

Post-Sternotomy Pain

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and the
CORE Osteopathic Principles and Practices Committee

Series B - Session #6 Ribs



Full Median Sternotomy

Central incision through the length of the sternum

Standard approach for CABG

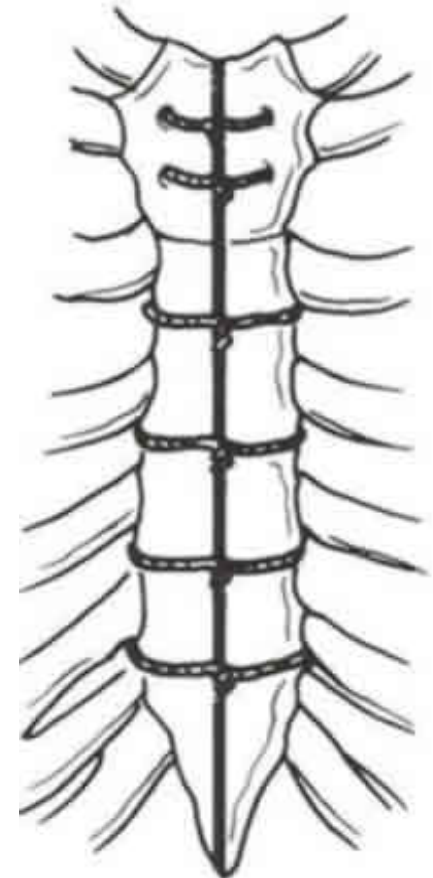
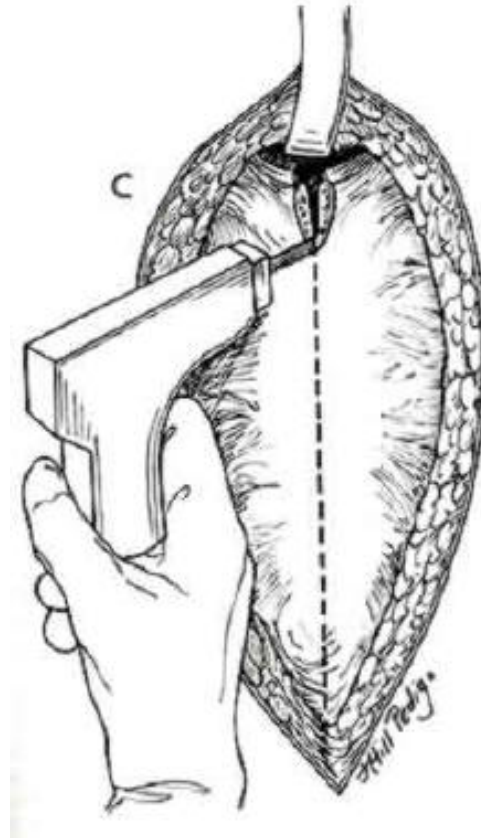
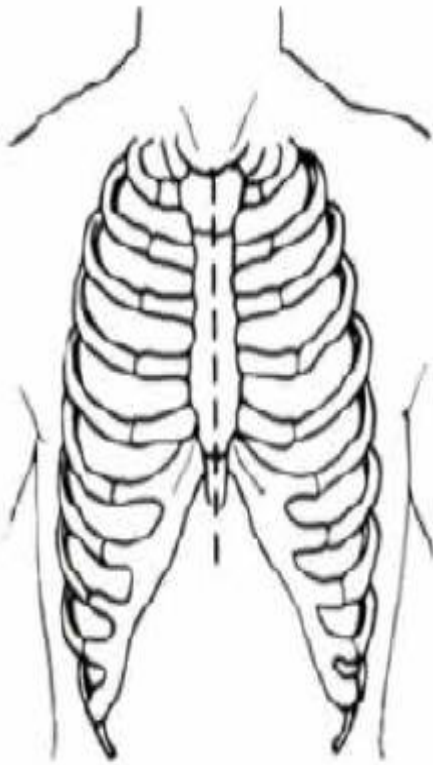
Partial Median Sternotomy

