

Clearing the cervical spine

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Missed cervical spine injuries can be catastrophic if the instability goes unrecognised, resulting in secondary injury of the cord and quadriplegia.¹ Thus 'clearing of the cervical spine' is mandatory before precautions for potential spinal injury can be terminated.

Primary care doctors may be expected to perform this assessment in sub-optimal conditions such as on the sports field or roadside. In contrast, others are required to exclude cervical injury in the casualty unit. Although better resourced, there is competition for available investigation modalities requiring prioritisation.

Attending physicians need to maintain a high index of suspicion. Patients with a significant closed head injury have a 20% chance of a cervical injury.

In an effort to exclude cervical injury, the patient's level of consciousness must be assessed. If this is reduced, further radiological investigation is required as other clinical modalities are not useful.

In the fully alert and orientated patient, the neck should be assessed for subjective pain, range of movement and a thorough neurological examination should be performed. Should the patient have a full, pain-free cervical range of motion, no further investigation is required.

Failing this, X-rays should be requested.² A minimum of three views are required, viz. anterior-posterior (AP), lateral and open mouth views. Less than this will result in missed injury. Up to 67% of fractures and 45% of subluxations dislocations are missed when only a horizontal beam lateral is employed.^{3,4}

As these X-rays are frequently interpreted by the attending physician in real time rather than by the radiologist, it is imperative that primary care physicians develop the skill to identify an abnormal spine radiographically.

Physicians are most comfortable with the lateral X-ray but it is essential that adequate views are obtained. The X-ray must include the base of skull to T1. Anything less is



Fig 1. Lateral cervical spine X-ray. Arrows denote soft-tissue line, the dashed line is the anterior body line, the stippled line denotes the posterior body line and the dot-dash line is the spino-laminar line.

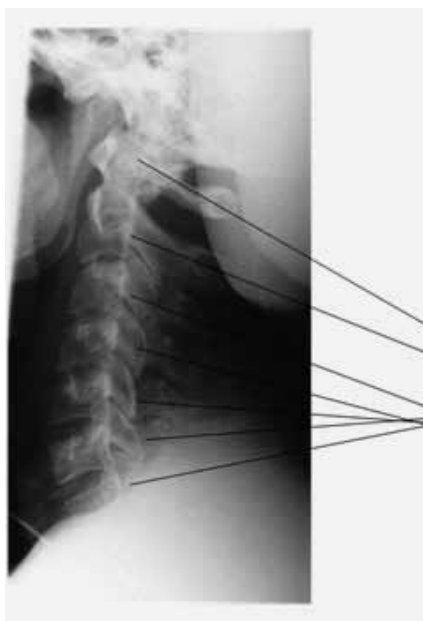


Fig 2. The lines of convergence are drawn down the spinous processes and should converge posteriorly.

inadequate and should be repeated or additional views obtained. Frequently the inferior cervical spine is not visible due to the shoulders overlying the area. Repeat views can be done with downward traction of the arms or the 'swimmers' and 'flying angel' views. Failing this a CT scan should be obtained.

The lateral should be assessed using 5 lines – 4 longitudinal and the lines of convergence (Figs 1 - 3). The first line is that of the soft tissue anterior to the spinal column. As a guideline, the soft tissue should be less than



Fig 3. Increased soft-tissue shadow anterior to C1-4.



Fig 4. C2 traumatic spondylolisthesis (hangman's fracture) with anterior and posterior line disruption but spino-lamina intact as the fracture is between the vertebral body and spinous process.

half the vertebral body width from C1 to C5, and less than a full body width at C6 and below. Then the anterior body line should be assessed, any disruption indicating a listhesis or forward slip of the column suggesting a dislocation or fracture (Figs 4 and 5). Likewise the posterior body line should be assessed, followed by the spino-laminar line. Then a line is drawn down the spinous process which should converge posteriorly. Should there be divergence, a posterior column disruption is suspected (Fig. 5). The integrity of the bodies and disc heights are also to be assessed.

The AP X-ray is then assessed for rotation (Fig. 6). The spinous processes need to be



Fig. 5. Unifacet dislocation of C5/6. All lines disrupted with forward shift (listhesis) and loss of articular facet contact.



Fig. 6. AP X-ray indicating normally aligned spinous processes.

visualised and should there be a sideways shift, a unifacet dislocation with spine rotation suspected.

The open mouth view is to assess the C1 and C2 vertebrae (Figs 7 and 8). Should there be splaying of the C1 articular masses, a C1 ring fracture is suspected. Should the sum of the overhang bilaterally exceed 7 mm, the transverse ligament is disrupted and the fracture unstable, requiring fixation. The odontoid (dens) can also be assessed on this view of fracture.



Fig. 7. Open mouth view with fracture at base of dens.

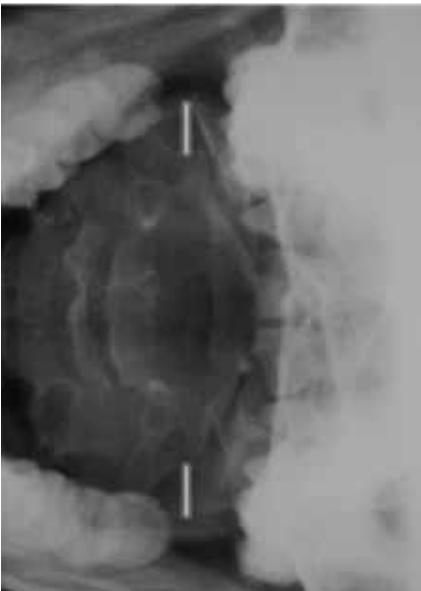


Fig. 8. Open mouth with C1 lateral mass overlap indicating transverse ligament rupture.



Fig. 9. Normal flexion-extension views demonstrating good range of motion.

Should the initial X-rays be normal but there is clinical concern, dynamic views

can be useful (Fig. 9). In the fully awake, cooperative patient flexion-extension views can be done. The patient should perform the motion and not be forced in any way. This may be unsuccessful if painful and the patient has muscle spasm and X-rays need to be assessed for adequate motion. These views may unmask instability not readily visible on the static views.

Computer tomography (CT) is useful in delineating bony structures and pathology. Overseas many protocols are escalating to CT as the primary investigation, but this is probably not appropriate in the South African setting with problems of access and cost. CT is indicated should there be poor visualisation on X-ray such as at the cervico-thoracic junction or a high index of suspicion of an atlanto-axial injury.

Magnetic resonance imaging (MRI) is excellent in assessing the soft tissue, including the ligaments and spinal cord. This is generally reserved for assessment of concomitant spinal cord injury or assessment of occult ligamentous injury.

In summary

- Missed cervical injury is catastrophic.
- At least three X-ray views required – AP, lateral, open mouth.
- Assess lateral with 5 lines.
- If lateral does not show C0-T1, then inadequate.
- Assess AP spinous process alignment.
- Assess open mouth for C1-2 overlap.
- CT when X-rays are inadequate.
- MRI is needed to assess the spinal cord and ligaments.

References available at www.cmej.org.za

Radiological pitfalls in hand injuries

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Fractures around the hand and wrist are common, resulting from work, sport and high-speed collisions. It is vitally important to recognise and treat these injuries promptly to optimise outcomes. Most of the injuries are detected by routine screening radiographs. There are, however, five relatively common injuries around the hand that are consistently missed by radiology staff and clinicians alike.