

Clinical Study

Clinical and radiological results 6 years after treatment of traumatic thoracolumbar burst fractures with pedicle screw instrumentation and balloon assisted endplate reduction

Jorrit-Jan Verlaan, MD, PhD^{a,*}, Inne Somers, MD^b, Wouter J.A. Dhert, MD, PhD^a,
F. Cumhur Oner, MD, PhD^a

^aDepartment of Orthopaedics, University Medical Center Utrecht, Heidelberglaan 100, 3584CX Utrecht, The Netherlands

^bDepartment of Radiology, University Medical Center Utrecht, Heidelberglaan 100, 3584CX Utrecht, The Netherlands

Received 28 July 2013; revised 9 October 2013; accepted 26 November 2013

Abstract

BACKGROUND CONTEXT: When used to fixate traumatic thoracolumbar burst fractures, pedicle screw constructs may fail in the presence of severe vertebral body comminution as the intervertebral disc can creep through the fractured endplates leading to insufficient anterior column support. Balloon-assisted endplate reduction (BAER) and subsequent calcium phosphate cement augmentation may prevent this event by restoring the disc space boundaries. The results of the first studies using BAER after pedicle screw fixation are encouraging, showing good fracture reduction, few complications, and minimal loss of correction at 2 years of follow-up.

PURPOSE: To present the clinical and radiological outcome of 20 patients treated for traumatic thoracolumbar burst fractures with pedicle screws and BAER after a minimum of 6 years follow-up.

STUDY DESIGN: Prospective trial.

PATIENT SAMPLE: Twenty consecutive neurologically intact adult patients with traumatic thoracolumbar burst fractures were included.

OUTCOME MEASURES: Radiological parameters (wedge/Cobb angle on plain radiographs and mid-sagittal anterior/central vertebral body height on magnetic resonance imaging scans) and patient reported parameters (EQ-5D and Oswestry Disability Index) were used.

METHODS: All patients had previously undergone pedicle screw fixation and BAER with calcium phosphate cement augmentation. The posterior instrumentation was removed approximately 1.5 years after index surgery. Radiographs were obtained preoperatively, postoperatively, after removal of the pedicle screws, and at final follow-up (minimum 6 years post-trauma). Magnetic resonance imaging scans were obtained preoperatively, 1 month after index surgery, and 1 month after pedicle screw removal. Health questionnaires were filled out during the last outpatient visit.

RESULTS: The pedicle screw instrumentation was removed uneventfully in all patients and posterolateral fusion was observed in every case. The mean wedge and Cobb angle converged to almost identical values (5.3° and 5.8°, respectively) and the mid-sagittal anterior and central endplates were reduced to approximately 90% and 80% of the estimated preinjury vertebral body height, respectively; this reduction was sustained at follow-up. Patient-reported outcomes showed favorable

FDA device/drug status: Approved (Inflatable bone tamps [Kyphx, Kyphon, Medtronic, Memphis, USA]); Not approved for this indication (Bone Source Calcium Phosphate Cement [Stryker, Kalamazoo, USA]).

Author disclosures: **J-JV:** Nothing to disclose. **IS:** Nothing to disclose. **WJAD:** Grant: AO Research Fund (Appr. E, Paid directly to institution/employer); Scientific Advisory Board/Other Office: Member Scientific Advisory Board DSM Biomedical (B per diem, annually on the average 1 day.). **FCO:** Consulting: Medtronic (B, Paid directly to institution/employer), Synthes (B, Paid directly to institution/employer); Speaking/Teaching Arrangements: Medtronic (B, Paid directly to institution/employer), AOSpine (B, Paid directly to institution/employer);

Scientific Advisory Board/Other Office: AOSpine (None); Research Support (Investigator Salary): Synthes (C, Paid directly to institution/employer); Research Support (Staff/Materials): Synthes (C, Paid directly to institution/employer); Grants: AOSpine (B, Paid directly to institution/employer), Synthes (E, Paid directly to institution/employer); Fellowship Support: Synthes (E, Paid directly to institution/employer).

The disclosure key can be found on the Table of Contents and at www.TheSpineJournalOnline.com.

* Corresponding author. Department of Orthopaedics, University Medical Center Utrecht, Heidelberglaan 100, 3584CX Utrecht, The Netherlands. Tel.: +31-88-7556971.

E-mail address: j.j.verlaan@umcutrecht.nl (J.-J. Verlaan)

results in 79% of the patients. One patient required (posterior) reoperation due to adjacent osteoporotic vertebral body collapse after pedicle screw removal.

