

Case Report

Traumatic atlantoaxial rotatory fixation associated with C2 articular facet fracture in adult patient: Case report

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Journal of Craniovertebral Junction and Spine 2014, 5:40

Abstract

Traumatic atlantoaxial rotatory fixation is a very rare injury in adults which is often misdiagnosed initially. Its combination with C2 fractures is predominated by dens lesions. Therapeutic management is challenging because of the difficulty to achieve optimal reduction and permanent stability. We report a rare case of traumatic atlantoaxial rotatory fixation in a 56-year-old women associated with C2 articular facet fracture successfully treated by conservative means after patient-awake manual reduction with optimal functional and radiographic outcome.

Key words: Atlantoaxial joint, cervical spine, injury, rotatory dislocation, reduction

INTRODUCTION

Traumatic atlantoaxial rotatory instability is a rare entity in adults. Moreover, they are often misdiagnosed on the initial radiographic and clinical evaluation. This delay in diagnosis may affect the treatment because conservative treatment is usually successful, but occasionally may require open reduction if diagnosis is delayed.

Due to its rarity, the terminology associated with traumatic rotatory injuries at the atlantoaxial level is somewhat confusing, as far as the mechanics of injury.

We report a rare case of acute post-traumatic atlantoaxial rotatory fixation (AARF) associated with C2 articular facet fracture in an adult that was treated successfully by conservative means.

CASE REPORT

A 56-year-old female was involved in a head-on collision between two vehicles. She wasn't wearing a seatbelt. She was transported to the nearest hospital. The chief complaint was posterior neck pain. The neurologic examination was normal. She was treated with analgesic drug. The patient came back after three days in our emergency with a severe torticollis, with an upper cervical spine pain associated with restricted and painful neck movement. On physical examination, the cervical spine was tender and right sided torticollis was present [Figure 1]. There was no obvious injury to the posterior soft tissues of the cervical spine. Neurological exam was normal.

Cervical spine radiographs demonstrate straightening and mild scoliotic change of the cervical spine. A cervical computed tomography (CT) scan with 3D reconstructions revealed anterior dislocation of the right lateral mass of C1 and posterior dislocation of the left lateral mass of C1. In addition, fracture of the C2 right superior articular facet was noted [Figures 2 and 3].

A manual manipulation was then attempted while patient was awake. At first, we held the mandible, providing traction in the cephalic direction, confirming that the patient did not develop pain or palsy in the upper extremities, and rotated it slowly

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	DOI: 10.4103/0974-8237.147083

to the left to obtain a feeling of reduction. Immediately after reduction, cervical pain was alleviated and no neurological complications were observed. A repeat plain radiograph and CT scan confirmed anatomical reduction [Figure 4].

Halo-vest immobilization was applied for 3 months. At 3 months after the halo-vest immobilization, flexion-extension cervical spine radiographs and CT scans showed healing of the articular facet fracture in an acceptable position with any residual C1-C2 asymmetry [Figure 5]. One year after the injury, she had a good range of neck movements, she was free of pain and torticollis, and returned to her normal daily activities.

DISCUSSION

AARF is a rare pathology of the adult upper cervical spine; it was described for the first time in 1907 by Corner^[1], although this pathology is reported to occur frequently in children^[2]; Venkatesan, in an English review of the literature, reported only 12 previous cases happened in the adult population of pure AARF.^[3]

The prevalence of rotatory dislocation in children may be attributed to specific anatomical features such as a relatively large head, the underdeveloped neck musculature, and the increased laxity of the joint capsule and the horizontal configuration of the C1-C2 articular facets. In children, this is usually seen after infection or inflammation of the surrounding tissues [Grisel's

syndrome], and is thought to be secondary to synovial joint effusion and neck muscle spasm.^[4]

Traumatic adult AARF as in the present case is reported very rarely, and frequently caused by high energy trauma, such as that sustained in traffic accidents or falls and often generated lethal injury.^[5,6]

Although the pathophysiology of AARF is not well-defined; anteroposterior stability of the atlantoaxial joint is primarily maintained by the transverse ligaments, alar ligaments, and the facet joint capsule. The alar or check ligaments are mostly responsible for rotational stability, as they limit rotation to 50°^[7]; there is evidence from cadaveric dissection and magnetic resonance imaging (MRI) studies to suggest that the pathologic mechanism by which rotatory dislocation occurs is through disruption of the facet capsule followed by alar ligament disruption. The lateral mass of the atlas rotating posteriorly locks behind the ipsilateral lateral mass in severe forms of atlantoaxial rotatory instability.^[3]

AARF can also be associated with fractures, due to a combination of bone and ligament disruption but this association is very rare;



Figure 1: Initial examination showing right-sided torticollis without neurological deficit

