

Vertebromedullary Trauma in Children

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Case Report

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Abstract: Our review is a retrospective study discussing epidemic, diagnostic and therapeutic characteristics of spine injuries in children at the Neurosurgery department in Ibn Tofail Hospital, Mohammed VI University Hospital Center (UHC) of Marrakech, during 9 years, from January 2002 to December 2010, permitted us to emphasize the following points: The mean age was 10 years old. Males represented 76%. Etiologies are dominated by the falls in 49%, and the motor-vehicle accident comes in the second place. Spinal pain is the main revealing sign. Spinal cord injuries were frequent. Injuries of cervical link are predominant on the other spine injuries. Surgical treatment has been used in 75.60% of children. Evolution of neurologic injuries depends on the severity of the initial injury.

Keywords: Trauma –spine –pediatric –diagnosis –treatment

INTRODUCTION

Pediatric spinal trauma (PST) differs from those of adult by their causes, seats, evolutions and treatments [1]. The aim of this work is to shed light on the different clinical, radiological and therapeutic aspects of these lesions, as they are often unknown and their consequences are serious, both in health and socio-economic terms

MATERIALS AND METHODS

Our work is a retrospective study of 41 cases of spinal trauma in children under the age of 16 in the neurosurgery department at the Ibn Tofail Hospital, Mohammed VI UHC over a 9-year period from January 2002 to December 2010. All of these children have benefited from a clinical assessment, specific neurological examination, and a radiological assessment including standard spine x-ray, with CT or MRI. Different epidemiological, clinical, para clinical and therapeutic aspects are reported and discussed.

RESULTS

Average age of patients is 10 years, with extremes ranging from 4 to 16 years, with a higher incidence for the age group 11-16 years. We noted a clear predominance of the male sex 76%. Occurrence of vertebral trauma in children is of various etiologies, the

most common in our series is the fall 49%, followed by road accidents road 36%. Other etiologies are represented by 3 cases of trauma following a sports accident, a case of an attempted autolysis by hanging, an electrocution and an assault responsible for vertebromedullary wound.

Table-1: cases distribution according to Frankel classification

| Frankel classification | Number of case | Poucentage (%) |
|--|----------------|----------------|
| A: complete injury, no motor or sensory function below the level of injury | 12 | 29,29 |
| B: Incomplete injury, no motor function | 7 | 17.08 |
| C: incomplete injury, motor function useless, sensory incomplete | 5 | 12,19 |
| D: incomplete injury, motor function useful, sensory incomplete | 2 | 4,87 |
| E: incomplete injury, motor function normal, sensory normal | 15 | 36,58 |

Clinical examination at admission ranged from simple spinal pain to complete loss of motor activity, sensory with vegetative disturbances depending on the level of spinal cord injury. Of the 41 children in our series, 15 children had no neurological disorders, while 26 children had neurological manifestations, with a predominance of class A and B of Frankel classification (Table 1).

Radiological assessment is based on spine x-ray (all patients), spine computed tomography (CT) (35 patients), and vertebromedullary magnetic resonance imaging (MRI) (8 patients). Cervical spine is the most frequently encountered in our series with 34%, followed by lumbar spine and dorsal spine. According to the radiological data, the various lesions objectified are: Fracture of the vertebral body or bone elements without dislocation in 31 cases, Fracture associated with dislocation in 3 cases, dislocation without detectable fracture in 9 cases, neurological lesion without radiological detectable abnormality, or SCIWORA (Spinal cord injury without radiographic abnormalities) in 4 children of our series.

Medical and orthopedic treatment (external immobilization + rest) were proposed for all children. Orthopedic treatment was exclusive in 10 of our 41 patients (34.14%), 6 with cervical trauma, and 4 with lumbar trauma. The other patients had received surgical treatment at the same time. It was performed in 31 patients in our study series, representing 75.6% of all patients in our series and distributed as follows: 14 cases of laminectomy, 7 cases of plaque fixation, and 6 cases had rods fixation. The establishment of an iliac graft associated with a fixation plate was used in 14 cases (45.16%), it was associated with a corporectomy in 12 cases and a dissectomy in 2 cases, 2 cases of strapping of 2 vertebrae and one fixation case per plate alone.

