

## ORTHOPAEDICS

# TWO ADJACENT LEVELS DISLOCATION OF THE CERVICAL SPINE MANAGED VIA AN ANTERIOR ONLY APPROACH

## A Case Report

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**ABSTRACT** • We report the rare case of a 52-year-old man who presented an incomplete tetraplegia after a hang gliding accident. Computed tomography revealed a complete bilateral facet fracture-dislocation at the C4C5 level, with a unilateral facet fracture-dislocation on the left side at the C3C4 level; there was also a sagittal fracture of the fifth cervical vertebra extending through the middle of its body with a second fracture through the posterior arch. The patient was taken urgently to the operating room and closed reduction maneuvers were performed under general anesthesia, followed by an anterior prevascular approach for C3 to C5 fusion with two iliac crest grafts and a plate. Patient's muscle strength was 3/5 on all four limbs on discharge and between 4/5 and 5/5 at one year. He stopped self-catheterization nine months after the accident. At two years follow-up, X-rays and CT scan showed a stable construct with satisfactory fusion. This is the first paper, in the literature, to describe double level contiguous cervical dislocation with a sagittal split fracture, and managed via an anterior only approach.

Keywords: cervical trauma; adjacent dislocations; split fracture; anterior approach

Bourghli A, Vital J-M, Boissière L, Obeid I. Luxation du rachis cervical à deux niveaux adjacents avec traitement chirurgical par voie antérieure unique. *J Med Liban* 2016; 64 (3): 181-185.

**RÉSUMÉ** • Nous rapportons le cas d'un patient de 52 ans ayant présenté une tétraplégie incomplète suite à un accident de parapente. L'imagerie scanner a révélé la présence d'une fracture-luxation bilatérale C4C5, ainsi qu'une fracture-luxation unilatérale gauche au niveau sus-jacent C3C4; on notait aussi un trait de refend sagittal au niveau de la cinquième vertèbre cervicale traversant le corps jusqu'à l'arc postérieur. Le patient a été admis en urgence au bloc opératoire, et une réduction par manœuvres externes sous anesthésie générale des deux niveaux luxés a été réalisée, suivie d'une chirurgie par voie antérieure prévasculaire réalisant une arthrodèse de C3 à C5 avec utilisation de deux greffons iliaques et d'une plaque vissée. La force musculaire aux quatre membres était à 3/5 à la sortie de l'hôpital, et entre 4/5 et 5/5 à un an. Le patient a arrêté l'auto-sondage neuf mois après l'accident. À deux ans, les radiographies et scanner de contrôle ont démontré un montage stable avec une arthrodèse satisfaisante. Il s'agit du premier cas, dans la littérature, décrivant une luxation du rachis cervical à deux niveaux adjacents, et traitée chirurgicalement par une voie antérieure unique.

## INTRODUCTION

Cervical spine injuries are common occurring up to 3% of all trauma patients, with traumatic facet dislocations representing approximately 6.7% of these injuries, most frequently involving the C5C6 and C6C7 levels [1]. Multiple simultaneous spine fractures and dislocations may be present in as many as 4.8% of the patients being treated at tertiary spinal centers [2]; these injuries are usually separated by several spinal segments. The occurrence of two complete cervical dislocations at adjacent levels is very uncommon and was described only one time in the literature [3].

We report the case of a patient who sustained a double level cervical dislocation associated to a split fracture, and managed via an anterior only approach with a short construct.

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## CASE DESCRIPTION

A 52-year-old man presented to the emergency department of our institution, transported by helicopter following a hang gliding accident.

The patient was stabilized per institutional protocol by the trauma team, but complete loss of motor and sensory function below the fifth cervical nerve root was noted at the time of injury. At presentation, neurological examination demonstrated an awake, alert patient, with a diaphragmatic breathing pattern, complaining of severe neck pain, with loss of sensation below the fourth thoracic nerve root level and altered motor function present distal to that of the fifth nerve root confirming tetraparesis with muscle strength between 1/5 and 2/5 on four limbs.

