

## Surgical Treatment of Isthmic Spondylolisthesis with Radicular Pain in Adults

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### ABSTRACT

A common consensus has not yet been reached on surgical management of isthmic Spondylolisthesis especially regarding the optimal surgical procedure. This prospective study was carried to see the outcome of Posterolateral fusion with instrumentation without decompression.

Eight consecutive patients, aged between 43 to 55 years, underwent primary surgery for isolated L4, L5 lumbar isthmic Spondylolisthesis of less than grade II that presented with radicular pain and exhibited instability on dynamic radiograph. The surgical procedure consisted of instrumentation with pedicle screws and rods (Moss Miami System) and posterolateral fusion in situ by placement of autogeneous bone graft, harvested from posterior iliac crest. Postoperatively Clinical and Radiological status were assessed and were graded according to Stauffer and Coventry method. The patients were followed up for one to three years. Radiological evidence of fusion was clearly evident by six months in all cases. Symptomatically all were relieved of radicular pain completely. One patient had recurrent backache due to causes unrelated to the illness of surgical procedure requiring occasional analgesic. No serious complication was encountered.

This lead to conclusion that in adults of our population with low grade isthmic spondylolisthesis and radicular pain Instrumentation with Posterolateral fusion without decompression was sufficient to relieve symptoms.

**Key words:** *decompression, instrumentation, Posterolateral fusion, Spondylolisthesis*

### INTRODUCTION

Spondylolisthesis is defined as the forward slippage of all or part of one vertebra on another.<sup>1</sup> When the slippage is due to a defect of the pars inter-articularis, it is referred to as isthmic spondylolisthesis.<sup>2</sup> In most patients, the symptoms of isthmic spondylolisthesis are not severe enough to need surgical treatment.<sup>3</sup> However, when the symptoms are severe enough to interfere with the patient's essential activities, a multitude of surgical

procedures have been proposed for their treatment. The type of operation that should be performed when patient has not responded to conservative treatment remains controversial. Some authors have recommended decompression and arthrodesis while others have recommended arthrodesis alone.<sup>4,7,10,17</sup> The aim of this study was to see the outcome of stabilization and arthrodesis without decompression.

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## MATERIAL AND METHODS

From 2003 to 2007 eight consecutive patients with low grade isthmic spondylolisthesis presenting with backache, radicular pain and Neurogenic claudication, underwent surgery in department of orthopedics, at Capital hospital. The criteria for inclusion were low grade isthmic spondylolisthesis (grade I and II), an age of more than 20 years, persistent pain in the back and radicular pain in the lower extremity despite non operative treatment which includes lumbar corset, spinal flexion exercises along with Non steroidal anti inflammatory medications for at least six months, no history of previous spinal surgery, absence of spinal deformity or cauda equina compression.

Pre-operatively all patients had plain radiographs of the lumbosacral spine that included anteroposterior, lateral, bilateral oblique to visualize the pars interarticularis and flexion extension stress views to see any change in the translation of L4, L5 (by measurement on the film). Preoperative assessment of cauda equina and nerve root compression was carried out by Magnetic Resonance Imaging (MRI) or Computed Tomography (CT) following myelogram. We excluded the patients, who were not mentally stable and having pain in different parts of body, who were complaining of pain that did not radiate below knee, who fail to show more than two millimeter translation in dynamic x-rays, who showed compression of cauda equina or nerve root in either MRI or CT myelogram. We followed the technique of Adam FF<sup>2</sup> which consisted of midline approach to fully expose L3, L4 and L5 vertebrae and their transverse process to their tips. Transpedicular screws were placed in L3, L4 and L5 vertebrae. Rods were contoured and placed on those screws (Moss Miami instrumentation). Before tightening the inner and outer nuts over the rods, distraction across L4, L5 was carried out to enlarge the neural foramina. This also incidentally resulted in slight reduction of the listhesis as was observed in postoperative x-ray films. These rods on either side were connected with pre-

stressed transverse connector for additional stability. Posterolateral fusion of those three vertebrae was carried out by decorticating their transverse process and posterior elements. Then Corticocancellous graft harvested from right posterior iliac crest through same incision were placed over those transverse processes, Intertransverse ligaments and posterior elements. Post operatively all patients were asked to wear lumbar corset for 3 months. The follow up period was ranged from 12 to 36 months. Follow up evaluation was done at 3, 6, 12, 24 and 36 months. Assessment was done according to Stauffer and Coventry<sup>3</sup> as follows (Table 1).

At follow up, clinical, radiological and functional outcomes were assessed. Solid fusion was considered to have occurred if trabeculi were seen bridging across the transverse processes.<sup>7</sup> Pseudoarthrosis was present if there was no continuity in the fusion mass or if lateral flexion and extension radiograph demonstrated more than two degree of angular motion or more than 2 mm of translation at the location of listhesis.<sup>9</sup> In addition if there was a radiolucent line around a pedicle screw then dynamic radiographs repeated.

