

Case Report

Multiple-level cervical spine trauma in children: Case report and literature review

A.J.F. da Silva^{a,b,*}, Fabrício A.C. Lopes^b, Wallan R. Mendes^b^a Neurosurgeon at the Manoel André Hospital Complex, Arapiraca, State of Alagoas, Brazil, and at the Pediatric Neurosurgery Division of the Santa Mônica Teaching Maternity - Alagoas State University of Health Sciences, Maceió, State of Alagoas, Brazil^b Manoel André Hospital Complex, Arapiraca, State of Alagoas, Brazil

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ABSTRACT

Spinal trauma is rare in children, but when it occurs, trauma of the cervical spine corresponds to 60%–80% of all cases. The most common causes of pediatric cervical spine injuries are automobile accidents, sports activities, and leisure-related accidents. Herein we report a surgically-treated case of cervical spine trauma with fractures of multiple vertebrae. A 12-year-old female victim of a high fall (from a tree) was admitted to the emergency room with neck pain and weakness in all the limbs. On examination, she was conscious, breathing spontaneously, with grade-4 tetraparesis, and preserved sphincter control. Cervical spine computed tomography (CT) revealed a burst fracture of the C4 body with retropulsion into the spinal cord and fractures of the C5 body and posterior elements of C2, C3, and C4. Cervical spine magnetic resonance imaging (MRI) revealed a hyper-signal of the spinal cord from C3 to C6 in T2, indicating contusion. Because no signs of posterior spine instability (ligament lesions) were noted on MRI, we decided to perform a C3–C5 anterior arthrodesis with C4 corpectomy and autologous (iliac) graft placement. The patient had a good postoperative evolution. Furthermore, the patient had no motor deficit, but due to the other fractures in the spine, we chose to keep the cervical collar for 3 months and followed-up on an outpatient basis. Although spinal trauma is less frequent in children than in adults, children can have severe cervical spine injuries (multiple fractures with spinal contusion), and then surgery plays a key role in stabilizing the spine and decompressing the spinal cord to avoid sequelae.

Introduction

Pediatric spinal trauma is rare and corresponds to < 10% of all cases [1]. In children, lesions of the cervical spine correspond to 60%–80% of all spinal injuries compared to 30%–40% in adults. The most common causes of pediatric cervical spine injuries are automobile accidents, sports activities, and leisure-related accidents [2]. Herein we report a surgically-treated case of cervical spine trauma with multiple-level fractures.

Case report

A 12-year-old female victim of a high fall (from a tree) was admitted to the emergency room with neck pain and weakness in all the limbs. On examination, she was conscious, breathing spontaneously, with grade-4 tetraparesis, and preserved sphincter control.

* Corresponding author at: R. Barão José Miguel 151, 57055-160 Maceió, AL, Brazil.

E-mail address: neuroajfs@bol.com.br (A.J.F. da Silva).

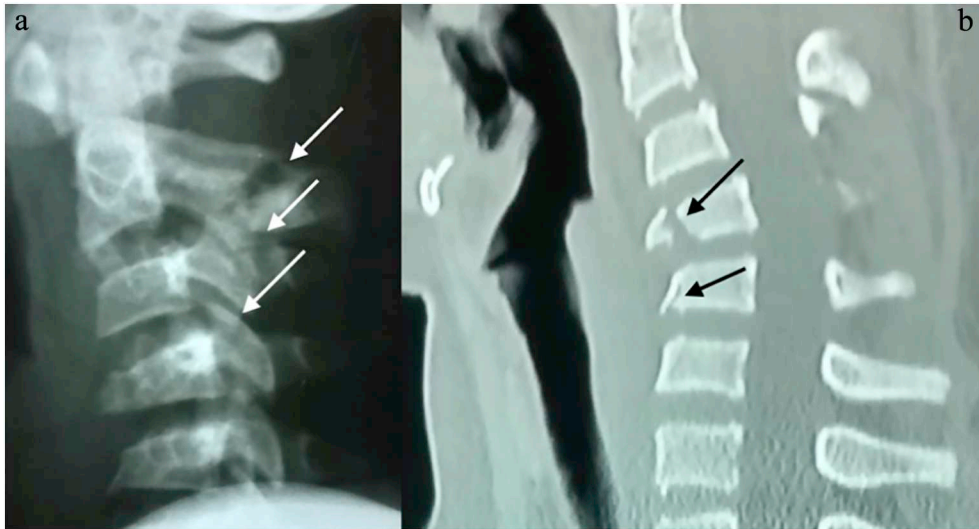


Fig 1. a- Cervical spine radiography with fracture of the posterior elements C2, C3 and C4 (white arrows); b- Computed Tomography (CT) scan: bony window with C4 and C5 body fracture (black arrows).

