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Technical Report

Novel technique of reduction of a chronic atlantoaxial rotatory fixation using a temporary transverse transatlantal rod

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Abstract

BACKGROUND CONTEXT: Chronic atlantoaxial rotatory fixation (AARF) is uncommon as acute AARF is easily reduced either spontaneously or by conservative methods. Various anterior and posterior surgical approaches for a chronic AARF have been reported because of the difficulty encountered in obtaining reduction.

PURPOSE: To describe a novel technique of reduction of a chronic AARF using a temporary transverse transatlantal rod.

STUDY DESIGN: Technical report.

METHODS: A 13-year-old girl presented with an 8-month-old chronic AARF with typical torticollis and ''cock-robin'' posture of the head with a normal neurology. As closed reduction with skull traction for 2 weeks failed to reduce the deformity, the patient underwent C1–C2 fusion. C1 lateral mass and C2 pedicle screws were inserted under computer navigation. A temporary transverse rod across the atlas and axis was placed to secure a three-column fixation to derotate the subluxed atlas into anatomical alignment. Rods were then connected between the C1 lateral masses and the C2 pedicle screws and fusion obtained with autologous iliac crest grafts.

RESULT: Anatomic reduction of the atlantoaxial region was obtained without neural compromise, and satisfactory fusion was observed at 6-months follow-up.

CONCLUSION: A temporary transatlantal rod provides a secure anchor point for easy maneuverability for reduction of a chronic AARF and has the advantage of being used even in the absence of the posterior arch of the atlas.

Keywords: Atlantoaxial rotation; Rotatory fixation; Torticollis; Technique

Introduction

The unusual anatomical configuration of the atlantoaxial complex allows it to be the main rotational pivot of the cervical spine. This, however, simultaneously predisposes atlantoaxial region to a disorder characterized by a persistent, often painful, rotational deformity called atlantoaxial rotatory fixation (AARF) because of its resilience to voluntary or involuntary correction [1].

The commonly accepted paradigm for neuroradiologically demonstrable irreducible C1–C2 dislocation with neural compression is surgical decompression by the transoral route [2–8]. However, when preoperative dynamic maneuvers and traction show a reducible deformity, neural decompression may be obtained by reduction of the dislocation and fixation and fusion with posterior instrumentation [9].

The authors describe a novel technique of using a temporary posterior transverse transatlantal rod to facilitate reduction of a chronic AARF after failed skull traction.

Case report

A 13-year-old girl, a known patient of juvenile rheumatoid arthritis on treatment, presented with an 8-month

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history of progressive torticollis. She had no antecedent episode of respiratory infection and had previously received only intermittent physical therapy for the torticollis without any detailed radiologic examination. Her physical examination showed torticollis, head tilting, neck rotation, characteristic cock-robin posture, and limitation of flexion/extension and rotation. Her neurologic examination was normal. Plain anterior posterior cervical radiograph showed lateral tilting of the cervical spine (Fig. 1). Cervical computed tomography (CT) revealed a rotatory subluxation of the atlantoaxial joint with an atlantoaxial distance of 5.3 mm (Fig. 2). The CT scans were also evaluated to assess the size of the C2 pedicle and C1 lateral mass to ascertain the possibility of safe screw insertion.

The patient was treated with continuous skull traction that was increased from 1 to 5 lbs (body weight 22 kg/48.4 lbs) with close neurologic and radiologic monitoring. Partial reduction of the deformity was observed at 1 week with no further improvement after an additional week of skull traction. She subsequently underwent open reduction and instrumented fusion.

