

How to handle (C-)spine Trauma

- an evidence based approach



Sigtuna Consensus Conference
(Cervical) Spine Trauma

November 2004

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TRAUMA & EMERGENCY RADIOLOGY

- ❑ Initiative NORDTER
- ❑ Sigtuna November 2004
- ❑ Lecturer
 - Craig Blackmore
 - Harborview Medical Center, Seattle, Washington.
- ❑ Multidisciplinary meeting
 - radiology,
 - orthopaedic surgery
 - general, emergency and vascular surgery
- ❑ Participating sites
 - Akademiska, Uppsala,
 - Karolinska Solna
 - Karolinska Huddinge,
 - SÖS
 - Svendborg, Denmark

❑ 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

- 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, Denmark

- Available scientific evidence was examined and stratified according to the value of the scientific data.

Sigtuna Consensus Conference on Spinal Imaging (SCCSI)

Evidence Based Evaluation of Spinal Imaging -what do we know today.
C. Craig Blackmore, MD, MPH, Harborview Medical Center,

Articles studied to the Sigtuna Consensus Conference on Spinal Imaging
November 2004

➤ **Clinical examination
can confidently
exclude c-spine injuries**

- ❑ **One of the 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

➤ Canadian C-spine Rule “CCR”

➤ Criteria for clinical exclusion of c-spine injury:

- ◆ Adults ≥ 15 yo,
 - ◆ No history of vertebral disease,
 - ◆ GCS 15
 - ◆ Injury < 48 hours old
1. No high risk factor
 2. Low risk factor present
 3. Able to actively rotate neck (± 45 degrees)

➤ CCR 1. No high risk factor

- ❑ Age \geq 65 years
- ❑ Dangerous mechanism, including:
 - Fall from \geq 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

➤ If Yes >>
radiological
examination

➤ CCR 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

If NONE >>
radiological
examination

➤ CCR 3

Able to actively rotate neck
(45 degrees left and right)

If NO then
radiological
examination

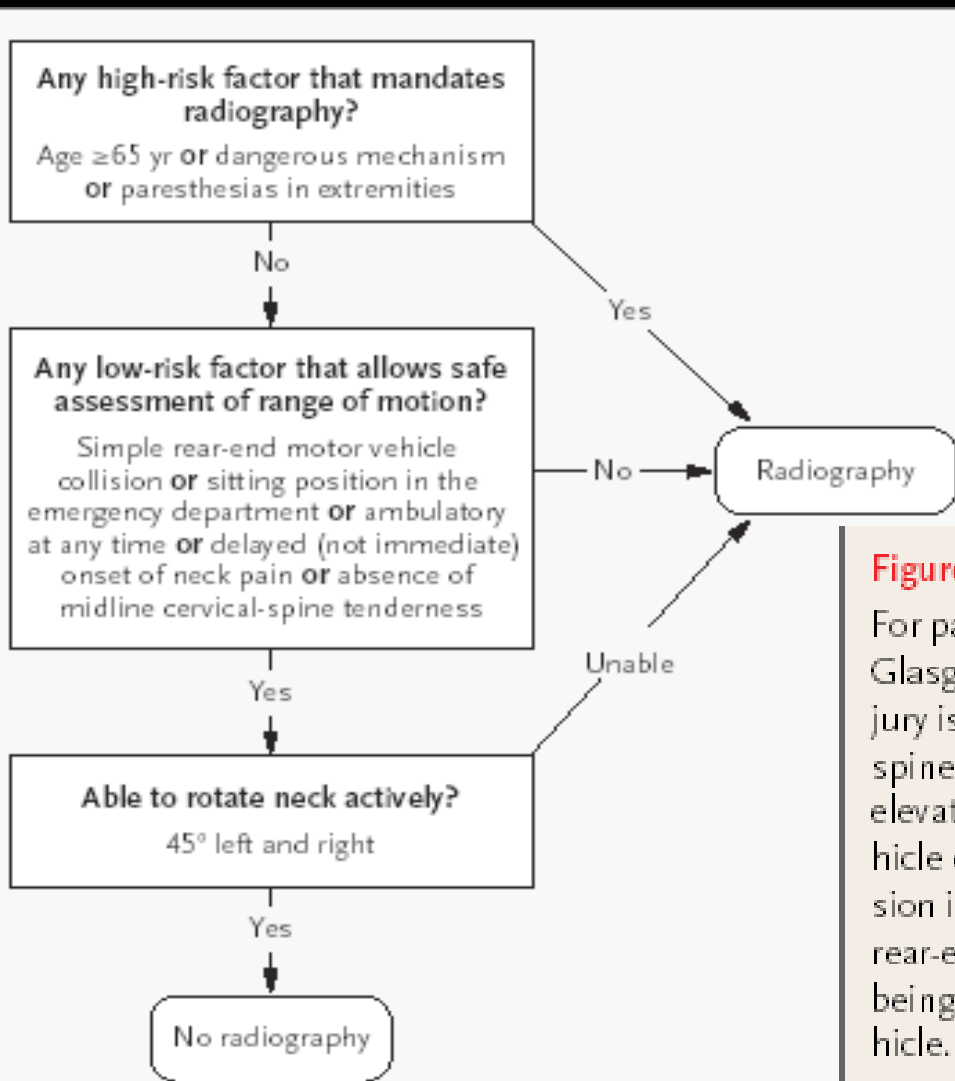


Figure 1. The Canadian C-Spine Rule.

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.

➤ **Summary:**
Clinical examination
can confidently
exclude c-spine injuries

- ❑ **NEXUS or Canadian C-spine Rule should be adopted, used, and taught**
- ❑ **(ATLS practice – NEXUS + movement test = OK)**

➤ What radiography??

- ❑ Journal of Trauma aug 03
- ❑ Meta-analysis C-spine
- ❑ N=2946
- ❑ CSI 221=7.5% of patients
- ❑ Plain film injury detection 132 (60%)
- ❑ CT injury detection 216 (98%)

➤ Indications for C-spine CT

- ❑ High risk patients
- ❑ Logistical reasons

➤ Indications for C-spine CT

□ High risk patient

- 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

➤ **Indications for C-spine CT**

□ **Logistical reasons**

- **Patient already in CT scanner and c-spine exam is indicated.**
- **Patient must be examined lying down.**

➤ Additional recommendation

- No extra plain film radiographs are necessary if CT is performed.

➤ **Special risk groups**

>>> **low threshold for CT /MRI**

□ **Increased fracture risk even with few symptoms**

□ **Pelvospondylit/Mb Bechterew**

□ **DISH**

□ **Old age 75 +**

- **low energy violence can cause fractures!**

➤ Comatose patient

- ❑ High resolution CT rules out fracture & 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 (T-L) SPINE

- ❑ In patients with high energy violence according to the trauma definition.
 - Use high resolution CT images to clear T-L 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.

➤ Special consideration T-L spine

- 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.

➤ T-L-spine:

Low risk group & no
neurological symptoms:

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

➤ BCVI

- ❑ BCVI (Blunt Cerebro-Vascular Injury (BCVI) 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 purpose
 - ❑ Not a clinical indication for imaging
 - ❑ Should NOT be done
 - ❑ Use of guidelines for clinical C-spine clearance is recommended (Nexus, Canadian C-spine rules)

➤ Radiological technical addendum

- ❑ 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
- ❑ 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