Pediatric Atlantoaxial Rotary Subluxation

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Contents

Abstract

Atlantoaxial rotary subluxation (AARS) is a relatively rare condition in children, characterized by the acute onset of fixed torticollis. The cause often remains elusive, but all cases are generally felt to be due to some form of inflammation, which can occur secondary to infection, an autoimmune process, or trauma. Trauma causing AARS can vary from significant injuries such as falls or motor vehicle accidents to more minor injuries such as a bump to the head or neck manipulation during surgery. Treatments are focused on reducing the subluxated atlantoaxial joints, and methods range from cervical collars, to cervical traction, to open reduction of the joints. This chapter presents a case of pediatric AARS and the author's preferred algorithm for treatment.

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A 7-year-old boy presented 1 week after developing the acute onset of torticollis. Attempts to straighten his neck were painful. He denied any history of recent infection, upper respiratory illness, antibiotic use, or recent surgery. His neurologic exam was normal. Radiographs of the cervical spine taken in the clinic were unremarkable. A diagnosis of acute AARS was made, and the patient was initially treated with a cervical collar and anti-inflammatory medication. The torticollis did not resolve, and 2 weeks later an MRI of the cervical spine was obtained. The MRI confirmed subluxation of the atlantoaxial joints and ruled out an infectious process. The patient was placed into cervical halter traction in the hospital and given benzodiazepines for muscle relaxation. After 2 weeks of halter traction, the torticollis failed to reduce. A cranial halo was placed under anesthesia, and skeletal traction was applied. After 1 week of skeletal traction, the torticollis resolved. The halo was incorporated into halo-vest immobilization of the cervical spine, which was continued for 3 months. After 3 months, the halo was removed, and the patient regained full, normal range of motion of the cervical spine.

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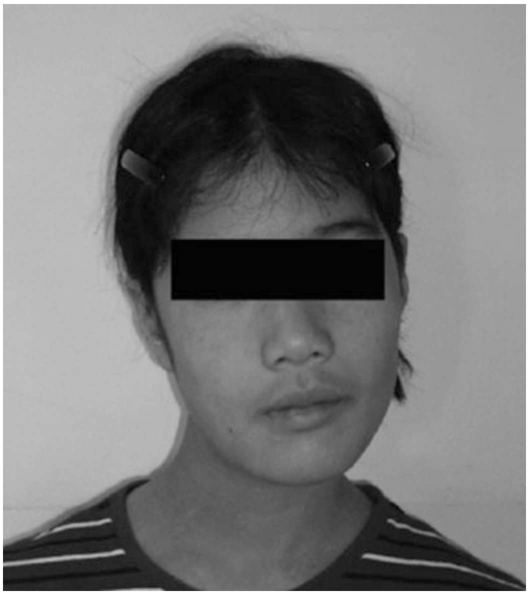

Fig. 1 Clinical photograph of the patient showing the acute "cock-robin" torticollis positioning of the neck (Adapted with permission from Wolters Kluwer: Spine, Ken Ishii, Morio Matsumoto, Suketaka Momoshima, et al., Remodeling of C2 Facet Deformity Prevents Recurrent Subluxation in Patients With Chronic Atlantoaxial Rotatory Fixation: A Novel Strategy for Treatment of Chronic Atlantoaxial Rotatory Fixation, 2011)

1 Brief Clinical History

A 7-year-old boy bumped his head while playing with his brother. When he awoke the next morning, he held his head in a "cock-robin" position (Fig. 1), and attempts to straighten his neck were painful. When the torticollis did not resolve after a week, his parents brought him to the doctor for evaluation. He denied any history of recent infection, upper respiratory illness, antibiotic use, or recent surgery. His neurologic exam was normal. Radiographs of the cervical spine taken in the clinic were unremarkable.

2 Preoperative Clinical Photos and Radiographs

See Fig. 1.

3 Preoperative Problem List

1. Acute atlantoaxial rotary subluxation

4 Treatment Strategy

AARS is typically a clinical diagnosis. Because the atlantoaxial joints naturally sublux with normal neck rotation, patients with clinical fixed torticollis have subluxation of these joints by definition. If there is suspicion for an infectious cause of inflammation causing AARS, laboratory studies, including a CBC, ESR, and CRP, can be obtained. Radiographs are most commonly normal but can be used as a baseline to rule out more significant injury such as a cervical spine fracture. Advanced imaging with CT scans has been advocated in the past, but may not help advance the treatment algorithm, and may impart an unacceptable amount of radiation to the neck of a growing child. MRI scans can be used if there is suspicion of an infectious process that can be treated such as a retropharyngeal abscess.

