Fracture of the odontoid process in children: A case report

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Introduction

Fractures of the upper cervical spine are rare in children before the age of 7 years [1]. However, apophysial fracture of the odontoid process represents the most frequent form [2–3]. In fact, up to this age, because of synchondrosis between the odontoid apophysis and the body of the axis, the fracture trait during flexion movement of the cervical spine most often passes by the synchondrosis, causing apophysial fracture [2–3].

These apophysial fractures are characterized by a late diagnosis that increases the risk of neurological injuries [4–5]. They respond well to conservative treatment [5–8], as long as late diagnosis is not too important [2]. Among the orthopaedic methods proposed for the reduction of separations, we chose that of Uchiyama et al. [8] which use active auto-reduction by a hyperextension movement.

We report a case of fracture of the odontoid apophysis treated according to this method.

Our observations

A child of 5 years fell backwards in October 2006 with impact on the occiput during a play accident. He was "manipulated" by a "traditional practitioner or bone-setter".

He was not taken to the teaching hospital center emergency room until 12 days after his accident. On clinical examination, he presented paresis of the upper limbs, more marked on the left side, classified as American Spinal Injury Association Stage C.

Summary

The authors report a case of apophysial fracture of the odontoid process in association with paresis of the upper extremities in a 5-year-old child. The fracture was treated by gradual guided self-reduction without anaesthesia, followed by a Minerva jacket cast immobilisation. Reduction was anatomical, and the neurological problems regressed within 48 hours.

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Radiography of the cervical spinal profile showed apophysial fracture of the odontoid process with anterior tipping up to 50% (Fig. 1A).

The displacement was reduced anatomically by asking the patient, with the help of a doctor, to make an active and progressive hyperextension movement of the cervical spine while the trunk was kept straight.

Reduction was maintained by Minerva occipito-mandibular plaster cast with frontal support in hyperextension and descending to the thorax up to the armpits (Fig. 1B).

The neurological problems regressed fully in 48 hours.

The Minerva plaster cast was removed at day 25 when a surinfected wound of the left armpit appeared.

Control radiographs disclosed the presence of an anterior bony bridge, and dynamic radiographies showed no mobility at the level of the fracture area. A sponge collar was installed for the duration of eight weeks.

Topical care, associated with the intake of antibiotics, achieved sore healing in 15 days.

At 4-month follow-up, the patient returned to school with complete restoration of his articular amplitudes and did not present any deficit. Radiography revealed remodeling around the old fracture area as well as moderate odontoid apophysial hypoplasia (Fig. 1C).

Discussion

Except for obstetrical traumas, injuries to the upper cervical spine and, notably, apophysial fractures of the odontoid occur on average towards the age of 4 years [1,3,6]. Traffic accidents are the most frequent cause in Western countries [9].

Delayed consultation is one of the characteristics of apophysial odontoid fracture. In a series of five cases that consulted for persistent cervical pain after trauma, Odent et al. [5] reported that one patient was examined four months after the initial injury, and another case six months after in a context of paraplegia. Alp and Crockard [4] described the most obvious case of diagnostic delay in a 7-year-old girl, arriving in a coma associated with flaccid tetraplegia diagnosed at recovery. The odontoid fracture was not diagnosed until 15 years later, when secondary neurological deterioration occurred. The delay in consultation may be aggravated in Senegal by problems of accessibility to sanitary hospital facilities and by the limited number of specialists. In addition, inopportune manipulations by "traditional practitioners” may worsen the initial lesions and engender neurological injuries.

The diagnosis depends on radiography of the cervical spinal profile [3,10]. Odent et al. [5] found one anterior displacements in 15 cases of apophysial fracture, and Sherk et al. [3] noted the same in 11 patients from their series. Odent et al. [5] thought that all their patients had anterior displacement at the time of the injury, with spontaneous reduction during radiography.

Except for Godart et al. [11] and Wang et al. [12], who proposed screwing of the odontoid as first-intention treatment in children less than 3 years old, most authors [1,3,5] chose conservative treatment. In fact, the integrity of the periost situated in the anterior part of the vertebral body of the axis warrants first-intention orthopaedic correction by hyperextension.

Uchiyama et al. [8] proposed reduction of the displacement without anesthesia, by asking the patient, with the assistance of a doctor, to make an hyperextension movement of the cervical spine while keeping the trunk straight. However, Mandabach et al. [7] recommended reduction of the displacement under general anesthesia, with the use of an image intensifier. Griffith [6] preferred progressive reduction by traction, which is inconvenient as it necessitates immobilization in bed, with a potential risk of distraction of the fracture area according to Mandabach et al. [7]. If anatomical reduction is planned, Warner and Hedequist [1] noted that 50% contact is sufficient as secondary remodeling corrects the vicious callus at that age. On our part, we have employed the method of Uchiyama et al. [8], which allows full reduction of the displacement without the risk of general anaesthesia.

Reduction is maintained by a Minerva cervico-thoracic plaster cast in hyperextension which is hardly onerous and
easy to accomplish. According to Warner and Hedequist [1], it would ensure better setting than thermoplastic devices. However, these Minerva plaster casts expose patients to sores, as reported by Dormans [13] and as seen in our case. Similarly, maintenance of the reduction by halo, as per Dormans [13] and Baum et al. [14], increases the risk of pin scars and deep infections, even dural penetration.

The duration of immobilization post-reduction extends from three [8] to 13 weeks [7].

The evolution of the neurological lesions is variable. In our case, regression of upper limb paresis occurred within 48 hours. Odent et al. [5] had only one case of partial recovery among seven tetraplegic or paraplegic cases. These findings confirm the results of Hadley et al. [15] who observed regression in 89% of cases presenting an incomplete medullary lesion versus only 20% in cases of complete lesion.

In our patient, we noted moderate hypoplasia of the odontoid apophysis at 14-month follow-up. This was certainly due to a potential growth disturbance of the odontoid process comparable to epiphysiodesis at the level of cartilage growth. Warner and Hedequist [1], Sherk et al. [3] and Ewald [16] consider that the weak longitudinal growth potential of the axis explains the infrequency of this complication. Nevertheless, Ferey et al. [17] reported the possibility of complete resorption after odontoid fracture. Hypotrophy may be the source of secondary instability that requires surgical arthrodesis.

Conclusion

This report of apophyseal fracture of the odontoid in 5-year-old child reminds us that the integrity of the anterior periost of the axis permits first-intention reduction without general anaesthesia, by an active hyperextension movement of the cervical spine. Immobilization for six weeks is sufficient, and the neurological evolution is good only if the medullary lesion is incomplete.

References