Injury of the Synchondrosis of the Dens. Case Report

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Abstract

Background Data: Injuries of the synchondrosis of the dens are very rare and are commonly unstable injuries.

Purpose: To report a case of fracture of the synchondrosis of the dens.

Study Design: Case report.

Patients and Methods: The parents of a 1.5 years old boy reported pain and limitation of neck movements of their child following a minor fall. Imaging studies revealed displaced fracture of the synchondrosis of the base of the dens. The fracture was not amenable to closed reduction. Reduction of the fracture was only possible through direct transoral reduction. Internal fixation was done using one screw using Bohler technique.

Results: Healing of the fracture was evident three months following surgical interference.

Conclusion: Transoral digtal pressure of the displaced dens is an effective method in reduction of the injured synchondrosis. Fixation with a single screw was effective until healing of the fractured synchondrosis. (2012ESJ021)

Keywords: synchondrosis, dens, axis vertebra.

Introduction

Pediatric cervical injuries are relatively rare, comprising 0.2% of all childhood fractures1. This is explained by the fact that the cervical spine in children is more flexible than in adult. This flexibility can dissipate a traumatic force leading to less frequent injury[8]. However, when injury does occur in children, upper cervical fractures are more common due to children's relatively large heads, short necks and undeveloped musculature[6,8]. The synchondrosis between the odontoid process and the body of C2 is particularly vulnerable to injury until it fuses typically at the age of 6-8 years[3]. Rapid flexion or deceleration of the neck is the most common mechanism of injury. However, the injury can follow a fall from low height[7]. The integrity of the anterior periosteum permits successful reduction of these injuries and external fixation using rigid neck collar or Minerva orthosis is recommended for 6 weeks. Surgery in the form of anterior fixation or posterior transarticular C1-C2 fixation and fusion is reserved for irreducible injuries and for cases in whom maintenance of the reduction is not possible[2,5].

We describe a case of 1.5 years old boy with injury of the basilar synchondrosis of the dens, who was admitted to the unit of spinal surgery in the orthopaedic department in Alexandria University Hospital.

Case Report:

The child's parents mentioned that their child felt from a one meter height and developed pain and limitation of movements of his neck. They went to a spinal surgeon who ordered plain X-rays, MRI and CT to the child's cervical spine. Injury of the synchondrosis of the dens with anterior displacement was evident (Figure 1). The treating surgeon noted that the fracture was not reducible even after maximum extension of the neck at the dynamic study of the cervical spine (Figure 2). The surgeon suggested open reduction and internal fixation of the fracture. The child was referred to us four weeks after the injury. He was pain free, neurologically intact and able to move his neck in all directions. We decided to reduce the fracture under fluoroscopy and do anterior screw fixation by the method adopted by Boehler[4].

The operation was done under general anaesthesia in the supine position. Two C-arms perpendicular to each other were used to allow safe drilling and placement of the anterior screw. Being resulting from a flexion injury, the neck was maximally extended to reduce the fracture. However, this manoeuvre did not succeed to reduce the fracture. The only method which was effective in reducing the fracture was direct digital pressure on the dens through the mouth of the child. This was done by one assistant under guidance of the anaesthetist to prevent dislodgement of the endotracheal tube. Fixation was done using 2.7 mm titanium screw. The bone stock of the dens at this age did not allow two screw fixation. A cervical collar was worn for 6 weeks. The immediate postoperative CT of the cervical spine appeared as if the screw has migrated from the body of C2 (Figure 3). Surprisingly, healing of the fracture was evident three months after surgery (Figure 4). The child had no symptoms and was able to move his neck in all directions.

