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Original article

## Cervical spine fractures in patients with ankylosing spondylitis: Importance of early management



*Fractures rachidiennes chez des patients atteints de spondylarthrite ankylosante : intérêt d'un traitement précoce*

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### ABSTRACT

**Introduction.** – Ankylosing spondylitis (AS) affects 0.5% of the population. Alteration of the biomechanical properties of the spine related to AS explains the high prevalence of traumatic vertebral fractures and risk of instability. At admission, 65% of patients present neurological signs. There are no reported studies regarding secondary neurological deterioration. The aim of this study was to evaluate the rate of secondary neurological deterioration before surgical treatment of spine fracture in a context of AS.

**Methods.** – This retrospective cases series consisted of patients admitted for traumatic cervical spine fractures or luxation in a context of AS between June 2007 and December 2012. Clinical status was evaluated using Frankel classification at time of trauma, at admission to the neurosurgery ward, as well as before and after surgery. Delay between trauma and admission, and between admission and surgery was recorded. Causes of morbidity, mortality and surgical management were discussed.

**Results.** – During the study period, seven patients were admitted for traumatic cervical spine fracture or luxation. All patients were autonomous before trauma. Between trauma and transfer to neurosurgery ward, the status of four patients worsened. Mean delay between trauma and admission was 12.9 days (range 1 to 60 days). Between admission to neurosurgery ward and surgical treatment, two more patients worsened and only two patients remained autonomous. Mean delay between admission and surgery was 15.7 h (range 2 to 24 h). Neurological deterioration was due to both deterioration during transfer despite immobilization with a rigid cervical collar and failure of X-ray to reveal any fractures, in two and three cases respectively. After surgery, clinical status remained unchanged in two patients, four patients improved, and one patient worsened. Two patients died from respiratory failure a few days after surgery due to neurological deterioration. Five patients had a delayed diagnosis (> 24 h).

**Conclusion.** – Cervical spine fracture in AS is a serious condition with high instability. Our series emphasizes the necessity of early surgical treatment because of risk of secondary neurological deterioration in cases of delayed treatment. CT scan must be the gold standard for exploration of these patients.

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### R É S U M É

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Spondylarthrite ankylosante

Fracture vertébrale cervicale

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**Introduction.** – La spondylarthrite ankylosante (SPA) touche 0,5% de la population. Les fractures vertébrales traumatiques sont une complication fréquente de la SPA dues à une altération des propriétés biomécaniques du rachis. Ces fractures sont instables et s'accompagnent fréquemment de lésions neurologiques. Soixante-cinq pour cent des patients présentent un déficit neurologique à l'admission. À notre connaissance, il n'existe pas d'étude concernant la dégradation neurologique secondaire avant prise en charge de telles fractures. Le but de cette étude était d'évaluer le taux de dégradation neurologique secondaire de ces patients avant traitement.

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**Méthodes.** – Nous avons étudié de manière rétrospective 7 cas consécutifs de fractures cervicales dans un contexte de SPA admis au service de neurochirurgie du CHU de Rouen entre juin 2007 et décembre 2012. Nous avons évalué le statut clinique par le score de Frankel au moment du traumatisme, de l'admission, avant et après traitement ainsi que le délai entre traumatisme et admission, et entre admission et chirurgie. Les causes de morbidité et mortalité ainsi que le type de traitement chirurgical étaient discutés.

**Résultats.** – Durant la période de l'étude, 7 patients ont été reçus au CHU de Rouen pour une fracture vertébrale cervicale dans un contexte de spondylarthrite ankylosante. Tous les patients étaient autonomes avant le traumatisme. Entre le traumatisme et l'admission dans le service de neurochirurgie 4 patients s'étaient aggravés. Le délai moyen entre le traumatisme et l'admission était de 12,9 j (entre 1 jour et 60 jours). Cinq patients avaient un diagnostic retardé (> 24 h). Entre l'admission et le traitement chirurgical, 2 patients se sont aggravés et seulement 2 demeuraient autonomes. Le délai moyen entre l'admission en neurochirurgie et l'intervention était de 15,7 h (entre 2 h et 24 h). Les causes de dégradation neurologique étaient : 2 détériorations pendant le transfert malgré une minerve rigide, et 3 fractures non diagnostiquées sur les radiographies. Après traitement, le statut clinique est resté inchangé chez 2 patients, 4 patients ont eu une récupération partielle et 1 patient s'est dégradé. Deux patients sont décédés d'une détresse respiratoire d'origine neurologique.

