



Non neurologic burst thoracolumbar fractures fixation: Case-control study



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ABSTRACT

Study design: Burst fractures not associated with any neurological deficits are frequent but not therapeutic agreement on their management is available to date. This case-control study was conducted to try to help guide therapeutic decision in the treatment of such fractures.

Materials and methods: This case-control study includes consecutive retrospective evaluation of 25 case-patients treated by posterior short-segment fixation associated with kyphoplasty (SFK) in the treatment of A3 thoracolumbar unstable fractures, as compared to a control-group composed of 82 patients treated by long-segment (LF) pedicle screws.

Results: SFK patients bled significantly less than the LF patients ($p=0.04$). Assessment of deformation progression, vertebral height restoration and reduction of the regional kyphotic angle in the SFK and LF groups revealed no statistically significant superiority of one approach on another. In contrast, the height of endplates was significantly increased in the SFK group ($p=0.006$). The patients' pain levels were significantly improved in the SFK group ($p=0.002$). However, patients from the SFK group stood earlier postoperatively (1.7 vs 3.7 days, $p=0.001$).

Conclusion: We believe that SFK in vertebral fractures is as efficient as LF for bone consolidation and spine stabilization. In addition, SFK patients may use fewer analgesics.

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Introduction

Traumatic thoracolumbar burst fractures are the most common spinal injuries caused by axial load with or without flexion force [1]. They occur predominantly in young patients. Their instability and the underlying mechanism have been studied in details and they tend to occur preferentially at the thoraco-lumbar spine junction with 60% of them being located between T11 and L2 [2]. Likewise, patients with mechanical instability secondary to spinal fracture or osteoporosis require stabilization [3]. The management of burst fractures not associated with any neurological deficits has not yet been properly codified and the treatment is generally purely conservative [2,4,5]. Initially, Long-segment Fixations (LF), including those at two levels above and two levels below the

fractured level were performed. With the development of the pedicle screw fixation system, Short-segment Fixations (SF) including those at one level above, one level below, or at the fractured level have frequently been used in an effort to reduce fixation and fusion level. Thus, good radiologic and clinical outcomes have been reported with posterior instrumentation and reduction [6,1,7]. SF via a posterior spinal approach is the most common and simple treatment option among surgical methods for treatment of thoracolumbar vertebral fractures. Minimally invasive cement augmentation techniques such as kyphoplasty and vertebroplasty have been shown to provide effective pain relief in patients with cancer or trauma-related vertebral compression fractures (VCFs) [7,8]. To date, no study has been able to demonstrate significant differences in clinical and radiologic results and efficiencies between these different kind of fixations [9,10]. To determine the efficacy and safety of SF at one level above and below associated with kyphoplasty in the fractured level for treatment of traumatic unstable fractures, we conducted a case-control study comparing SFK with LF. To address this, we studied a

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group of 25 patients treated by SFK as compared with a control group of 82 patients treated by LF.

Materials and methods

Ethics statement

This study has been approved by the institutional review board. Written consent was obtained and recorded in each patient's medical file.

Study population

A total of 107 consecutive patients with acute vertebral fractures of the thoracolumbar spine were recruited in our Neurosurgery/Neurotraumatology Department from January 2009 to September 2014. 82 patients in the LF group with at least two levels above and two levels below the fracture were considered as the control group. 25 patients (ratio 1:3) were treated by SFK (one level above and one below the fracture and kyphoplasty in vertebral fracture). All the patients had unstable vertebral burst fractures classified as type A3 on the Magerl scale, without any neurological complications [2]. The inclusion criteria were the following: patients were aged at least 18 years with a single traumatic fractured level in the thoracolumbar spine region (T4-L4) and the period of time between the trauma and the operation was less than one week. Patients with pedicle fracture, fracture distortion or torsion, or previous spine surgery due to trauma were excluded from our study. The assignment in the SF group was performed for nearly 1 patient out of 3–4 due to a lower availability of the kyphoplasty kits whose use is restricted in our department.

Radiologic assessment

Spine CT scans have been performed before surgery to classify the fracture (Fig. 1A). Although it is very important to determine the integrity of the posterior ligamentous complex (PLC) in these injuries, MRI was performed only when the diagnosis of distortion or torsion fracture was uncertain.

