

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

ScienceDirect

journal homepage: [www.elsevier.com/locate/radcr](http://www.elsevier.com/locate/radcr)

## Case Report

# Atlantoaxial rotatory subluxation presenting as acute torticollis after mild trauma ☆☆☆,★,★★

Megan R. Greenberg, BS<sup>a,\*</sup>, Jason L. Forgeon, MD<sup>a</sup>, Lisa M. Kurth, MD<sup>b</sup>,  
Robert D. Barraco, MD MPH<sup>c</sup>, Pratik M. Parikh, DO<sup>a</sup>

<sup>a</sup> Lehigh Valley Health Network, Department of Emergency and Hospital Medicine/USF Morsani College of Medicine, Cedar Crest Boulevard & I-78, Allentown, PA 18103, USA

<sup>b</sup> Lehigh Valley Health Network, Department of Surgery/USF Morsani College of Medicine, Cedar Crest Boulevard & I-78, Allentown, PA 18103, USA

<sup>c</sup> Lehigh Valley Health Network, Trauma Surgery/Critical Care, Department of Surgery/USF Morsani College of Medicine, Cedar Crest Boulevard & I-78, Allentown, PA 18103, USA

## ARTICLE INFO

## Article history:

Received 25 June 2020

Revised 12 August 2020

Accepted 13 August 2020

## Keywords:

AARS

Torticollis

Minor trauma

## ABSTRACT

Atlantoaxial rotatory subluxation (AARS) is a rare outcome of trauma in adults. We present a case of a 38-year-old female who presented with neck pain and stiffness after a mild trauma. On exam the patient had a “cock-robin” position, comparable to acute torticollis. Computerized tomography demonstrated findings consistent with AARS. Reduction was performed in the emergency department and the patient had no further neurological sequelae. Recognition of AARS after trauma requires a high index of suspicion and early diagnosis is important to best patient outcomes.

© 2020 The Authors. Published by Elsevier Inc. on behalf of University of Washington.

This is an open access article under the CC BY-NC-ND license.

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

## Introduction

Cervical spine injuries occur in 2.4% of blunt traumas [1]. Atlantoaxial rotatory subluxation (AARS) is a rare outcome of trauma in adults [2]. As reported by Rahimizadeh et al in 2010, in the 20th century, there were only 57 adults with reported cases of atlantoaxial rotatory fixation, a term that

encompasses rotatory displacement arising from either subluxation or dislocation [2]. In the pediatric population, AARS is more common and can be spontaneous or seen in trauma, particularly with congenital malformation; 1 multicenter cohort showed that of children with blunt trauma related cervical spine injury, AARS accounted for 10% of injuries [3]. In adults, it can lead to a catastrophic outcome with neurological morbidity if the diagnosis is delayed [4].

☆ Author contributions: All authors provided substantial contributions to manuscript content. All authors gave final approval of the version of the article to be published.

☆☆ The authors have no outside support information, conflicts or financial interest to disclose.

★ Authors would like to acknowledge M. Rayl for formatting and editing.

★★ Conflicts of Interest: None.

\* Corresponding author.

E-mail address: [greenberg5@usf.edu](mailto:greenberg5@usf.edu) (M.R. Greenberg).

<https://doi.org/10.1016/j.radcr.2020.08.028>

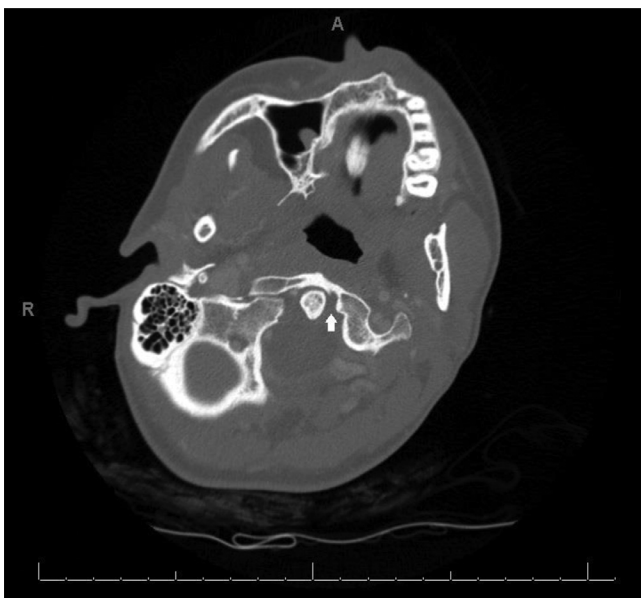
1930-0433/© 2020 The Authors. Published by Elsevier Inc. on behalf of University of Washington. This is an open access article under the CC BY-NC-ND license. (<http://creativecommons.org/licenses/by-nc-nd/4.0/>)



**Fig. 1** – Initial presentation showing patient with acute torticollis, or “cock-robin” head position.



**Fig. 3** – Coronal view of the CT of cervical spine again demonstrating asymmetry of odontoid lateral mass interspaces (arrow).



