Fusion from lumbar spine to the sacrum: analysis and treatment of mechanical complications. A report of 135 cases.

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Retrospective review of patients who underwent lumbosacral fusion (mean 2- years follow-up)
Monocentric continue series.
Materials (1)

- **135 patients** (62 males, sex ratio 0.45), mean age **57 years** (16 – 78).

- **Operated between January 2007 and December 2010** (average of 2 years).

- **Indications:**
  
  - **90 Low Back Pain due to DDD (including SPL),** 26 Degenerative Scoliosis,
  - **11 Isthmic Spondylolisthesis,** 8 Posterior Wedge Osteotomy for kyphotic deformity.

- **Posterior Instrumentations:**
  
  - **SHORT CONSTRUCTS:** 59 cases (L5-S1: 1, L4-sacrum: 29, L3-sacrum: 29)
  - **MEDIUM CONSTRUCTS:** 72 cases (L2-sacrum: 29, L1-sacrum: 21, Thoracic spine - sacrum **below the apex:** 22)
  - **LONG CONSTRUCTS:** 4 cases (Thoracic spine - sacrum **above the apex**).
Types of Sacral Fixations:
- S1 screw
- Sacral plate with iliac screw
- S1 sacral plate + sacral wing

Systematic radiographic analysis
Immediate post operative X-ray (J3)
X-ray « full spine » after 3 months, 1 year and 2 years.
Methods

In case of unexplained post operative pain
We performed a CT-Scan (thin sections):
Cortex perforation,
Screw loosening,
Ectopic screws

Analyzing of bony brigdes, stability of sacral construct, pseudarthrosis.

Complications were related to
Etiology
Sagittal balance
Height and Angulation of L5 S1 disc
Results

22 patients have had a mechanical complication at latest follow-up (16%)

17 pseudarthrosis at L5-S1 level (with sagittal imbalance in 2 cases)

5 impingements between alar screw and intra pelvic sciatic nerve

no intracanal disruption, no vascular trauma, no fracture.
Pseudarthrosis at L5-S1 level

**DDD:** 9 cases/ 90 (6 long constructs > L1 S)
- 4 TLIF, 1 PLIF,
- 4 without cage

**Degenerative Scoliosis:** 6 cases/ 26
- No cage at L5 S1 level

**Isthmic Spondylolisthesis:** 2 cases/ 11
- No cage at L5 S1 level

*CT Scan:*
loosening of screws S2/ S1/ L5
No solid bony bridge

**Reoperation with ALIF +/- posterior implant exchange**

*Reoperation with ALIF*
in 1 case posterior procedure
iliac fixation + extension of construct

**Reoperation with ALIF**
No relationship between morphotype and pseudarthrosis
Pseudarthrosis in long adult spinal deformity instrumentation and fusion to the sacrum: prevalence and risk factor analysis of 144 cases.

Kim YJ, Bridwell KH, Lenke LG, Rhim S, Cheh G

**Prevalence 24%**
Thoracolumbar kyphosis, Coxarthrosis, Sagittal imbalance, Age > 55 at the time of surgery, No iliac fixation increase the risk of L5-S1 nonunion

**Biomechanical comparison of lumbosacral fixation techniques in a calf spine model.**
Lebwohl NH, Cunningham BW, Dmitriev A, Shimamoto N, Gooch L, Devlin V, Boachie-Adjei O, Wagner TA.

Two points of sacral fixation is a safer alternative
For major deformities iliac screws are recommended

**Loosening of sacral screw fixation under in vitro fatigue loading.**
Lu WW, Zhu Q, Holmes AD, Luk KD, Zhong S, Leong JC.

During the initial phases of bone fusion, implant loading must be reduced to obtain solid fusion
A cage at L5 S1 level significantly reduces sacral screws loads
Screw impingement

5 cases (3.7%), always at alar screw level.

(Clinical presentation: postoperative sciatica sometimes delayed (0 to 1 year post op))

Reoperation for removal of screw, or sacral plate
An anatomic study of the S2 iliac technique for lumbopelvic screw placement.


*Spine* 2009 May 20;34(12)

Intra-articular screw (sacroiliac): 60%, No vascular injury

Three-dimensional image-guided placement of S2 alar screws to adjunct or salvage lumbosacral fixation.

Nottmeier EW, Pirris SM, Balseiro S, Fenton D.

*Spine J.* 2010 Jul;10(7):595-601

Entry point of S2 screw: cephalad and lateral to S2 dorsal foramen
Conclusion

Sacral fixation S1 - S2 is reliable but 16% of mechanical complications

Pseudarthrosis L5 S1

Deformities, long constructs, disc height at L5 S1 level

Iliac anchorage

In all cases

Systematic cage at L5 S1 level (ALIF at best)

Alar ectopic screws and impingment

Lateral and ascending screwing