Introduction

Paediatric cervical spine (C spine) injury is uncommon. However cord injury may have devastating consequences. C5-C7 is the area most often injured, although the upper cervical spine is more at risk in younger children compared with adults.

Cervical spine injury should be suspected when any of the following are present –
- Multiple traumatic injuries
- Significant injury above clavicles
- Trauma with unexplained hypotension
- Mechanisms:
  - Pedestrian vs car
  - Passenger in RTC
  - Fall > 3m
- Patient’s with limited neck movement
- Neurological deficit
- Central neck pain

Clinicians need to be aware that immobilisation of a distressed/mobile child may be counterproductive and can have negative consequences eg. Airway compromise
- Increased pain
- Pressure areas

Immobilised patients must have a nurse/doctor with them at all times.

Anatomical and radiological differences in paediatric cervical spine can make management and interpretation of investigations difficult. Children have relatively large occiputs, ligamentous laxity, cartilaginous areas and growth plates.

High doses of ionising radiation are associated with adverse long term effects. The magnitude of this risk in relation to cervical spine imaging has not been precisely defined, however the risk is likely to be more significant the younger the patient.

General principles

- Consider C spine injury in all trauma presentations
- Aim to rule out this possibility early in presentation & document clinical clearance if appropriate (see algorithm)
- C spine immobilisation should not impair airway management and should not result in secondary complications
- If radiology is required, it should be completed using the lowest possible dose of ionising radiation (ie. Plain films and if required CT localised to area of concern)
**Imaging**

Do not x-ray children who are:

- Alert, conscious, verbal and cooperative and
- With no distracting injuries and
- No central neck tenderness and
- Normal neurology

This should be clearly documented in the clinical notes

**Which Views?**

Imaging in Resus Room - lateral cervical spine

In radiology department – lateral cervical spine, AP and PEG/odontoid views. C7-T1 junction must be visible on lateral films.

Cervical spine films should only be cleared by radiology, ED SMO/registrar, orthopaedic registrar or neurosurgical registrar. This must be clearly documented in the patient notes.

See also Explanatory Notes 8 & 9 below

**Collars**

Placement of a Philadelphia collar should be considered for any child who must remain with neck immobilisation for greater than 4 hours. These can be obtained through Orthotic department in hours. Scripts and phone contact details are found with fracture clinic follow up charts. After hours, collars may be requested from the Adult Emergency Orthotic supplies.

There is no evidence for the use of soft collars in cervical spine injury.
Algorithm: Assessment & Management of Possible Cervical Spine Injury

See Explanatory Notes below for more detail

Any of:
- Altered level of consciousness
- Intoxicated
- Focal neurology
- Distracting injury

Immobilise
- Hard collar and trauma bed
- Consider thoracic elevation device (TED) if > 10 years of age

Clinical Examination
Midline tenderness?
Neurological deficit?

Patient having urgent CT head?

Cervical spine imaging & analgesia

Active movement (patient initiated)
L and R rotation >45°

CT cervical spine
Abnormal
Normal

Persistence of any of the following:
- Unstable A, B, C
- Altered level of consciousness
- Intoxicated
- Distracting injury
- Focal neurology

No Cervical spine imaging required

No

Discuss with SMO & Orthopaedic Team

Continue Immobilisation
Discuss with SMO / Ortho
May need CT cervical spine or MRI

Re-examine patient
- Midline tenderness
- Neurological deficit?
- Pain-free ACTIVE movement (patient initiated)
  L and R rotation >45°

Document Cervical Spine cleared

Yes

No
Explanatory notes

1. Altered Level of Consciousness and Intoxication

Altered level of consciousness is present if any of the following is present:
   (a) Glasgow Coma Scale score of 14 or less; or any score other than alert on the AVPU scale
   (b) Disorientation
   (c) Persistent anterograde amnesia
   (d) Delayed or inappropriate response to external stimuli.

Patients should be considered intoxicated if they have either of the following:
   (a) A recent history of intoxication or intoxicating ingestion or
   (b) Evidence of intoxication on physical examination.

Patients may also be considered to be intoxicated if tests of bodily secretions are positive for drugs that affect level of alertness, including a blood alcohol level greater than .08 mg/dL.

2. Focal Neurological Deficit

Any focal deficit found on examination of motor or sensory systems.

3. Distracting Injury

This is defined as any injury that could potentially distract a patient from a cervical spine injury and includes:
   1. A long bone fracture
   2. A visceral injury requiring surgical consultation
   3. A large laceration, degloving or crush injury
   4. A large burn
   5. Any injury producing acute functional impairment.

4. Midline Tenderness

When evaluating the neck, loosen the cervical collar and palpate directly in the midline. Midline posterior bony cervical spine tenderness is present if the patient complains of pain on palpation of the posterior midline neck from the nuchal ridge to the prominence of the first thoracic vertebra.

5. Active neck rotation

Is the patient able to rotate neck 45 degrees to the left and right without assistance.

6. Immobilisation

Immobilisation is the use of rigid collar and trauma bed (or spinal board) and sandbags, according to the comfort and distress of the child. A distressed child in a collar is not well immobilised. Therefore some children can be better immobilised using sandbags and reassurance. There is a lack of consensus on the ideal method of immobilisation. A recent Cochrane review could not identify any studies that showed definite benefit from immobilisation, but studies have demonstrated the negative effect immobilisation can have on respiratory function.
7. Thoracic Elevation Device (TED)

Children less than 10 years have large occiputs. In standard immobilization devices this results in cervical hyperflexion. A thoracic elevation device (TED) (made of foam padding) can be placed under the shoulders of all children under the age of 10 years. The TED can be placed when transferring patient from the ambulance trolley to the trauma bed (or spinal board). The patient will need a ‘logroll’ prior to imaging if a TED has not been placed initially.

8. Imaging

The standard cervical spine imaging series will be a cross-table lateral, an anteroposterior and an open-mouth odontoid view. C7-T1 junction must be seen on lateral films.

9. Further imaging

CT Scanning is indicated in the event of a suspected bony abnormality or if plain films have not adequately imaged the cervical spine to the C7/T1 junction. Ideally CT scanning should be restricted to the specific part of the cervical spine that requires further investigation (in order to reduce radiation exposure). MRI scanning is usually indicated when identification of soft tissue injury is required or if there is a suspicion of spinal cord injury without radiological abnormality (SCIWORA). SCIWORA refers to a spinal cord injury that is sustained without cervical spine abnormality being detected on plain film or CT. This injury pattern is more common in the paediatric population because of greater ligamentous laxity.

If immobilisation is likely to be required for more than 4 hours, the use of a ‘Philadelphia’ collar and/or sandbags is recommended.

References


Kwan I, Bunn F, Roberts I, on behalf of the WHO Pre-Hospital Trauma Care Steering Committee. Spinal immobilisation for trauma patients. Cochrane Database of Systematic Reviews 2001, Issue 2. Art. No.: CD002803.