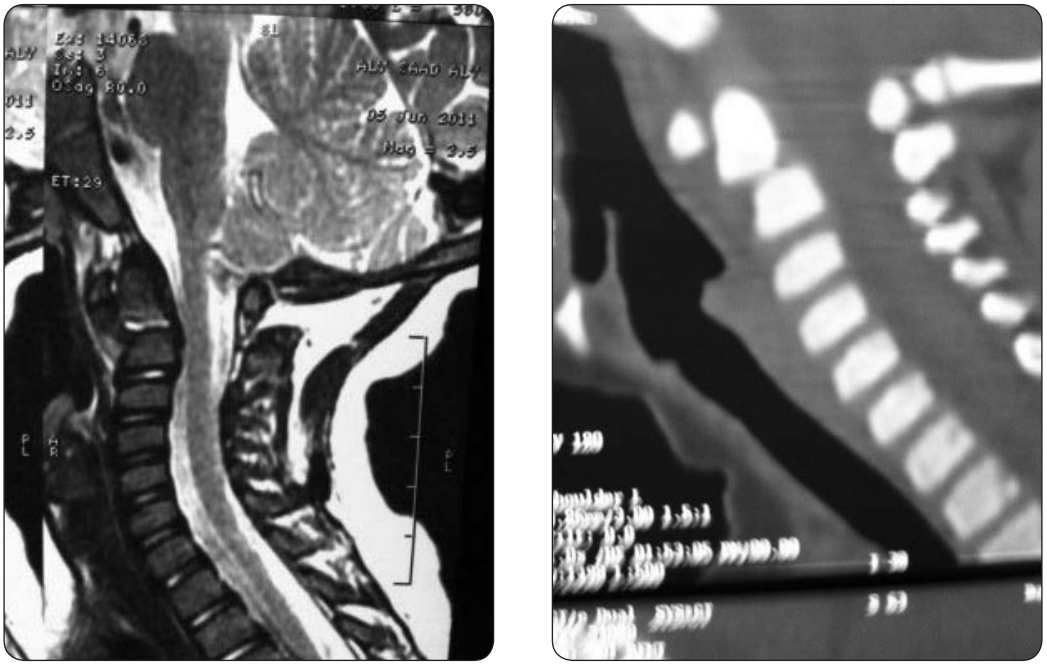

Figure 1. Preoperative sagittal MR and CT of the cervical spine showing the disrupted synchondrosis.

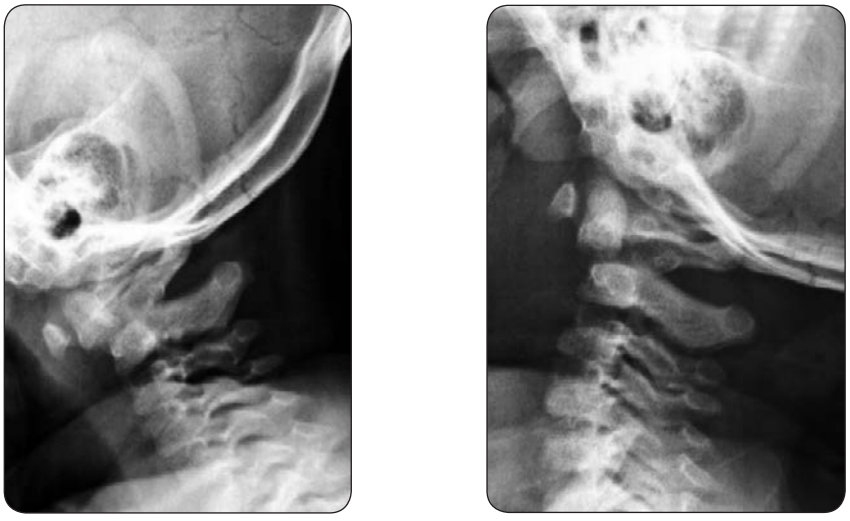

Figure 2.
Dynamic study of the cervical spine showing irreducibility of the fractured synchondrosis.

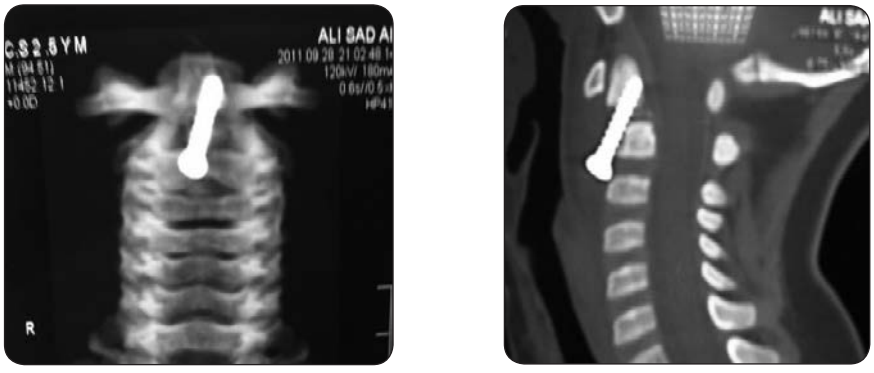

Figure 3.
Postoperative sagittal and coronal CT of the cervical spine. The screw appears as if it cut through the proximal fragment.

