

Clinical Study

Early versus late surgery of thoracic spine fractures in multiple injured patients: is early stabilization always recommendable?

Markus R. Konieczny, MD^{a,b,*}, Johannes Strüwer, MD^c, Birger Jettkant, MD^a,
Christian Schinkel, MD^{a,d}, Thomas Kälicke, MD^{a,e}, Gert Muhr, MD^a,
Thomas M. Frangen, MD^{a,f}

^aDepartment of Traumatology, University Hospital Bergmannsheil, Bürkle de la Camp-Platz 1, 44789 Bochum, Germany

^bDepartment of Orthopedic Surgery, University Hospital Düsseldorf, Moorenstrasse 5, 40225 Düsseldorf, Germany

^cDepartment of Orthopedics and Rheumatology, University Hospital Marburg, Baldingerstraße, 35043 Marburg, Germany

^dDepartment of Traumatology, Klinikum Memmingen, Bismarckstraße 23, 87700 Memmingen, Germany

^eDepartment of Traumatology, St Josefs Hospital Bonn-Beul, Hermannstraße 37, 53225 Bonn, Germany

^fDepartment of Orthopedics and Traumatology, Elisabeth-Klinik Bigge, Heinrich-Sommer-Straße 4, 59939 Olsberg, Germany

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Abstract

BACKGROUND CONTEXT: Many institutions' retrospective studies investigated the effect of the timing of surgery on outcomes of polytraumatized patients with severe lesions of the thoracic spine and mainly found a better outcome for patients who were operated on less than 72 hours posttrauma.

PURPOSE: We conducted a prospective study in a Level I trauma center to validate the retrospective data and to investigate other variables, in addition to the timing of surgery that may influence patient outcomes.

STUDY DESIGN: Prospective observational clinical study.

PATIENT SAMPLE: Within this prospective study at a Level I trauma center, we enrolled 38 multiple injured patients with unstable fractures of vertebral column from Level Th1 to L1. Further inclusion criteria consisted of an injury severity score of 16 or more and an intensive care unit (ICU) stay of more than 7 days. The age of included patients was limited from 16 or more to 75 or less years.

OUTCOME MEASURES: Hospital stay, stay on ICU, and mortality.

METHODS: Twenty-two patients were operated on less than or equal to 72 hours posttrauma, and 16 received late surgery greater than or equal to 72 hours posttrauma.

RESULTS: Patients who received early surgery had a significantly higher mortality rate ($p < .01$) than those who received late surgery. Sixty-seven percent of our patients who had an initial hemoglobin (Hb) less than 10 mg/dL died. Seventy-five percent of those patients who had an Hb less than 10 mg/dL and received a thoracic drain died.

CONCLUSIONS: Although some reports indicate advantages for early surgery for thoracic spine trauma in the polytraumatized patient, careful patient selection should be used. Based on the results of this prospective study, early surgery for thoracic spine trauma in patients with concomitant severe thoracic trauma and low initial Hb levels may pose a risk for poor clinical outcomes. © 2015 Elsevier Inc. All rights reserved.

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* Corresponding author. Department of Orthopedic Surgery, University Hospital Düsseldorf, Moorenstrasse 5, 40225 Düsseldorf, Germany. Tel.: (49) 151-11639612; fax: (49) 121-2521459081.

E-mail address: Markus@Konieczny.net (M.R. Konieczny)

EVIDENCE & METHODS

Context

Early surgery for unstable fractures is commonly recommended. The authors present their experience with patients who have sustained significant multi-trauma.

Contribution

In this case series report of a specific trauma patient population, the investigators found that patients undergoing spinal surgeries had high mortality rates if they were taken to surgery with hemoglobin levels less than 10.

Implications

While early surgery allows for more rapid mobilization and its resulting benefits, medical stabilization/maximization is mandatory to allow its safe undertaking.

—The Editors

Introduction

Analyzing the German Trauma Registry, Schinkel et al. [1] found that 20% of all analyzed polytraumatized patients sustained vertebral column fractures. Half of them presented a spinal cord abbreviated injury score (AIS) of 3 or more [2]. These findings are congruent with the other studies [1,3,4], which state that 6% to 30% of polytraumatized patients had a fracture of the vertebral column and that most of the high-grade thoracic spine injuries present with thoracic trauma. Miller et al. [5] showed that thoracic trauma is an independent risk factor for pneumonia and acute respiratory distress syndrome, thus leading to worse outcomes.

About 70% of all polytraumatized patients with vertebral column injuries in the German Trauma Registry have been operated on within 72 hours posttrauma [1]. Early-operated patients showed a shorter stay in intensive care unit (ICU), shorter time of ventilator support, and shorter hospital stay in a retrospective study [1]. Several other retrospective studies also showed a better clinical outcome or at least no disadvantage for early-operated patients with spinal cord injuries compared with later-operated patients [1,4,6–10].

However, some studies report adverse effects for early-operated patients in subgroups [6,11]. The particular reasons why patients have been operated on early or late have not been investigated in previous studies. So, actually we do not know whether early-operated patients have a better outcome because of the timing of operation or other reasons, as most studies mentioned previously were of a retrospective nature and therefore offered limited evidence. We still do not have a well-established concept for the timing of stabilization for the regarded group of patients.

There are several considerations that point out that an early operation could endanger patients who are polytraumatized. The “second hit phenomenon” because of post-traumatic activation of numerous humoral and cellular systems leading to syntheses, expression, and liberation of inflammatory mediators has been shown in several studies [12,13]. Waydhas et al. [13] showed that surgery in patients who have a posttraumatic increased level of inflammatory response might trigger a late multiple organ dysfunction syndrome.

Prospective studies in multiple injured patients with femoral fractures have shown a clear improvement of outcomes in early-operated patients [14], but Vindenes et al. [15] clearly point out that surgery of pelvis, femur, spine, and skull lead to significantly different activations of the immune system and thus cannot be compared with each other.

Because previous retrospective studies from many institutions provided controversial data, the objective of this study was to investigate prospectively the effect of the timing of spinal surgery on multiple injured patients and other variables, in addition to timing of surgery, which may influence patient outcomes.

Patients and methods

Within a prospective study from January 1, 2006 to January 31, 2008 at a Level I trauma center, we enrolled 38 multiple injured patients with unstable fractures of vertebral column from Level Th1 to L1. The definite classification of the spine fractures was according to the AO classification (Type B or C fracture, >30° kyphosis, and/or neurologic impairment) [16]. Further inclusion criteria consisted of an injury severity score (ISS) of 16 or more and an ICU stay of more than 7 days. The age of included patients was limited from 16 or more to 75 or less years. Patients were excluded in case of impairment of the immune system like human immunodeficiency virus infection, known genetic alterations that affect the immune system as severe combined immunodeficiency autoimmune disorders, or coexisting cancerous disease. Addiction to alcohol and other drugs represented further exclusion criteria.

We chose these exclusion criteria because we believe that the second hit phenomenon plays an important role in operational timing and did not want the analyses of its effects to be disturbed by impairment of the immune system or other reasons that might have weakened or altered the individuals' immunologic response.

The inclusion criteria ICU stay of 7 or more days was added because we know that patients who sustain a polytrauma are routinely transferred to ICU. If after a few days of observation, the patients can be transferred to another unit, the patients' condition is better than that of the patients who have to stay longer on the ICU. Patients who sustain an isolated trauma of the vertebral column with an AIS 4 and minor fractures of their extremities will be

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