Central incision from sternal notch to the 4th-5th rib

Commonly used for valvular surgeries



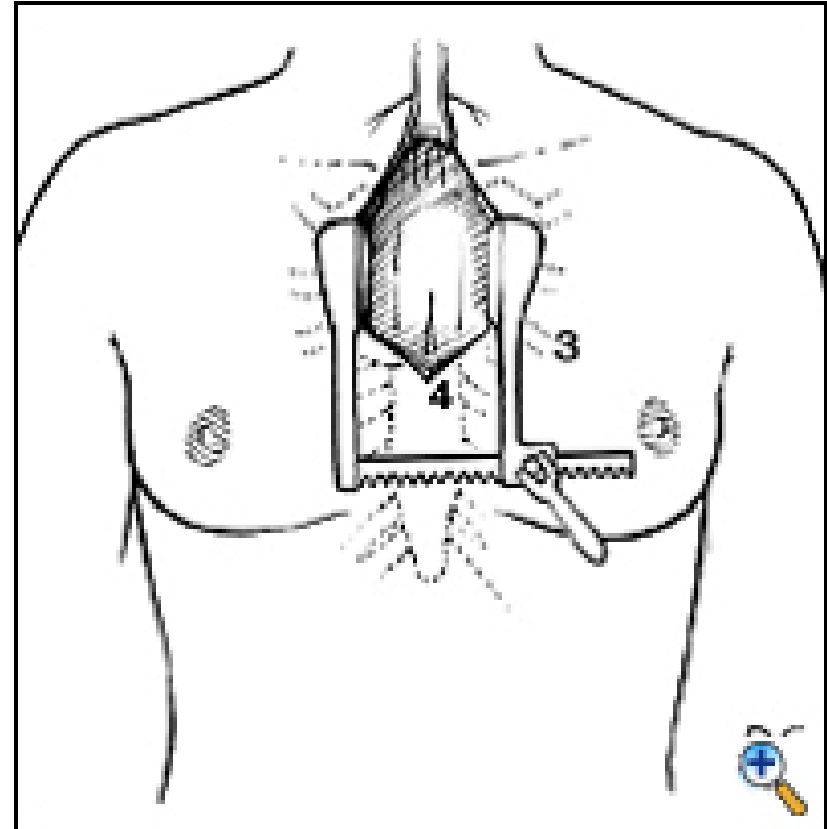
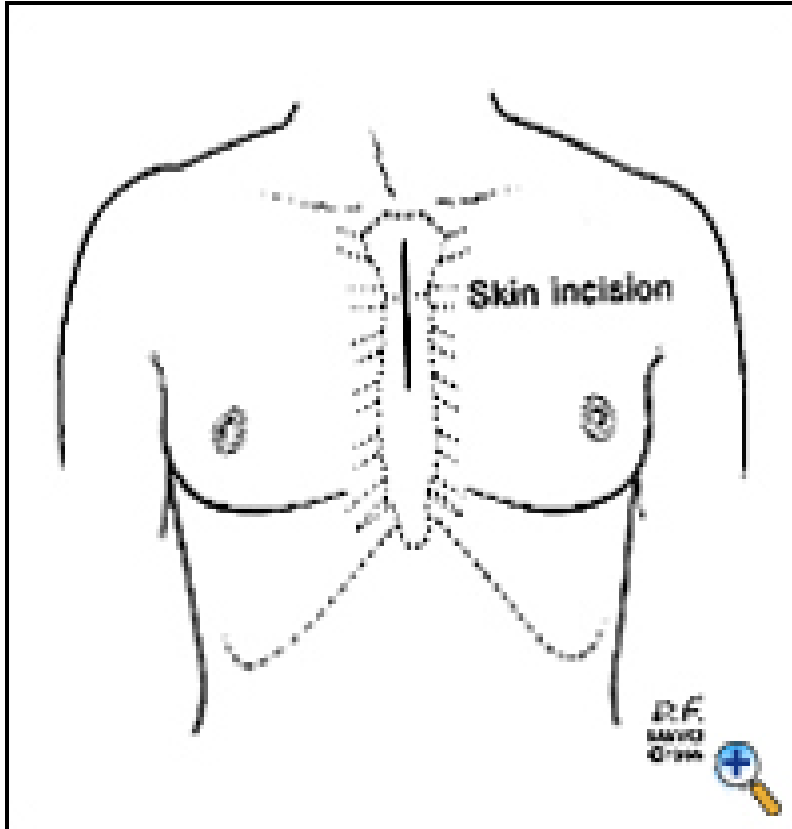
Full Midline Sternotomy: Incision and Repair



heartlungdoc.com



Partial Sternotomy: Incision and Retractor Use



Based on the previous pictures and your hospital experiences, discuss how the following could cause post-surgical pain in a post-sternotomy patient?

- Sternal incision
- Retractor use during surgery
- Positioning during surgery
- Sternal incision repair using wire loops



What would be your expected musculoskeletal findings in a post-sternotomy patient?

What impact would these somatic dysfunctions have on this patient during:

- Respirations
- Movement
- Rehabilitation



- What are the potential causes of vascular or lymphatic congestion in a post-sternotomy patient?
- What are the potential causes of autonomic imbalance in this post-surgical patient?



Appropriate Osteopathic assessment of a post-sternotomy patient should include the following highest yield regions:

- Sternum
- Costal Cartilage Segments (Chondrals)
- Ribs



Assess the sternum for:

- Deviation or fascial drag
- Respiratory response
- Pain-related response (tenderpoints)

What somatic findings would you expect at the sternum in a post-sternotomy patient?

What treatments could you use in a post-sternotomy patient if you found a sternal dysfunction (acute inpatient vs. outpatient)?





