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Case report

Sacral stress fracture after lumbar and lumbosacral fusion. How to manage it? A proposition based on three cases and literature review



C. Scemama*, H. D'astorg, P. Guigui

Department of Reconstructive and Orthopaedic Surgery, Université René-Descartes, European Hospital Georges-Pompidou, AP-HP, 20, rue Leblanc, 75015 Paris, France

ARTICLE INFO

Article history:

Received 11 February 2015

Accepted 16 November 2015

Keywords:

Lumbar
 Sacral
 Fusion
 Complication
 Stress fracture

ABSTRACT

Sacral fracture after lumbosacral instrumentation could be a source of prolonged pain and a late autonomy recovery in old patients. Diagnosis remains difficult and usually delayed. No clear consensus for efficient treatment of this complication has been defined. Aim of this study was to determine how to manage them. Three patients who sustained sacral fracture after instrumented lumbosacral fusion performed for degenerative disease of the spine are discussed. History, physical examinations' findings and radiographic features are presented. Pertinent literature was analyzed. All patients complained of unspecific low back and buttock pain a few weeks after index surgery. Diagnosis was done on CT-scan. We always choose revision surgery with good functional results. Sacral stress fracture has to be reminded behind unspecific buttock or low back pain. CT-scan seems to be the best radiological test to do the diagnosis. Surgical treatment is recommended when lumbar lordosis and pelvic incidence mismatched.

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Well-known complications of long and rigid instrumentation used for degenerative spinal disease are pseudarthrosis, implant failure and adjacent segment disease [1]. Because the majority of patients undergoing spinal fusion for degenerative disease are older and therefore at risk of osteoporosis, sacral insufficiency fracture, a rare complication, has been described for last decade in the literature. In 2013, Odate et al. [2] showed a 4.3% prevalence of sacral fracture after lumbosacral instrumentation.

This complication could be a source of prolonged pain and a late autonomy recovery in old patients.

Risk factors have largely been identified in previous studies: old age, female, osteoporosis, increased stress transmitted to the sacrum by the long moment arm of multi-segmental fixation [3], or discussed like unmatched lumbar lordosis and pelvic incidence after lumbar arthrodesis, high pelvic incidence [2].

Despite, previous descriptions of sacral insufficiency fractures, diagnosis remains difficult, unclear and usually delayed. No clear consensus for efficient treatment of this morbid complication has been already defined.

We present three cases of sacral insufficiency fractures after lumbar and lumbosacral arthrodesis. Our purpose is to review these

three cases, to compare them to previous described cases and discuss how to manage these patients.

1. Case report

1.1. Case 1

A 72-year-old woman (BMI: 19.7), presented with the complaint of one year of progressively increased lumbar and bilateral leg pain associated with sagittal imbalance trouble. Physical examination was unremarkable. Her past medical history was significant only for smoking addiction and osteoporosis. Imaging revealed degenerative lumbar scoliosis with L3-S1 stenosis and L4-L5 grade I spondylolisthesis. She underwent L3-S1 decompression, posterolateral fusion and instrumentation L2-S1 (bilateral S1 screws only) with one level Smith-Petersen osteotomy without iliac crest bone graft. The patient's postoperative course was uneventful. At two months postoperatively, she had sacral pain and left L5 radicular pain that did affect her activities. Plain radiographs were non-contributive (Fig. 1) and a CT-scan was done. A transversal S1 fracture with L5-S1 pseudarthrosis was diagnosed and she underwent for a two-time revision surgery, firstly posterior revision with bilateral iliac extension, secondly an anterior interbody L4-L5 and L5-S1 fusion using cage. Revision surgery was protected by brace for 3 months. At last follow-up, 6 months postoperatively, the sacral fracture had completely healed and L5-S1 fusion was done

* Corresponding author. Tel.: +33 6 42 65 16 55.

E-mail addresses: scemamacaroline@gmail.com (C. Scemama), h.dastorg@gmail.com (H. D'astorg), pierre.guigui@aphp.fr (P. Guigui).

