TRAUMA SPECIALISTS, L.L.P.

TRAUMA CLINICAL GUIDELINES

GUIDELINE # 18  Clinical Research Protocol

OPEN REDUCTION INTERNAL FIXATION (ORIF) OF CHEST WALL FRACTURES:
CLINICAL MANAGEMENT

PURPOSE: To identify patients with chest wall fractures (sternum and/or ribs) who may benefit from ORIF. Population to include unilateral flail chests, GCS $\geq$ 14, no spine or spinal cord injury, no recent laparotomy, no severe pulmonary contusion requiring mechanical ventilation, and fully expanded lungs with no missing lobes.

RESPONSIBLE PARTIES: Trauma Surgeon (TS) 
Trauma Residents (TR) 
Trauma Anesthesiologists (TA) 
Trauma Radiologists 
Cardiothoracic Surgeons (CTS) 
Trauma Orthopedic Surgeons (OS) 
Trauma PAs

CLINICAL GUIDELINE:
I. Initial management of chest wall fractures
   A. Oxygen by mask-(non-rebreather) to maximum 100% humidified
   B. Intubate for
      1. Respiratory rate sustained $>30$
      2. Hypoxemia ($\text{PaO}_2 \leq 60$)
      3. Hypercarbia ($\text{PCO}_2 \geq 55$)
      4. Inability to cough
   C. Tube thoracostomy(s) for hemo or pneumothorax
   D. Epidural catheter for pain control of severe pain
   E. Fiberoptic bronchoscopy to clear all retained secretions, mucous plugs and clots causing lobar collapse (patient may require repeated bronchoscopies)
   F. Aggressive pulmonary toilet (IPV, Bronchodilators)

II. Indications for ORIF of chest wall fractures
   A. Mechanical instability of chest wall causing
      1. Hypoxemia related to chest wall mechanical instability as evidenced by $\text{PaO}_2 < 60\text{mmHg}$ with spontaneous breathing and $\text{FiO}_2 \geq 60\%$
      2. Hypercarbia ($\text{PCO}_2 \geq 55$), in non COPD patients
      3. Incomplete clearing of bronchial secretions and recurrent atelectasis
requiring multiple bronchoscopies because of inadequate cough due to flail and/or pain
4. Intractable pain not responding to standard pain measures and epidural catheter
5. Traumatic thoracoplasty causing collapse of at least one lobe and ≥ 25% loss of vital capacity of one lung.
   Daily chest x-ray or repeat chest CT scan shows progressive collapse of rib cage
6. Marked sternal flail and/or overlapping sternal fracture(s)
7. Failed extubation attempt(s) due to mechanical instability and/or pain.
B. Other indications for thoracotomy to repair chest wall fractures urgently
   1. Tracheal or Bronchial tear requiring thoracotomy to repair
   2. Lung tears requiring thoracotomy to repair
   3. Major Intrathoracic vascular injury(s) requiring thoracotomy
   4. Open pneumothorax
   5. Bleeding requiring thoracotomy, including large extrapleural hematoma
   6. Traumatic intercostal hernia
   7. Entrapment of chest wall muscle by angulated rib.
C. Diagnostic tests
   1. 3D CT scan of chest and volumetric chest cavity analysis (compare L to R)
   2. Bedside spirometry after above completed
D. Delayed Indications for ORIF ribs
   1. Non Union of Ribs
   2. Delayed diagnosis of intercostal hernia

III. Contraindications for ORIF
   A. Chest wall sepsis in area of thoracotomy or ORIF area
   B. Pneumonia
   C. Empyema
   D. Septicemia
   E. ARDS or severe pulmonary failure-See Pulmonary Failure Protocol
   F. Extensive heterotopic calcifications of chest wall intercostal muscles

IV. Preoperative assessment
   A. Patient must have clear tracheobronchial tree and must be able to cooperate with tests
   B. A 3D CT and Volumetric analysis of each lung cavity with CT pleural cavity volume measurements
   C. Bedside spirometry

V. Surgery timing for ORIF
   A. Preferably less than one week from time of injury (preferably less than 5 days)

VI. Follow-up
   A. 3D CT scan chest with volumetric analysis at 3 months post ORIF
   B. Volumetric analysis if ORIF done for traumatic thoracoplasty
The policies, procedures and protocols contained herein represent clinical guidelines only. Clinical judgment must be exercised for each individual case.

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Revisions: 9/99 Dr. Long, Karen Schade, RN, TNC
4/09 W.Long, M.D.
11/11 W. Long, M.D., S. Bergstrom, R.N. – Updated practice
11/14 W. Long, M.D.