THE SHOULDER

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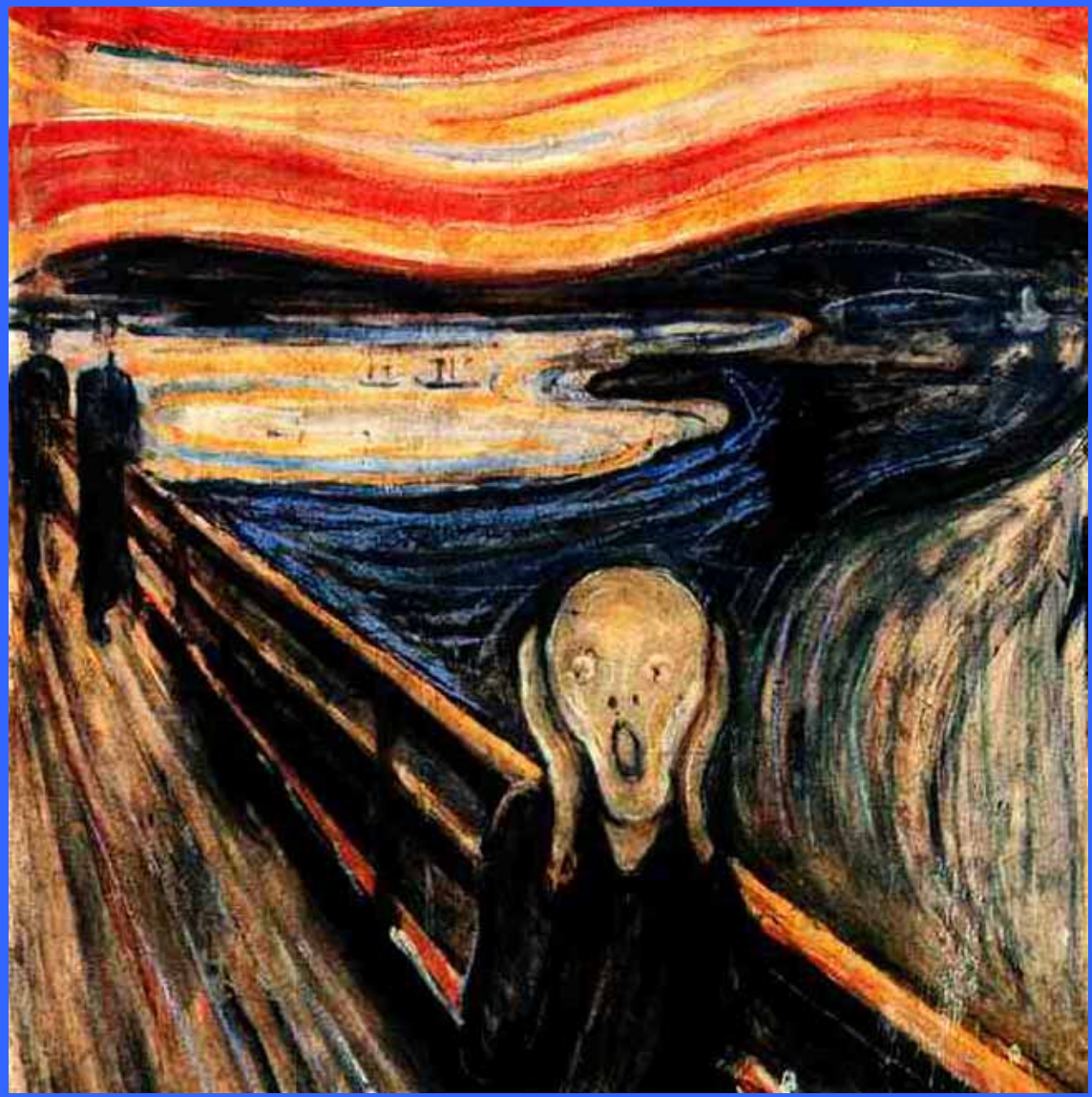
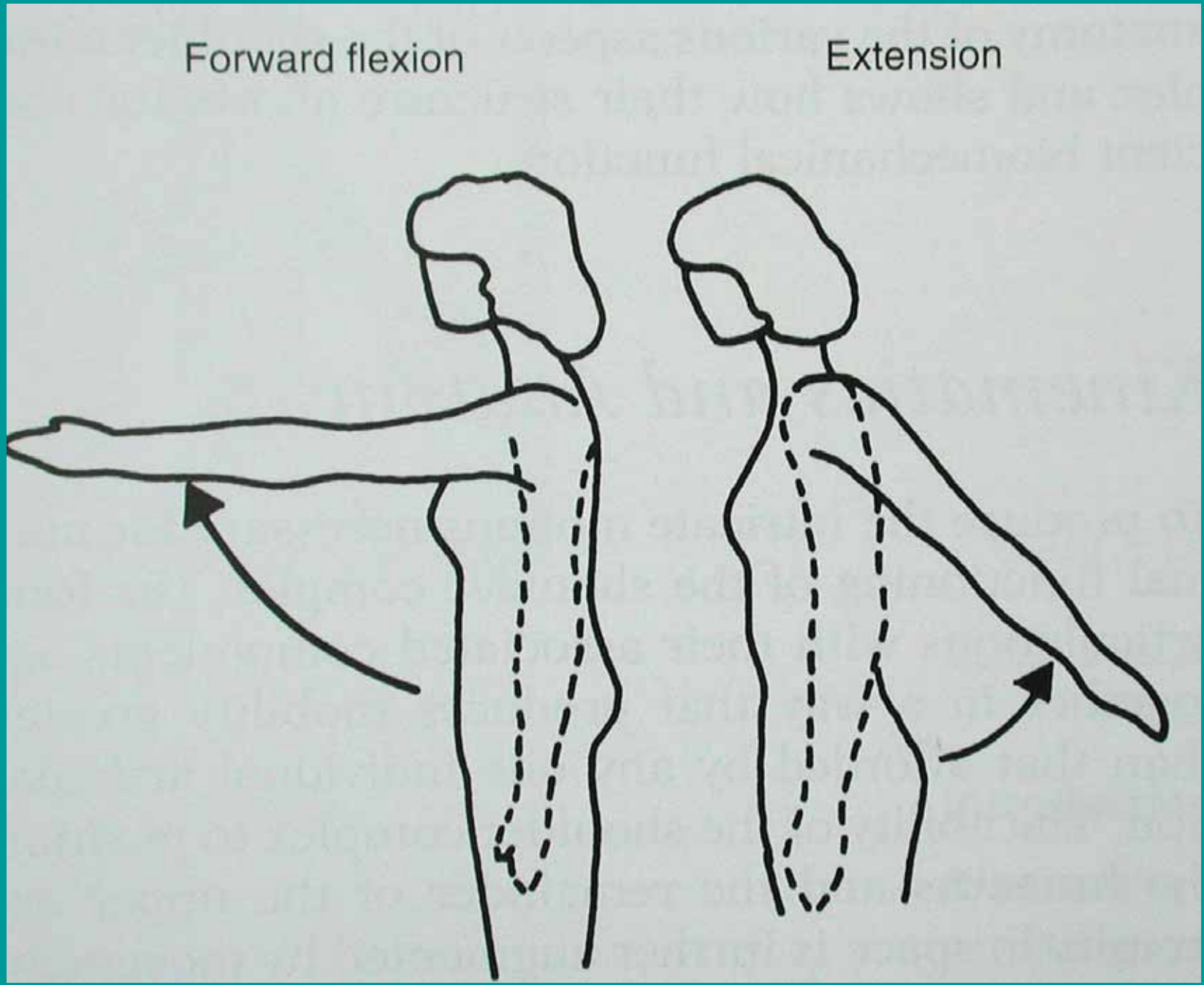
