

Handling acute spinal injuries with focus on C-spine and radiological investigation – an evidence based approach.

Report from the consensus meeting in Sigtuna, November 18-19, 2004 arranged by Nordic Forum for Trauma and Emergency Radiology (NORDTER).

This document is a result from the multidisciplinary meeting held with representatives for radiology, orthopaedic surgery, general and vascular surgery from Akademiska, Uppsala, Karolinska Solna & Huddinge, SÖS and Svendborg, Denmark. Invited expert and lecturer was C.Craig Blackmore from Harborview Medical Center, Seattle, Washington.

Participants:

- Orthopaedic surgery
 - Rune Hedlund, Karolinska
 - Claes Olerud, Akademiska
 - Gunnar Sandersiöö, Karolinska
 - Ulric Willers, SÖS
- Surgery – general, emergency & vascular
 - Folke Hammarqvist, Karolinska
 - Oskar Hägglund, Karolinska
 - Karin Isaksson, Karolinska
 - Olle Lindström, Karolinska
 - Rabbe Takolander, SÖS
- Radiology- general och neuroradiology
 - Mats Beckman, Karolinska
 - Per Grane, Karolinska
 - Mariann Hammar, Akademiska
 - Klaus Lange, SÖS
 - Bertil Leidner, Karolinska
 - Adel Shalabi, Karolinska
 - Anders Sundin, Akademiska
 - Jörgen Törnkvist, SÖS
- Nordter representative
 - Henrik Teisen, Svendborg, Denmark

Available scientific evidence was examined and stratified according to the value of the scientific data. The goal was to create recommendation for the acute care of spinal injuries with focus on C-spine radiology with an evidence based approach.

This document is available from NORDTER at www.nordictraumarad.com. It is available in PowerPoint presentation and in both Swedish and English. Craig Blackmore's presentation and the background articles studies are also possible to download. The material is free to use providing that the source is presented.

Conclusions

Clinical examination can confidently exclude c-spine injuries:

One of the following two validated algorithms should be adopted, used, and taught.

- **NEXUS**
 - Absence of midline tenderness
 - Absence of focal neurological deficit
 - No intoxication
 - A normal level of alertness
 - Absence of painful distracting injury
- **Patients fulfilling these criteria are cleared from c-spine injury.**

- **Canadian C-spine rule , “CCR”**
 - Adults ≥ 15 years old,
 - No history of vertebral disease,
 - GCS 15
 - Injury < 48 hours old
 - 1. No high risk factor, including:
 - Age > 64 years
 - Dangerous mechanism, including:
 - Fall from ≥ 1 meter/5 stairs
 - Axial load to head (diving)
 - High speed vehicular crash (100 km/h, rollover, ejection)
 - Bicycle collision
 - Motorized recreational vehicle
 - Paresthesias in extremities
 - 2. Low-risk factor is present
 - Simple rear end vehicular crash, excluding:
 - Pushed into oncoming traffic
 - Hit by bus/large truck
 - Rollover
 - Hit by high speed vehicle
 - Sitting position in emergency department
 - Ambulatory at any time
 - Delayed onset of neck pain
 - Absence of midline cervical tenderness
 - 3. Able to actively rotate neck (45 degrees left and right)
 - **Patient that fulfils the first criteria, has no high risk factor, has any low risk factor present and can actively rotate the neck is cleared from c-spine injury.**

