Rib Stress Fractures and Unstable Shoulders

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Are they Connected?

• YES

• Talk Outline:
  – Rib stress fractures - something you know about
  – Unstable shoulders – something you might not know about
  – How they are likely connected and why you should care
  – Some rehab exercises (thanks, Marc Nowak)
Rib Stress Fractures in Rowers

• ~10% of the total number of injuries
  – Intercollegiate rowers

• They occur in 8-16% of elite rowers, 2% of university rowers and 1% of junior elite rowers

• Primarily affects the 5th-9th rib

• Biomechanics
  – Greatest bend is at the middle third in its posterolateral segment
  – Site of the vast majority of fractures

Rib Anatomy
Muscle Anatomy
Kinetic Chain in Throwers and Rowers

• Connection between ground (foot stretcher) and ball (handle)
• Disruption = poor function or injury
• Disruption can occur at any link in the chain, or several
The chest wall is an important contributor to the kinetic chain.
• **Serratus Anterior**
  – Medial border of the scapula
  – Anterolateral first through ninth ribs
  – Stabilizes the scapula
• **External Oblique**
  – Interdigitates with the Serratus on the 5-9 ribs
• Opposing action with repetitive stress
• Diaphragm and breathing contribute
Rib Stress with Breathing

- Chest wall expands and lifts with inhalation
- Sinks and compresses with exhalation
- Combined with load to chest wall leads to bending/ fracture
- Lateral most bend = riskiest

Rib Stress Fracture History and Cause

- Sporadic case reports until early 1990’s
- Now common at all levels, not just elite
  - Oar shape?
  - Training?
  - Winter training on erg?
  - High load per stroke?
  - Use of slides?
  - Fault of the shoulder?
Stress Fracture History

- Insidious onset
- Overuse
- Training error/ biomechanics/ bone health

- Sounds just like stress fractures in other places and other sports
Stress Fracture Continuum

Vague pain → Stress injury → Stress fracture → fracture
Causes of Stress Fracture

- Training error
  - Too much too fast
  - Training camps
- Metabolic
  - eating disorder, disordered eating
- Biomechanics
  - Kinetic chain!
Stress Fracture Physical Exam

- SPECIFIC tenderness localizing to 1 (or 2) ribs
  - Typically lateral, could be anywhere on bony rib
  - Usually found at region of greatest rib bend
    - Anterior to posterior axillary line (armpit)
- Pain reproduced with chest wall compression AWAY from tender area
Stress Fracture Evaluation

- The Aussie experience:
  - History of pain with daily activities, night pain

- Physical exam 5 elements:
  push up, sit up, deep breath, cough, rib spring

- Presence of 5 of these at day 4-5 correlated highly with rib stress fracture on imaging
Stress Fracture Imaging

- Bone scan is best
- MRI, increasingly
- Ultrasound if able
- Unlikely to see on x-rays
Stress Fracture Treatment

- Just like any other, relative rest, pain free cross training, expect 6 weeks to return to sport
CHEST WALL PAIN PROTOCOL

Based on 28 cases of chest wall pain in rowers

Athlete Presentation

Remove from on water trg for 5 days

Re-evaluate Day 5

No pain on subjective / objective tests

Resume modified on water training

Residual pain on subjective / objective tests

negative

Bone Scan

Real Time US +/- CT

positive

negative “Stress Reaction”

negative Stress Fracture

3-4 weeks no on water training

4-6 weeks no on water training

No pain on subjective / objective tests

Real Time US +/- CT

no pain on subjective / objective tests

Based on 13 cases of rib stress reaction / stress fracture

Graduated build based on length of time out of the boat

2 week graded return to on water training

Full Training

Predictive Subjective / Objective Tests

• Push Up
• Sit Up
• Deep Breath
• Cough / Sneeze
• Night Pain
• ADL’s

Based on 13 cases of rib stress reaction / stress fracture

Graduated build based on length of time out of the boat

Full Training
Stress Fracture Prevention

• Dynamic core stabilization program followed by US womens national team (PT Marc Nowak)
• Unfortunately does not result in 0% stress fractures
• Some have tried serratus anterior strengthening without success
• Look for the training error
• And now let’s look for the connected kinetic chain disruption – the unstable shoulder
The Shoulder in Rowing

- Rowers are at risk for shoulder dislocation
  - Especially at the start
- Shoulder subluxation = shoulder is partially dislocating
- Clicking, popping, shoulder area pain
  - Usually vague
it’s not very stable
it’s actually a series of joints
The Rotator Cuff

- 4 small muscles
- Provide stability
- Easy to strain

- Need to be balanced
You can guess what’s wrong with shoulders based on age

• Younger = less stable
  – Multidirectional instability
  – Dislocations without much damage

• Older = stable, but stiffer
  – Rotator cuff tears, arthritis, frozen shoulder
  – Dislocations, injuries with a lot of damage
Load and Shift and Sulcus Sign for Instability
Shoulder Blade Instability
Kinetic Chain

- Connection between ground (foot stretcher) and ball (handle)
- Disruption = poor function or injury
- Disruption can occur at any link in the chain, or several
The shoulder is an important contributor to the kinetic chain.
Scapular Stabilizers
The Connection

• Rib stress may come from inability to stabilize the shoulder blade
• Force transmitted to chest wall
• Strongly recommend rowers do shoulder stabilizing rehab exercises “prehab”