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Traumatic postero-lateral C1-C2 dislocation complicated with locked lateral mass and type II odontoid fracture – a 5-year follow-up: A case report

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Abstract:

Study design: case report

Objective: To document our experience in managing a rare complex of traumatic postero-lateral atlantoaxial dislocation combined with locked lateral mass and type II odontoid fracture.

Summary of background data:

Method: A 30 years-old male patient was referred to the author’s department. He complained of a decrease in neck range of motion following a traffic accident. Neurological examination was normal. Computed tomography (CT) and open mouth X-ray showed a type II odontoid fracture and a postero-lateral dislocation with laterally locked left lateral mass at the C1-C2 level. Considering the difficulty and risk in reduction, due to this rare instability and dislocation, a two-staged treatment was performed. With up to 11 kg skull traction for 7 days before surgery, the locked lateral mass and the lateral dislocation was finally reduced without any neurological deficit. And once closed reduction was confirmed by open-mouth and lateral X-ray views in the cervical spine, a second staged C1-C2 surgical fixation and fusion with iliac bone graft was performed to achieve a normal anatomic alignment with a better stability.

Result: The patient showed significant amelioration of neck symptoms post-operatively and a successful reduction and fixation of the C1-C2 articulation was achieved. At the 5-year follow up, solid bone fusion was evident on the CT-scan.

Conclusion: For traumatic posterolateral atlantoaxial dislocation complicated with type II odontoid fracture, a closed reduction of the lateral dislocation before operation is both useful and safe because the surgeons do not need to reduce the extremely rare lateral dislocation during the operation. Posterior atlantoaxial stabilization and fusion, rather than the occipitocervical fusion as reported previously, is biomechanically stable enough to achieve solid fusion in this rare trauma while not sacrificing the occipito-atlantal joint.

Key words: Cervical trauma; atlanto-axial; Postero-lateral dislocation; Goel-Harms technique.
Introduction:

The overall incidence of C1-C2 dislocation account for less than 2% among all the upper cervical spine injuries and usually present as anterior dislocation[1]. In the present study, we describe a 5-year follow up for a unique complex of traumatic postero-lateral atlantoaxial dislocation complicated with locked lateral mass and type II odontoid fracture. The goal is to discuss the management of this condition based on our experience.

Case report:

A 30 years old male was transferred to our unit 4 days after an accident while travelling by bus. Clinical examinations revealed a stiffed head posture with decreased in the range of neck motion but had no obvious neurological abnormalities. Open mouth radiograph (fig.1.a) demonstrated a right lateral dislocation of C1 on C2, a type II odontoid process with the proximal fragment translated horizontally and a loss of C1 left lateral mass height. The sagittal radiograph (fig.1 b) showed an increase in soft tissue swelling anterior to C1 and C2, with a posterior displacement relative to the sagittal alignment. The coronal and axial CT (fig.1. c. d.) was also analyzed to confirm the diagnosis.

Considering the resulting instability, a two- staged treatment was performed. As traction could distract the locked facet joint and assist moderately in re-aligning[2], we began with a continuous axial traction of maximum 11kg weight on a pulley. Daily clinical examinations were performed and the C1-C2 reduction was monitored by open mouth radiograph every 2 days. 7 days after continuous traction, a satisfactory reduction was observed on the open mouth radiography (fig.2a). To ensure better stability, surgical C1-C2 fixation and reduction was performed. Pre-operatively, the axial, sagittal and coronal CT was examined to determine the optimal screw length, diameter, entry point and trajectory. Under general anesthesia, the patient’s head was positioned on a Mayfield headrest of 7 kg of traction weight. A posterior midline incision was made in customary fashion to expose the lateral border of the C1 and C2 lateral mass. Bilateral C1 lateral mass screw and C2 pedicle screw were inserted using the Goel-Harms technique. A successful anatomical alignment and reduction was achieved. Post-operative radiographs (fig.2c) and CT scans (fig.2d) demonstrated restoration of C1-C2 articulation and a reduction of the odontoid fracture. Post-operative immobilization consisted of semi-rigid cervical collar for 12 weeks.

