

Traumatic Posterolateral Atlantoaxial Dislocation with Type II Odontoid Fracture: Case Report

Bretschneider H*, Meyner T and Schneiders W

University Hospital Carl Gustav Carus, Technische Universität Dresden, Dresden, Germany

*Corresponding author: Bretschneider H, University Hospital Carl Gustav Carus, Technische Universität Dresden, Dresden, Germany, E-mail: Henriette.Bretschneider@uniklinikum-dresden.de

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Abstract

Background context: The combination of atlantoaxial joint dislocation and odontoid process fracture is usually a lethal injury and as a result, reports of survivors are rare. In the last thirty years only fifteen clinical cases have been described.

Purpose: We present a case of a 30 year old patient with a traumatic posterolateral atlantoaxial dislocation (type V dislocation based on the Fielding classification), type II odontoid fracture and initial complete tetraplegia, who survived for 10 months after the accident.

Study design of case report

Methods: A review of the medical records since the time of initial hospital admission throughout follow-up was performed.

Results: The immediate first aid, uninterrupted rescue time, transfers to a level I trauma centre and the absence of cerebral vascular lesions contributed to the patient's survival. The injury was immediately treated by reduction and internal stabilization of the occiput to C2-C4. After the surgery and transfer to rehabilitation clinic the complete tetraplegia did not recover and communication by the patient was only possible by eye- and eyelid movement. Due to severe complications resulting finally from the complete tetraplegia (cardiac arrhythmia, recurrent pneumonias leading to endocarditis, peritonitis and sepsis), the patient died after 10 months.

Conclusion: This rare case and presented management strategy underlines the significantly increased mortality rate with high cord injuries.

Keywords: Atlantoaxial joint dislocation; Odontoid process fracture; Cervical spine; High cord injury; Occipitocervical stabilization; Tetraplegia

Introduction

The combination of atlantoaxial joint dislocation and odontoid process fracture is usually a lethal injury and as a result, reports of survivors are rare. In the last thirty years only fifteen clinical cases have been described [1–3]. The patients had no neurological deficits in seven of the reported cases [1–7]. In only one case a spastic tetraparesis was described [4]. We present a case of a 30-year-old male with an atlantoaxial dislocation and type II odontoid fracture with a complete tetraplegia, dysphagia and his follow-up.

Case Report

A 30-year-old male was admitted to our hospital by flying ambulance after having an accident as a moped rider. He was found unconscious with a Glasgow Coma Scale score of 3 at the accident scene. On arrival at the emergency room he had a blood pressure of 75/40 mmHg and a heart rate of 70 bpm. The cervical spine was initially immobilized in an unphysiological flexed and lateral bended position. Diagnostic work-up revealed a posterolateral atlantoaxial dislocation with odontoid fracture and prevertebral hematoma of the soft tissue, frontobasal and midfacial fracture including a right orbital roof fracture, lack of right vertebral artery perfusion, anterior pelvic ring fracture and multiple open thigh and lower leg fractures. The axis (C2) was fractured at the odontoid process (type II fracture based on the Anderson and D'Alonzo classification) and right transverse process. The atlas (C1) was displaced caudolateral to the right relative to C2 (type V dislocation based on the Fielding classification) (Figure 1).

Magnetic resonance angiography (MRA) was used to evaluate his cervical spine and blood circulation of the brainstem in detail and to verify the suspected damage to the vertebral artery. Brain MRA did not reveal any sign of diffuse axonal injuries, intracranial haemorrhage or disruption of a vertebral artery. Furthermore, a misalignment-dependent compression of the right vertebral artery was suspected. As a result of the MRA a prevertebral and epidural hematoma as well as edema of the spinal cord with haemorrhages on the level of C1 to C3 was detected (Figure 1).



Figure 1: CT scan (A, B) of the cervical spine showing the posterolateral atlantoaxial subluxation with type II odontoid fracture. The MRI showed edema of the spinal cord with haemorrhages on the level of C1 to C3 (C). MRA of the cervical vessels displayed compression of the right vertebral artery (D).

The indication for immediate dorsal occipitocervical stabilization based on considerable atlantoaxial dislocation was defined, because the fracture was very unstable and a halo or other more immediate fixation would not suffice.

The patient was placed in prone position and a middle posterior approach was performed. A surgical posterior spinal stabilization of the occiput to C4 was executed after traction with spontaneous reduction by using neon occipitocervical system (Ulrich medical, Ulm, Germany). The screws had good grip in the occiput, C2, C3 and C4. A postoperative computer tomography scan showed physiological alignment of the C0-C1 joints and correctly placed hardware (Figure 2). Postoperative immobilization was realized using a Philadelphia orthosis for 8 weeks. Open thigh and lower leg fractures were treated with intermediate fixation and external fixation in the same session.