Initial cervical CT scan showed a complete bilateral facet fracture-dislocation at the C4C5 level, with a unilateral facet fracture-dislocation on the left side at the C3C4 level; there was also a sagittal split fracture of the fifth cervical vertebra extending through the middle of its body with a second fracture through the posterior

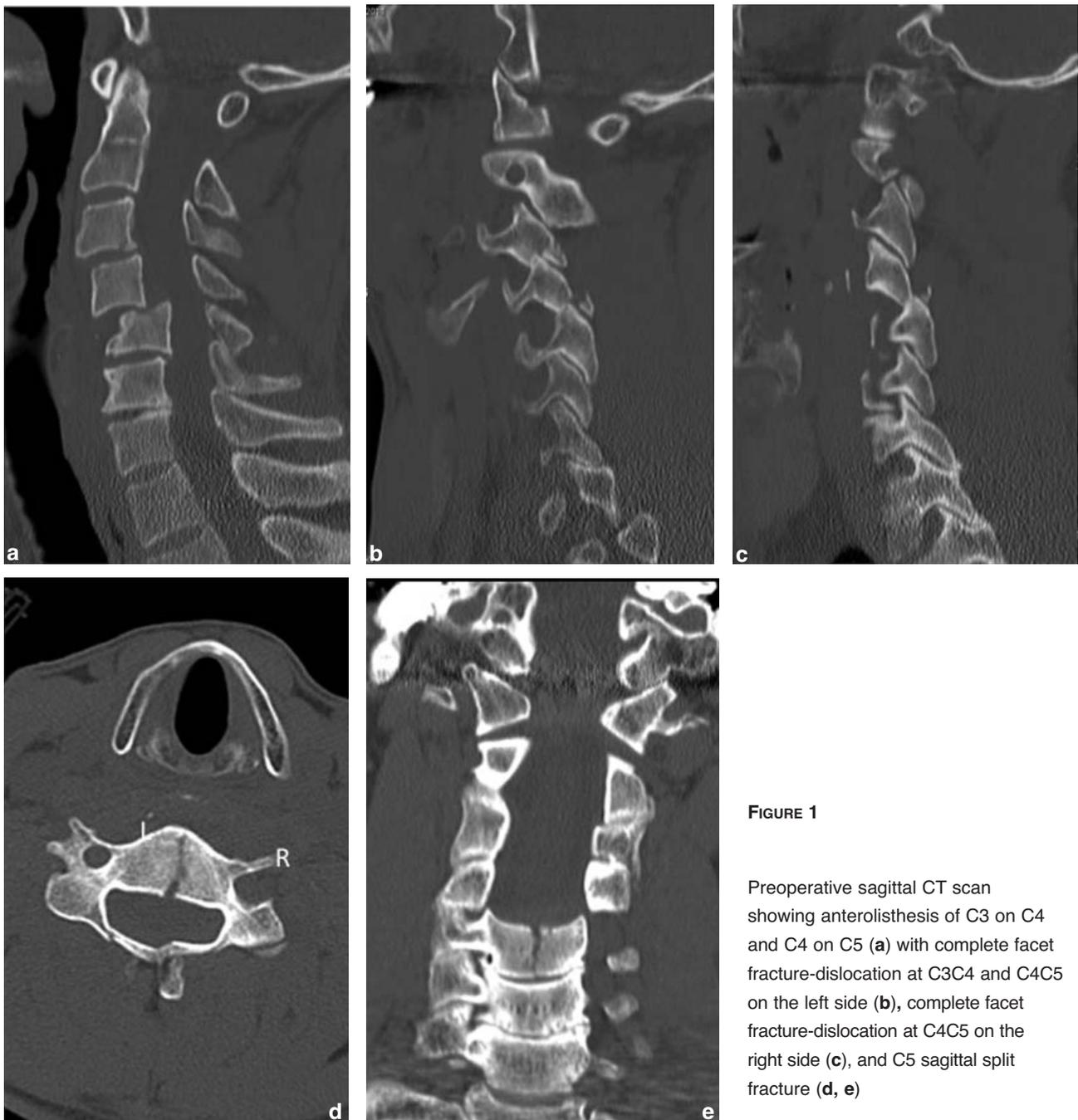
neural arch. Figures 1a to 1e illustrate this complicated fracture dislocation.

Given the tetraparetic presentation, traction with a Gardner-Wells skull tongs was applied in the ER (8 kg) until the preoperative work-up was done; no reduction of the dislocations was obtained.

