

# LUMBOSACRAL FIXATION PROBLEMS A CLINICAL STUDY

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## ABSTRACT :

Loss of sacral fixation is the most frequently cited complication of lumbosacral deformity surgery. In this study 58 patients who underwent lumbosacral fusion and instrumentation because of various spinal problems were included for evaluation. 34 patients had various types of spondylolisthesis, 6 patients had adult scoliosis, 5 patients had vertebral malignancy, 10 patients had degenerative spine and segmental instability, 3 patients had spinal tuberculosis.

Total number of 116 sacral screws were used. In addition to the sacral screws 14 patients' sacral rods were buried in to the sacrum which were named as Jackson's method. In 26 patients promontorial (medial), in 18 patients alar (lateral) screw placement was performed. In 22 patient long segment fixation, in 36 patients short segment fixation were performed. Fixation above L4 is considered as long segment fixation (more than 3 segments).

Lumbosacral fixation types were in 3 groups: I- Lateral (Alar) fixation (18 patients) II- Medial (promontorial) fixation 3- Jackson's method (iliac butress) (14 patients).

Complications were 4 (6.8%) sacral screw loosening and pseudoarthrosis. 3 (16.6%) of them were in group I, 1 (3.8%) was in group II and no complications occurred in group III. On the other hand all complications were in long fusion group (4 patients, %18).

Conclusion: 1- Jackson's method is a secure lumbosacral fixation method. 2- Promontorial fixation is better than alar fixation. 3- Long segment fixation with lumbosacral area is prone to mechanic complications more than short segment fixation.

**Key words:** Lumbosacral, posterior, fixation.

## INTRODUCTION

Lumbosacral area is the part of the spinal column that is most prone to problems (8, 9, 12). Loss of sacral fixation is the most frequently cited complication of lumbosacral deformity surgery (5). Different sacral screw positions are described in the literature. Biomechanic testing of each were done before (5).

### Screw positions:

Lateral S1  
Medial S1  
Standard S1  
Converging S1  
Standard S2

The most common disorders are spondylolysis, spondylolisthesis, degenerative problems, spinal stenosis and segmental instabilities. Tumors, infectious diseases and spinal deformities are additional causes of problems in that area.

Lumbosacral fusion may be accomplished with or without instrumentation. Fusion with instrumentation has gained increasing popularity in the recent years. Herkowitz has reported %35 of pseudoarthrosis rate in fusion without instrumentation whereas applying instruments to aid in achieving the effusion has reduced the pseudoarthrosis rate to less than %10.

## MATERIALS AND METHODS

58 patients with various disorders were retrospectively divided in to three groups. Lumbosacral fusion with transpedicular screws and rods were performed. In the first 18 patients the screws were oriented laterally toward the alae, screws were placed medially towards the promontorium in the latter 26 patients. Jackson's intrasacral rod application was performed in 14

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cases. In none of the patients anterior fusion was performed.

A total 116 screws were used. The number of fused segments ranged from 2 to 14, the average was 4.5 segments. All of the patients were freely mobilized within 3-15 days with a brace. The patients were followed at an average of 24.7 months (11-58).

In our clinic we had used 5 different lumbosacral fixation method:

- Alar (lateral) S1
- Promontorial (medial) S1
- Double screw or Chopin block
- Galveston method
- Jackson's method (iliac butress)

In the evaluation we excluded the double screw or Chopin block and Galveston type fixation because of insufficient number of cases. Patients with anterior fusion in addition to the posterior fusion were also excluded from the study.

**Three different type of fixation were included in this study:**

1. Lateral (Alar) fixation
2. Medial (promontorial) fixation
3. Iliac butters (Jackson's method)

#### Patients and Diagnosis

Spondylolisthesis and Spondylolysis	34
Scoliosis	6
Infection	3
Deg. Spine and Segmental instability	10
Tumor	5

33 male and 25 female patients with mean age of 56 (13-61) were operated on and included to the study. Instrument distribution was as followed: CD/44 patients, Synergy 12 patients, Alici 2 patients.

Posterior fusion was performed while patient lying prone on the Relton-Hall frame in all patients.