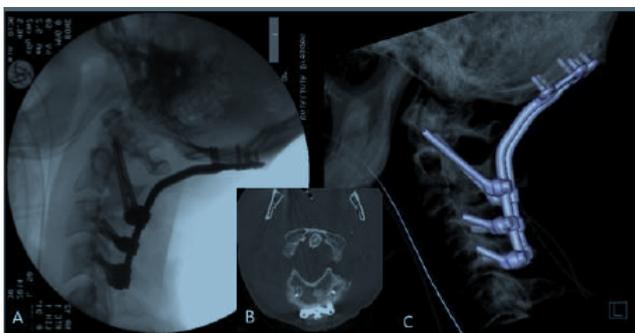


Figure 2: The postoperative x-ray and computer tomography scan showed physiological alignment of the C0-C1 joints and correctly placed hardware (A-C).

After the operation the patient was transferred to the ICU. Due to severe cardiac arrhythmia and a third degree atrioventricular block on the fifth day after the operation a cardiac pacemaker was implanted. For comfortable long-term

ventilation a tracheotomy was performed. Enteral nutrition was administered by feeding tube through the abdominal wall. During and after the weaning period the patient presented a complete tetraplegia with dysphagia and expired proprioceptive reflexes. Communication by the patient was only possible by eye and eyelid movement because of vocal cord paralysis. Two weeks after the accident and after definitive stabilization of the lower leg fractures in subsequent operation the patient was transferred to a specialized neurological rehabilitation clinic. During the rehabilitation process the neurological status did not improve and recurrent pneumonias were treated with antibiotics. Eight months after the injury the patient developed a severe peritonitis due to a toxic megacolon, this resulted in a right hemicolectomy with colostomy. Ten months after the accident the patient died due to sepsis by endocarditis resulting in multiple organ failure.

Discussion

There are few descriptions of atlantoaxial dislocation and type II odontoid fracture as an unusual upper cervical spine injury in the literature. According to Meng, Tian and Wang et al. only 15 cases have been described [2,3,8]. However, a patient with traumatic posterolateral atlantoaxial dislocation (type V dislocation based on the Fielding classification), type II odontoid fracture and initial complete tetraplegia who survived for 10 months after the accident has not been reported yet. In the scientific literature only case studies with the combination of atlantoaxial joint dislocation, type I-IV dislocation based on the Fielding classification, and odontoid process fracture and missing or incomplete neurological deficits are described.

In general, type V atlantoaxial joint dislocation represents a fatal injury. The cause of the injuries leading to atlantoaxial dislocation varies from motor vehicle accidents to falls from great heights or riding accidents. The trauma mechanism consists of a combination of lateral collision, rotation, and distraction. Furthermore, other groups have also reported a multidirectional pathomechanism in upper cervical spine injury [9,10].

In the present case, an uninterrupted rescue time, transfer to a level I trauma center and the absence of vascular lesions as well as partial brain stem lesions contributed to the patient's survival. Most of the previous victims of traumatic atlanto-occipital dislocation died at the scene of the accident or within the first hours [11]. Payer et al. reported about more traumatic atlantooccipital dislocation survivors since the improvement in emergency management [11].

Although there is no general standard for the treatment of traumatic atlantoaxial dislocation with type II odontoid fracture, halo traction has been reported as the initial treatment [12]. Autricque and Oh et al. reported two different cases where the patients were purely treated with a Halo-vest [4,7]. The main disadvantage of external fixation such as halo-vest is the long treatment time of up to 6 months [3].

Treatment in adult survivors consists of open reduction and posterior occipitocervical fusion, [1,4] or open reduction and posterior transarticular fusion [6,12] or C1-C2 pedicle screws

fixation [3] in the initial or secondary treatment. Other authors reported an anterior screw fixation of the odontoid before posterior transarticular fusion with [2] or without [5,8] iliac crest graft between C1-C2. Postoperative immobilization with a Minerva orthosis for up to three months has been reported [1,4,5]. Ni et al. discussed bilateral C1 laminar hooks combined with C2 pedicle screw fixation for an alternative treatment of C1-C2 instability not suitable for placement of transarticular screws [13]. However, a treatment algorithm has not yet been established. The type of treatment should be based on the expected neurological outcome and the severity of dislocation. In patients without any neurological symptoms the atlantooccipital joint should not be fused to prevent the nodding motions of the head. In those rare cases with severe neurological symptoms and severe dislocation as in the presented case, the occipitocervical fixation or fusion should be performed to ensure maximum stability.

Concerning the neurological symptoms in these injuries Miyamoto stated that only 16% of atlantoaxial injuries lead to neurologic deficits [14]. In general, upper cervical spine injuries with severe neurologic deficits usually result in death due to respiratory failure. In those who survive, neurologic deficits occur infrequently and, if they occur, they are often mild [15].

Besides respiratory insufficiency, cardiac arrhythmia is a typical postoperative complication in patients with neurological deficits. In the presented case the combination of respiratory and cardiac complications followed by sepsis and multi-system failure ultimately resulted in a lethal outcome.

Conclusion

In conclusion, this report describes a traumatic posterolateral atlantoaxial dislocation with type II odontoid fracture and initial and persistent complete tetraplegia, which was treated immediately by closed reduction and occipitocervical stabilization. Due to severe complications resulting from the complete tetraplegia the patient died ten months later. This case underlines the significantly increased mortality rate with high cord injuries.

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