Surgical Stabilization of Rib Fractures (SSRF or Rib Plating)

Purpose

Surgical Stabilization of rib fractures should be considered in patients with flail chest, flail sternum, and painful rib fractures associated with movement that have been refractory to conventional pain management in order to improve morbidity and mortality.

Indications

1. Non-ventilated patients:
    - Chest wall instability
        - 3 or more segmental rib fractures (flail chest)
        - 3 or more bi-cortically displaced/offset rib fractures
        - clinical findings of paradoxical motion
        - instability or "clicking" on palpation of chest wall or as reported by the patient
    - 3 or more displaced rib fractures
        - with displacement of >50% the rib width AND 2 or more pulmonary physiological derangements.
2. Ventilated patients:
    - Chest wall instability
        - 3 or more segmental rib fractures (flail chest)
        - 3 or more bi-cortically displaced/offset rib fractures
        - clinical findings of paradoxical motion
        - instability or "clicking" on palpation of chest wall or as reported by the patient
    - Failure to wean from ventilator

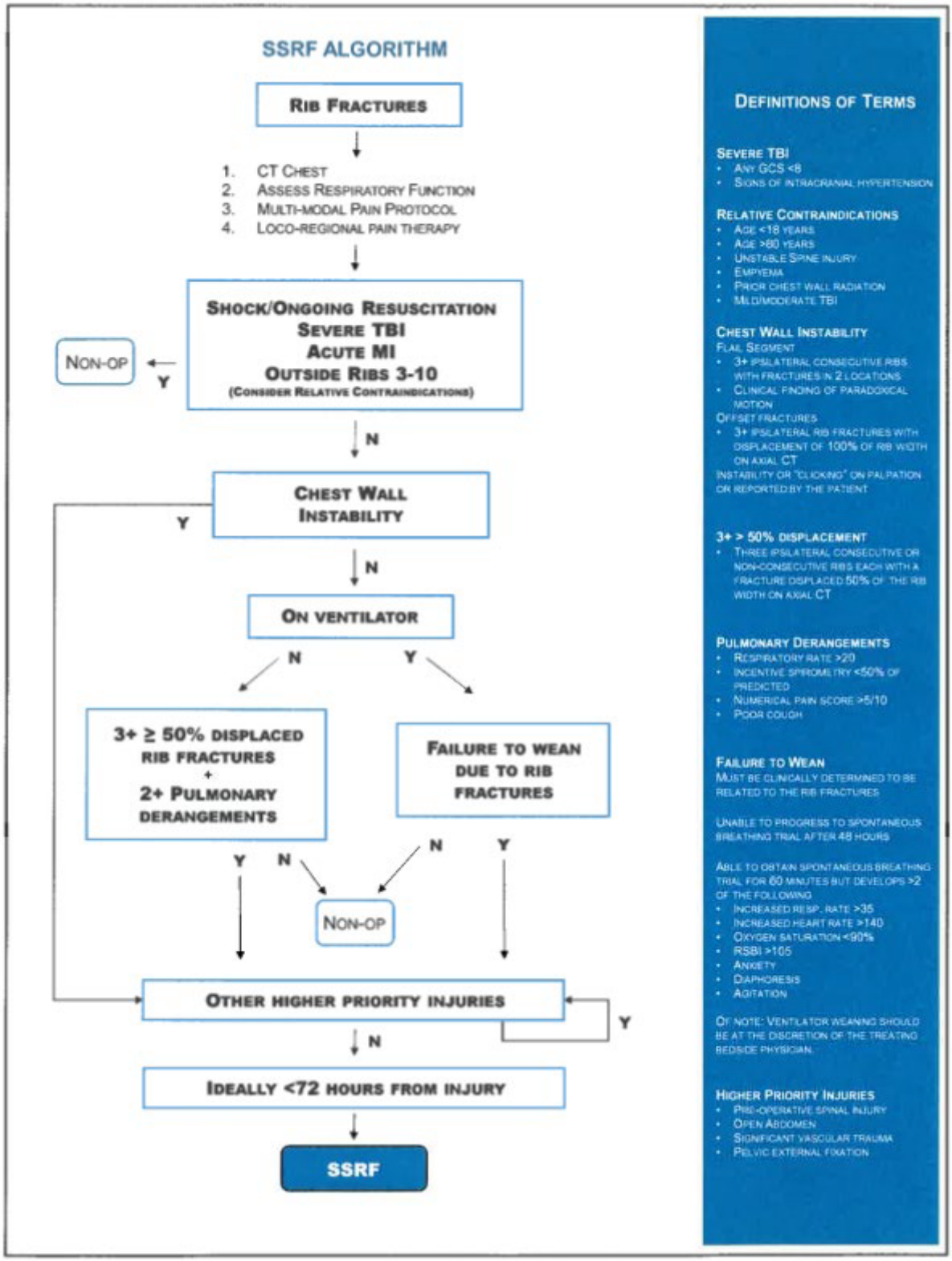
Contraindications

1. Absolute
    - shock/ongoing resuscitation
    - severe traumatic brain injury

    - acute myocardial infarction
    - fractures outside of ribs 3-10
2. Relative
    - Age <18 yrs
    - Age >80 yrs
    - unstable spine injury
    - empyema
    - history of chest wall radiation
    - mild to moderate traumatic brain injury

Timing

1. Non-ventilated patients
    - when feasible, less than 24 hrs is optimal
    - should be performed within 72 hours of injury
    - SSRF should be delayed in the face of higher priority injuries
2. Ventilated patients
    - earliest feasible time for flail indication
    - should be performed within 72 hrs of injury for non-flail indications.
