

Guidelines for the Treatment of Cervical Fractures with or without Spinal Cord Injury

*All patients with radiographic evidence of cervical fracture with dislocation and/or clinical or radiographic evidence of spinal cord injury **Must** be admitted to the ICU for close respiratory and neurological monitoring. The pre-printed Spinal Cord Injury Orders will be used on all patients.*

All field collars should be changed out to a permanent rigid collar within 6 hours of admission.

***Note:** Admission location and monitoring criteria for patients with documented cervical fractures without radiographic evidence of dislocation and without clinical or radiographic evidence of spinal cord injury is left to the discretion of the admitting Attending Physician. The pre-printed Spinal Cord Injury Orders will be used on all patients when appropriate.*

Standard approaches to care include:

Immobilization:

Cervical Fracture with Dislocation, with/without Spinal Cord Injury:

- All patients will be maintained in a rigid cervical collar with strict cervical and log roll precautions until temporary stabilization using halo traction or halo vest is applied (*Note: If the patient will be maintained in halo traction for >24 hours he/she should be placed on a rotoest bed to promote respiratory toileting, to be discontinued after surgical fixation*)
- Definitive operative stabilization of such fracture dislocations will occur within the first 24-48 hours of hospitalization

Cervical Fracture without Dislocation, without Spinal Cord Injury:

- All patients will be maintained in a rigid cervical collar, unless otherwise determined by the Attending Physician. Log roll precautions, operative intervention and length of collar use to be determined by the Attending Physician

Neurological Examination:

- Every 1-2 hours until definitive stabilization is achieved and for at least 24 hours post-operatively, unless otherwise determined by the Attending Physician. After 24 hours, the frequency of neurological examination may be progressively weaned as determined by the Attending Physician. Evaluation should be based upon the ASIA scoring system, unless otherwise determined by the Attending Physician.

Steroids:

- Steroids will be administered in all patients with evidence of spinal cord injury (excluding penetrating injury and/or nerve root injury) unless contraindicated by concurrent illness or injuries
 - **Load:** Methylprednisolone 30mg/kg IV over 15 minutes
 - **Infusion:** (*Begin 45 minutes after bolus*)
 - Within 0-3 hours of injury
 - Methylprednisolone 5.4mg/kg/hr IV for 23 hours
 - Within 3-8 hours of injury
 - Methylprednisolone 5.4mg/kg/hr IV for 47 hours
- All patients receiving steroids must also have the following ordered
 - Pepcid 20mg IV/PO/FT Q12 or Prevacid 30mg PO/FT Daily
 - Routine finger stick blood sugar monitoring with institution of and insulin sliding scale or insulin gtt for BS \geq 140

Blood Pressure:

- To promote spinal cord perfusion MAPs will be maintained \geq 90 for 7 days post injury *Pressures should be maintained using the following:*
 - Dopamine 2-10 mcg/kg/min IV
 - Phenylephrine 5-200mcg/min IV
 - When able to take PO's institute one of the following oral agents and begin weaning gtt
 - Ephedrine 25mg PO Q6 (*maximum dose 150mg/24 hours*)
 - NaCl tablets 1-2gms PO TID (*maximum dose 4gms TID*)
 - Florinef 0.2mg PO Daily (*maximum 1mg/24 hours*)
 - Midodrine 10mg 30 min before sitting up or TID (*do not use in combination with ephedrine*)
 - Institute abdominal binding and elastic (ACE) bandages to lower extremities when placed in the sitting position or cleared for OOB activity

Respiratory:

- All patients **must** receive continuous oxygen saturation monitoring (*Maintain a low threshold for intubation in high cervical injury C5 or above*)
- Initiate quad cough and suctioning Q2 hours when appropriate
- Incentive spirometer Q2 hours when appropriate
- Albuterol 2.5mg in 3cc NS per nebulizer, every 6 hours in the intubated and high cervical (C5 or above) non-intubated patient

DVT Prophylaxis:

- Upon admit all patients will received SCS with antiembolic stockings unless contraindicated by lower extremity injuries
- Non-operative cases will receive enoxaparin 30mg SQ BID within 48 hours of admission, unless otherwise determined by the Attending Physician.

- Operative cases will have enoxaparin 30mg SQ BID started within 48 hours of surgery regardless of drain placement.
- DVT prophylaxis in patients with traumatic brain injury, in addition to their spinal injury, will be evaluated on a case by case basis by the Attending Neurosurgeon.