The patient was then taken to the operating room and closed reduction maneuvers were performed under general anesthesia by the spinal surgeon attempting to reduce both levels dislocations. First, for the bilateral C4C5 dislocation, traction was applied with the neck slightly

flexed until the articular facets were tip to tip, at which time the neck was again extended and dislocation was reduced. Secondly, for the unilateral left C3C4 dislocation, the head was inclined away from the dislocated articulation (toward the right side), when the articular facets were tip to tip, the head was tilted back toward the dislocated side (left side), and the neck was re-extended. Image intensifier screening was used throughout this procedure, laterally for the bilateral dislocation and obliquely for the unilateral dislocation.

This was followed by a classical right Smith-Robinson



**FIGURE 1**

Preoperative sagittal CT scan showing anterolisthesis of C3 on C4 and C4 on C5 (a) with complete facet fracture-dislocation at C3C4 and C4C5 on the left side (b), complete facet fracture-dislocation at C4C5 on the right side (c), and C5 sagittal split fracture (d, e)

anterior approach, the patient being under traction with a slight downward inclination of the operating table. The discs C3C4 and C4C5 were altered as expected, and removed with the posterior longitudinal ligament, the dura mater was noted to be free.

Two monocortical autologous bone graft were taken from the right iliac crest and put in both discs spaces for interbody fusion, stabilization was obtained with an anterior plate extending from C3 to C5 and secured with four long screws (Figure 2). Patient stayed in the surgical intensive care unit for three weeks; he was then discharged to the rehabilitation center, and had to wear a rigid neck collar for two months after the surgery. Regular follow-up showed progressive improvement of the global motor function, with a muscle strength 3/5 on all four limbs on discharge, 4/5 at three months postop, and between 4/5 and 5/5 at one year. He stopped self-catheterization nine months after the accident. X-rays (Figures 3a & 3b) and



**FIGURE 2.** Immediate postoperative lateral X-ray showing the C3C5 anterior fusion with two iliac crest grafts.



**FIGURE 3.** Two years postoperative X-rays showing a stable construct with complete fusion at both levels.

CT scan were done at two years post-surgery and showed complete fusion in good position at both operated levels (Figures 4a to 4c).

#### DISCUSSION

In our described case, two levels dislocations with a sagittal split fracture were involved [4, 5]; the mechanism of injury should include three types of movements, axial loading, flexion and rotation, resulting in compression, shear and rotation forces occurring simultaneously at the concerned levels for the double dislocation to occur. Shear forces probably disrupt the posterior ligaments and facet capsules, and associated to compression forces, they caused the bilateral C4C5 dislocation with the sagittal fracture of C5 vertebral body and posterior arch, the rotation force added to the two previous ones caused the C3C4 asymmetrical dislocation.

Management of such a complicated fracture dislocation can be very challenging. It should include a quick reduction of the dislocations, associated to a spinal fixation and fusion by either an anterior, or posterior, or a double approach. Success rate of reduction and potential for recovery from neurological deficits are higher when reduction is achieved within the first four hours after the initial injury [6]. Rapid traction under sedation with the use of heavy weights and close monitoring is a safe and successful technique, bringing the reduction of unilateral or bilateral facet dislocations in an average of 21 minutes [7]. This first step of reduction was unfortunately not successful in our case and the patient was taken quickly to the OR for the second step of reduction that is the closed manipulations under general anesthesia. These kinds of traction maneuvers using the skull tongs should be performed one or at most two times before proceeding to

surgical maneuvers, and under control of the image intensifier screening. In our case, these maneuvers succeeded in reducing both levels dislocations, but in case the manipulations fail, surgical reduction should be performed.

Surgical management represents an area of great controversy among spinal surgeons for the treatment of cervical spine dislocations [8], because it can actually be done by either, anterior, or posterior, or a combined approach [9]. The posterior approach is advocated for its ability to perform the reduction with direct vision and control of the facets, fixation can be done by either lateral mass [10] or pedicle screws. Main drawback of the posterior approach is the lack of a good anterior support because the disc is always torn in the case of a dislocation with poor chances of healing which may increase the probability of failure. The anterior only approach was widely described in the literature [11, 12], it is an interesting option for several reasons: it is unnecessary to turn the patient, discectomy frequently enables effective reduction of the dislocation if not reduced by external maneuvers, and interbody fusion offer reliable mechanical stability with rapid taking of the graft. In a Cochrane review, Del Curto [13] showed that very low quality evidence from two trials indicated little difference in long-term neurological status, pain or patient-reported quality of life between anterior and posterior surgical approaches to the management of individuals with subaxial cervical spine facet dislocations, but sagittal alignment may be better achieved with the anterior approach.