Surgical technique

The patient was positioned prone under general anesthesia on a radiolucent operation table with the head attached firmly to the head ring of the table. Intraoperative neuromonitoring with somatosensory evoked potentials and motor evoked potential was used to ensure safe reduction of the atlantoaxial dislocation. No intraoperative skeletal traction was used. Subperiosteal dissection was performed to reveal the occiput and the arch of C1. The muscle attachments of C2 were detached, and the C2–C3 facet joints were exposed. A wide lateral dissection was performed to expose the C1–C2 facet joints. The capsules of both facet joints were found to be disrupted. With the assistance of computer navigation, 3.5-mm–diameter appropriate length C1 lateral mass and C2 pedicle screws were inserted. A temporary rod was then placed across the posterior arch of the atlas connecting the two lateral masses (Fig. 3 and Fig. 4). A similar transverse rod was placed across the two pedicle screws inserted into the C2 vertebra. This provided a secure grip of the atlas that enabled easy reduction by elevating and rotating the rod with a small rod holder in the direction opposite to the subluxation, while the transverse rod at C2 provided a stable anchor against which the C1 rod was rotated. The rotational force used should be gentle and gradually increased while carefully observing the screws during this maneuver. This maneuver negated the need to hold the C1 arch with a towel clip that can cause inadvertent slippage into the spinal canal with accidental injury to the spinal cord. Satisfactory reduction was confirmed intraoperatively (Fig. 5). Once reduced, the atlantoaxial complex was stabilized with rods connecting the C1 lateral mass and the C2 pedicle screws and fusion facilitated by autologous iliac crest grafts.

Postoperative protocol consisted of immobilization with a soft collar for 2 months. In the presence of poor bone stock with questionable stability of the construct recognized intraoperatively, an extended rigid postoperative immobilization such as a halo vest may be considered. Postoperative radiographs and CT scans were obtained to evaluate the reduction and accuracy of the screws inserted (Fig. 4). Follow-up CT showed accurate reduction of the atlantoaxial complex with fusion at 6 months.

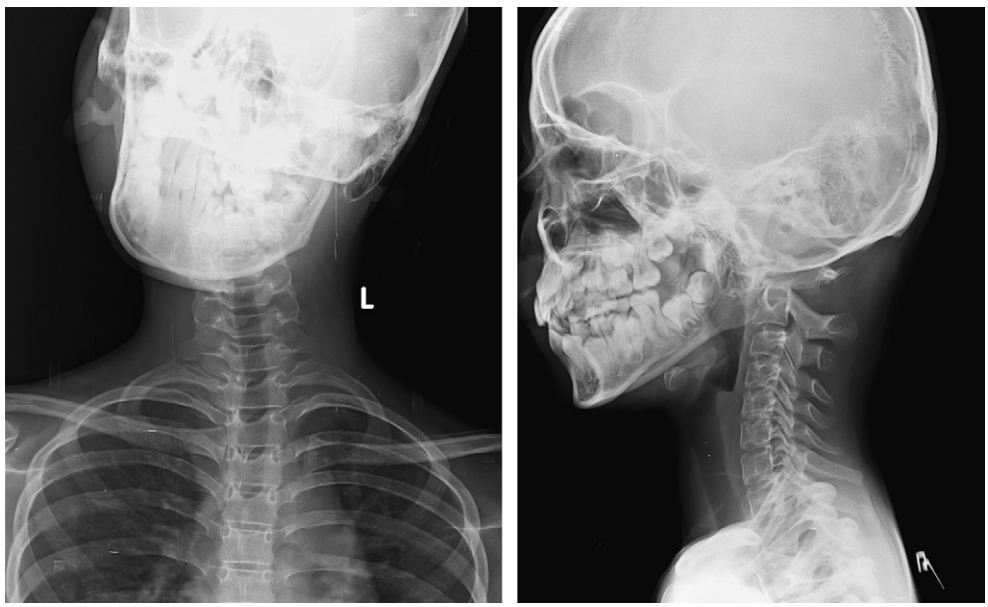

Fig. 1. Anterior posterior radiograph of the cervical spine shows tilting of the head, whereas the lateral radiograph shows an increased distance between the C1 posterior arch and the C2 spinous process.