

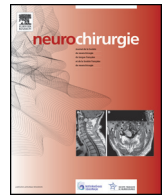


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Original article

## Anterior approach with expandable cage implantation in management of unstable thoracolumbar fractures: Results of a series of 93 patients



*Arthrodèse par voie antérieure avec mise en place de cage prothétique vertébrale dans le cadre des fractures instables du rachis thoracolumbaire : résultats d'une série de 93 cas*

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### ARTICLE INFO

#### Article history:

Received 8 July 2015

Received in revised form 24 January 2016

Accepted 29 January 2016

Available online 27 April 2016

#### Keywords:

Expandable cage

Fusion

Iliac crest graft

Kyphosis

rhBMP2

Thoracolumbar fractures

### ABSTRACT

**Introduction.** – Anterior approach indications in unstable thoracolumbar fractures (UTLF) are debated. The aim of this study was to evaluate the results of anterior fixation and expandable prosthetic vertebral body cage (EPVBC) implantation alone or combined with a posterior approach in the management of UTLF.

**Materials and methods.** – Ninety-three patients underwent anterior fixation with implantation of an EPVBC for UTLF from T7 to L5. Long-term kyphosis and vertebral height loss reduction, functional outcomes including visual analogical scale and Oswestry disability index were evaluated.

**Results.** – Anterior fixation led to a significant increase of vertebral body height with a gain of 13% after a previous posterior approach, 38% after a single anterior approach and 65% after combined posterior and anterior approaches ( $P=0.0001$ ). However, anterior fixation did not significantly enhance the vertebral regional kyphosis angle ( $P=0.08$ ), except in cases of single anterior approach for thoracic fractures ( $P=0.03$ ). No significant difference was found between early, 3 months and 1 year postoperative vertebral regional kyphosis angle and vertebral body height ( $P=0.6$ ). Complete fusion was routinely observed at 1 year postoperatively. rhBMP2 implantation in selected cases appears to be a safe and reliable strategy. No infections or surgical revisions were observed after the anterior approach.

**Conclusion.** – Anterior approach and EPVBC implantation, in UTLF, is a safe and effective procedure, providing long-term vertebral body height and kyphosis correction. Adverse effects of anterior approach remain acceptable. Single anterior fixation is a reliable surgical alternative in thoracic fractures without posterior spine segment injury or spinal cord compression. These results prompted us to extend anterior approach indications in oncology and infectious diseases.

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### R É S U M É

**Introduction.** – Les indications chirurgicales d'abord antérieur du rachis dans le cadre des fractures thoracolumbaires instables (FTLI) demeurent débattues. L'objectif de cette étude est d'évaluer les résultats de l'arthrodèse par voie antérieure (AVA) avec implantation d'une cage prothétique vertébrale extensive (EPVBC) seule ou en combinaison avec une ostéosynthèse postérieure dans le cadre des FTLI.

**Matériels et méthodes.** – Quatre-vingt-treize patients ont été opérés par abord antérieur avec implantation d'une EPVBC pour FTLI de T7 à L5. La déformation cyphotique à long terme, la perte de hauteur vertébrale, ainsi que les résultats fonctionnels (score visuel analogique et l'index d'incapacité Oswestry) ont été évalués.

#### Mots clés :

Cage extensive

Fusion

Greffon iliaque

Cyphose

rhBMP2

Fractures thoracolumbaires

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**Résultats.** – L'AVA permet une augmentation significative de la hauteur vertébrale avec un gain de 13% après arthrodeèse par voie postérieure, 38% lors d'une AVA isolée, et 65% après une arthrodeèse circonférentielle combinant voies postérieure et antérieure dans le même temps chirurgical ( $p = 0,0001$ ). Cependant, l'AVA n'améliore pas significativement l'angle de cyphose vertébrale régionale ( $p = 0,08$ ), excepté dans les cas d'AVA isolée dans les fractures du rachis thoracique ( $p = 0,03$ ). On ne note pas de différence significative en comparant l'angle de cyphose vertébrale régionale ainsi que la hauteur vertébrale en postopératoire immédiat, à 3 mois, et 1 an postopératoire ( $p = 0,6$ ). Une fusion complète a été observée de manière systématique à 1 an. L'utilisation de rhBMP2 dans des cas sélectionnés apparaît comme une alternative sûre et fiable. Aucune infection ni révision chirurgicale n'ont été observées après AVA.