INTEGRATE:

Orthopedic
Neurologic
&
Structural

EXAMS



Acute Inpatient

- Functional Methods

Outpatient (healing complete)

- Strain-Counterstrain
- Ligamentous Articular Release
- Myofascial Release
- Occipito-Sternal Balancing
- Sacro-Sternal Balancing



- Chondral segments can exhibit dysfunction independently from rib dysfunction
- Assess for structural or respiratory dysfunction and/or pain response while monitoring chondral segments



- What somatic findings would you expect at the chondral segments in a post-sternotomy patient?
- What treatments could you use in a post-sternotomy patient if you found a chondral dysfunction (acute inpatient vs. outpatient)?



Acute Inpatient

- Functional Methods
- Strain-Counterstrain

Outpatient (healing complete)

- Treatments listed above
- Facilitated Positional Release
- Muscle Energy



Inhalation & Exhalation are primary rib motions

- Pump-Handle
 - Anterior aspect of rib moves superiorly like a pump-handle on inspiration and caudad on expiration
- Bucket-Handle
 - Lateral aspect of rib moves superiorly like a bucket-handle on inspiration and caudad on expiration

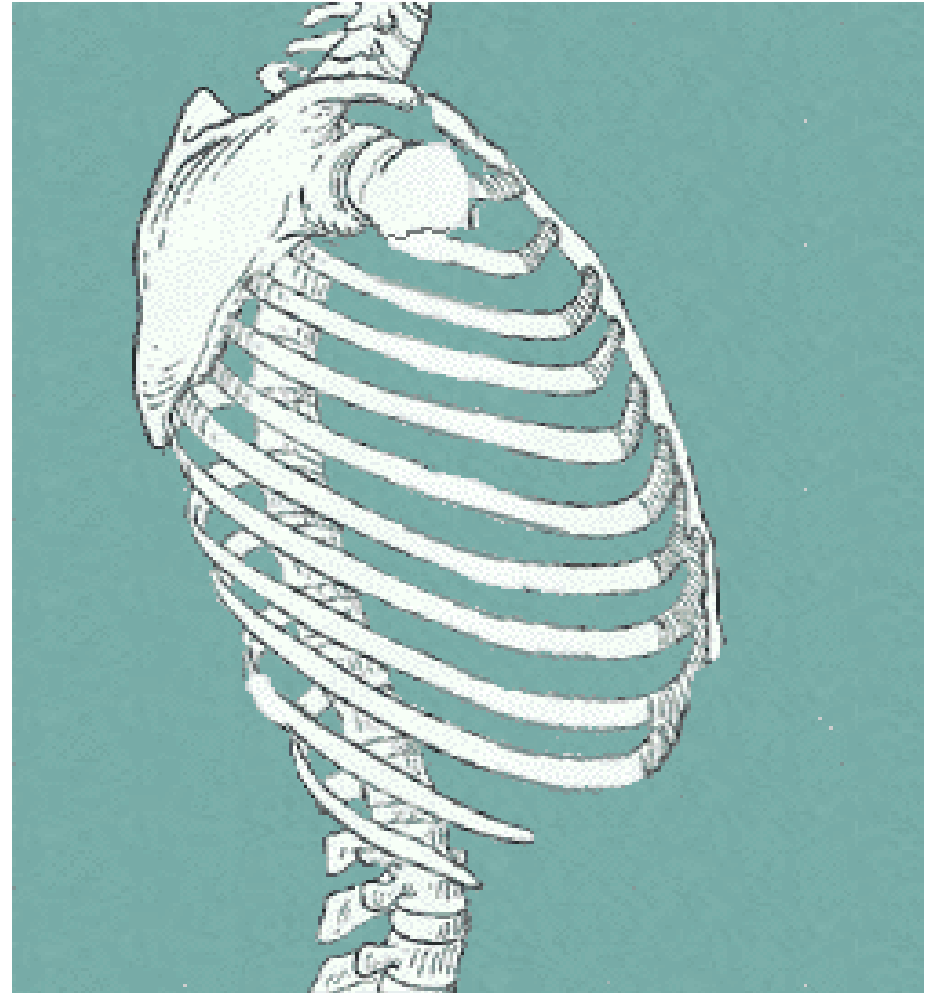
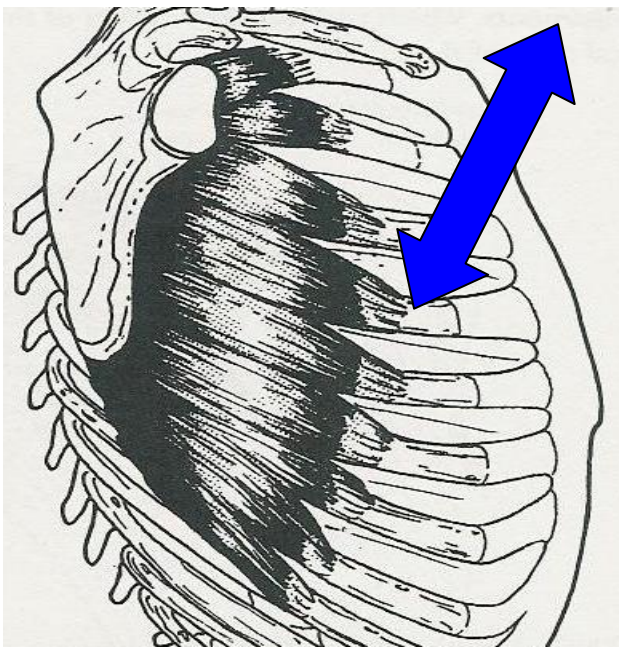


