Isolated fracture through the synchondrosis of the anterior arch of the atlas
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Clinical History:
A 5-year-old boy was hit by a car travelling at 30 miles per hour and suffered a head injury. On admission to hospital he complained of neck pain and was noted to have slight head tilt towards the left associated with cervical muscle spasm.

Imaging Findings:
CT of the cervical spine performed soon after admission showed disruption of the left synchondrosis of the anterior arch of the atlas with separation of the disrupted fragments by 3mm (Figs. 1, 3a). No other cervical spine injuries were identified. The patient’s neck was immobilised with a halo frame, and follow-up CT 6 weeks after the injury demonstrated good healing of the fracture with callus bridging the fracture margins (Figs. 2, 3b). The halo frame had to be removed 2 months after the trauma due to infection at the pin sites. A SOMI (sterno-occipito-mandibular immobiliser) brace was applied instead for a further 2 months. An interval MRI scan performed 3 months after the injury demonstrated fusion of the anterior arch fracture and no ligamentous injury (Fig. 4). The patient made a good recovery with normal range of cervical movements and no neurological deficit.

Discussion:
Cervical spine injuries are rare in children due to low exposure to high-energy trauma and anatomical differences, such as laxity of intervertebral ligaments [1]. Isolated fractures of the anterior arch of the atlas are even more uncommon, with less than fifteen cases described in the literature to date [1-6].

The mechanism of injury in all reported cases is a fall onto the head or road traffic collision, resulting in axial compression forces to the upper cervical vertebrae. Apophyseal / epiphyseal areas are considered the weakest points for injury, but may also raise diagnostic challenges by mimicking a fracture. Clinical presentation classically includes neck pain, cervical muscle spasm with decreased range of movement, and head tilt; neurological deficit is not commonly reported [1-6]. As plain radiographs often fail to demonstrate the fracture, suspicious clinical signs and relevant mechanism of injury should prompt further investigation with cross-sectional imaging.

Treatment options for isolated atlas fractures are mostly conservative, ranging from a firm cervical collar through immobilisation in a halo brace to traction, with good outcome in all reported cases. Surgical management, including
repair under microendoscopy, is only described in adults [7].

**Differential Diagnosis List:** Isolated fracture through the anterior arch of the atlas, Unfused synchondrosis, Traumatic disruption of the synchondrosis

**Final Diagnosis:** Isolated fracture through the anterior arch of the atlas

**References:**


Figure 1

**a**

Description: Axial cervical-spine CT on the day of trauma demonstrating disruption of the left-sided synchondrosis of the anterior arch of the atlas, but no injury to the posterior arch and no increase in the atlanto-dental distance. Origin: Department of Radiology, Birmingham Children's Hospital, Birmingham, UK

**b**

Description: Axial cervical-spine CT on the day of trauma demonstrating disruption of the left-sided synchondrosis of the anterior arch of the atlas, but no injury to the posterior arch and no increase in the atlanto-dental distance. Origin: Department of Radiology, Birmingham Children's Hospital, Birmingham, UK
Figure 2

Description: Axial cervical-spine CT images 6 weeks after the injury demonstrating sclerosis and callus formation at the fracture site. **Origin:** Department of Radiology, Birmingham Children's hospital

Description: Axial cervical-spine CT images 6 weeks after the injury demonstrating sclerosis and callus formation at the fracture site. **Origin:** Department of Radiology, Birmingham Children's hospital
Figure 3

**Description:** Three-dimensional reformatted images of the cervical spine CT on the day of injury demonstrating the fracture (a), and 6 weeks after the injury demonstrating healing (b). **Origin:** Department of Radiology, Birmingham Children's hospital

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**Description:** Three-dimensional reformatted images of the cervical spine CT: on the day of injury demonstrating the fracture (a), and 6 weeks after the injury demonstrating healing (b). **Origin:** Department of Radiology, Birmingham Children's hospital
Description: Axial fat-saturated T2-weighted MR image through the anterior arch of the atlas 3 months after the trauma demonstrating complete fusion at the fracture site. Origin: Department of Radiology, Birmingham Children's hospital.