Treatment options are typically based on the amount of time from the onset of symptoms, and include using a cervical collar and anti-inflammatory medication to try to relax the cervical muscles and allow a spontaneous reduction of the atlantoaxial joints, using halter or skeletal traction with benzodiazepines to reduce the joints, or open reduction with internal fixation. For cases that present less than 2 weeks from the onset of symptoms, trying a cervical collar and NSAIDs is appropriate, and successful in the majority of cases.

If symptoms persist despite use of the collar, patients can be admitted to the hospital for supervised cervical halter traction and benzodiazepines for muscle relaxation. Patients can be started with small amounts of weight, and the weight can be increased 2–3 pounds per day, up to about 50% of body weight. Frequent neurologic checks, including cranial nerve exams, are required for patients in cervical traction. If the halter traction is successful, patients are maintained in a cervical collar for 3 months to prevent recurrence.

If halter traction fails to reduce AARS, skeletal traction can be applied. The author's preferred method is to place a cranial halo under anesthesia. For children, 6–8 pins should be used due to the thinner bone of immature skulls. Care should be taken to avoid the temporalis muscles and the supraorbital nerves when placing pins. Weight can be gradually increased, while performing serial neurologic examinations, in the same manner as that used for halter traction (Fig. 2). If skeletal traction is successful, patients are maintained in halo vests for 3 months to prevent recurrence.

If halter traction and skeletal traction both fail to reduce the AARS, open reduction and C1-2 arthrodesis are typically required.

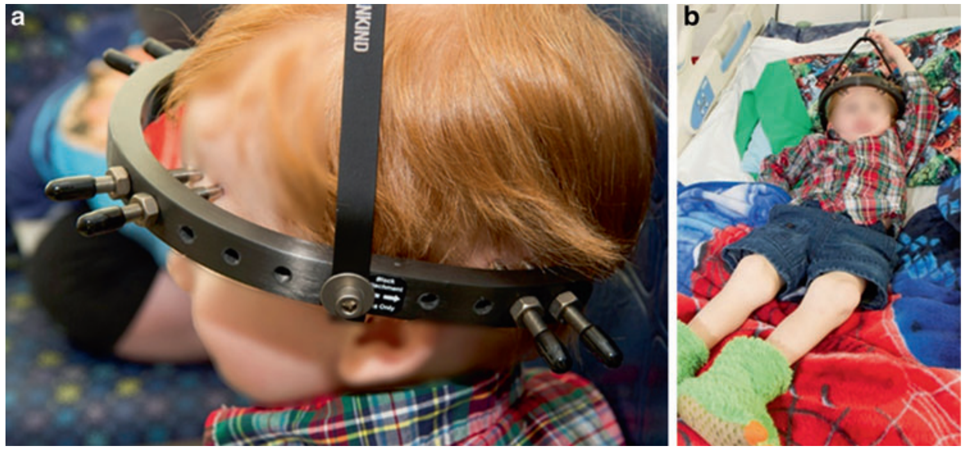

Fig. 2 (**a**) A clinical photograph of a child with a cranial halo in place. Two pins are placed on either side anteriorly above the lateral portion of each eyebrow. Two pins are paced on either side posteriorly just above and behind the pinna of the ear. (**b**) Clinical photograph of a child lying in bed in halo-gravity traction

