Spine III: Trauma
Cervical Spine Injury in Children
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Introduction

Cervical spinal cord injury is rare in children (flexibility and elasticity protect against the traumatism)
70-80% of pediatric spinal injuries are at the cervical region.
In young child most injuries are between occiput and C2 compared children after 8 - 9 years and the adult.

Prognosis is conditioned by several neurological symptoms and association injuries.
Interest & Challenges

Anatomical and physiological characteristics (Fulcrum – Pseudosubluxation C2-3
Frequency most often at cranial spinal junction
Clinical examination and neurological disorders
Indications and Radiological studies (ligamentous laxity) should be well studied
(anesthesia & radiation)
Lesions confused by cartilaginous structures & ossification centers.
Importance of the initial management of a child with CSI.
Atlantoaxial rotary subluxation

Treatment must take account of spinal growth of the child.
Particularity of cervical spine

Masse of the head is disproportionally large. Neck muscles relatively underdeveloped and ligaments are lax and elastic.
Vertebral body anterior wedging cartilaginous
Articulating facets more horizontally oriented
Congenital abnormalities and incomplete ossification of odontoid process predispose to injury
Static & Growth Disorders

- Disorders of the spinal static.
  - cartilage growth.
  - ossification centers
  - Diagnosis failed (pseudo fracture, os odontoideum, congenital defect spina bifida...)

- Disorders of growth.
  - High risk in children very young
  - Injury final of the epiphyseal plate
  - The growth monitoring allows diagnosis.
Evaluation of Spinal Injury

- Mechanism of the traumatism and Physical Exam
- Radiological Evaluation
- Management
  - Traction: 5 pounds / per spinal level
  - Immobilization
  - Surgery + / -
Radiographic evaluation

Anterior arch of C1 - odontoid < than 5 mm.

The tangent to the previous arc C1 and C3 tangent to C2 (line Swischuk).

The line of the growth cartilaginous of dens is through the upper joint of C2.

A retro pharyngeal hematoma as indirect sign of trauma

Distinguish a fracture with synchondrosis & pronounced vascular channels in the ossification center
Immobilization

- The immobilization has to be the rule (rigid cervical collar)
  - on the place of the accident
  - during the transport
  - and in room of emergency and radiology

Immobilize to prevent further injury: the spine is immobilized depending on the age by a moss collar or a simple billot holding the spine in extension.
Review

- Our study is 21 cases: 19 males & 02 females
- Age:
  - 3 to 8 years ......................... 7 cases
  - 8 to 15 years ..........................14 cases
- Localization and siege:
  - Upper cervical spine ...................9 cases
  - Lower cervical injury ..................12 cases
- Traffic accident in .......9
- Falls .........................5
- Spine injury by diving.......4
- Sports related accidents...3

- In younger patients: Traffic accidents and falls
- Motor vehicle, diving, Sports activities in young and adolescent
Clinical signs

- Spinal cord injury should be suspected when trauma patient:
  - Unconsciousness
  - Torticollis and Cervical rigidity
  - Neck pain, Radicular pain
  - Numbness, neurologic disorders
Material & Methods

• Upper cervical spine:
  Fracture C1 and C2 ............................................9 cases

• Lower cervical injury:
  -Vertebral fracture .............................................. 3 cases
  -Fracture with (sub)luxation ................................. 3 cases
  -Subluxation without fracture ............................... 6 cases

• Spinal cord swelling with high signal in MRI ..... 2 cases
  (Sciwora syndrome)
There is in children physiological laxity difficult to interpret especially C2 C3
- The initial images are almost always technically imperfect due to the painful contracture.
SCIWORA
Illustrative commun lesions

**Ibrahim** R. 4 years (traffic accident) odontoid fracture at the synchondroses (tear and abruption epiphyseal) with anterior displacement. Apophysial fracture of the odontoid process represents the most frequent form.
Case 1

Odontoid fracture occur through dens body synchondrosis with anterior displacement
Control 2 years after the injury and treatment

Conservative treatment with contention in extension by minerve with occipital – mentonier - thoracic sternal support
B. Alla present after traffic accident: left head rotation associated with a torticolis
TDM: Rotary rotation C1 / 2 with odontoid as central pivot and right joint surface
discovery without full decoaptation of the articular area (rotary dislocation type 2
Fielding and Hawkins)
B. Alla 5 years displacement C1 < 5 mm  Right lateral atlantoaxial joint anteriorly subluxed

Fielding and Hawkins classification of atlantoaxial rotatory subluxation
Higher incidence in children, usually associated with deficiency of transverse and/or alar ligaments.
Treatment

Conservative traitement (medical and orthopedic: soft collar and analgesics)
The control TDM: Amendment of the rotary dislocation type 2 Fielding and Hawkins & proper alignment vertebral C1 C2
Odontoid fractures

- Fractures of the dens represent 10% of all fractures and dislocations of the cervical spine of the child.
- The trauma occurs in synchondrosisis to the base of the dens and the displacement is anterior.
- It’s described as an abruption epiphyseal. The mechanism of injury is severe with a fall from a great height or accident.
No Surgical Treatment hard collar immobilisation

Clin.exam.: cervical pain & limitation of the movements of the neck

Age: 13 ans
Sexe: M.

Stabilization by minerva and cervical collar

Before Trt

After Trt (2 months)
No surgically Treatment

Age : 12 years
Sexe : M.

Cervical pain with limitation of the movements of the neck

Odontoïde Fracture Type 1

TDM before Trt

X Rx after trt
Surgery

unstable fracture that do not maintain alignment and persistence of un-stability after conservative treatment.
Posterior C1-2 stabilization with bone graft and wiring
Anterior displacement of dens & fracture of anterior arche of C1
Posterior Occipital – C3 fixation (Occipito C2-3 screw) with rods from Occiput to C-3

Removed at 6 months)
M. Mohamed 12 years cranio cervical trauma after a fall from a height of 6 meters: cervicalgies & bilateral luxation C6-7 and articular bilateral fracture of c6 and right pedicle fracture of C5
Bilateral dislocation (stems + polyaxial screws and screwing C5-7 (No at C6 (bilateral articular collapse of C6))
M.11 years Traffic motor injury: Paraparesis and torticollis C7 fracture dislocation with cervical spinal cord compression
Surgical treatment after reduction by traction performed by a plate and screws C6-7-T1
Mortality among spine injured children is higher than adults (associated craniocerebral injuries).
Conclusion

- CSI in infants and young children are often difficult to diagnose. In a child under 7 years with neck pain associated with stiffness or torticollis, cervical spine injury should be suspected especially after a trauma with hyperflexion.
- The majority of these injuries can be treated by reduction and containment. Surgery is indicated in cases of major instability and after the failure of the reduction and external contention. In these cases the surgical approach must take into account the child's growth.