**Conclusion.** – L'AVA avec implantation d'une EPVBC, dans le cadre des FTLI, est une procédure sûre et efficace, permettant une conservation à long terme de la réduction cyphotique et de la hauteur vertébrale. Les complications demeurent acceptables. L'AVA isolée est une alternative fiable en cas de fracture thoracique sans lésion du mur postérieur ni atteinte médullaire. Ces résultats nous ont incités à élargir les indications des abords antérieurs aux pathologies rachidiennes infectieuses et oncologiques.

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## 1. Introduction

Unstable thoracolumbar fractures pose the problem of early and delayed posttraumatic kyphotic deformity. Correction and prevention of kyphotic deformity is therefore a surgical challenge given its impact on clinical outcomes [1–3]. Unstable thoracolumbar fractures with severe kyphotic deformity commonly require posterior fixation via percutaneous or conventional opened procedures. The interest of using an anterior approach in order to correct post-traumatic kyphosis and stabilize these thoracolumbar fractures has previously been demonstrated [4–8]. Therefore, anterior arthrodesis indications for Magerl A.3.2 and A.3.3 burst fractures or in cases of intervertebral disc lesion to prevent delayed kyphosis remains debated but increasingly performed. The anterior approach is commonly performed after the posterior approach. A single anterior approach could be performed in thoracic fractures when there is no injury of the posterior spine wall or no spinal cord lesion. The combination of a posterior and anterior approach should particularly be considered in pseudarthrosis and delayed kyphotic deformity.

The aim of this study was to evaluate, in these different situations, the potential interests, advantages and disadvantages of an anterior approach with expandable vertebral body cage implantation in the management of traumatic spine injury and subsequently discuss surgical perspectives in spine surgery.

## 2. Materials and methods

### 2.1. Study design and patient population

A total of 93 patients were included in this retrospective study, which was approved by the Ethics Committee of the Aix-Marseille University and undertaken after informed consent was obtained from each patient (Table 1). All patients were admitted to our institution for the management of an unstable thoracolumbar fracture (single center study). Inclusion criteria included patients with a burst fracture or unstable vertebral fracture that would require an anterior arthrodesis according to the Load Sharing Classification [9]. The presence of an initial neurologic deficit was not an exclusion criterion. A modified Frankel scale grade was determined (American Spine Injury Association/International Medical Society Paraplegia. International standards for neurological and functional classification of spinal cord injury patients [revised]. Chicago, IL: American Spinal Injury Association, 1992). Patients with a previous medical history of metastatic or evolving cancer, severe osteoporosis, or inflammatory and active infectious disease were excluded from the study. Severe osteoporosis was defined as two or more osteoporotic fracture and confirmed on osteodensitometry.

**Table 1**

Clinical and radiological study baselines.  
Données cliniques et radiologiques de l'étude.

Clinical and radiological study baselines	
Number of patients	93
Sex ratio M/W	50/43
Mean age	41 years
Mean follow-up	22 month
Fractures levels	
T7 to T10	12%
T11 to L1	60%
L2 to L5	28%
Fractures types	
A33	82.5%
A32	10%
C	7.5%
Frankel modified scale	
Grade A	10%
Grade C	2%
Grade D	2%
Grade E	86%
Pseudarthrosis	
18/93	19%
Anterior and posterior approach	
85/93	91%
During the same session	
12/85	14%
Anterior approach alone	
8/93	9%
RhBMP-2 implantation	
38/93	41%

M: man; W: woman.

Initial CT-scanning was routinely performed to classify the fracture, determine the need for an anterior intervertebral graft and establish radiographic measurements. Preoperative MRI was performed in most cases to assess neurological lesions, as well as disc and soft tissues lesions.

Patients were evaluated early after surgery, at 3 months, and 1 year, then annually thereafter. Postoperative radiographic evaluation included a CT-scan in all the cases, to measure the restored vertebral body height, and regional and vertebral kyphosis.

Pain was evaluated using a visual analog scale (VAS) in the pre-operative period, on the day of discharge, at 3 months (87 patients) and 1 year after surgery (68 patients). Functional outcome was evaluated using the Oswestry Disability Index at 1 year postoperatively in the 68 patients available at that follow-up time [10]. Disability was considered minimal between 0–30%, moderate between 31–50% and severe between 51–100%.

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