Imaging of Pectoralis Major Injury

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Background:

- Ultrasound and MRI
  - Effective: diagnosis and characterization of pectoralis major injury
- Pitfalls: errors in diagnosis
  - Due to complex anatomy
  - Unfamiliar: recent redefined anatomic descriptions

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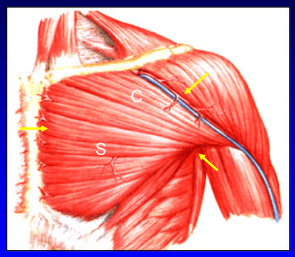
Pectoralis Major

- Clavicular head:
  - Lamina from medial clavicle
- Sternal head
  - Manubrial and costal laminae



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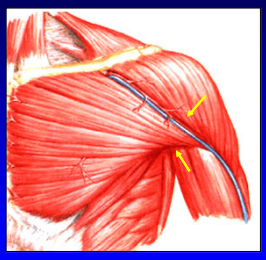
Pectoralis Major

- Attachment:
  - Courses over biceps brachii long head tendon
  - Inserts lateral to biceps brachii tendon
  - Anterior humeral shaft
  - 4 – 6 cm cephalocaudad
  - Note: twisting



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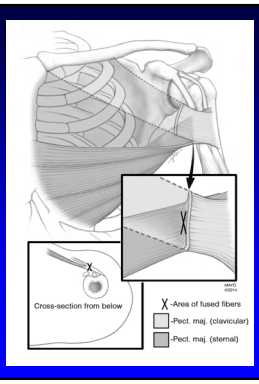
Pectoralis Major

- Clavicular head:
  - Forms anterior layer
- Sternal head:
  - Forms posterior layer and inferior aspect of anterior layer
- Each layer: 2 mm thick
- "U" shaped
- Fuses 11 mm proximal to insertion



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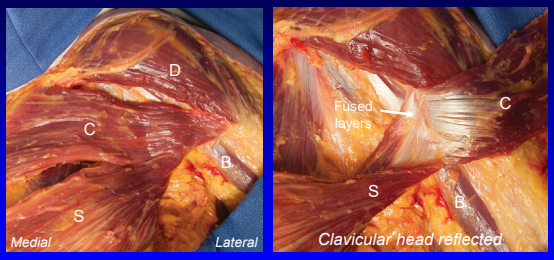
Pectoralis Major



S = sternal head; C = clavicular head
D = deltoid; B = bicep brachii

Chiavaras MM et al. Skeletal Radiol 2015; 44:157

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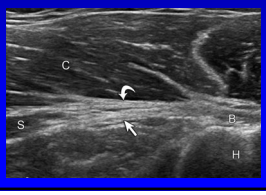
Pectoralis Major: ultrasound

- Begin short axis over bicipital groove
- Identify bicep brachii long head
- Scan inferior to identify pectoralis major tendon superficial to biceps tendon



Curved arrow = anterior layer
Straight arrow = posterior layer
S = sternal head
C = clavicular head
B = biceps brachii long head
H = humerus
(Right side of image = lateral)

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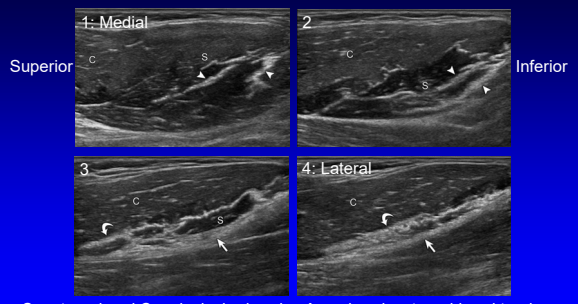
Pectoralis Major: short axis (sagittal plane)



S = sternal and C = clavicular heads; Arrowheads: sternal head tendons
Curved arrow = anterior layer; Straight arrow = posterior layer