All Ribs have **BOTH** pump &
bucket-handle motions

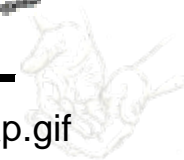
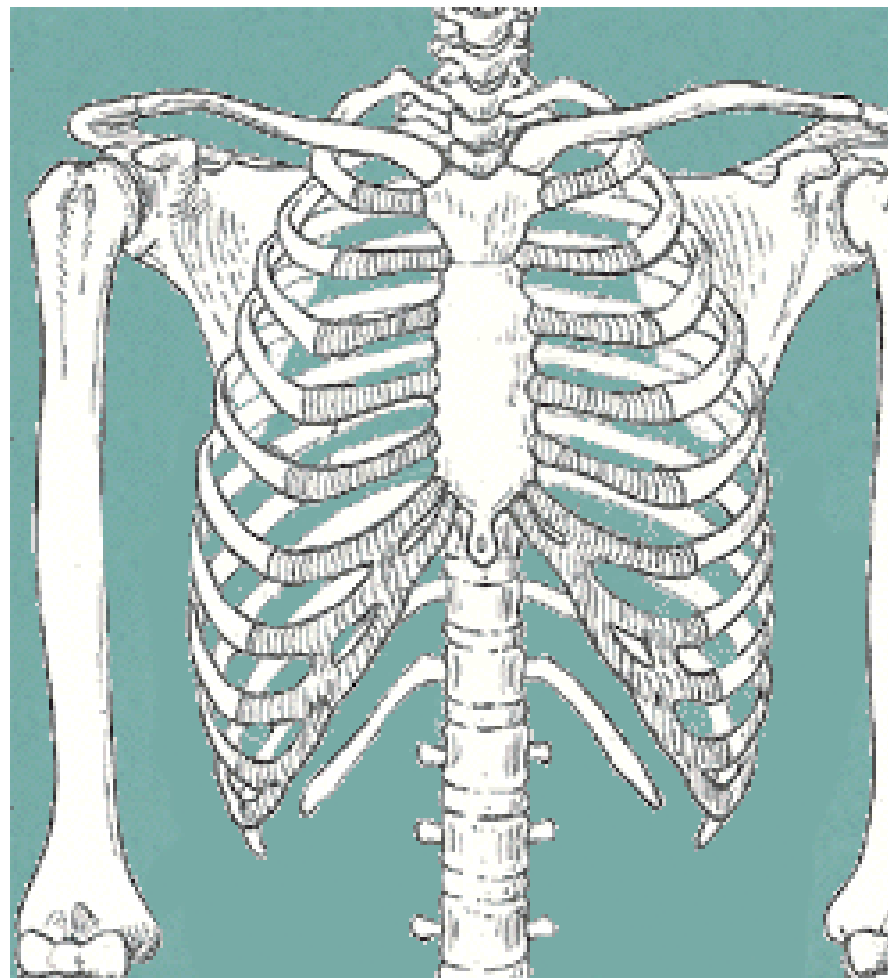
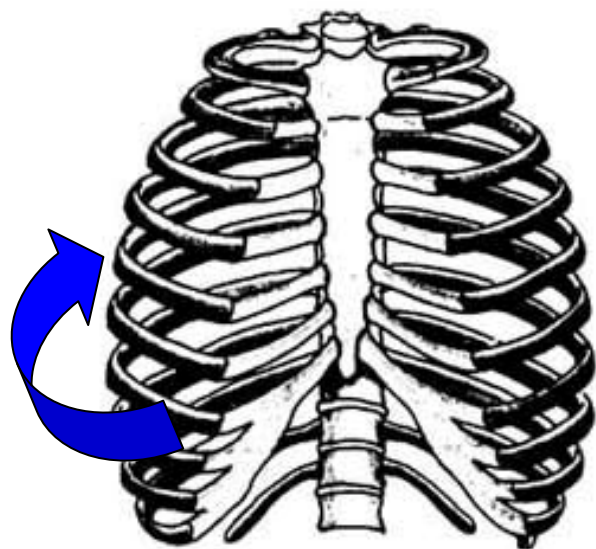
- Cephalic ribs have more pump-handle motion
- Caudal ribs have more bucket-handle motion



