CERVICAL SPINE CLEARANCE

SUMMARY
Cervical spine clearance following traumatic injury is an area of great controversy. Patients often fall into one of two categories: those who are awake and alert and able to participate in a clearance protocol and those who are obtunded or unresponsive and not able to participate in clearance of their cervical spine. A missed cervical spine injury can be devastating and may lead to chronic neck pain or even paralysis. Use of cervical collars for more than 72 hours, however, is associated with skin breakdown and ulcerations that represent not only a significant health issue, but ultimately an economic burden as well.

RECOMMENDATIONS

Alert, awake patients may be cleared by physical examination alone with further studies necessary in those patients who demonstrate pain to palpation (Level I).

Obtunded patients or those with impaired mental status secondary to distracting injuries or intoxicants must be cleared radiographically. Necessary studies include an adequate lateral cervical spine film followed by dynamic CT scan from the base of the skull to T1. Patients with a mechanism for possible thoracic spine injury who are not undergoing chest CT scan should have their CT evaluation extended to the T4 level. If no abnormality is detected, final clearance and removal of the cervical collar is appropriate (Level II).

Due to the significant incidence of cervical collar-induced decubitus ulcers, cervical spine clearance and collar removal should be performed within 72 hours of injury (Level II).

INTRODUCTION
Cervical spine injuries have been reported to occur in up to 3% of patients with major trauma and up to 10% of patients with serious head injury.[1] Missed injury can result in delayed treatment, instability, and possible quadriplegia. Patients who are awake and alert can reliably be cleared of cervical spine pathology by painless clinical examination alone as has been shown by prospective data involving over 6000 trauma patients.[2] On the other hand, patients who are obtunded are much more difficult to assess and ultimately clear of cervical spine injury. There is no Class I data by which to base a final clearance protocol in this type of patient.

Many modalities have been investigated for cervical spine clearance of the obtunded patient. Plain films, CT scans, fluoroscopic and static flexion/extension films, and MRI have all been studied as to their reliability and usefulness in cervical spine clearance. Lateral cervical spine plain films have been shown to have a sensitivity of only 85%.[3] By adding three views (lateral, antero-posterior and open mouth odontoid), the sensitivity increases to approximately 93%.[1] Dynamic CT scan has increased this sensitivity even more, but at increased cost. Also, CT can not adequately evaluate subtle soft tissue or ligamentous injuries. These injuries, although representing only 2.2% of all cervical spine injuries, can be the cause of significant instability. Therefore fluoroscopic and static flexion/extension films have been used successfully to identify these injuries. This requires significant manpower and time, however, with cooperation between radiology technicians, trauma physicians, and radiologists. Thin cut (spiral) CT has been found to be effective in identifying minor fractures of the cervical spine in those areas of questioned ligamentous damage. MRI can also be used to identify ligamentous injury, but is associated with patient transport issues, cost effectiveness, and time utilization.

LITERATURE REVIEW
Many studies support the use of physical examination alone for cervical spine clearance in the awake, alert, trauma patient. Velmahos studied 549 such patients who underwent physical examination followed by 3-view radiograph and CT of any suspicious area. No patient without pain on physical exam was found to have a cervical spine injury.[4] Ersoy also found no missed injuries in 267 pain-free, alert, trauma

patients.[5] These studies and others support the appropriateness of clinical examination alone in alert patients with no distracting factors.

Optimal assessment of obtunded patients, however, is an area of great controversy. The Eastern Association for the Surgery of Trauma (EAST) Practice Management Guidelines Committee has recently reported their current literature review and evidence-based guidelines. They recommend 3-view plain film with CT scan of the base of the skull to C2. This is substantiated by reports of Link and Blacksin that between 4-8% of occipital condyle or C1-C2 fractures are missed on three-view radiographs alone.[2] Their guidelines further suggest that if the above films are negative, the patient undergo lateral cervical spine fluoroscopy with static images at extremes of flexion and extension done by housestaff or attendings of trauma, neurosurgery, or orthopedic surgery. Ajani reported their experience with a protocol involving initial 3-view plain films; CT for equivocal or abnormal films, followed by flexion/extension films and, if those were abnormal, MRI or fine cut CT. They found that out of 48 unconscious or uncooperative patients, 47 had normal flexion/extension films and 1 had an abnormal flexion/extension film. This fracture was reevaluated with fine-cut CT and was confirmed. They concluded that this protocol was appropriate, even though the identification rate was only 1.1%, due to the "enormous social and economic costs that may follow missed unstable cervical injuries."[1] Sees reported similar results in 20 obtunded patients who underwent bedside fluoroscopic examinations. In this study, one patient was found to have a significant subluxation not seen on plain film, but again confirmed by thin cut CT.[6] MRI alone, or following plain films, has not been studied primarily due to its prohibitive cost as well as time and transport requirements.

The performance of complete cervical spine clearance must be done in a timely fashion as decubitus ulcers and skin maceration occur frequently. In a recent study by Davis et al, a 40% overall incidence of cervical collar-induced decubiti was identified, with a 55% incidence in patients wearing a collar over 5 days.[7] Sees reported a 15% incidence of skin breakdown in those patients with collars in place over 8 days. Therefore, it is recommended that total clearance be performed within 72 hours of admission.

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