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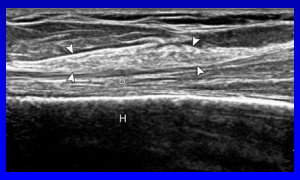
Pectoralis Major: ultrasound

- Distal tendon: short axis (sagittal)
- Fused anterior and posterior layers
- Identified over biceps brachii tendon



Arrowheads: fused anterior and posterior layers
B = biceps brachii long head
H = humerus
(Right side of image = inferior)

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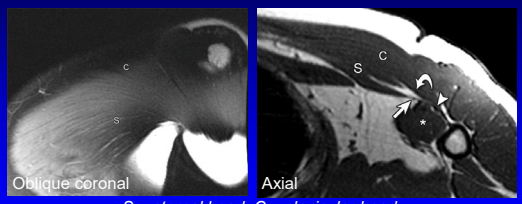
Pectoralis Major: MRI

- Axial, oblique sagittal, and oblique coronal planes



S = sternal head; C = clavicular head
Curved arrow = anterior layer; Straight arrow = posterior layer
Arrowhead = biceps brachii long head
** = biceps brachii short head + coracobrachialis*

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Clinical Presentation

- Pectoralis major tear:
  - First described in 1822
  - Butcher boy lifting a large piece of beef
- More commonly:
  - Bench press exercise, steer-riding
  - Stretch of actively contracting muscle
- Clinical:
  - Immediate pain, palpable defect
  - Ecchymosis: axilla, chest wall, upper arm

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Pectoralis Tear: imaging findings

- Full-thickness (anterior + posterior layers):
  - Retracted tendon + hemorrhage over coracobrachialis / short head biceps
  - No tendon over biceps brachii long head
  - Fluid/edema at humerus
  - Anterior displacement of biceps brachii tendon

Connell DA, et al. Radiology 1999;210:785
Weaver JS, et al. J Ultrasound Med 2005;24:25

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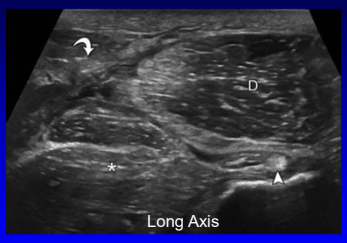
Case 1: full-thickness, full-width tear

Medial



Lateral

Curved arrow = torn and retracted pectoralis major
** = short head biceps brachii + coracobrachialis*
Arrowhead = biceps brachii long head; D = deltoid

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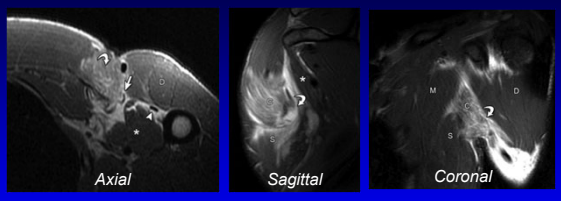
Case 2: full-thickness, full-width tear



Curved arrow = torn and retracted pectoralis major
Arrow = tendon stump
** = short head biceps brachii + coracobrachialis*
Arrowhead = biceps brachii long head; D = deltoid
S = sternal and C = clavicular heads; M = pectoralis minor

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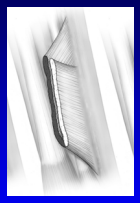
Pectoralis Tear: imaging findings

- Partial thickness
  - Posterior layer torn (sternal head)
  - Medial to fused anterior / posterior layers
  - Intact tendon superficial to biceps long head (fused anterior + posterior layers)
  - Fluid: musculotendinous junction or deltopectoral groove
  - Intact clavicular head



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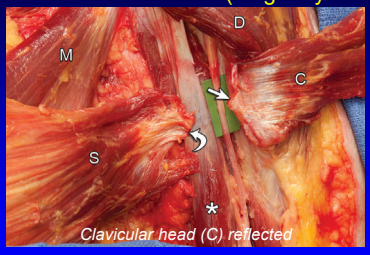
Case 3: partial-thickness, full-width sternal head tear (surgically created)