Cervical spine computed tomography (CT) revealed a burst fracture of the C4 body with retropulsion into the spinal canal and fractures of the C5 body and posterior elements of C2, C3, and C4 (Figs. 1 and 2). Cervical spine magnetic resonance imaging (MRI) revealed a hypersignal of the spinal cord from C3 to C6 (Fig. 3). Because no signs of posterior spine instability (ligament lesions) were noted on MRI, we decided to perform a C3–C5 anterior arthrodesis with C4 corpectomy and autologous (iliac) graft placement. The patient had a good postoperative evolution. Furthermore, the patient has no motor deficit, but due to the other fractures in the spine, we chose to keep the cervical collar for 3 months and followed-up on an outpatient basis.

Discussion

Fractures of the cervical spine in children are often associated with significant morbidity and mortality (corresponding to 16%–18%). Pediatric patients are more sensitive to cervical trauma than adults [3].

The pediatric skeleton is immature and under development; therefore, these lesions differ from those presented by adults in terms of pattern, etiology, incidence, and treatment [4,5].

Complete maturation of the upper cervical spine (C1–C2) and lower cervical spine occurs around the age of 10 and 14 years, respectively. Up to 2 years of age, there is a higher incidence of craniovertebral and C1–C2 transition injuries. From 2 to 6 years of age, the highest incidence occurs at C3–C4. From the age of 10, the incidence is similar to that observed in adults, with lesions below C5 [6]. The high elasticity of the infant spine probably protects it from some bone injuries and might explain the low incidence of spinal fractures in childhood and the relatively high incidence of spinal cord injuries without radiological abnormalities [7].

The clinical picture of pediatric patients with spinal trauma may vary in terms of the number of injuries that can occur. There may be only pain in the cervical, thoracic, or lumbar paravertebral regions at the level of the trauma or there may be severe neurological lesions such as tetraplegia or paraplegia [8].

In imaging studies, an X-ray examination with anteroposterior, lateral, and transverse incidences can be performed. In neurologically stable children, dynamic radiography (flexion and extension) can be performed to confirm the instability of the cervical spine. CT has limited utility, particularly in children aged < 10 years because in this age group, most cervical lesions are in the ligaments rather than in the bones. MRI is useful for evaluating soft-tissue, ligament, and disc lesions. MRI is indicated mainly in cases wherein neurological symptoms persist even with normal radiography and CT [8].

In children, most cases of cervical spine trauma can be treated with external immobilization (halo or Minerva device). However, the elasticity and flexibility of pediatric patients makes this immobilization difficult compared to that in adults. About 25%–30% of cervical spine injuries require a surgical procedure aimed at maintaining the stability of the spine, thus limiting morbidity. Indications include irreducible dislocations, progression of deformity, unstable lesions, and decompression of neural structures [3,8]. The approach may be anterior, posterior, or both, depending on whether the lesion is in the anterior or posterior spine, or in both [8]. In the present case, lesions at multiple levels were an aggravating factor, along with instability in the anterior spine.

Moreover, neurological recovery is still better in pediatric patients than in the adults, even with extensive injury [9].



Fig. 2. Sagittal T2-weighted magnetic resonance imaging (MRI) showing spinal cord contusion (white arrows).

Conclusion

Although pediatric spinal trauma is less frequent as compared to spinal trauma in adults, severe cervical spine injuries (multiple fractures with spinal cord contusion) may occur in children. In these cases, surgery plays a key role in stabilizing the spine and decompressing the spinal cord to avoid sequelae.

Declaration of competing interest

None of the authors listed on the manuscript have any potential conflict of interest to report.



Fig. 3. C4 anterior cervical corpectomy and fusion (C3-5) with iliac crest strut graft.

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