**Fig. 2** – Axial view of the CT of cervical spine shows rotation of the atlas (C1) on a fixed axis (C2) with decreased distance between the odontoid (C2) and lateral mass of the atlas (C1) indicating atlantoaxial rotatory subluxation (arrow).

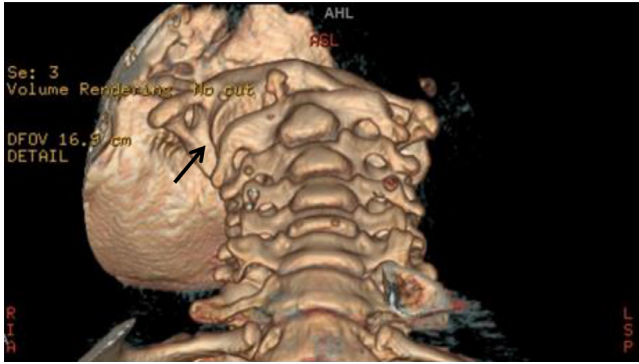


**Fig. 4** – Sagittal view of CT of cervical spine showing prevertebral soft tissue edema from C3-C5 (black arrow).

The most common presentation of AARS is a “cock-robin” position of the neck followed by a suboccipital headache [5]. This looks like torticollis, with the head tilted to 1 side, rotation to the contralateral side, and decreased range of neck motion [6]. We describe a case of AARS presenting as acute torticollis after mild trauma in a middle-aged female.

### Case Report

A 38-year-old female patient with a history of migraines presented to the emergency department (ED) with a chief complaint of neck pain and stiffness, stating “I can’t turn my head.” Patient reported that 5 days earlier her son reached over and with 2 fingers quickly pulled her chin to her left side. Thereafter, she had severe neck pain. Pain was greater on the right

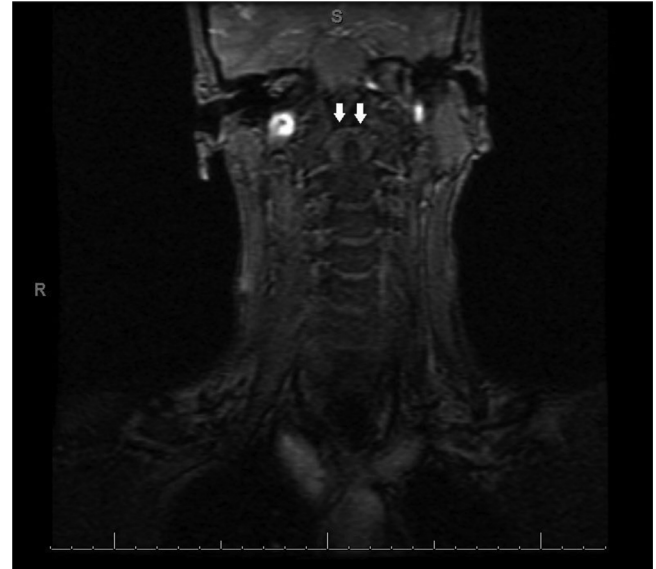


**Fig. 5 – 3D Reconstructive CT showing the anterior cervical spine with the atlas (C1) rotated on the axis (C2). The left lateral mass is posteriorly displaced (white arrow) and the right lateral mass is anteriorly displaced (black arrow) indicating atlantoaxial rotatory subluxation.**