Standart landmarks were regarded for orientation. Preperation of pedicular tunnel is done by curett and checked by image intensifier.

In the 2 out of 14 patients in Jackson's group original instrument was used (C.D.).

In 26 patients promontorial (Medial), in 18 patients alar screw placement were performed (Table 1).

In 22 patients long segment fixation and in 36 patients short segment fixation were performed (Table 1).

Fixation of above L4 was considered as a long fixation (More than three segments).

#### RESULTS

Sacral screw loosening and pseudoarthrosis were seen 4 (6,8%) patients. Instrumented segments were 5,11 and 14 in these patients (In the final evaluation it is recognized that all 4 complicated cases were in the long fusion group). According to the groups established retrospectively, fusion of three or less segments was considered as short segment fusion and fusion of more than three segments is considered as long segment fusion. There were 22 patients in the long segment fusion group (Table 2). In the remaining 36 patients fusion of 3 or less segment was performed. No pull-out of sacral screws occurred in this group.

Totally there were four complications related with sacral screws which all were in the long fusion group (4/22 = 18%). There was no complication in the short fusion group (0%).

In comparing the patients according to the type of sacral fixation. There was no complication with Jackson's method (Table - 1). 3 of 4 patients with sacral loosening were in alar fixation group. There was only 1 patient with sacral screw loosening in the medial screw fixation group.

Superficial wound infection was seen in 2 (3.4%) patients and radicular pain in 2 patients (3.4%) which resolved spontaneously in 3-6 months without any evidence.

#### DISCUSSION

A large number of spinal surgeons are currently performing 360 degree fusion of the lumbosacral region due to the risk of pseudoarthrosis (2, 8). Weight born on the sacral screws is increased in parallel with the length of the fusion, because the lever arm is increased and the importance of sacral fixation is further emphasized in cases where long segment fusion is indicated (1, 2, 11).

Promontorial and alar screw orientations in lumbosacral fixation were compared in previous studies and reported in the literature. Zindrick has concluded that alar fixation is stronger than the other (12). Edwards stated that medial S1 and lateral S1 screw posi-

Table 1.

	Number of patients	Number of mechanical complications	Percentage (%)
Alar fixation	18	3	16,6
Promontorial fixation	26	1	3,8
Iliac butress (Jackson)	14	0	0
Total	58	4	6,8

Table 2.

	Number of patients	Number of mechanical complications	Percentage (%)
Long segment fusion	22	4	18
Short segment fusion	36	0	0
	58	4	6,8

tions provide equivalent and significantly greater proximal sacral fixation than the standart S1 screw position. And he reccomended the bicortical screw fixation and stressed the proper length of the screw to anterior cortex of sacrum (2, 4, 5, 10).

Jackson had described sacral rods embedded to the sacrum laterally and called this method as iliac butress (6, 7). In this method screws are inserted medially and cephalad toward the anterosuperior corner of the sacrum (Transpedicular end plate fixation). Promontorial screw insertion has been favored by many spinal surgeons due to its ease of application and strength but this alone may not be the solution. Vertical and alar screw insertion concomitantly is suggested by Roy-Camille and in the CDI system.

Iliosacral screws add further strength to sacral fixation but may cause sacroiliac pain due to transfixation of the joint. Chopin plate is developed in order to overcome this difficulty (3). Another important method in lumbosacral fixation is the Galveston method proposed by Allen and Ferguson and is widelly used in long segment paralytic scoliosis and other long segment deformities (1).

There is significant difference between the Jackson's method and only screw fixation in regard to

screw loosening and pull-out in our study. The complication rate was 16.6% in alar fixation and 3.8 in promontorial fixation and 0% in Jackson's method.

On the other hand there is a significant difference in comparing the long lever arm and short lever arm (18% and 0% respectively).

Therefore we prefeere more secure systems like Galvestone and Jackson's method in patients who needs long lever arm fixation.

We can conclude that the promontorial fixation is better than the alar fixation and in those cases which require fixation and fusion longer than 3 segments, sacral fixation should be augmented with additional method such as Jackson's or Galvestone method or iliosacral screws. Jackson's fixation is a secure method.

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