Plain radiographs were obtained after surgery, at 1-month and 12-month follow-up (Fig. 2). The vertebral body compression ratio

(Beck index) (Fig. 1B), vertebral wedge angle (Farcy angle) (Fig. 1C), and Cobb angle (Fig. 1D) were measured on standing radiographs. Recovery of vertebral height was measured on the sagittal reconstructions using the Beck index, as described by Maestretti, by comparing the height of the anterior face of the fractured vertebral body with that of the posterior face of the same body [11] (Fig. 1B). The Cobb angle which reflects changes in the segmental curve was measured between the superior endplate of the upper and the inferior endplate of the lower adjacent vertebrae to the fractured vertebral body [12] (Fig. 1D). The Farcy angle was measured between the superior and the inferior endplate of the fractured vertebral body [13] (Fig. 1C). These three indices are appropriate for appreciating and reflecting the anatomical shape of the fractured vertebral body.

Clinical assessment

All the patients in this series underwent preoperative clinical assessments, neurological tests and pain assessments. Operative assessment included operation time, intraoperative blood losses, intraoperative additional procedures and number of screws. Initially and during the follow-up period (1- and 12-month), all the patients underwent clinical assessments to exclude neurological deficits, and pain assessments with analgesic consumption. The date of the first postoperative wake-up and length of hospital stay were also recorded. Early (<1 month) and late (1–12 months) postoperative complications were collected. At 12-month follow-up, the status of autonomy and validity of patients were also collected. Patients with discomfort and embarrassment that had to be ablated were also registered.

Statistical analyses

Demographic and radiographic parameters and clinical outcomes of SFK were compared with those of LF surgery. Data were analyzed using the SPSS program for Windows V17.0 (SPSS, Chicago, IL, U.S.A); Student's *t*-test for paired series was used to test the significance of the differences between the two groups with an alpha risk level of 5%. Mann-Whitney U, χ^2 Pearson test were used for analyses. Data are presented as the mean \pm standard deviation. For all analyses, a *p*-values of <0.05 was considered statistically significant.

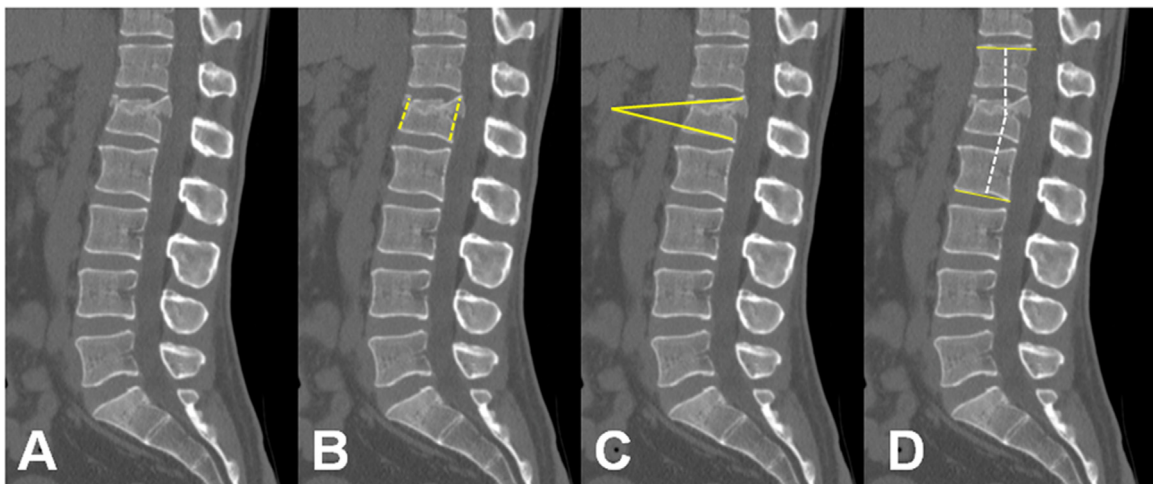


Fig. 1. (A), Sagittal spine CT scan before surgery to classify fracture. (B), Vertebral body compression ration (beck index). (C), vertebral wedge angle (Farcy angle), (D) Cobb angle were measured on standing radiographs and initial CT scan.

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