CONCLUSIONS: Balloon-assisted endplate reduction is a safe and low-demanding adjunct to pedicle screw fixation for the treatment of traumatic thoracolumbar burst fractures. It may help achieve minimal residual deformity and reduce the number of secondary (anterior) procedures. Despite these positive findings, one in five patients experienced daily discomfort and disability. © 2015 Elsevier Inc. All rights reserved.

Keywords: Burst fracture; Endplate reduction; Balloon; Calcium phosphate cement; Clinical outcome; Patient related outcomes

Introduction

Traumatic thoracolumbar fractures are serious injuries that can result in postural deformity, neurologic deficits, persisting pain, and loss of previous employment [1]. Currently, pedicle screw instrumentation is the most commonly used surgical technique to treat traumatic thoracolumbar burst fractures [1,2]. As demonstrated by some authors, pedicle screw fixation may fail in the presence of severe vertebral body comminution as the intervertebral disc can creep through the fractured endplates into the burst vertebral body leading to insufficient anterior column support [3–6]. Anterior and circumferential stabilization techniques have been proposed as possible solutions to this problem [1]. Although the outcome of these techniques may yield satisfactory clinical results, the surgical burden has been shown to be considerably larger with longer operation time, increased blood loss, and higher complication rates compared with posterior-only procedures [2]. Recognizing the need for anterior column reinforcement, some authors have performed transpedicular spongiosaplasty to support the pedicle screw construct. For reasons poorly understood, forcing cancellous bone into the fractured vertebra has not shown to prevent secondary collapse and the technique has been abandoned by most surgeons today [7]. Reasoning that proper restoration of the intervertebral disc space boundaries might prevent intrusion of the disc in the fractured vertebral body after pedicle screw fixation, other authors have used transpedicularly introduced balloons to reduce the fractured endplates (balloon-assisted endplate reduction [BAER]) and subsequently filled the intraosseal voids created by the balloons with bone cement [8–10]. The results of the first (uncontrolled) studies using BAER after pedicle screw fixation have been encouraging, showing good fracture reduction, few complications, and minimal loss of correction at approximately 2 years of follow-up [8–10]. Until now, however, only short-term follow-up data have been available on the outcome of patients thus treated. As safety and feasibility have been established, longer follow-up studies are now required to assess the risk of recurrent kyphosis and the need for secondary anterior procedures. In the present prospective uncontrolled study, the clinical and radiological outcome of 20 patients treated for traumatic thoracolumbar burst fractures with pedicle screws and BAER are presented after a minimum of 6 years follow-up.

Patients and methods

A total of 20 consecutive, neurologically intact patients (eight males, 12 females; mean age 42 years; range, 18–75 years at the time of injury) with traumatic burst fractures of the thoracolumbar spine due to motor vehicle accidents or falls from height were included between January 2002 and December 2003. Within 5 days after trauma, all patients underwent pedicle screw fixation (Diapason; Stryker, Kalamazoo, MI, USA) followed by BAER (KyphX; Kyphon, Sunnyvale, CA, USA) and calcium phosphate cement augmentation (BoneSource; Stryker), a technique described before by several authors [8–13]. After discharge, patients were allowed unrestricted activity but were advised to wear a plaster jacket during ambulation for the first 8 weeks. Rehabilitation programs were available on patient request. All patients agreed to have the pedicle screw instrumentation removed between 12 and 18 months post-trauma as part of the study protocol, which was approved by the local institutional review board, to ensure comparability of clinical and radiological results between patients during follow-up. After the pedicle screw system was removed, patients were discharged without restrictions on physical activity. Standardized clinical examinations were scheduled to assess locomotor function and neurologic status preoperatively, postoperatively, 1 month after index surgery, 1 month after removal of instrumentation, and at follow-up, 6 years after the last patient had had surgery. During the last visit, two health questionnaires (EQ-5D and Oswestry Disability Index [ODI]) were filled out by the patients approximately 1 hour before clinical examination. In case an item from a questionnaire was answered with two statements, the higher of the two was recorded. If a question was not answered (because it was inapplicable), the final score was adjusted to obtain a correct percentage [14]. To assess the wedge and Cobb angle of the fractures, plain radiographs (anteroposterior and lateral) were obtained in supine position preoperatively and in standing position approximately 1 week after surgery (patient wearing the plaster jacket), 1 day after removal of the pedicle screw instrumentation, and at final outpatient follow-up. The reliability of the radiographic measurements was assessed by comparing data from two independent observers. Magnetic resonance imaging (MRI) scans (T1 and T2 weighted) were obtained preoperatively, 1 month after index surgery, and 1 month after removal of the instrumentation to evaluate

Download English Version:

<https://daneshyari.com/en/article/6211873>

Download Persian Version:

<https://daneshyari.com/article/6211873>

[Daneshyari.com](https://daneshyari.com)