The evolution of the neurological deficit was dependent on severity of initial lesion, so that all neurologically intact children on admission remained. However, those with severe neurological deficit showed no improvement.

DISCUSSION

Spinal trauma of children is rare compared to adult and compared to pediatric trauma. Their frequency varies between 1 to 10% of all spinal injuries, and between 1 to 25% for all pediatric traumatology [1,2]. The average age is usually between 8 and 14 years old. The frequency of spinal injuries increases exponentially with the age of the child, especially from the age of 9-10 years [1-3]. The male sex predominates [1,3,4]. Our series joins what has been described by the literature. Etiologies are dominated by 2 main causes: road accident (RA) and falls. These 2 etiologies are

responsible for an average of 60% of pediatric spinal trauma. Predominance of RA becomes evident especially beyond 11 years. Falls predominate in children under 9, and mainly cause cervical lesions. [1,2,4] Spinal trauma of young child under 9 is most often localized in the upper cervical spine (occiput-C3). The lesions below C3 are observed especially in the big child. The distribution and characteristics of these lesions become more and more similar to those of the adult from the age of 12 years. The second highest frequency in literature is the trauma of thoracic spine and thoraco lumbar hinge, the latter often caused by violent trauma in a context of polytrauma. Finally, it is the lumbar spine that is the least affected in the vast majority of series, it is seen especially in the big child [1,4,5],

Clinically, very careful examination of the spine will seek, without over-mobilizing the patient, pain, paravertebral muscle contracture, abnormal angulation or projection, and the presence or not of a neurological deficit. In older child, clinical manifestation of neurological deficit is quite similar to that of adult, lesion may be incomplete (intramedullary syndrome, anterior contusion of the spinal cord syndrome, lateral syndrome), or may be complete (paraplegia or total tetraplegia) [3,4]. Medullary lesions without radiologically detectable spinal lesions or "SCIWORA" correspond to traumatic lesions of spinal cord, without vertebra-disco-ligament abnormality visible by the various radiological examinations. This type of lesion, rare in adults, is a pediatric entity because of the anatomical and biomechanical properties of the immature rachis. [2,3,6]. PST is integrated in a context of polytrauma in 20 to 60% of cases. Associated lesions that can be found are numerous, in the literature, we find that among them, head injuries are the most common [2,4,7].

Purpose of radiological assessment is to make an injury description, to define the spinal stability, the mechanisms of neurological lesions, and to guide therapy, as well as the choice of possible approach. As a first step, standard radiographs will be requested, and depending on the results obtained, further examinations may be requested. CT allows a fine analysis of anatomical changes of the spine; it also allows differentiating between fracture and synchondrosis in a young child. However, its limits are medullary lesions [8,9]. Medullary MRI is used to detect a surgically treatable lesion and to evaluate the type of spinal cord injury, and also offers advantage of visualizing ligament damage, discs and bone signal abnormalities [8-10].

Management begins at the accident site, respecting the conditions of transport and ensuring resuscitation [8]. Medical treatment alongside usual treatment is based on: rest, muscle relaxants, and anti-

inflammatory drugs, a study published by Pettiford [11] showed that there is a lack of evidence criteria regarding high dose of Methylprednisolone in children, and the majority of traumatized children of the spine are currently managed on the basis of extrapolated evidence from adult studies and that beneficial role of steroids remains uncertain.

Purpose of orthopedic treatment is to stabilize the lesions by effective restraint [8]. In our series, orthopedic treatment was sufficient in 10 children (19.04%), which is not compatible with the results published in the literature, where the majority of schools prefer orthopedic treatment especially in subjects under 8 years, this can be explained by the age of the cases in our series (87.8% are over 8 years old) [4,7,8].