## RESULTS

All patients in the series had solid fusion seen after six months of surgery. Function was considered as composite of pain, return to preoperative work, performance of daily activities and use of analgesics and rated according to Stauffer and Coventry.<sup>6</sup> The overall analysis showed excellent or good result in 86% of patients. One patient (14%) had recurrent back ache which showed severe degenerative changes at L2 and L3 level (Figure 1-4).

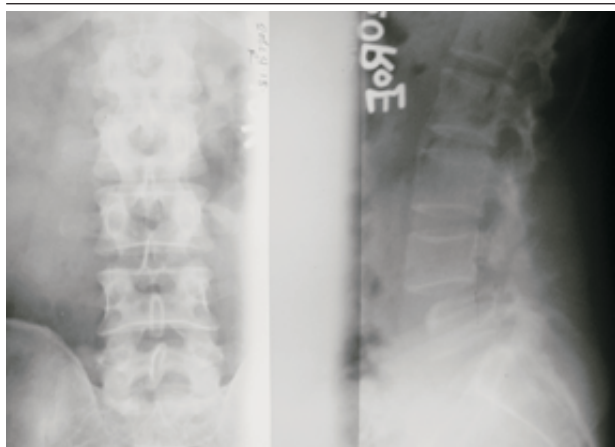
One patient developed superficial wound infection that subsequently healed with dressings and intravenous antibiotics. Two patients complained of hypoesthesia in the buttock, probably due to injury to superior cluneal nerves while harvesting the graft. Four patients had pain

**Table 1. Criteria for estimate of clinical results in posterolateral lumbar spine fusion**

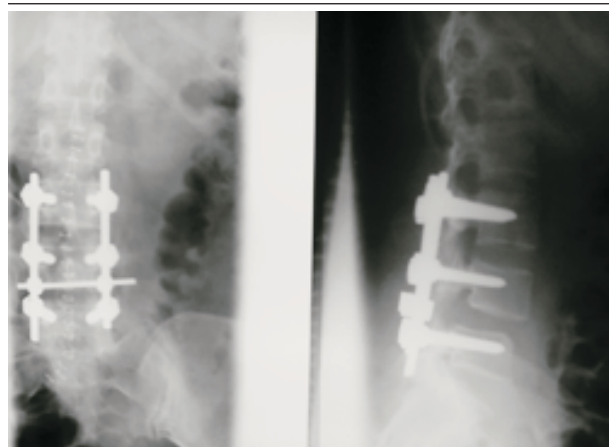
Result	Relief of Back and Leg Pain*	Criteria		
		Return to Employment	Restriction of Physical Activities	Use of Analgesic
Good	76-100	Yes	No or slight	No or infrequent
Fair	26-75	Yes, with limitations or less strenuous work	Yes (limited activities)	Frequent (mild)
Poor	< 25 (or worse than before operation)	No, disabled	Yes (greatly limited activities)	Regular (strong or narcotic)

\*in Percent

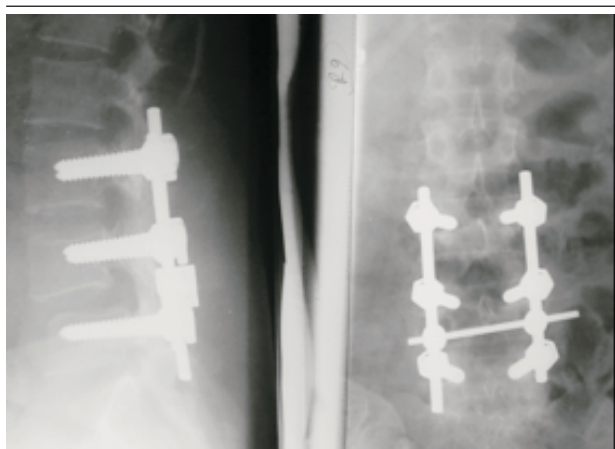
Redrawn from Stauffer RN, Coventry MB. Posterolateral lumbar spine fusion. *J bone joint surg [Am]* 1972;54:1195-1204.



**Figure 1.** Preoperative Radiograph of lumbar spine. A/P and Lateral View.



**Figure 2.** Immediate post operative Radiograph. A/P and Lateral View.



**Figure 3.** Six months post operative Radiograph showing fusion.



**Figure 4.** Two years post operative Radiograph showing solid fusion.

at the donor site that lasted for a month. No serious complications were encountered (Table 2).