    - SSRF should be delayed in the face of higher priority injuries.


SSRF ALGORITHM
RIB FRACTURES
1. CT CHEST
2. ASSESS RESPIRATORY FUNCTION
3. MULTI-MODAL PAIN PROTOCOL
4. LOCO-REGIONAL PAIN THERAPY
SHOCK/ONGOING RESUSCITATION
SEVERE TBI
ACUTE MI
OUTSIDE RIBS 3-10
(CONSIDER RELATIVE CONTRAINDICATIONS)
NON-OP
Y
N
CHEST WALL INSTABILITY
Y
N
ON VENTILATOR
N
Y
3+ ≥ 50% DISPLACED RIB FRACTURES
+
2+ PULMONARY DERANGEMENTS
FAILURE TO WEAN DUE TO RIB FRACTURES
Y
N
N
Y
NON-OP
OTHER HIGHER PRIORITY INJURIES
Y
N
IDEALLY <72 HOURS FROM INJURY
SSRF
DEFINITIONS OF TERMS
SEVERE TBI
• ANY GCS <8
• SIGNS OF INTRACRANIAL HYPERTENSION
RELATIVE CONTRAINDICATIONS
• AGE <18 YEARS
• AGE >80 YEARS
• UNSTABLE SPINE INJURY
• EMPYEMA
• PRIOR CHEST WALL RADIATION
• MILD/MODERATE TBI
CHEST WALL INSTABILITY
FLAIL SEGMENT
• 3+ IPSILATERAL CONSECUTIVE RIBS WITH FRACTURES IN 2 LOCATIONS
• CLINICAL FINDING OF PARADOXICAL MOTION
OFFSET FRACTURES
• 3+ IPSILATERAL RIB FRACTURES WITH DISPLACEMENT OF 100% OF RIB WIDTH ON AXIAL CT
INSTABILITY OR "CLICKING" ON PALPATION OR REPORTED BY THE PATIENT
3+ > 50% DISPLACEMENT
• THREE IPSILATERAL CONSECUTIVE OR NON-CONSECUTIVE RIBS EACH WITH A FRACTURE DISPLACED 50% OF THE RIB WIDTH ON AXIAL CT
PULMONARY DERANGEMENTS
• RESPIRATORY RATE >20
• INCENTIVE SPIROMETRY <50% OF PREDICTED
• NUMERICAL PAIN SCORE >5/10
• POOR COUGH
FAILURE TO WEAN
MUST BE CLINICALLY DETERMINED TO BE RELATED TO THE RIB FRACTURES
UNABLE TO PROGRESS TO SPONTANEOUS BREATHING TRIAL AFTER 48 HOURS
ABLE TO OBTAIN SPONTANEOUS BREATHING TRIAL FOR 60 MINUTES BUT DEVELOPS >2 OF THE FOLLOWING
• INCREASED RESP. RATE >35
• INCREASED HEART RATE >140
• OXYGEN SATURATION <90%
• RSBI >105
• ANXIETY
• DIAPHORESIS
• AGITATION
OF NOTE: VENTILATOR WEANING SHOULD BE AT THE DISCRETION OF THE TREATING BEDSIDE PHYSICIAN.
HIGHER PRIORITY INJURIES
• PRE-OPERATIVE SPINAL INJURY
• OPEN ABDOMEN
• SIGNIFICANT VASCULAR TRAUMA
• PELVIC EXTERNAL FIXATION

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