Increase in A-P
dimension by
upper ribs;
**Pump- Handle
Motion**



Increase in transverse dimension by lower ribs; **Bucket-handle motion**



No anterior articular attachments and no costotransverse articulations posteriorly

- Caliper motion** is primary motion:
- Move posterior and lateral on inhalation
 - Move anterior and medial on exhalation



Muscular attachments contributing to respiratory dysfunctions:

- Scalenes to ribs 1-2
- External & Internal intercostals
- Pectoralis minor ribs 3-5
- Serratus anterior ribs 3-9
- Diaphragm to inner surface ribs 6-12
- Quadratus lumborum to rib 12

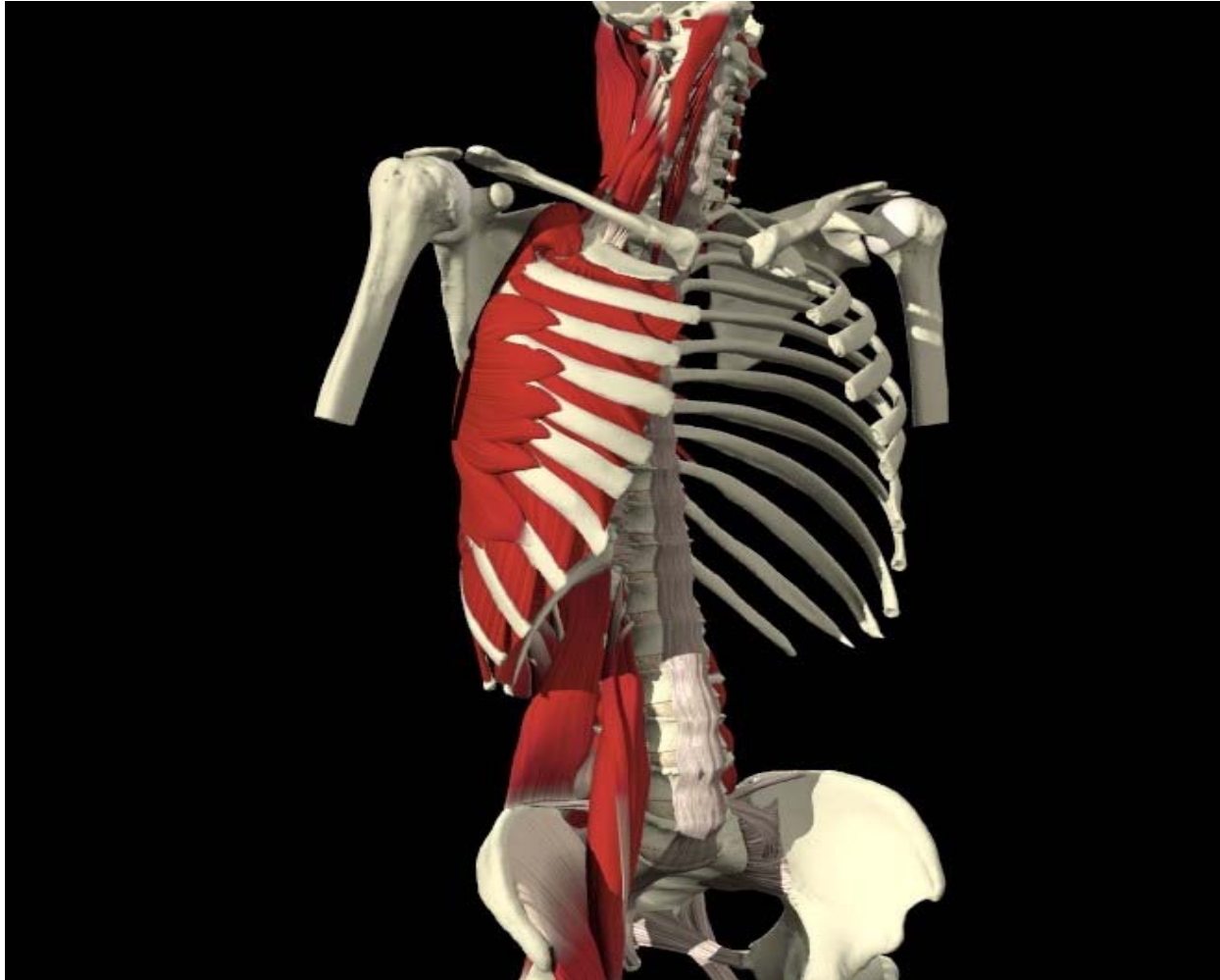
Ligamentous strain

- Costo-transverse & costo-vertebral articulations

Chondral dysfunction

Thoracic vertebral dysfunction





There are 2 types of motion dysfunction within the ribcage:

- **Respiratory Rib Dysfunctions**
 - Inhalation Restriction
 - Exhalation Restriction