Additional Treatment Guidelines:

- All patients not on a rotoest bed will be turned every 2 hours
- All patients will initially receive an indwelling foley catheter with Q2 I&O monitoring
 - The patient will initially be allowed an attempt at self evacuation, this will be followed up with a bladder scan or straight catheterization if results provide proof of retention ($\geq 100\text{cc}$ unless history significant for BPH then may liberalize to 150cc) a routine catheterization program will be instituted
 - I&O catheterization will begin once urine output is ≤ 2 liters in 24 hours and will be ordered in the following manner
 - I&O catheterization Q6 hours if $\geq 400\text{cc}$ change frequency to Q4 hours
- All patients will have the following consults within 48 hours of admission unless contraindicated secondary to instability (*emphasis on early mobilization*)
 - Physical Therapy
 - Occupational Therapy
 - Speech Therapy for Swallow evaluation
 - If unable to pass or participate in swallow evaluation; a feeding tube will be placed and nutritional support initiated within 48 hours of admission
 - Physical Medicine and Rehabilitation
- All patients with evidence of altered rectal tone, perineal sensation, or with evidence of lack of bowel function will be started on the following bowel regimen within 24-48 hours of admission
 - Colace 100mg PO/FT BID
 - Bisacodyl Suppository 10mg PR with digital stimulation administered at the same time daily

PRACTICE MANAGEMENT GUIDELINES FOR IDENTIFYING
CERVICAL SPINE INJURIES FOLLOWING TRAUMA
AT SAN FRANCISCO GENERAL HOSPITAL

The following recommendations are a series of evidence-based guidelines for the safest and most effective means for identifying significant injuries of the cervical spine following traumatic injury. These guidelines were adapted from the EAST Guidelines. Injuries which are most likely to lead to neurologic damage by causing or exacerbating trauma to the spinal cord are the focus of this document, including bony, ligamentous, and other soft tissue abnormalities. Trauma patients at risk can be categorized according to their clinical presentation into 4 categories that are at special risk for various types of injuries, or at minimal or no risk for injury. The following Guidelines are presented by category of patient and recommendations specific to that category are provided.

Radiologic clearance of the cervical spine should occur only after the hemodynamic, respiratory, and surgical stabilization of the patient. During such stabilization the cervical spine should be kept immobilized (cervical spine collar, sand bags, in-line traction).

1. 3-view cervical spine x-rays are defined as follows:
 - Lateral Cervical Spine Radiograph: must be of good quality and adequately visualize the base of the occiput to the upper part of the first thoracic vertebrae.
 - Anteroposterior Cervical Spine Radiograph: must reveal the spinous processes of C2 to C7.
 - Open Mouth Odontoid Radiograph: must visualize the entire dens and the lateral masses of C1.

CATEGORY 1

- 1. Alert, awake, not intoxicated, without distracting injury, neurologically normal, no midline neck pain or tenderness even with full range of motion of neck and palpation of cervical spine.**

Guidelines:

- 1.1: Cervical spine x-rays are not necessary.
- 1.2: Attending level physician makes the determination, documents this in the medical record and removes the cervical spine collar.

Appropriate specialties: Emergency Medicine
 Trauma Surgery
 Orthopaedic Spine Surgery
 Neurosurgery

- 1.3: Optimal timing: within 2 hours after admission to the Emergency Department. An order for collar removal will be written and clearance of the C-spine will be clearly documented in the medical record.

CATEGORY 2

2. Alert, awake, complaints of neck pain with a neurologically normal exam

Guidelines:

- 2.1: 3-view cervical spine x-rays are obtained.
- 2.2: Axial CT images at 2 mm intervals with sagittal reconstructions obtained through suspicious areas identified on 3-view cervical spine x-rays.
- 2.3: If lower cervical spine is not adequately visualized on lateral cervical spine x-ray:
 1. Swimmers view – if adequate,
 2. Axial CT images at 2 mm intervals through lower cervical spine with sagittal reconstruction.
- 2.4: If 2.1-2.3 are normal (confirmed by a formal Radiology/Neuroradiology Attending read of x-rays and CT) , the patient has midline cervical pain and a normal neurological exam, the cervical collar should remain in place and the patient should follow-up in clinic in one to two weeks with flexion and extension lateral cervical spine x-rays.
- 2.5: Optimal timing: within 2 hours of admission to the Emergency Department. An order for collar removal will be written and clearance of the C-spine will be clearly documented in the medical record.

CATEGORY 3

3. Awake, alert with neurologic deficits referable to a spine injury

Guidelines:

- 3.1: Plain films and CT images as described in 2.1-2.3.
- 3.2: MRI of the cervical spine within 2 hours of presentation to the Emergency Department.
- 3.3: Patients with a neurological deficit (sensory or motor) referable to a possible spinal cord injury should be managed using the Spinal Cord Injury protocol (with attention to immobilization, log-roll precautions, MAP parameters, and steroid administration) until the C-spine has been cleared and an order written in the chart to remove the collar.

CATEGORY 4

4. Altered mental status and return of normal mental status not anticipated for 2 days or more (e.g. severe traumatic or hypoxic, ischemic brain injury)

Guidelines:

- 4.1: Plain films and CT images as described in 2.1-2.3.
- 4.2: Axial CT images at 1 mm intervals with sagittal reconstruction from the base of the occiput through T1. In patients <14 years and stable for transport, an MRI study to evaluate ligamentous injury should be performed, ideally within 48 hours.
- 4.3: If 4.1, 4.2 are normal and there is confirmation by a formal Radiology/Neuroradiology Attending read of the CT scan, the collar will be removed and the cervical precautions will be discontinued. An order for collar removal will be written and clearance of the C-spine will be clearly documented in the medical record.
- 4.4: Optimal timing: within 24-48 hours of admission.