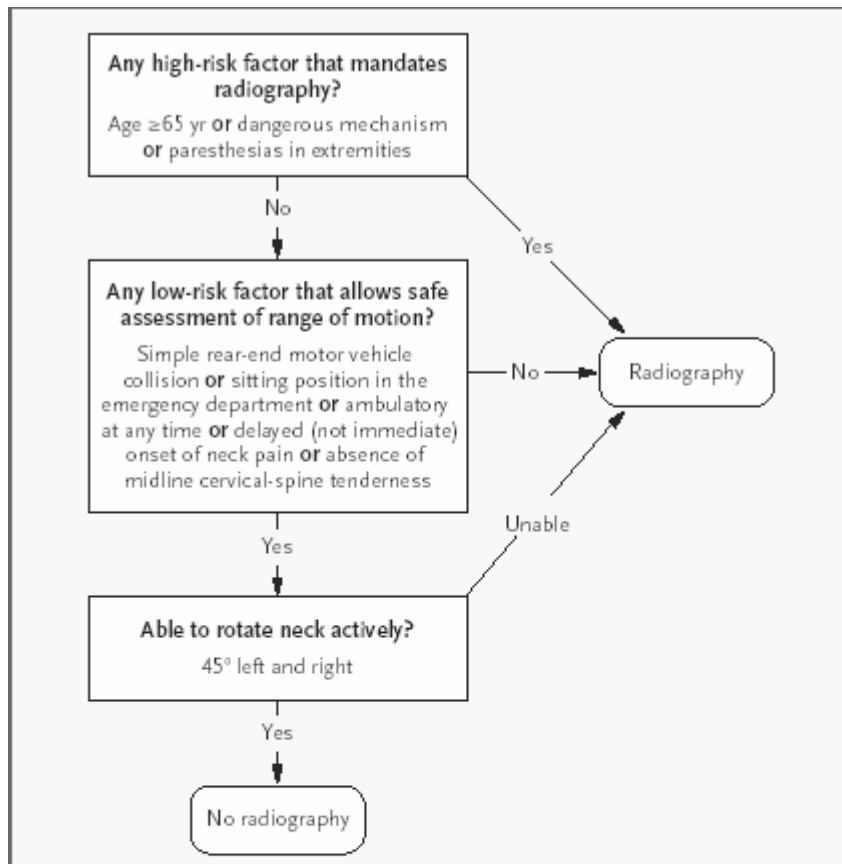


Figure 1. The Canadian C-Spine Rule.

For patients with trauma who are alert (as indicated by a score of 15 on the Glasgow Coma Scale) and in stable condition and in whom cervical-spine injury is a concern, the determination of risk factors guides the use of cervical-spine radiography. A dangerous mechanism is considered to be a fall from an elevation ≥ 3 ft or 5 stairs; an axial load to the head (e.g., diving); a motor vehicle collision at high speed (>100 km/hr) or with rollover or ejection; a collision involving a motorized recreational vehicle; or a bicycle collision. A simple rear-end motor vehicle collision excludes being pushed into oncoming traffic, being hit by a bus or a large truck, a rollover, and being hit by a high-speed vehicle.

- **ATLS practice which include NEXUS criteria with the addition of movement test can also be used.**
- **(If an algorithm is already implemented additional criteria may be used.)**

Indications for C-spine CT instead of plain x-ray:

- **CT in high risk patients**
 - Focal neurology
 - Severe head injury- unconscious, skull fracture, intracranial haematoma
 - High energy mechanism
 - Motor vehicle crash ≥ 50 km/h
 - Auto vs pedestrian
 - Death at scene
 - Pelvic fracture
- **CT for logistical reasons**
 - Patient already in CT scanner and c-spine exam is indicated.
 - Patient must be examined lying down.
- **No extra plain film radiographs are necessary if CT is performed.**

CT in additional risk groups:

- **Low threshold for CT or MRI examination, even with few symptoms.**
 - Vertebral disease such as pelvospondylitis or DISH
 - In patients ≥ 75 years old, low energy violence may cause fractures.

Comatose patient:

- High resolution CT rules out fracture and dislocation.
- No good data available on the necessity to rule out ligamentous injury.
- In our experience we have not encountered ligamentous injuries with spinal cord injuries in this group.
- In our clinical practice C-spine is fully cleared on the basis of negative CT examination, and collar taken off.

THORACO-LUMBAR (TL) SPINE EXAMINATION

- **High energy violence according to the trauma or ATLS definition.**
 - Use high resolution CT images to clear TL spine.
 - CT images & reformats from high resolution thoracoabdominal examinations are sufficient.
 - Increasing evidence exists that CT has higher sensitivity for fracture detection than plain x-ray.
 - When spinal examination is clinically indicated in a patient with high energy trauma the use of full thoracoabdominal CT is recommended, to rule out soft tissue injury.

- **Low risk group & no neurological symptoms:**

- Plain X-ray of TL spine according to general clinical practice is the first line of examination.
- No scientific evidence published.

BCVI

- (Blunt Cerebro-Vascular Injury) is a rare injury with incidence about 1% in high-energy trauma patients. The injury has potentially devastating consequences (cerebral infarcts, death).
- Further investigations are necessary before any general recommendation can be made, and risk factors need to be identified and examination procedures evaluated.

Children

- > 9 years old - same rule as adults. NEXUS supports this strategy.
- <9 years old - no solid data on how to image exists.
- No solid data on CT vs radiography.
- Children are more sensitive to radiation.

Imaging C-spine acutely for insurance purposes.

- This is not a clinical indication and should not be done. The use of guidelines for C-spine clearance is recommended, see above Nexus or CCR.

Radiological CT technical notes,

Recommendations are not evidence based but reflects our practice and opinion

- **C-spine**

- Helical single slice CT $\leq 1,5$ mm with overlapping reconstructions.
- Multislice CT detector width and image thickness ≤ 1 mm, dose reduction measures should be used.
- Reformats in coronal, sagittal and 2 oblique views
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- **T-L spine**

- Helical single slice CT ≤ 5 mm with overlapping reconstructions
- Multislice CT detector width and image thickness $\leq 2,5$ mm
- Reformats in coronal and sagittal views

Addendum

The intention of the consensus group is to spread this document through local and regional meetings and education, in trauma manuals and relevant home pages. The different medical specialties are to be addressed.

A follow up meeting is planned to the end of 2005.

Sigtuna 19 November 2004

For the consensus group

Mats Beckman, Nordter

Bertil Leidner, Nordter

