Cervical spine clearance

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Cervical spine clearance

- Not again
- Same old story
- Evergreen
- so what ........................................
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Suspect Spinal Injury

- High-speed crash
- Unconscious patient
- Multiple injuries
- Neurological deficit
- Spinal pain / tenderness
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In case of spinal cord injury

Goal:

Reduction of resulting neurological deficit and prevention of any additional loss of neurological function

Management of spinal cord injury

Resuscitation

Evaluation
Resuscitation

- Spinal immobilization
- Airway management
- Cardiovascular resuscitation
- Pharmacologic treatment
- Adjunct treatment
## Spinal immobilization

<table>
<thead>
<tr>
<th>Protection</th>
<th>priority</th>
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<tbody>
<tr>
<td>Detection</td>
<td>secondary</td>
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- Rigid cervical collar
- "Log rolling"
- Rigid transportation board (remove ASAP)
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Now the problem starts
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1. Which patient should be cleared?
2. When should it be done?
3. What needs to be done?
4. Who should do it?
5. Whom can I ask?
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The problem is not any more to get a collar on. It is very difficult to get it off.

Do not touch this patient.
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Conscious patient

Altered LOC
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Diagnosis of spinal injuries

Clinical and radiological evaluation
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Clinical evaluation (spine)

Inspection and palpation
Occiput to coccyx

"Do the extreme and look at your patient"

Otmar Trentz, Switzerland
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Clinical evaluation (spine)

Inspection and palpation
Occiput to coccyx
Clinical evaluation (spine)

Inspection and palpation
Occiput to coccyx
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Clinical evaluation (spine)

Inspection and palpation
Occiput to coccyx

- Pain with movement
- Tenderness
- Gap or step
- Edema and bruising
- Spasm of associated muscles
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Clinical evaluation (spine)

Neurological assessment

- Sensation
- Motor function
- Reflexes
- Rectal examination
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Radiological assessment

X-rays
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Radiological evaluation

- No uniform consensus on imaging of cervical spine.
- Plain x-ray is still widely used.
- Has a limited role in severely injured multi trauma patients.
- CT is routinely used in Level 1 Trauma Centers.
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Radiological evaluation

Cervical spine

X-ray Guidelines (cervical)

- Adequacy, Alignment
- Bone abnormality, Base of skull
- Cartilage, Contours
- Disc space
- Soft tissue
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Radiological evaluation

Cervical spine

X-ray Guidelines (cervical)

- Adequacy, Alignment
- Bone abnormality, Base of skull
- Cartilage, Contours
- Disc space
- Soft tissue
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Radiological evaluation

X-ray Guidelines (cervical)

- Adequacy, Alignment
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- Disc space
- Soft tissue
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Conscious patient

Altered LOC
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Conscious patient
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Alert, sober, neurologically normal patient

1. If no neck or spine pain or tenderness to palpation or voluntary movement
2. Remove c-collar
3. If still no pain or tenderness with voluntary movement
4. No further spine evaluation or c-spine x-ray necessary
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Alert, sober, neurologically normal patient

- Neck of spine pain or tenderness to palpation or voluntary movement?
- After removal of c-collar?
- If “yes” to any question
  ⇒ Protect c-spine
  ⇒ Obtain necessary x-ray
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- Radiographic: Normal x-rays
- Clinical:
  ⇒ Normal neurological exam and
  ⇒ Absence of spinal pain / tenderness

Caution

Drugs, alcohol, distraction injuries may mask an injury
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If pain or some kind of neurology is present further titrated evaluation

» CT
» MRI
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Conscious patient

Altered LOC
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Altered LOC
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- Multi trauma patients have an unstable cervical spine injury until proven otherwise.
- May not be clinically apparent.
- Need for complete and adequate radiological survey of cervical spine.
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- 1.5-3% of multi trauma patients sustain cervical spine injury (CSI).
- 10% severe head injured patients have a CSI.
- 5-8% of patients with fractures may have normal plain x-ray.
- Incidence of delayed diagnosis: 4.2 - 22.9%
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- Most common reason for delayed diagnosis (53%) is inadequate radiographic evaluation
- Upper and lower cervical spine injuries are commoner than mid cervical injuries
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Radiological evaluation  Cervical spine

- 21 centers participated in the National X Radiography Utilisation Study.
- 34,069 blunt trauma patients enrolled.
- Studies included plain x-ray, CT, MRI.
- Standard three views were obtained on all patients supplemented by other views and CT/MRI.