- **Structural Rib Dysfunctions**
 - Subluxations
 - Compression
 - Torsions



- Diagnosed when asymmetry of motion exists while palpating rib cage excursion during respiratory effort
- Single rib or a group of ribs can demonstrate restriction during inhalation or exhalation



Inhalation Restriction

- Rib (s) that do not rise with inhalation, but move freely during exhalation
- In group dysfunction, the **Key Rib is the uppermost rib**
- Also termed: Exhalation Dysfunction

Exhalation Restriction

- Rib (s) that do not lower with exhalation, but move freely during inhalation
- In group dysfunction, the **Key Rib is the bottommost rib**
- Also termed: Inhalation Dysfunction



- After determining the phase of respiratory restriction, assess whether pump-handle or bucket-handle motion is most restricted.
- What treatments would you use in a post-sternotomy patient if you found a respiratory rib dysfunction (acute vs. chronic)?



Diagnosed while assessing rib angles

Rib subluxations are the most commonly diagnosed structural dysfunctions and will subsequently be reviewed.

3 types:

- Anterior subluxation
- Posterior subluxation
- Superior 1st rib subluxation



Anterior Rib Subluxation Diagnosis:

- Rib angle tender
- Rib angle **less** prominent posteriorly
- Prominence of anterior portion of rib
- Marked motion restriction for both inhalation and exhalation

Posterior Rib Subluxation Diagnosis:

- Rib angle tender
- Rib angle **more** prominent posteriorly
- Anterior portion of rib less prominent
- Marked motion restriction for both inhalation and exhalation



Superior 1st Rib Subluxation Diagnosis:

- Palpation of superior aspect of 1st rib shows dysfunctional side to be 5-6mm cephalic compared to other side
- Marked tenderness of superior aspect of first rib
- Restriction primarily during Exhalation

What treatments would you use to treat your post-sternotomy patient if you found a structural rib dysfunction (acute inpatient vs. outpatient)?



Acute Inpatient

- Functional Methods
- Ligamentous Articular Release
- Myofascial Release
- Strain-Counterstrain
- Diaphragm balancing

Outpatient (healing complete)

- Treatments listed above
- Rib Raising
- Facilitated Positional Release
- Muscle Energy
- Diaphragm redoming



- Improve and synchronize sternal motion
- Improve rib motion
- Decrease pain experienced by patient
- Balance autonomic tone
- Improve diaphragmatic functioning
- Other goals?



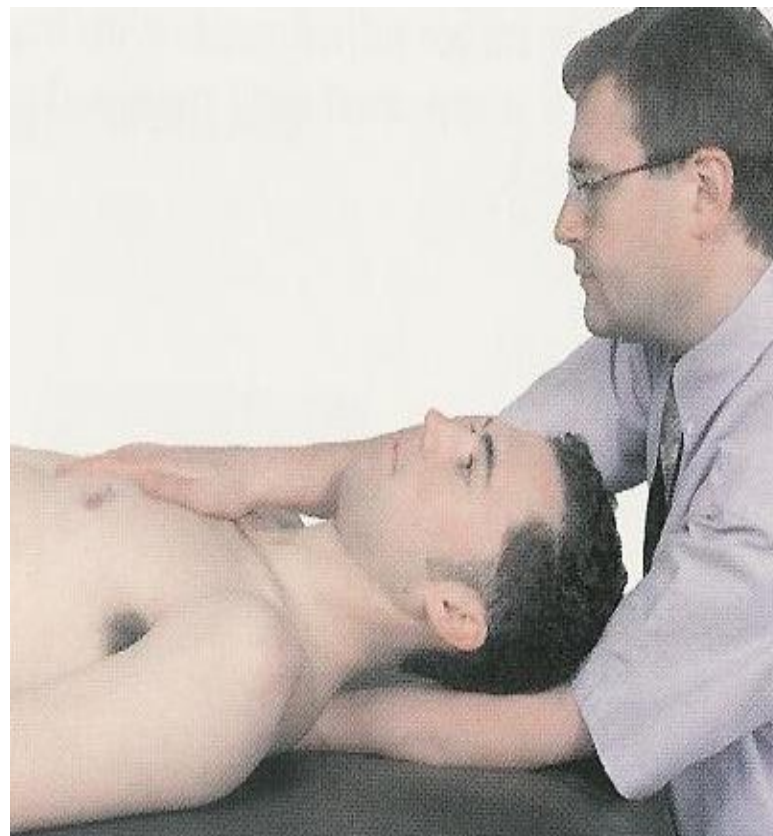
Patient supine –

- Physician should contact body of sternum either standing beside patient or from the head of the bed
- Carry the sternum to the point of balanced ligamentous tension (utilizing as many planes of motion as are necessary)
- Test respirations and ask patient to hold their breath in the phase providing the best ligamentous balance
- Repeat until maximal response is obtained
- Recheck





Greenman (p.139)



Kimberly Manual (p.145)