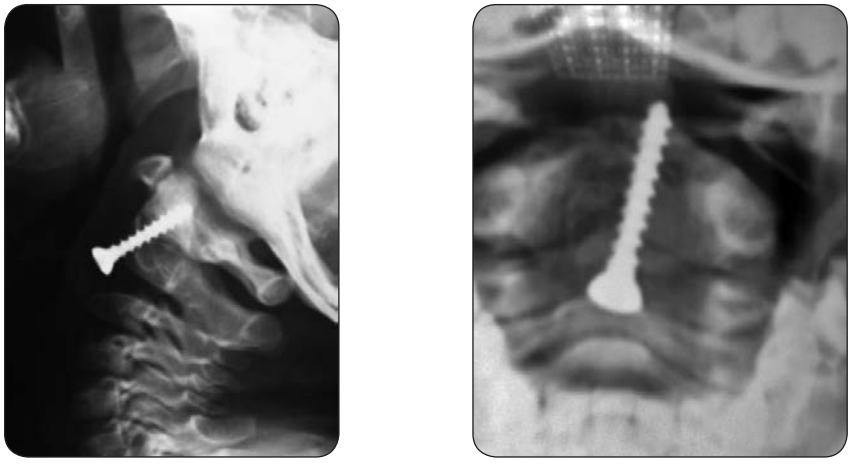

Figure 4.
Anteroposterior and lateral views of the cervical spine three months after surgery showing healing of the synchondrosis with subperiosteal bone formation.

Discussion

This case represents a rare paediatric cervical injury following a relatively minor trauma. Bone softening, lack of bone stock and irreducibility of the fracture made management of this injury challenging. Transoral digital pressure was the only method which helped in reduction of the fracture. Huber et al[6] reported a on transoral digital reduction of a displaced fracture of the basilar synchondrosis of the odontoid but external immobilization using Minerva Plaster was done until healing of the fracture was radiologically evident.

Synchondrosis fractures of the odontoid mostly develop from a flexion injury. In our case, anterior bridging of the fracture confirms integrity of the anteriorly separated periosteum on one hand and

confirms the mechanism of injury as being a flexion one.

There is misunderstanding in the literature regarding closure of the synchondrosis. Blauth et al[2] found that the synchondrosis does not heal after anatomical reduction and posterior stabilization of the fracture. Accordingly, he recommends anterior reaming of the synchondrosis to promote fusion. We disagree with Blauth because cartilaginous healing of the synchondrosis and the subperiosteal new bone formation were sufficient in our case to restore stability of the synchondrosis. Premature closure of the synchondrosis is not the only mechanism for restoring stability of the odontoid in children. Closure of the synchondrosis is related to the age of the patient and usually occurs at the age of 6-8 years.

An interesting observation was healing of the fracture in spite of incomplete reduction of the fracture. This can be explained by the minor trauma producing minor soft tissues damage and by the flexion mechanism resulting in separation the anterior periosteum without actual tear. This provides a new source for subperiosteal new formation which provides local stability and compensates for the delay or failure of healing and or closure of the synchondrosis.

Conclusion

Injury of the odontoid basilar synchondrosis can result from minor trauma to the neck of children below 8 years. Transoral closed digital reduction of the fracture is a helpful technique that allows direct anterior osteosynthesis of the dens. Closure of the synchondrosis is not necessary for a stable healing and the separation of the anterior periosteum allows anterior bridging of the fracture.

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الملخص العربي

يشتمل البحث على كسر نادر للعظمة السنية حدث لطفل عمره عاما ونصف بسبب سقوط الطفل من ارتفاع قدره مترا. وقد فشل العلاج التحفظي في رد وتثبيت الكسر .وكانت الطريقة الناجحة لرد الكسر هو إدخال اصبع السبابة لأحد مساعدينا في فم الطفل للضغط المباشر على طرف العظمة السنية وقام بذلك احد المساعدين. وقد تم التثبيت الداخلي بواسطة مسمار باستخدام طريقة بوهلر.