RESULTS

- Incidence of CSI > 2.4%.
- 818 patients had one or more CSIs.
- 570 (69.6%) of these had complete and adequate set of radiographs.
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Radiological evaluation

- 33.5% of patients sustaining CSI were not detected on plain x-rays.
- Can expect one totally occult CSI in every 1,481 blunt trauma evaluation or
- less than one unstable injury every 6,500 screening evaluation
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Radiological evaluation

- New protocol developed to
  - standardize imaging
  - provide a complete radiological assessment
  - implemented 07/2001
- Required categorising patients in one of three groups.
Cervical Spine Imaging Protocol

Trauma Conscious = V1
- AP, Lateral, PEG plain X-ray

Review by Radiologist or Senior ED Consultant
- Normal plain films
- Abnormal plain films

Clinical Evidence of Spinal Cord Injury
- Spinal MRI when stable

Cervical CT
- Occiput to C3 [3mm helical + sagittal & coronal reformats]
- C2 to C6 [3mm helical + sagittal reformats]
- Top C6 to T4/5 [3mm sagittal reformats] or
  (e.g. Poor Quality X-ray, Fusion, Degenerative changes >2 levels)

Normal Imaging but unstable
- Active Flexion/Extension after review & when stable
- Spinal MRI if indicated

Major Trauma (Un)conscious = V2
- AP, Lateral, Plain X-ray

Cervical CT
- Occiput to C3 [3mm helical + sagittal & coronal reformats]
- C2 to C6 [3mm helical + sagittal reformats]
- Top C6 to T4/5 [3mm sagittal reformats]

Normal Imaging
- Stop
- Spinal MRI only if clinically indicated

Abnormal Imaging
- Spinal MRI Scan

Major Trauma & Spinal Cord Injury = V3
- AP, Lateral, Plain X-ray

Cervical CT
- Occiput to C3 [3mm helical + sagittal & coronal reformats]
- C2 to C6 [3mm helical + sagittal reformats]
- Top C6 to T4/5 [3mm sagittal reformats]

Spinal MRI Scan ASAP

Developed by Dr Dinesh Varma, MB B.S., FRANZCR
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Major Trauma & Spinal Cord Injury = V3

AP, Lateral, Plain X-ray

Cervical CT
- Occiput to C3 [1mm helical + sagittal & coronal reformats]
- C2 to C6 [3mm helical + sagittal reformats]
- Top C6 to T4/5 [3mm helical + sagittal reformats]

Spinal MRI Scan ASAP
34 yr old female
High speed MCA
GCS 13 at scene
Fracture right femur and pelvis
- 10% of patients with vertebral fractures have another fracture somewhere in the vertebrae.
- Identify another vertebral fracture and another.
- Radiologic imaging is required to determine the exact location and extent of the fracture.
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- Treat life-threatening injuries first
- Immobilize
- Appropriate spine films
- Document examination
- Neurosurgical / orthopedic consult
- Transfer unstable fracture / cord injury
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**Major Trauma (Un)conscious = V2**

- AP, Lateral, Plain X-ray
- Cervical CT
  - Occiput to C3 [1mm helical + sagittal & coronal reformats]
  - C2 to C6 [3mm helical + sagittal reformats]
  - Top C6 to T4/5 [3mm helical + sagittal reformats]

**Normal Imaging**
- Stop

**Abnormal Imaging**
- Spinal MRI Scan
- Spinal MRI, only if clinically indicated
47m
bicycle rider
GCS 6
left temporal / parietal skull fracture
DAI
bilateral frontal and left temporal contusions
dislocated shoulder
47m
bicycle rider
GCS 6
left temporal / parietal skull fracture
DAI
bilateral frontal and left temporal contusions
dislocated shoulder
C5/C6 burst fractures

Jefferson fracture
C5/C6 burst fractures

Jefferson fracture
Jefferson fracture
C5 burst fractures
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Trauma Conscious = V1

AP, Lateral, PEG plain X-ray

Review by Radiologist or Senior ED Consultant

Normal plain films

Clinical Evidence of Spinal Cord Injury

Spinal MRI

Abnormal plain films

Normal Imaging but symptoms

Spinal MRI

Cervical CT
Occiput to C3 [1mm helical + sagittal & coronal reformats]

C2 to C6 [3mm helical + sagittal reformats]

Top C6 to T4/5 [3mm sagittal reformats] or
As indicated by Plain X-rays
(e.g. Poor Quality X-ray, Fusion, Degenerative changes >2 levels)

Active Flexion/Extension
38M hit from behind
Medium speed
GCS 15
No other injuries
Neck pain
38M hit from behind
Medium speed
GCS 15
No other injuries

Neck pain
72M
medium speed
MCA
GCS 13
neck pain
72M
medium speed
MCA
GCS 13

Neck pain
42 F
roll over, GCS 15
No other injuries

Neck pain
42 F
roll over, GCS 15
No other injuries

Neck pain
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- Oblique and Swimmer's views removed from our imaging protocol.
- Low threshold for CT of cervico-cranial and cervico-thoracic region.
- MRI being increasingly used
  - in the appropriate clinical setting.
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- ↑ Number of patients scanned
- No repeated attempts at plain x-ray
- More subtle injuries identified.
- CT not a stand-alone clearance tool
- Combination of plain X ray and CT sensitivity of 98% in fracture detection
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Role of MRI

- Definite role in assessing cord injury, ligamentous & disc integrity
- Brachial plexus injuries
- Persistent symptoms in the presence of normal plain films and CT
FUTURE

- Plain x-ray has and will have an ongoing place in imaging protocols.
- Given the role of various modalities every Institution will have to formulate their own protocols.
- Level 1 Trauma Centers routinely use CT given the complexity of their patient population.
- MRI is being used more widely as their availability increases.
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Priorities

Speed up the process of spinal clearance

Do not miss any cervical spinal injury

Get the collar off
But today!!
Thank you.