Traumatic injury of the transverse atlantal ligament: Identification of instability in the case without apparent misalignment.

Lesão traumática do ligamento transverso do atlas: Identificação de instabilidade no caso sem desalinhamento aparente

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RESUMO

Palavras-chave: ligamento transverso do atlas, trauma raquimedular, intervalo atlandoental, instabilidade atlantoaxial, diagnóstico radiológico

ABSTRACT
Introduction. In some cases C2 may suffer only rotational dislocation around its own axis (dens), causing no increase in the atlantodental interval (ADI), making it difficult to diagnose the instability in static radiographies. Objective. To report a case of atlanto-axial traumatic subluxation, without bony injury or displacement, in which the diagnosis cannot be achieved through conventional radiology and computed tomography, and discuss the types of transverse ligament injuries, its diagnosis, the instability and their treatment. Methods. A 61-year-old man, victim of head (occipital), complaining neck. Static radiographies and CT scan of cervical spine were performed, demonstrating no abnormalities. Flexion and extension cervical radiography revealed an increase of ADI in flexion, indicating instability and damage to the transverse atlantal ligament (TAL). The MRI of the cervical spine demonstrated the discontinuity of the TAL, configuring an injury to the structure of the ligament. The patient underwent to early surgery with C1-C2 fixation using the Goel-Harms’ technique. Results. The diagnosis could be revealed only in dynamic radiographs or MRI study. The patient presented complete improvement of symptoms. Conclusions. The use of cervical dynamic radiography and / or magnetic resonance imaging allowed the diagnosis of instability and visualization of the TAL injury, avoiding the lack of diagnosis with its consequences. The MRI allows a direct view of the ligament injury, their classification and the prognostic evaluation of the injury, guiding the therapy, surgical or conservative.

Key words: Transverse atlantal ligament, cervical spine trauma, atlantodental interval, atlantoaxial instability, radiologic diagnosis

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INTRODUCTION

The clinical instability is defined by White and Panjabi as the loss of ability of the spine under physiological loads to maintain its alignment so there is no initial or additional neurological deficit, no major deformity, and no pain [7]. The presence of fractures or misalignments (luxations/subluxations) contributes to the suspicion and identification of post-traumatic instability.

The anterior dislocation of C1 on C2 allows the diagnosis, by increasing the atlantodental interval (ADI). In some cases C2 may suffer rotational dislocation around its own axis (dens), causing no increase in the ADI, making it difficult to diagnose instability in static radiographies.

We describe a case of atlanto-axial traumatic subluxation, without bony injury or displacement, determined solely by rupture of the substance of the transverse atlantal ligament (TAL), in which the diagnosis cannot be achieved through static radiography and computed tomography, and discuss the types of transverse ligament injuries, its diagnosis, the instability and their treatment.

CASE

A 61-year-old man, victim of falling roof with a head trauma (occipital), complaining neck pain and “shock starting in the neck and irradiating to the occipital region and dorsal spine” when flexing the neck, with no neurological deficits.

Anteroposterior, lateral and open mouth radiographies (Figure 1) and CT scan of cervical spine (Figure 2) were performed, demonstrating no abnormalities. As the patient remained symptomatic was performed a flexion and extension cervical radiography that revealed an increase of ADI in flexion, indicating instability and damage to the TAL (Figure 3). The MRI of cervical spine demonstrated the discontinuity of the TAL, configuring an injury to the structure of the ligament (Figure 4).

The patient underwent to early surgery with C1-C2 fixation using the Harms technique [3] (screws in the lateral masses of C1 and C2 pars) (Figure 5), and presented complete improvement of symptoms.
The atlanto-axial instability can occur because fractures in C1, C2, or in isolated lesions of the transverse atlantal ligament. In these types of injuries often the patient is neurologically intact, only complaining neck pain.

Classically, it has been used the Spence’s rule [6] for diagnosis of TAL lesions, which claims to be likely the lesion if in open mouth radiography the total amount of overlap of both lateral masses of C1 on C2 is $\geq 6.9$ mm. These criteria are useful in injuries as Jefferson’s fractures (burst fracture of the atlas), when a spreading of the lateral masses is seen, which does not occur in the C1-C2 subluxation without associated fractures.

Studies with static radiographs and CT scans of cervical spine may not show an injury to the TAL, without misalignment at rest and no fracture of lateral mass of C1. The dynamic study (flexion / extension X-rays) can reveal an ADI increased in the flexion position and the MRI can demonstrate the rupture of the ligament.

The classical biomechanical study of instability after TAL injury, conducted by Oda et al, showed that in the most of ligament injuries the ADI is increased in the dynamic radiographs. The authors propose the flexion/extension X-rays of cervical spine as the most important diagnostic method of C1-C2 instability [5].

With the advent of MRI, Dickman et al. performed a study about the transverse atlantal ligament injuries and suggested a new classification for these lesions, separating them into ruptures of the substance of TAL (type I) and fractures and avulsions involving the tubercle for insertion of the TAL in the lateral mass of C1 (type II) [1]. The study by Dickman et al., in contrast to the biomechanical study of Oda et al., suggests the MRI as a key test for the diagnosis of TAL injuries and states that normal relationships of C1 lateral masses on open-mouth radiographs or a normal atlantodental interval on lateral cervical radiographs does not exclude transverse ligament injury. Further, they don’t advocate the use of flexion and extension radiographs in patients with extensive fractures of C1 or C2, even if the ADI is normal on static radiographs, because of the risk of neurological damage.

In this report we describe a case of pure lesion of the transverse ligament (type Ib of Dickman), in which the patient complained it only for neck pain and Lhermitte’s signal in the cervical flexion, without neurological deficit. X-rays showed no fracture or misalignment which would indicate the diagnosis. Due to the maintenance of symptoms was performed a computed tomography, which also was unable to diagnose any injury that justified the clinical status of the patient.

The cervical radiographs on flexion and extension demonstrated the mechanical consequence of the ligament injury, the increase of the ADI. Later, the MRI showed clearly the breakdown of the substance of TAL, featuring an injury type Ib of Dickman.

According to Dickman et al. transverse ligament lesions in avulsion (type II) present high rate of healing with conservative treatment (external immobilization), different from lesions of the substance of TAL (type I), in which the possibility of resolution without surgery is very remote, being the early surgery for internal fixation the best treatment in these cases.

Surgical treatment of such injuries involves restraint the atlas against the axis. There are several techniques able to achieve that goal. Many biomechanical studies suggest that the well-established systems of wires or cables are unable to stabilize movements of rotation. Systems with screws, transarticular C1-C2 screws or lateral masses of C1 and pars or pedicles of C2 screws, are more acceptable options for rigid fixation in the atlantoaxial segment [2,4].

A frequent mistake in surgical treatment of C1-C2 instability is to include the occipital in the fixation, which promotes unnecessary increase in the craniocervical restriction. C1-C2 instability leads to fixing C1 and C2.

The presentation of this case report demonstrates the difficulty in diagnosing pure injuries of transverse ligament, without bony lesion or evident misalignments. High index of suspicion in patients with normal cervical static radiographs and CT scans and which maintains neck pain can lead to the diagnosis.

The use of cervical dynamic radiography and / or magnetic resonance imaging allows the diagnosis of instability and visualization of TAL injury, avoiding lack of diagnosis with its consequences, including pseudoarthrosis, recurrent symptoms and neurological damage.

The MRI allows direct view of ligament injury, their classification and the prognostic evaluation of the injury, guiding the therapy, surgical or conservative.
REFERENCES


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