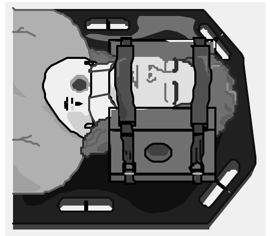

STATE TRAUMA ADVISORY BOARD
MANAGEMENT RECOMMENDATIONS

SUBJECT: VERTEBRAL X-RAYS (C_1S_1) IN BLUNT TRAUMA PATIENTS

These treatment recommendations are based on an evidence-based-medicine analysis of the literature performed by the Eastern Association for the Surgery of Trauma (EAST). The results of this analysis were published as a synopsis in the Journal of Trauma (J Trauma 44(6):941-57, 1998) and are available as a complete document at www.east.org. Because they are based on a formal evidentiary analysis of the literature, the EAST guidelines represent what the authors present as the optimal management strategies based on available literature.

The recommendations contained below are an attempt to translate the EAST guidelines into evidence based practice. Although they attempt to follow the EAST guidelines as closely as possible, there may be equivalent methods of accomplishing any one given management goal. Individual steps in these recommendations, therefore, represent treatment suggestions. Substitution of any or all of these recommendations by equivalent approaches that are based on consideration of the evidence-based literature review as published by the EAST is a valid treatment option.

PURPOSE: Determination of the stability of the cervical spine is a common problem encountered by those charged with the responsibility for the acute care of trauma patients. Several specific issues are of particular concern for medical, economic and legal reasons: who needs cervical spine radiographs; what views of the cervical spine should be obtained; when should flexion/extension radiographs, fluoroscopic radiographs, CT scans, or MRI scans be obtained; and how do we demonstrate the absence of significant ligamentous injury in the comatose trauma patient.

I. RECOMMENDATIONS

A. Cervical Spine

1. Trauma patients who are awake, alert, sober and neurologically normal, and have no neck pain: These patients are extremely unlikely to have an acute c-spine fracture/subluxation. With the patient in a supine position, remove the c-collar and palpate the spine. If there is no significant tenderness, ask the patient to voluntarily move his or her neck from side to side. If there is no pain, have the patient voluntarily flex and extend his or her neck. Again, if there is no pain, c-spine films are not mandatory.

2. All other trauma patients should have the following three cervical spine x-rays: lateral view revealing the base of the occiput to the upper border of the first thoracic vertebrae, anteroposterior view revealing the spinous processes of the second cervical through the first thoracic vertebra, and an open mouth odontoid view revealing the lateral masses of the first cervical vertebra and entire odontoid process. Axial CT scans with sagittal reconstruction should be obtained for any questionable level of injury, or through the lower cervical spine if this area cannot be visualized on plain radiographs. All life-threatening hemodynamic and pulmonary problems should be addressed before a prolonged c-spine evaluation is undertaken. Before removing cervical spine immobilization devices, all radiographs should be read by an experienced emergency medicine physician, neurosurgeon, orthopedic spine surgeon, radiologist, or other physician with expertise in interpreting these studies.

3. If the cervical spine radiographs are normal but the patient complains of neck pain, cervical spine radiographs with the patient actively positioning their neck in extreme flexion and extension positions should be obtained. If the flexion and extensions are positive, then the patient should be maintained in cervical immobilization and referred to a neurosurgeon. If normal and patient has pain, maintain cervical immobilization and re-evaluate in one week.

4. If the patient has a neurologic deficit that may be referable to a cervical spine injury, they should have an immediate surgical subspecialty consultation and MRI scan of the cervical spine.

5. Trauma patients who have an altered level of consciousness due to a traumatic brain injury, or due to other causes which are considered likely to leave the patient unable to complain of neck pain or neurologic deficits for 24 or more hours after their injury, may be considered to have a stable cervical spine if adequate three-view plain x-rays (CT supplementation as necessary) and thin cut axial CT images through C_1 and C_2, are read as normal by an experienced physician. The responsible surgeon must exercise caution in clearing the cervical spine in a comatose patient.

6. If the patient has abnormalities of the cervical spine discovered on any studies, the surgical subspecialty responsible for spine trauma should be consulted.

B. Complete Vertebral Spine (cervical, thoracic, lumbar, sacral) Indications for Evaluation

1. Clinical evidence of vertebral spine fracture/dislocation
    a. Pain over vertebral spine
    b. Deformity
        (1) Malalignment (step off)

(2) Gibbus

c. Neurological findings C_1-L_5/S_1

(1) Motor/sensory deficits

(2) Paresthesias/dysesthesias

2. Paravertebral fractures
   a. Transverse process fractures or spinous process fractures
   b. Posterior rib fractures/dislocations
   c. Scapular fractures - except for direct blow type injuries
   d. Sternal fractures - except for direct blow type injuries

3. Presence of a known acute vertebral fracture

4. Mechanisms of injury
   a. Axial loading of the vertebral spines
   b. Massive impact of torso (logging accident)
   c. Severe head or neck injury
5. Underlying medical condition (surgeon discretion)
   a. Osteoporotic diseases
   b. Unconscious patient
   c. Combative/intoxicated unreliable patient
   d. Rheumatoid arthritis

II. METHODOLOGY OF SPINE EVALUATION

All x-rays should be done at the time of admission, unless there are specific contraindications to doing to, ie:

* Hemodynamic instability
* Marked respiratory insufficiency
* Profound hypothermia
* Urgent/emergency operation

A. Standard portable films - evaluate films for signs of vertebral spine injury
   1. C-spine - 3 views (AP, lateral, odontoid)
   2. Chest x-ray (supine or upright AP)
   3. Pelvis, KUB, IVP, cystogram (supine)

B. If the lateral c-spine x-ray is inadequate for proper view of lower cervical and upper thoracic vertebrae (T_1) obtain the following:
   1. Swimmer's view if patient has thin, normal sized neck
   2. CT scan of lower cervical, upper thoracic vertebrae (C_5 - T_3) in contiguous 3mm cuts

C. For definitive x-rays of vertebral bodies obtain the following:

1. C-spine (oblique views, repeats of any unsatisfactory portable c-spines)
2. CT scan if poorly visualized area
3. T-spine (AP, lateral)
4. L-spine (AP, lateral)
5. Sacrum/pelvis (AP, lateral)

Flexion/extension views must be done under direct physician supervision in the conscious and cooperative patient. These should not be done in the unconscious patient.

Patients with continuing neck pain and normal c-spine films should have a neurosurgeon consultation, and be kept in a rigid cervical immobilization until cleared.

D. Patients with obvious spine pathology should receive CT scans beginning two vertebrae above and ending two vertebrae below (if appropriate) with 3mm contiguous cuts for all cervical and lumbar spines. For T_1-T_{12} spines, do 3mm contiguous cuts for three above and three below obvious pathology.

Information received in part from:

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