Curved arrow = torn sternal head (S); Arrow = posterior layer
** = short head biceps brachii + coracobrachialis*
M = pectoralis minor; D = deltoid

Chiavaras MM et al. Skeletal Radiol 2015; 44:157

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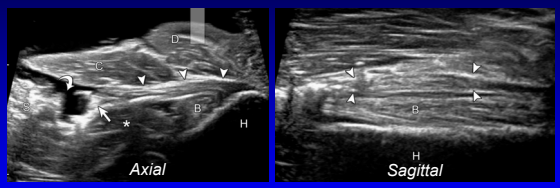
Case 3: partial-thickness, full-width sternal head tear (surgically created)



Curved arrow = torn sternal head (S); Arrow = posterior layer
Note: intact fused anterior and posterior layers (arrowheads) over biceps brachii long head tendon (B)
** = short head biceps brachii + coracobrachialis*
D = deltoid; H = humerus

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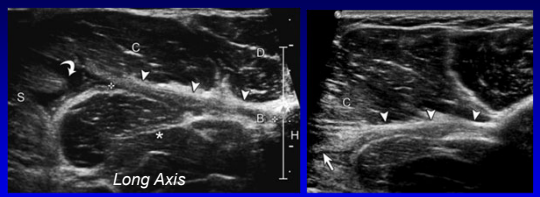
Case 4: partial-thickness, full-width sternal head tear



Curved arrow = torn sternal head (S)
Note: intact fused anterior and posterior layers (arrowheads) over biceps brachii long head tendon (B)
** = short head biceps brachii + coracobrachialis*
C = clavicular head; D = deltoid; H = humerus

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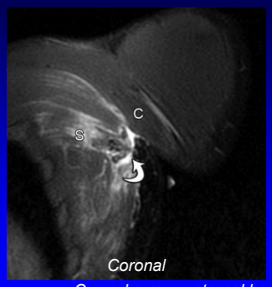
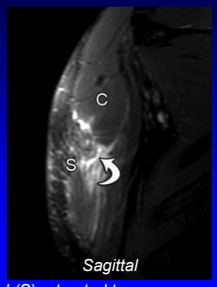
Case 4: partial-thickness, full-width sternal head tear



Coronal



Sagittal

Curved arrow = sternal head (S) retracted tear
C = clavicular head

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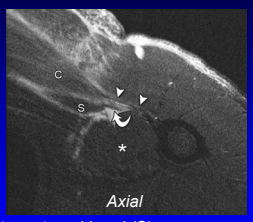
Case 5: partial-thickness, full-width sternal head tear

Long Axis



Axial

Curved arrow = torn sternal head (S)
Note: intact fused anterior and posterior layers (arrowheads) over biceps brachii long head tendon (B)
** = short head biceps brachii + coracobrachialis*
C = clavicular head

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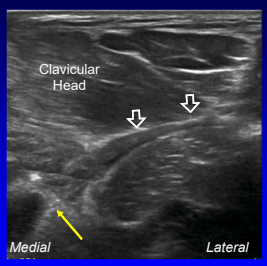
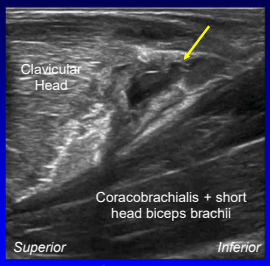
Case 5: partial-thickness, full-width sternal head tear (arrow)



Long Axis



Short Axis

Note: intact fused anterior and posterior layers (open arrows)

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Take Home Points

- Partial-thickness tear
  - Most common
  - Sternal head medial to fused layers
  - Hematoma over short head biceps / coracobrachialis
- Full-thickness tear
  - No tendon over biceps brachii long head
  - Fluid around biceps with anterior displacement

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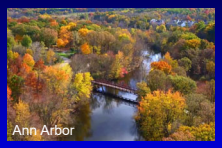
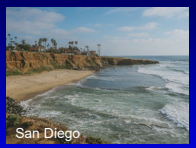
Thank you!





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