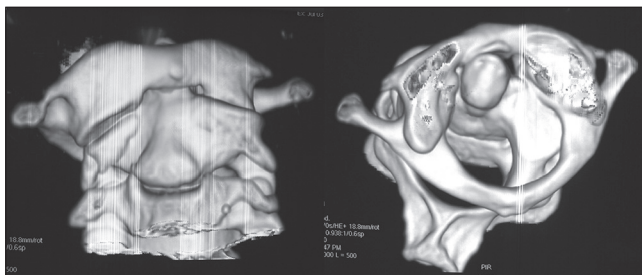


Figure 3: Tridimensional reconstruction showing Fielding type I atlantoaxial dislocation with right C2 superior facet fracture



Figure 2: Sagittal reconstruction of cervical computed tomography (CT) scan showing fracture of the right superior facet of the axis and posterior atlantoaxial dislocation



Figure 4: Post-reductional frontal computed tomography (CT) scan reconstruction control showing achieved reduction



Figure 5: Third month computed tomography (CT) scan control showing optimal stability and healing of the C2 facet fracture

C2 fractures are relatively the most frequently founded, and only six such cases have been reported in the literature^[8,9]; but AARF in combination with an articular facet fracture, like in our case, is an extremely rare injury and to the best of our knowledge only Seybold described similar case.^[10] However, because of the complexity and heterogeneity of these fractures, they are usually lumped under the descriptive category of “miscellaneous C2 fractures” in most published reports.^[8]

Fielding and Hawkins described four types of AARF.^[11] This classification, which has been widely accepted, correlates with an increasing risk of spinal instability and potential neurological impairment. This case was categorized as Type I. There is translation of facets without a corresponding increase of the atlantodens interval and the rotation is within the normal range of atlantoaxial rotation. It is the only type that can occur without the rupture of ligaments, with the dens acting as the pivot. A type I injury was the most common deformity, and the most difficult to recognise on X-ray.^[12] In a typical AARF, the patient presented with torticollis, a painful neck, and without neurologic symptoms after high-energy trauma. A high index of suspicion, thorough clinical examination and appropriate imaging, are mainstay in obtaining an early diagnosis of this condition. The plain radiographic findings are non-specific and may sometimes be difficult to demonstrate, due to difficulties in positioning and in radiographic interpretation.^[13]

CT scanning is considered the best method to detect this abnormality^[14], and three-dimensional CT reconstruction is an additional aid in demonstrating subluxation. CT scan also allows an excellent demonstration of abnormal C1-C2 relationships, visualizing the dislocation, determining whether it is unilateral or bilateral, and looking for fractures. Three-dimensional reconstruction images give a global view of the cervical deformity. MRI can offer direct visualization of tear or avulsion of the transverse ligament.^[15,16]

The goals of treatment are to restore the normal pain-free range of motion, prevent or reverse any neurologic compromise, and restore the spinal stability. The treatment options include

conservative care, immobilization, traction, manual reduction, and surgery. Conservative treatment is the first step to treat fixed AARF if the transverse ligament is intact.^[5]

Therapeutic management of rotatory dislocation with Fielding type I involves reduction using the traction method and immobilization with either a halo vest or different types of collars for 6–12 weeks has achieved good long-term rotational stability in most cases.^[3] Venkatesan *et al.*,^[3] reported two cases of AARF and commented that early recognition of atlantoaxial rotatory subluxation or dislocation is essential to successfully achieve closed reduction. Weißkopf *et al.*,^[5] pointed out that the success rate of conservative treatment decreases in proportion to the length of the dislocation treatment interval.

Surgical stabilization is advised for cases of AARF showing spinal instability, neurological deficit, delayed diagnosis, failed reduction, ligamentous disruption, and/or recurrent dislocation.^[11,17]

Our patient presented with an acute case of Fielding type I AARF with no neurological symptoms. We therefore performed manual reduction with the patient awake, and cervical pain was alleviated after reduction. Only Han *et al.* have described awake manual reduction without the need for anesthesia^[18], but this kind of manual reduction should be performed as soon as possible by experienced surgeons close to a functional operating theater.

Definitive treatment of this injury is still open for discussion. In general, all atlantoaxial dislocations require some form of immobilization, either internal or external.

Our patient presented with a rotatory atlantoaxial dislocation accompanied by a superior articular facet fracture of C2. She was treated successfully by conservative means. One year after the injury, she had a good range of neck movements; she was free of pain and torticollis, and returned to her normal daily activities.

CONCLUSION

Early diagnosis of AARF improves outcomes with no operative management, but requires a combination of clinical assessment and appropriate radiographic imaging. To our knowledge, this is the second cases of AARF with C2 lateral articular facet fracture that has successfully treated with conservative means.

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How to cite this article: Bellil M, Hadhri K, Sridi M, Kooli M. Traumatic atlantoaxial rotatory fixation associated with C2 articular facet fracture in adult patient: Case report. *J Craniovert Jun Spine* 2014;5:163-6.

Source of Support: Nil, **Conflict of Interest:** None declared.