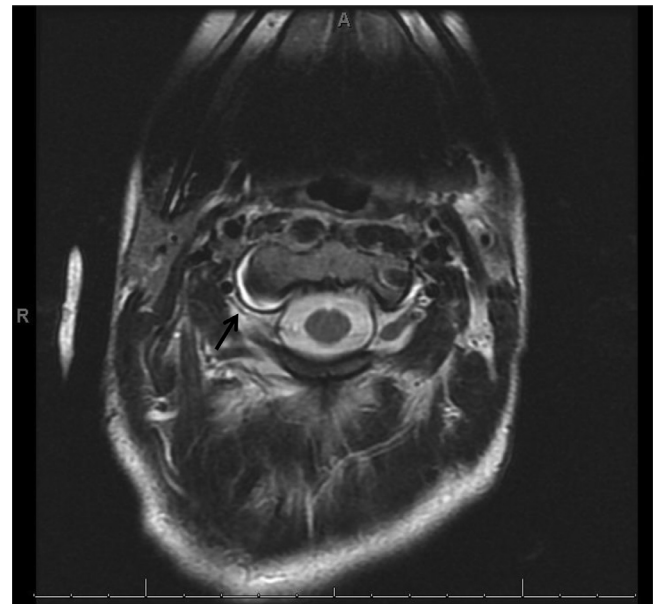


**Fig. 6 – 3D Reconstructive CT showing the lateral cervical spine with the left lateral mass of C1 posteriorly displaced on C2 (arrow) indicating atlantoaxial rotatory subluxation.**

lateral neck than the left and accompanied by posterior neck pain going “into the skull.” She went to an urgent care center 2 days prior to ED presentation; imaging was not performed but she was prescribed a nonsteroidal antiinflammatory drug, muscle relaxant, and steroids for a diagnosis of “neck spasm”; these provided minimal relief. In the ED our patient denied severe headache, vision or hearing changes, speech changes, focal weakness, numbness, or tingling, fever or chills. On physical exam, the patient was afebrile with normal vital signs. She appeared uncomfortable but cooperative, sitting on the bed with her head tilted to the right and her chin rotated to the left (Fig. 1). She had significant painful restriction of her neck. Her trachea was midline, she had no submandibular gland tenderness or swelling, and no hypertonicity of the sternocleidomastoid muscles. Oropharyngeal exam was limited due to pain and mild trismus but the visualized intraoral anatomy was



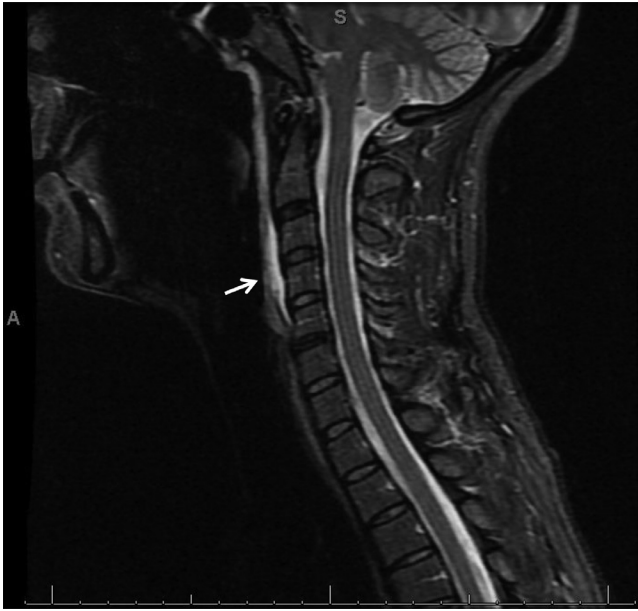
**Fig. 7 – Coronal view of MRI of cervical spine showing symmetry of the odontoid lateral mass interspaces (arrows) with realignment of prior rotatory subluxation.**



**Fig. 8 – Axial view of MRI of cervical spine showing T2 hyperintense signal at the C1-C2 junction (black arrow) signifying joint effusion.**

unremarkable. There was mild upper midline cervical tenderness to palpation. She had no focal neurologic deficits on exam. A computed tomography (CT) of her neck with contrast and cervical spine without contrast were ordered with 3D reconstructive views and the patient was given IV Valium for symptomatic relief.

The CT scans demonstrated asymmetry of the odontoid lateral mass interspaces with posterior displacement of C1 on C2 on the left as well as prevertebral soft tissue edema from



**Fig. 9 – Sagittal STIR view of MRI of cervical spine re-demonstrates prevertebral soft tissue edema from C3 to C5 (white arrow).**

C3 to C5 vertebral levels. These findings suggest a lateral axial rotatory subluxation (Figs. 2-4).

