

Case Resolution

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DIAGNOSIS: Upper cervical spinal traumatic injury.

DISCUSSION

If this girl had been traveling in the family car with a child restraint system appropriate for her age, this case would not have been published; however, in Argentina, these devices are used in barely one-third of the cases. According to Unicef and the Argentine Society of Pediatrics, the leading cause of death in early childhood is related to traffic accidents. The neurological condition of this patient is compatible with a central spinal syndrome with a motor deficit at the C5 metameric level for the upper limbs and C4 for the phrenic nerve, neither of which corresponds to the injured vertebral sector. Anatomic-metameric dissociation is common in pediatric spinal trauma due to viscoelastic tissue differences. Thermalgesic sensitivity was difficult to assess because of the child's age, but she reacted to the nociceptive stimulus.

The incidence of traumatic injuries of the upper cervical spine in childhood is very low, but the prevalence is close to 80%, with significant morbidity and mortality. In the first years of life, the C2-C3 spinal segment is subjected to a variety of mechanical stresses, as it is a hinge area between two dissimilar anatomical and functional regions: the craniocervical hinge and the subaxial spine. In general, ligament injuries prevail. In half of the publications referring to neurological involvement, no radiographic abnormality has been found, which configures the entity called SCIWORA. This diagnosis was ruled out in this girl, because a unilateral facet subluxation was corroborated by tomography (Figure 4). Decades ago, a radiologist named Leonard Swischuk wrote a report on the diagnostic value of the C1-C3 spinolaminar line in children, the diagnostic ranges of which are shown in Figure 1. Since then, this radiographic parameter has been reproduced literally in specialty publications and books without additional consideration. In more than one third of children <10 years of age, a physiological subluxation according to Swischuk's line is observed without any antecedents, although it has been mentioned sporadically in acquired torticollis. In addition to trauma, a pathologic line has been linked to Down syndrome and other diseases such as odontoid fracture and sagittal instability of C1-C2. In several published cases of unilateral or bilateral C2-C3 subluxation (and in this infant), the spinolaminar line was strictly normal, which constitutes a false negative. It is therefore advisable to add other radiographic evaluations: a translation of C2 over C3 greater than 4 mm, an alteration of the spinal axis in kyphosis, widening of the C2-C3 interspinous space, and an incongruent relationship of the articular facets. In this girl, along with ligament damage and joint instability, there was also an epiphysiolysis of the axis body. In many post-mortem investigations and kinetic cadaveric reproductions, Salter-Harris type I or II physeal injuries have been described, with significant mechanical instability, associated with posterior capsuloligamentary damage.

Any doubt regarding the facet relationship warrants a CT scan with paramedian sagittal slices. The CT scan dispels the doubt raised by the X-ray taken on admission regarding the facet relationship: it confirms the instability and supports the indication for surgical reduction and stabilization.

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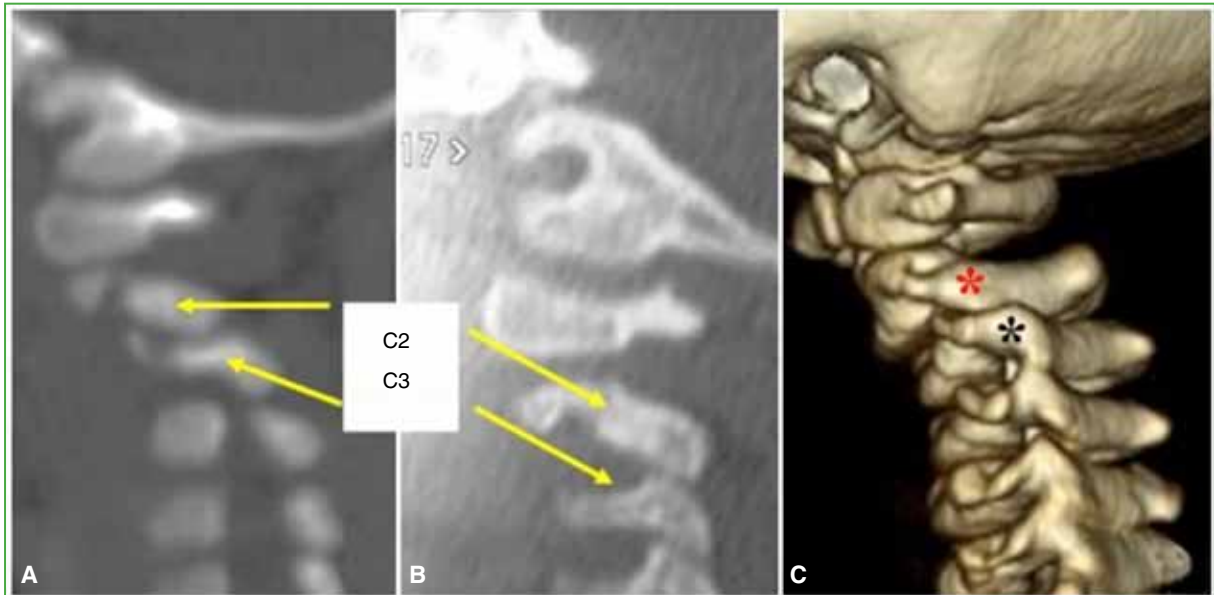


Figure 4. Computed tomography of cervical spine, paramedian sagittal slices. **A.** Fixed left subluxation of C2-C3 with small fracture of the upper end of the C3 facet. **B.** Normal right facet relationship. **C.** 3D reconstruction. C2 (red asterisk) and C3 (black asterisk) facets.

However, this imaging study is not systematically recommended in patients with spinal trauma, because its ionizing effect has been associated with the development of long-term cancer in children. Its precise indication is a score ≤ 8 on the Glasgow scale. Routine MRI is not recommended either, because in addition to the cost and the need for sedation, there is a significant prevalence of false positives. Its indication depends on the damage or deterioration of the associated neurological state.

CONCLUSIONS

The spinolaminar line described by Swischuk is invaluable for evaluating the upper cervical spine in infants and toddlers. However, there are false negatives or, on the contrary, alterations related to anomalies of other structures that do not express the C2-C3 segment. The compromise or progressive deterioration of neurological function is an indication for MRI, but it is not a systematic methodology, as is CT, which is reserved for very justified cases.

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