## DISCUSSION

The treatment of choice for adults with isthmic spondylolisthesis and radicular pain remains a matter of controversy.<sup>13,16</sup> Various surgical procedures have been undertaken to relieve symptoms. The nerve root can be compressed or irritated at various levels. Within spinal canal, a disc herniation, if present, can compromise the nerve root, the dural sac and it can push them to be compressed against the posterior superior margins of sacrum or corresponding lamina. The nerve root can also be compromised at pars intraarticularis by the fibrocartilaginous mass of Pseudoarthrosis.<sup>10</sup> In the root canal or foramen dysfunction the nerve root can be caused by narrowing of the foramen in spinal extension or by stretching it across the isthmic hook in spinal flexion.<sup>14,15</sup>

Peek et al<sup>13</sup> reported good results after arthrodesis in the adults who had high grade slip and severe sciatica. Garreau de Loubresse et al<sup>7</sup> reported the result for 48 patients who had an arthrodesis for treatment of isthmic spondylolisthesis. Of the 25 patients with arthrodesis alone, four had Pseudoarthrosis compared with seven of 23 treated with arthrodesis and decompression. Relief of symptoms was also better in group treated without decompression. In their study pseudoarthrosis rate was 8.7% in the group without decompression and 17.4% in the group with decompression, and there was no significant difference in radicular pain relief between the two groups.

In patients with isthmic spondylolisthesis and radicular pain, we need to differentiate between those with irritation of the nerve root without demonstrable neurological loss caused by posterior arch mobility and those with nerve root compression and serious neurological injury. Former does not, as a rule, require decompression

**Table 2. Pre and post operative data of the patients studied (n= 8)**

Patient characteristics	findings.
Age in years, mean (range)	50.6 (43-55)
Gender Women/Men	8/0
Preoperative findings.	
Clinical	
Low back pain	8
Radicular pain	8
Radiological	
Level L4/L5	8
Grade I/Grade II	8
Instability	8
Post operative	
Fusion	
Fusion	8
Pseudoarthrosis	0
Back pain	
None	5
episodic	2
Constant	1
Radicular pain	
None	8
Constant	0
Functional outcome:	
Excellent or good	7
Fair	1
Poor	0

while later might require decompression to relieve the symptom. Some reports<sup>7,18</sup> have proposed an anterior approach for lumbar fusion. Kaneda<sup>12</sup> has suggested a posterior approach with instrumentation without laminectomy. He attributed foramen distraction for beneficial effect on the radicular pain. However it also is possible that fusion alone gives suppression of posterior arch mobility which is the principle cause of nerve root irritation. This may explain why posterolateral fusion alone preserving and including all posterior elements restores stability and eliminates nerve root irritation. This can explain significant clinical difference especially with regard to radicular pain between patients with fusion and those with Pseudoarthrosis and hence unstable segment. This may also explain why the presence or absence of radicular compression as judged by CT myelography or MRI did not influence the final results. Instrumentation was used in 16 patients in their study and decision on instrumentation was based on instability and hyper mobility as detected by dynamic radiographs.

In the series of Garreau de Loubresse et al,<sup>7</sup> there was no significant difference in the functional outcomes between groups with and without decompression as there were 65% excellent or good resulting in the first

group and 88% in the last group. Some authors report that decompression may generate progression of slip and Pseudoarthrosis, while other report that decompression is seldom required in young patients.<sup>6,11,18-20</sup>

In the series of Adam FF<sup>21</sup> where he did comparative study of 46 patients with 23 patients in each group, in first group fusion with decompression was done and in second group only fusion was done. There was no significant statistical difference between those two groups in terms of fusion and functional outcome.

In our series 100% fusions was achieved after the surgery. Incidentally all our patients were female, and did not have habit of smoking or taking alcohol. During surgery we carried out meticulous dissection, thorough decortications of laminae, spinous processes, and transverse processes using high speed bur. We exposed and cleaned intertransverse ligament which is a good bed to place graft across the transverse processes for intertransversers fusion. Combined with stable instrumentation this resulted in good fusion in all of our cases. Our series is smaller as compared to other series<sup>6,7</sup>, where they have found high rates of Pseudoarthrosis. We believe that above factors are responsible for such a high fusion. In our series functional outcome was 86% excellent to good results which is comparable to other studies quoted above. We attribute the relief from backache to the instrumentation and solid fusion. Likewise relief from radicular symptoms including mild neurogenic claudication from the root dysfunction can be attributed to the prevention of narrowing of the foramen in spinal extension or by stretching it across the isthmic hook in spinal flexion.<sup>14,15</sup> that usually occurs in isthmic spondylolisthesis by instrumentation and later fusion maintaining it. In fact distraction during instrumentation also widens neural canal and foramina easing the irritated nerve root. This should explain total relief from symptoms in all of our patients. The patient who had recurrent backache due to working in the field as heavy manual worker developed severe degenerative change above the fused segment. This patient constituted fair result.

## CONCLUSION

In adults with low grade isthmic spondylolisthesis and radicular pain without demonstrable neurological deficit, fusion alone with instrumentation in distraction achieves good functional outcome. Thus decompression after all may be omitted in surgical treatment of low grade spondylolisthesis. However, more cases should be followed to establish our procedure.

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