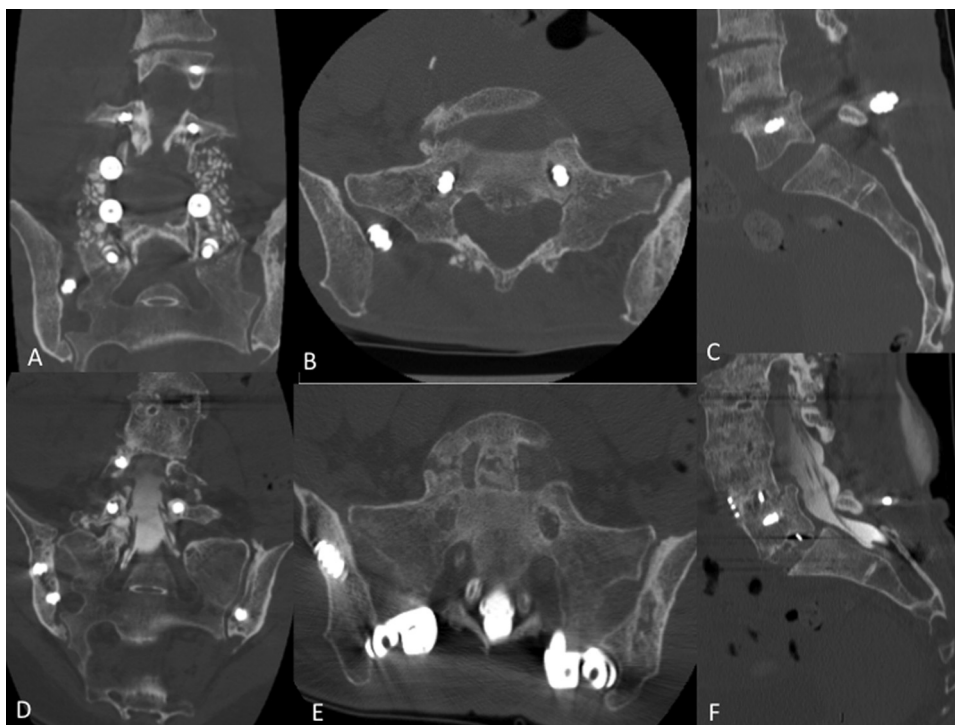


Fig. 1. CT-scans before (A, B, C) and one year after revision surgery for sacral stress fracture of case 3 (D, E, F). Diagnosis stayed difficult even with the use of CT-scan. At one year after surgery, consolidation was done with a circumferential L5-S1 fusion. Despite peroperative X-ray control of screws positioning, iliac screws were sometime more in the sacro-iliac articulation than in only in iliac bone (A, B, C).

on control CT-scan. The patient made a satisfactory recovery with only little sacral pain that is not affecting activities.

1.2. Case 2

A 77-year-old woman (BMI: 22.4), presented with a total loss of walking abilities for 6 months with low back and bilateral lower extremity pain. She had no significant medical history. She had a significant lumbar surgical history with 3 years earlier lumbar surgery of L3–L5 decompression, posterolateral fusion and instrumentation. Two years postoperatively, she presented an adjacent segment disease with a first revision surgery, with posterior liberation posterolateral fusion and instrumentation extension to S1 (bilateral S1 pedicular screws only). Fifteen days after this second surgery she presented low back and bilateral lower extremity pain, which affected activities. Pain had progressively increased with appearance of left L5 deficit. Plain radiographs were inconclusive and a CT-Scan was done. It revealed a sacral proximal plate fracture with S1 screws failure. She underwent in our hospital for a second revision surgery with L5-S1 decompression, bilateral iliac extension of posterolateral fusion and instrumentation. At last follow-up, 8 months postoperatively, sacral fracture nearly healed with a complete relief of pain symptoms. Left L5 deficit was persistent.

1.3. Case 3

A 67-year-old woman (BMI: 18.2), presented with a low back pain and right L5 radicular pain for few months. Her significant medical history was a long past of rheumatoid arthritis, with corticosteroid treatment which had lead to osteopenia and C0–C4 arthrodesis with posterior iliac crest graft. Imaging revealed a degenerative lumbar scoliosis and she underwent for a T12–S1 with bilateral iliac extension posterolateral fusion and instrumentation (modular fixation, pedicular S1 and iliac screws; Praxis®, Medtronic). The patient's postoperative course was uneventful. At

Table 1

Pelvic incidence and lumbar lordosis before and after revision surgery.

	Pelvic incidence	LL post-index surgery	LL post-revision surgery
Case 1	72.3	58.7	62.3
Case 2	76	65.7	66.7
Case 3	69.5	61.9	72.4

two months postoperatively, she had presented a rocking L5 radicular pain without neurological deficit. CT-scan revealed a U unmoved sacral fracture with a proximal implants failure. She underwent for a revision surgery with proximal extension to T11 and distal posterior extension with 2 iliac implants on the right side and 1 implant on the left side. Bilateral iliac crest graft and artificial bone were used. She had an additional anterior approach with anterior L1–L2, L2–L3, L3–L4, L4–L5 and L5-S1 cage interbody fusions (Fig. 1). An additional protection brace for three months was used. At one year postoperatively, she had no residual pain and no autonomy lost. Sacral fracture consolidation was shown by a one-year control CT-scan.

Pelvic incidence (PI) and lumbar lordosis (LL) of these three patients are summarized in Table 1. Measures were done on standing lateral full spine radiographs, on Keops spine software (SMAIO corporation®, Lyon, France). Full spine lateral X-rays before and after revision surgery of cases 1 and 3 are represented in Fig. 2. Before index surgery, it was noticed for all the cases, that the high of L5-S1 interbody space was preserved.

2. Discussion

Sacral stress fracture is a really rare complication of lumbar fusion. Only 37 sacral fractures after lumbar fusion were described in literature (Table 2) [2,4–13]. Klineberg et al. described a prevalence of 1.3% of sacral stress fracture after short lumbosacral fusion and a prevalence of 3.1% after long segment fusion [8]. It was

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