Our patient was emergently seen by the trauma team and the senior surgical resident performed a reduction at the bedside; subsequently applying a cervical collar for stability. Neurosurgery was consulted and a magnetic resonance imaging (MRI) was ordered. The MRI demonstrated resolution of the C1/C2 malalignment. There was mild prevertebral soft tissue edema and a small C1-C2 joint effusion. There was no evidence of ligament disruption. (Figs. 5-9)

The patient's pain improved the day after admission. Neurosurgery recommended no surgical intervention. They advised maintenance of a cervical collar, continuing non-steroidal and muscle relaxant medications, and an office follow-up within 14 days. The patient fortunately did not have any neurologic sequelae from this potentially serious injury from a low mechanism.

## Discussion

Recognition of AARS after trauma requires a high index of suspicion, in adults neurologic complications are more common than in children [4]. Prompt diagnosis significantly increases chances for closed reduction to be successful as well as decreases the rate of recurrence [6,7]. CT is the imaging modality of choice to make the diagnosis since radiographs are difficult to interpret due to positioning issues and the complicated anatomy of the atlanto-axial region [8]. However, MRI may

provide a better view of the surrounding soft tissue and spinal cord. Additionally, the reported frequency of missed injuries to the cervical spine range from 4% to 30% without imaging [1]. Both CT and MRI may be necessary to arrive at the diagnosis [9]. The CT scan will show a rotated position of the atlas on the axis with or without a simultaneous forward or backward displacement of the atlas [8].

Although usually benign, the presentation of acute torticollis has many other causes apart from AARS including sternocleidomastoid spasm, drug-induced torticollis/dystonia, C1-C2 dislocation, upper respiratory infection/abscess, fracture of the cervical spine or clavicle, injury of a cervical spine ligament or muscle, and spinal epidural hematoma [10]; it is important to keep all of these in the initial differential.

Treatment strategies for a case diagnosed early generally involve a closed reduction and immobilization with a halo-ring or cervical collar. For cases refractory to this treatment, as is common in chronic or recurrent cases with a delayed diagnosis, surgery may be indicated [2,5].

## REFERENCES

- [1] Torretti JA, Sengupta DK. Cervical spine trauma. *Indian J Orthop* 2007;41(4):255-267. doi:10.4103/0019-5413.36985.
- [2] Rahimizadeh A, Williamson W, Rahimizadeh S. Traumatic chronic irreducible atlantoaxial rotatory fixation in adults: review of the literature, with two new examples. *Int J Spine Surg* 2019;13(4):350-360 Published 2019 Aug 31. doi:10.14444/6048.
- [3] Powell EC, Leonard JR, Olsen CS, Jaffe DM, Anders J, Leonard JC. Atlantoaxial rotatory subluxation in children. *Pediatr Emerg Care* 2017;33(2):86-91. doi:10.1097/PEC.0000000000001023.
- [4] Singh VK, Singh PK, Balakrishnan SK, Leitao J. Traumatic bilateral atlantoaxial rotatory subluxation mimicking as torticollis in an adult female. *J Clin Neurosci* 2009;16:721.
- [5] Eghbal K, Derakhshan N, Haghghat A. Ocular manifestation of a cervical spine injury: an adult case of traumatic atlantoaxial rotatory subluxation manifesting with nystagmus. *World Neurosurg* 2017;101(817) 817.e1-817.e3.
- [6] Barimani B, Fairag R, Abduljabbar F, Aoude A, Santaguida C, Ouellet J, et al. A missed traumatic atlanto-axial rotatory subluxation in an adult patient: case report. *Open Access Emerg Med* 2019;11:39-42 Published 2019 Jan 15. doi:10.2147/OAEM.S149296.
- [7] Venkatesan M, Bhatt R, Newey ML. Traumatic atlantoaxial rotatory subluxation (TAARS) in adults: a report of two cases and literature review. *Injury* 2012;43:1212-15.
- [8] Roche CJ, O'Malley M, Dorgan JC, Carty HM. A pictorial review of atlanto-axial rotatory fixation: key points for the radiologist. *Clin Radiol* 2001;56(12):947-58. doi:10.1053/crad.2001.0679.
- [9] Gourin CG, Kaper B, Abdu WA, Donegan JO. Nontraumatic atlanto-axial subluxation after retropharyngeal cellulitis: Grisel's syndrome. *Am J Otolaryngol* 2002;23(1):60-5.
- [10] Hussain K, Abdo MM, AlNajjar FJ, Abbo M. Not your typical torticollis: a case of atlantoaxial rotatory subluxation. *BMJ Case Rep* 2014;2014 bcr2013201023. Published 2014 Mar 25. doi:10.1136/bcr-2013-201023.