Fig.1: a) Open mouth radiograph; b) Pre-operative sagittal CT scan showing Type 2 fracture of the odontoid process; c) Axial CT scan showing a postero-lateral displacement; d) Coronal CT scan showing the lateral and posterior dislocation of the atlas over the axis.

Fig.2 a) open mouth radiograph 7 days after axial traction; b) C1-C2 screw placement; c) lateral radiograph 3days post-operatively; d) post-operative coronal CT scan
Post-operative follow-up was done at 3 months, 6 months, 1 year and 5 years and at the 5th-year follow-up a solid fusion was evident on the CT-scan.

Fig.3: a) post-operative 5-year coronal CT scan; b, c & d) post-operative 5-year sagittal CT scan showing fusion of the odontoid process.

Discussion

Pure traumatic atlantoaxial dislocation is an extremely rare condition. Most C1-C2 dislocations tend to happen in pre-existing conditions as in congenital abnormalities[3][2] and rheumatoid arthritis[4][3]. Epidemiological study by Gleizes, V. et al.[5], found two cases out of 116 cases of upper cervical spine injuries. Anderson, L.D. and R.T. D’Alonzo[6] described Type II odontoid fractures as fractures occurring between the transverse ligament and the body of C2 is the only type of odontoid fracture associated with atlantoaxial dislocation. Until now, no cases of complex posterolateral C1-C2 dislocation complicated with locked lateral mass and type II odontoid fracture have been reported.

Neurological presentation widely depends on the stability provided by the transverse ligaments and the diameter of spinal canal. Some authors have reported the reliability of standard three views imaging[7] while others support the role of CT in providing a higher specificity[4][8]. MRI is the modality of choice for evaluation of patients with neurological signs or symptoms to assess soft tissue[9] injury of the cord and ligaments.


Although there is no globally accepted treatment algorithm for atlantoaxial dislocation, the goal of treatment always focuses on providing a stabilized anatomical alignment of the upper cervical spine[13]. Diverse surgical approaches have been reported in the literature for the reduction of atlantoaxial dislocation, however the Goel-Harms technique has proven to be very effective[14]. It provides a minimized risk of vertebral artery injury and intra-operatively allows direct better guide for screw placement[15][5]. Goel-Harms technique is compatible with most anatomical variations and do not require the use of posterior wiring[16] which can pose a risk of injury to the underlying spinal cord.

Conclusion
This is a unique case that describes a combination of traumatic posterolateral C1-C2 dislocation complicated with locked lateral mass and type II odontoid fracture. Initial traction to reduce the locked lateral mass with a heavy weight was essential. Eventually, to achieve a stable anatomic alignment and prevent any delay fusion, an open reduction with C1-C2 fixation was required.

Reference

AUTHOR DECLARATION TEMPLATE

We wish to draw the attention of the Editor to the following facts which may be considered as potential conflicts of interest and to significant financial contributions to this work. [OR] We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property.

We further confirm that any aspect of the work covered in this manuscript that has involved either experimental animals or human patients has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

We understand that the Corresponding Author is the sole contact for the Editorial process (including Editorial Manager and direct communications with the office). He is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs. We confirm that we have provided a current, correct email address which is accessible by the Corresponding Author and which has been configured to accept email from elunekevin@hotmail.com.

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2. Wu Shi Yang 2017.12.17
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fig 2: a) open mouth radiograph 7 days after axial traction; b) C1-C2 screw placement; c) sagittal radiograph 3 day post-operatively; d) post-operative coronal CT scan.
No abbreviations
Key points:

- The aim of this report is to introduce the management and outcome of a unique complex of traumatic postero-lateral atlantoaxial dislocation complicated with locked lateral mass and type II odontoid fracture.
- Goel-Harms technique as reported previously, has proved to be every effective technique as it is compatible with most anatomical variations, provides a minimize risk of vertebral artery injury and intraoperatively allows direct better guide for screw placement.
- Posterior atlantoaxial stabilization, rather than the occiputocervical fusion as reported previously, is biomechanically stable enough to achieve solid fusion in patient with such rare complex injury.