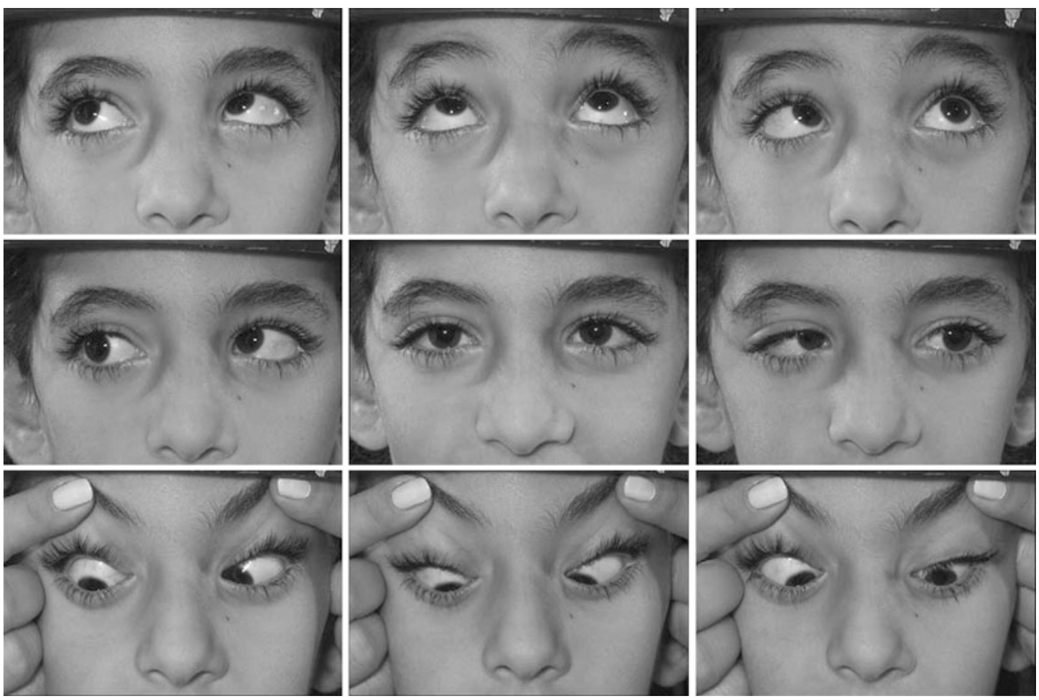

Fig. 3 (**a**) Abnormal lateral gaze of the right eye while the patient is attempting to look toward the right side, indicative of an abducens cranial nerve palsy. (**b**) Abnormal tongue thrust while the patient is attempting to stick the tongue straight out, indicative of a hypoglossal cranial nerve palsy (Reprinted from Journal of American Association for Pediatric Ophthalmology and Strabismus, 8, Emma Pinches,Dominic Thompson,Hilali Noordeen,Alki Liasis,Ken K. Nischal, Fourth and sixth cranial nerve injury after halo traction in children: A report of two cases, 580–585, Copyright (2004), with permission from Elsevier)

5 Basic Principles

Halo Traction:

1. In children, cranial halos are typically placed under a general anesthesia.
2. In children, 6–8 pins are used, and each is tightened to between 2 and 5 inch-pounds of torque, due to the thinner nature of the immature skull.
3. The pin sites are prepped with chlorhexidine.
4. Anteriorly, two pins are placed on either side, 1 cm above the lateral portion of each eyebrow.
5. Posteriorly, one or two pins are placed 1 cm above, and just posterior to the pinna of each ear.
6. The pin sites can be cleaned daily with soap and water.
7. Weight is typically initiated with 5 pounds and can be increased 2–3 pounds every day, up to about 50% of body weight (Fig. 2).

8. Frequent neurologic examinations are required, including shortly after each addition of weight, including checking the cranial nerves.
9. Typically, up to 2 weeks is allowed for reduction of AARS using skeletal traction, before proceeding with open reduction and fusion of C1-2.
10. Once reduction of the AARS has been achieved, the halo traction can be converted to halo-vest immobilization to maintain the reduction for 3 months.

6 Images During Treatment

See Figs. 2 and 3.

7 Technical Pearls

1. The halo should be placed just inferior to the equator of the skull (the area of the greatest skull diameter).
2. Hair is removed behind the ears to avoid getting tangled in the pins.
3. The pressure on each pin is rechecked 1 day after halo placement using a torque wrench, to ensure no loosening.
4. Traction is meant to be continuous, but weight can be safely removed, if needed, for bathing, trips to the restroom, or general comfort and sleep.
5. The most common cranial nerve palsies are to the abducens nerve, which causes loss of lateral gaze, and to the hypoglossal nerve, which causes asymmetry of the tongue. (Fig. 3).
6. The weights can be removed and replaced daily to allow for examination of the torticollis to determine its persistence or resolution.

8 Avoiding and Managing Problems

1. Use proper anterior pin placement to avoid the temporalis muscle and the supraorbital nerves.
2. Include examinations of the cranial nerves, especially the abducens and hypoglossal nerves, for patients in cervical traction.

9 Cross-References

► Atlas Fractures
► Odontoid Fractures
► Pediatric Halo Application
► Unilateral Cervical Facet Fracture-Dislocation

References and Suggested Readings

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