

Clinical Study

Single-stage anterior release and posterior instrumented fusion for irreducible atlantoaxial dislocation with basilar invagination

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Received 1 June 2015; revised 19 August 2015; accepted 14 September 2015

Abstract

BACKGROUND CONTEXT: The options available for treatment of irreducible atlantoaxial dislocation (IAAD) with basilar invagination are odontoidectomy, posterior decompression, and posterior atlantoaxial joint distraction. In 2006, Wang et al. described that most IAAD can be reduced following anterior release of contracted soft tissues. Anterior release may be done by transoral (TO) or retropharyngeal (RP) approach. Posterior instrumented fusion provides stability and helps in achieving further reduction.

PURPOSE: This study aimed to study the neurologic and radiological outcome following treatment of basilar invagination associated with IAAD by anterior release and posterior instrumented fusion.

STUDY DESIGN: A retrospective case series was carried out.

PATIENT SAMPLE: The patient sample comprised 19 patients with IAAD.

OUTCOME MEASURE: Patients were assessed for neurologic recovery by Benzel modified Japanese Orthopaedic Association (mJOA) score and radiologically by assessing reduction on lateral radiographs and comparing clivus-canal angle (CCA) on preoperative and postoperative computed tomography scan.

METHODS: Nineteen consecutive patients with IAAD were surgically treated. Anterior release was done via TO approach in 12 patients and RP approach in 7. Following anterior release, all patients underwent posterior instrumented fusion.

RESULTS: This study included 15 men and 4 women with mean follow-up of 18 months. Pathology included occipitalization of atlas in 16 patients, os odontoideum in 2, and missing posterior elements of axis in 1. All patients had cervical myelopathy. Occipitocervical fixation was done in 18 patients and C1–C2 transarticular screw fixation in 1. Fifteen patients had anatomical reduction whereas four had partial reduction. The CCA improved from a mean preoperative angle of 111.47° to mean postoperative angle of 142.84°. The mJOA improved from preoperative mean mJOA of 12.89 to a postoperative mean mJOA of 16.84. Fusion was achieved in all patients. Maceration of posterior wound which healed by daily cleaning and dressing was noted in three patients. Implant breakage on one side was noted in 1 patient at 3 months post operation; however, the patient remained asymptomatic.

FDA device/drug status: Not applicable.

Author disclosures: **SKS:** Nothing to disclose. **RAA:** Nothing to disclose. **PSN:** Nothing to disclose. **SKB:** Nothing to disclose.

The authors do not have any other source of support.

The authors have taken consent of the patient and approval from the Institutional Ethics Committee for the use of patient's clinical data for the purpose of this publication.

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CONCLUSION: This series reinforces the safety and efficacy of both TO and RP anterior release for reduction of IAAD. Posterior fixation helps in achieving further reduction and provides stability. Anterior release followed by instrumented posterior fusion is a safe and effective modality of treatment for IAAD associated with basilar invagination. © 2015 Elsevier Inc. All rights reserved.

Keywords: Basilar invagination; Fusion; Irreducible atlantoaxial dislocation; Posterior fixation; Retropharyngeal anterior release; Transoral anterior release

Introduction

Irreducible atlantoaxial dislocation (IAAD) is defined as dislocation that cannot be reduced on flexion-extension or by cranial skeletal traction. Basilar invagination is a common component in IAAD and also a cause of compression of medulla and upper cervical cord. Radiologically, basilar invagination is said to be present when the tip of the odontoid process projects above the foramen magnum. It is classified into two types [1]. In type A, there is IAAD and the tip of the odontoid process lies above the Chamberlain line, Wackenheim clival line, and McRae line (Fig. 1 Left). In type B, the entire complex of clivus, basiocciput, and the craniovertebral junction (CVJ) is located rostrally, and the tip of the odontoid process is above the Chamberlain line but below the McRae and Wackenheim clival line. Type B is not associated with atlantoaxial dislocation (AAD).

Irreducible atlantoaxial dislocation may be congenital or acquired. There is stenosis of the foramen magnum and compression of the medulla oblongata and upper cervical spinal cord resulting in neurologic symptoms, obstructive hydrocephalus, syringomyelia, or even death. The treatment of IAAD is challenging. Treatment options include transoral (TO) decompression [2], indirect posterior decompression [3], atlantoaxial joint distraction and posterior fixation [4], and TO or retropharyngeal (RP) anterior release followed by posterior fixation [5,6].

Wang et al. first described single-stage anterior release and posterior instrumented fusion [5]. Transoral approach was used for anterior release in Wang et al.'s series. Following this, similar procedure has been performed and reported by various surgeons [6–8]. A review of literature showed that anterior release may be performed via RP approach [6], video-assisted transcervical approach [8], or micro endoscopic approach [9]. We report our experience with single-stage anterior release and posterior instrumented fusion. Anterior release was performed by TO or RP approach in our series. The purpose of publishing this series is to show that good clinical and radiological outcome is reproducible by this method and that anterior release via both TO or RP approach is equally efficacious.

Materials and methods

Between January 2007 and October 2013, 19 consecutive patients of IAAD with type A basilar invagination underwent anterior release followed by posterior fixation and fusion. A retrospective review of the OT reports, patient records, and radiographs was performed. Our indications for

EVIDENCE & METHODS

Context

Limited surgical options are available to address irreducible atlantoaxial dislocation (IAAD) with basilar invagination. The authors present their single-center experience with a single-stage anterior release and posterior instrumented fusion.

Contribution

The authors' study involved 19 patients. Average follow-up was 18 months for the cohort. Instrumentation failure occurred in one patient and all individuals were reported as having sustained a successful outcome from surgery. Based on their experience in the short term, the authors conclude that anterior release followed by instrumented posterior fusion is a safe and effective treatment modality for irreducible AAD associated with basilar invagination.

Implications

As the authors correctly point out, their case series consists of only 19 patients. This limits what broad conclusions can be drawn from the research. Given the design, this study is likely confounded to some extent by both selection and indication bias. Given the small number of patients in this series, the study's findings may not be generalizable to a broader population. While this is clearly interesting and an important technical case series, from an evidence-based standpoint, the results presented here represent Level IV evidence.

—The Editors

surgery were presence of neurologic deficit and demonstration of spinal cord compression on magnetic resonance imaging. Irreducibility was determined before surgery by an attempt at skeletal traction reduction of the deformity. Skeletal traction was given by the application of Gardner-Well tongs to the skull. On admission, skeletal traction was given to all patients for 3 weeks starting with 3 kg and gradually increasing it to 8–10 kg (maximum 1/10th of body weight). Patients who showed satisfactory reduction of AAD and basilar invagination underwent a posterior instrumented fusion and were excluded from the study.

Patients who did not show reduction were taken under general anesthesia, and attempt at reduction was done using

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