In regard to the single case of cervical dislocation at two adjacent levels described in the literature [3], it is quite similar to our case with a two levels anterior dislocation, one bilateral C5C6 and one unilateral C6C7, associated to a split fracture of C6; the dislocations

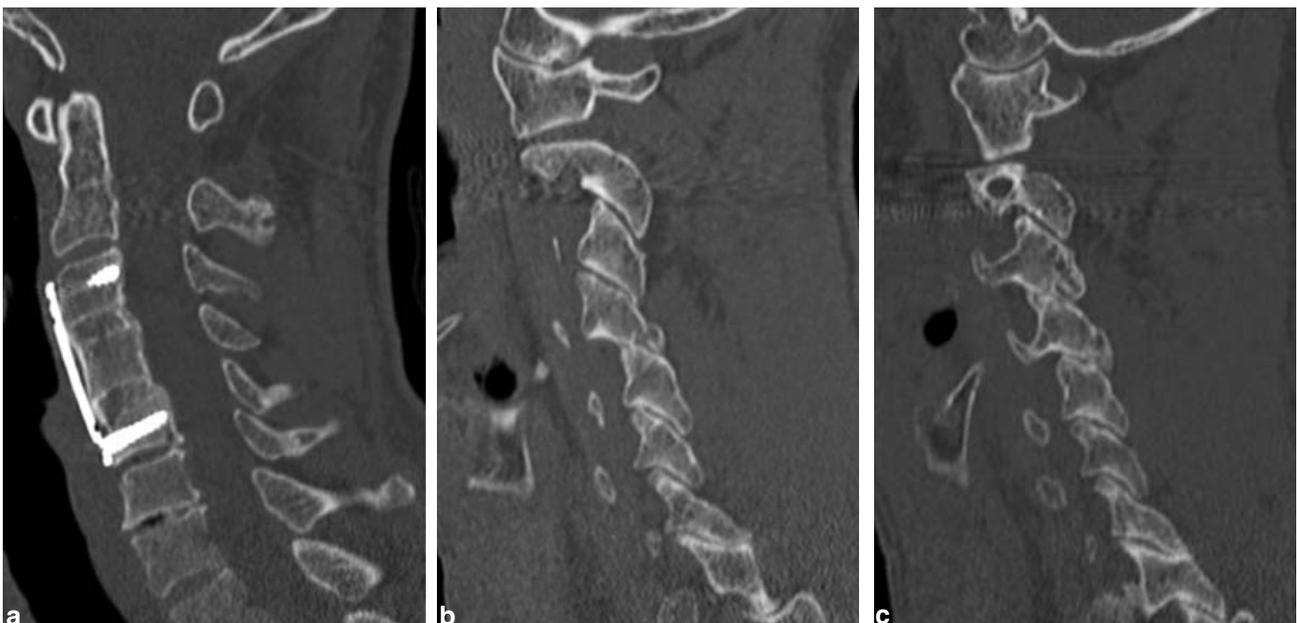


FIGURE 4. Two-year postoperative CT scan confirming the fusion.

occurred at the most commonly concerned levels in these kind of injuries i.e C5C6 and C6C7 whereas in our case, it occurred at higher uncommon levels i.e. C3C4 and C4C5. Management of the aforementioned case consisted of an only posterior approach with fixation from C4 to T1 using a wire and iliac crest bone graft, therefore the fixation extended from one level above to one level below the concerned injured levels. For our patient, the anterior only approach enabled a short fusion between C3 and C5, only at the injured levels, with a complete fusion seen on CT scan.

This is the first case in the literature describing double level contiguous cervical dislocations with a sagittal fracture, and managed via an anterior only approach with good clinical and radiological outcome. We think that the anterior only approach is suitable even in such a complicated fracture-dislocation, it enables saving levels in the instrumentation with satisfying postoperative mobility and fusion.

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