For surgical treatment, posterior approach is the most frequently used. It is easy to perform, sometimes even in an emergency. Various means of spinal stabilization can be used in this way: lacings, plates and screw fixation osteosynthesis. Anterior approach may be necessary especially in case of fracture of the cervical spine. A small screw plate or an earlier Roy Camille staple, or Caspar's small plates, are usually used at this level. Access to the thoracotomy or laparotomy of the thoracic or lumbar spine is rarely used in children. This approach is more difficult than at the cervical level and presents a lot of risks, which considerably limits its indications [12,13].

Surveillance must be rigorous, which may indicate the removal of the material after a few months after consolidation, so as not to hinder regional spinal growth [12-14].

The best treatment is preventive. It will focus on the main causes of spinal injuries in children, and become aware early on of the most serious dangers of its environment.

CONCLUSION

Spinal trauma is relatively rare in children. The upper cervical region is very vulnerable especially in young children with predominant ligamentous lesions and SCIWORA. The diagnosis is based on clinic, CT and sometimes MRI. Majority of patient can be treated only by orthopedic means, surgery is reserved for precise indications, and finally the evolution depends on the initial neurological state.

Contributions of the authors

All the authors contributed to the medical care of the patient, as well as the writing this article they approved.

REFERENCES

1. Parent S, Jean Marc MT, Marjolaine R, Felix J, Hubert L. Spinal cord injury in the pediatric population: A systematic review of the literature. *Journal of neurotrauma*. 2011;28:1515-24.
2. Muzumdar D, Ventureyra CG. Spinal cord injuries in children. *Journal of pediatric neuroscience*. 2006;1:43-48.
3. Ferey S, Kalifa S, Cohen PA, Adamsbaum C. Traumatismes du rachis chez l'enfant. *J Radiol*. 2005;86:263-72.
4. Leah Y, Carreon, Glassman CV, Campbell MJ. Pediatric spine fractures: A review of 137 hospital admissions. *Journal disord tech*. 2004;17:477-82.
5. Bilson LE, Brown J. Pediatric Spinal Injury type and severity are age and mechanism dependent. *Spine* 2007;32:2339-47.
6. Bosh P, Vogt T, Timothy W. Pediatric spinal cord injury without radiographic abnormality. *Spine* 2002; 27: 2788-800.
7. Erhan B, Ulu MO, Gunduz B, Tanriverdi T. Pediatric spine and spinal cord injury in Istanbul: A retrospective analysis of 106 patients. *Neurosurg Q* 2005;15:21-4.
8. Brockmeyer DL. Spinal cord and spinal column injuries in children: current management options. *Seminars in neurosurgery* 2002;13:39-46.
9. Panuel M, Girard N, Petit P, Jouve J.L, Bourlière-Najean B, Faure F, Raybaud C, Devret P. Imagerie des lésions traumatiques vertébro-médullaires de l'enfant. *Encycl. Méd. Chir. (Elsevier, Paris), Pédiatrie* 1998;10:4-090-C-10.
10. Sleight JB, Allred D, Hyman J. Use of magnetic resonance imaging in evaluating injuries to the pediatric thoracolumbar spine. *Journal of pediatric orthopaedics*. 2001;21:288-93.
11. Pettiford JN, Bikhchandani, Ostlie J, Shawn D, Ronald SP, Sharp J, Juang D. A review: the role of high dose of methylprednisolone in spinal cord trauma in children. *Pediatr surg int*. 2011;10:3003-12.
12. ROGER, LYON M. Pediatric spine surgery: Principles and techniques of the spine surgery, Tome2 2004;13:267-94.
13. Parent S, Dimar J, Dekutoski M, Roy-Beaudry M. Unique Features of Pediatric Spinal Cord Injury. *Spine* 2010;35:202-8.
14. Roy-Camille R, Ronald E, Saillant G. Conduite à tenir devant un traumatisme du rachis. *EMC (paris France). Urgences*. 24 1995;100E 10.