Patient seated –

- Physician seated contacting dysfunctional rib:
 - Middle finger of one hand on rib angle
 - Middle finger of other hand on anterior aspect of rib shaft
 - Thumbs placed laterally in mid-axillary line on rib
- Patient instructed to carry shoulder opposite the side of lesion posteriorly
- Doctor instructs patient to stop & hold position when they feel balanced tension through monitoring fingers
- Patient instructed to inhale and hold breath for correction of lesion
- Slowly return to neutral & re-check



Specific Treatments: LAR for Ribs

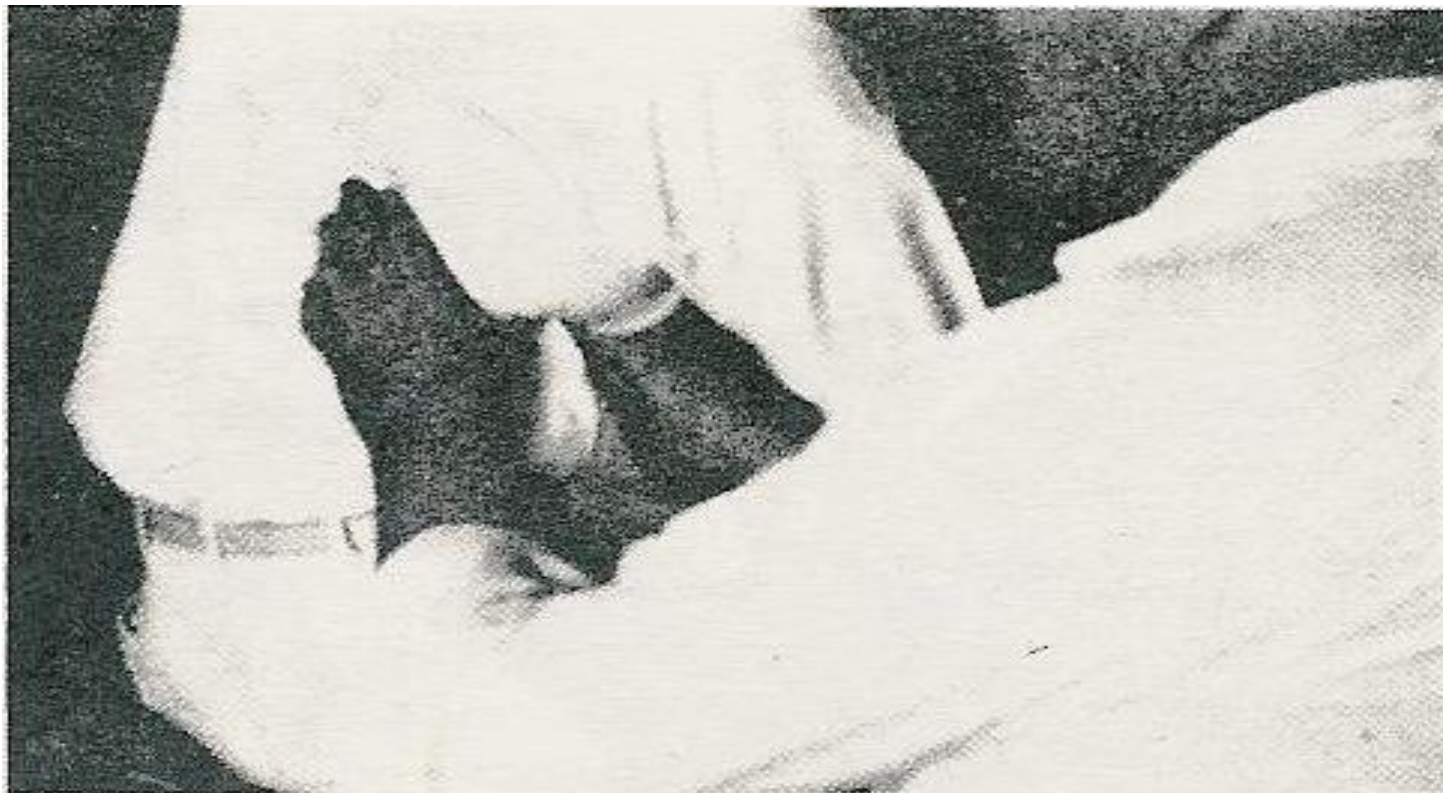
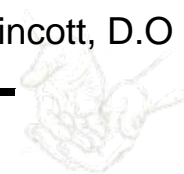
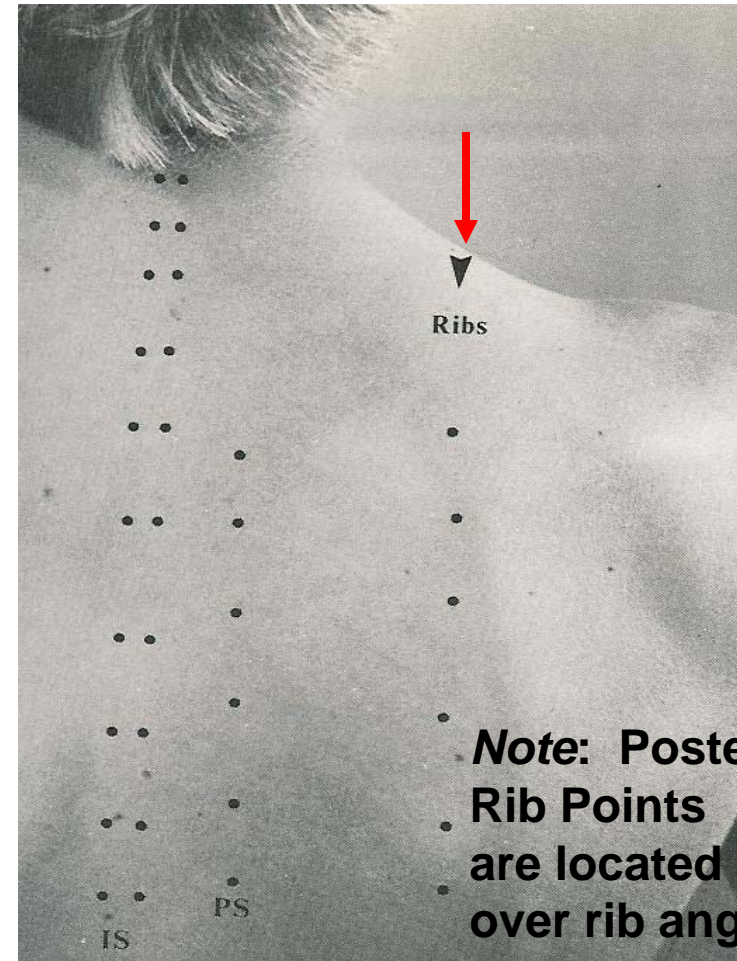
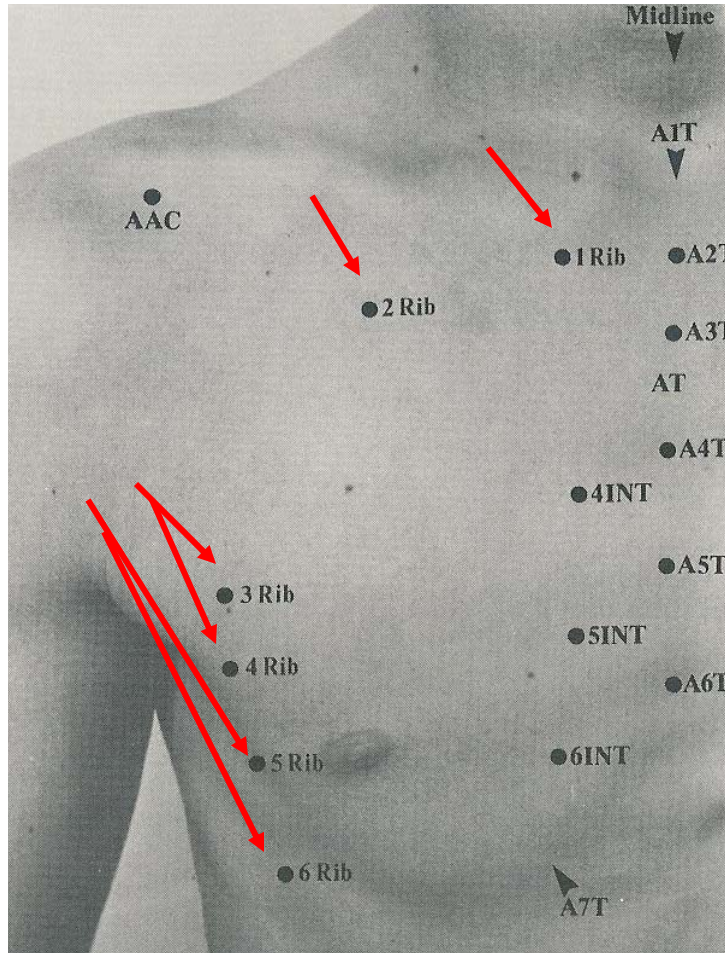


Fig. 7. Rib Technique



- Identify sternal, chondral, or rib tenderpoints
- Treat patient in seated or supine position based on point location and patient comfort
- Press on the point and tell the patient: “This is a 10 on a 1-10 pain scale”
- Passively move the patient utilizing flexion/extension, sidebending, and rotation until the patient reports the pain is 0-3
- Hold this position 120 seconds if treating a rib tenderpoint; otherwise hold for 90 seconds
- Monitor for warmth, softening, or a pulsation
- Slowly return to neutral and recheck





Note: Posterior Rib Points are located over rib angles



Ciba Clinical Symposia "Thoracic-outlet Syndrome" is Volume 23 Number 2, 1971

www.ctsnet.org

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