**Conclusion.** – Les fractures vertébrales cervicales chez les patients atteints de SPA sont une pathologie mettant en jeu le pronostic vital et fonctionnel. Notre série est en faveur d'un traitement rapide du fait du risque de détérioration neurologique. Le scanner du rachis est l'examen de première intention en cas de SPA.

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## 1. Introduction

Ankylosing spondylitis (AS) affects 0.5% of the global population [1]. An inflammatory process results in paravertebral benign ossification that bridges the small vertebral joints of the spine [2,3]. The consequences of this extensive spinal ossification are essentially sagittal deformation such as kyphosis and loss of flexibility, constituting risk factors for spine trauma.

The relative risk of traumatic vertebral fractures in patients with AS has been estimated as 3 times higher than in the global population [4]. These spine traumas, which are located at cervical level in 81% of patients [1,5], are complicated by neurological lesions in 65% of patients [2,6–8]; probably due to the high instability of these fractures. There is scarcity of data in the literature on the timeline of these neurological deteriorations, and particularly whether post trauma instability is taken into account in patient management. The basic question was to analyse the role of instability in secondary neurological deterioration, which could be avoided by optimal management.

The aim of this study was to evaluate the rate of secondary neurological deterioration before treatment, in a consecutive series of patients with cervical spine fracture in a context of AS.

## 2. Patients and method

This retrospective study consecutively enrolled a series of patients with AS admitted to the neurosurgery department of Rouen University Hospital for traumatic cervical spine fracture between June 2007 and December 2012.

The primary objective of our study was to evaluate the prevalence and timing of secondary neurological degradation before fracture osteosynthesis and after surgical treatment. The secondary objectives were to analyse functional results at 6 months, causes of neurological degradation and rate of morbidity and mortality.

The clinical status of each patient was evaluated using the Frankel classification [9] at different times (Table 1): initial trauma (T0), admission to neurosurgery ward (T1), immediate preoperative period (T2), and discharge (T3). According to the Frankel classification, grades D and E were considered as favourable (independent patients) and grades A, B and C as unfavourable (dependent patients).

Secondary neurological deterioration was defined as the loss of at least one grade in preoperative or postoperative period during

the different intervals T0–T1, T1–T2 and T2–T3. Severe secondary neurological deterioration was defined as loss of two or more grades.

The circumstances of spine injury were described. Radiological findings were reported taking into account the vertebral location and type of vertebral fracture. Three types of lesions were found: Tear-drop fracture, Chance fracture and fractures associated with uni- or bilateral articular luxation.

All patients were transported to the neurosurgery ward with a rigid cervical collar. Then, in cases of articular luxation, cervical traction was used, to immobilize the spine and prevent movement in order to reduce luxation before surgery. The weight used for cervical traction corresponded to 5% of the patient's weight. Traction took into account former spine deformity and respected pre-existing kyphosis since any hyperextension movements might cause neurological degradation. Reduction was monitored by X-ray following cervical traction. If there was no luxation, fractures were immobilized with a rigid cervical collar.

After reduction and immobilization, all fractures were surgically stabilized by osteosynthesis. Postoperative CT scan evaluated quality of implantation, and, new clinical evaluation was performed prior to discharge. Clinical outcomes at 6 months were estimated (Fig. 1).

## 3. Results

Between June 2007 and December 2012, seven consecutive patients (sex ratio M/F 2.5; mean age 65.3 years, range: 47–89) with AS were admitted for traumatic cervical spine fracture and/or luxation (Table 1). As regards their comorbidities, two patients were on anti-platelet drugs after a coronary by-pass, one patient had osteoporosis and one had diabetes. As detailed in Fig. 2, at time of trauma (T0), all seven patients were autonomous, with four and three patients in Frankel E and Frankel D classification respectively. The fracture was caused by a fall at patient height in three patients (cases 2, 6, and 7), by a fall from a ladder in two patients (cases 4 and 5), and by a road accident in two patients (cases 1 and 3). The mechanism of fracture was flexion in three patients, extension in three patients, and compression in one patient. Cervical fractures involved the lower cervical segment (C5–C7) in all patients. There were two chance fractures, three tear-drop fractures and two fractures associated with articular luxation.

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