL observed complication in Five (14.7 %) patients. These included three implant-related failures; screw breakage at the S1 level in two patients and one patient had a one-sided rod broken. One had a dura tear during surgery, and one had a fungal infection at the perioperative stage (Candida albicans).

NOBORU HOSONO ET AL - observed total 37.5% complication in patients undergoing PLIF .

Most common complication was transient neurological deficit (17%) , CSF Leak (8.8%) and permanent neurological deficit (7.5%) . other complications noted were screw misplacement , delayed wound healing , hematoma etc.

HIROYUKI HAYASHI ET AL observed no serious systemic complications or deep surgical site infections. No immediate postoperative neurological complications were observed, although an incidental dural tear was observed in two patients (5.4%).

Reoperation was required in three patients (8.1%) due to intolerable symptoms in their lower extremities caused by adjacent segment degeneration. The mean period between the first surgery and the revision surgery was 76 months.

T. SUH ET AL observed total 3 transient nerve palsy and 2 deep infection. In group 2 there was one transient and one permanent nerve palsy and one deep infection.

5. CONCLUSION

In this study, we have concluded that 30 patients with single level lumbar spondylolisthesis who failed to respond to conservative management were treated with posterior lumbar interbody fusion and bone grafting gives significant subjective symptomatic relief according to Oswestry Disability Score and return to normal activities.

However, this is a small study to conclude anything definitely.

Name of Patient	Date	
		Signature/Thumb impression of patient/guardian
Student	Date	Signature

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