CNMC

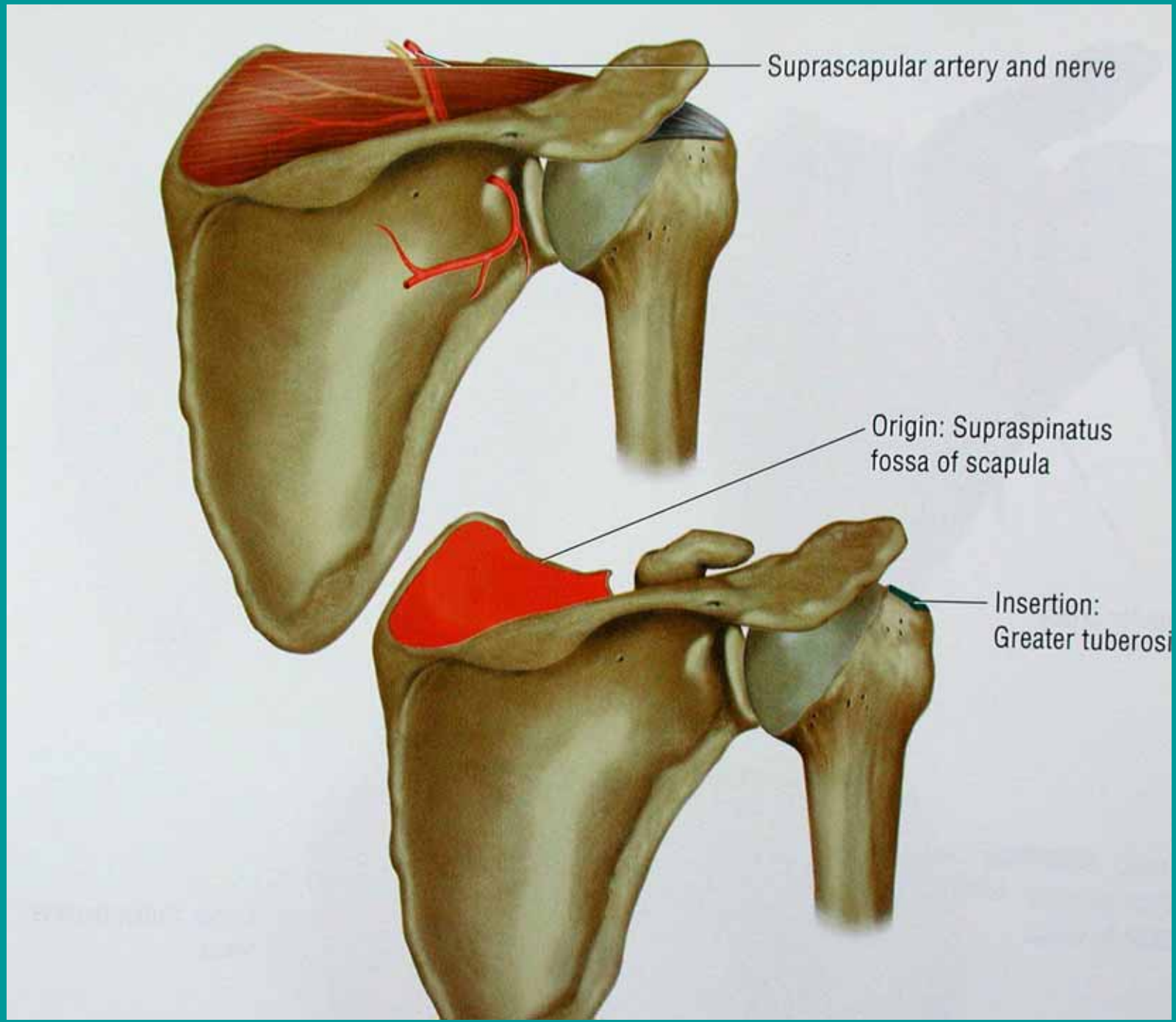
Shoulder

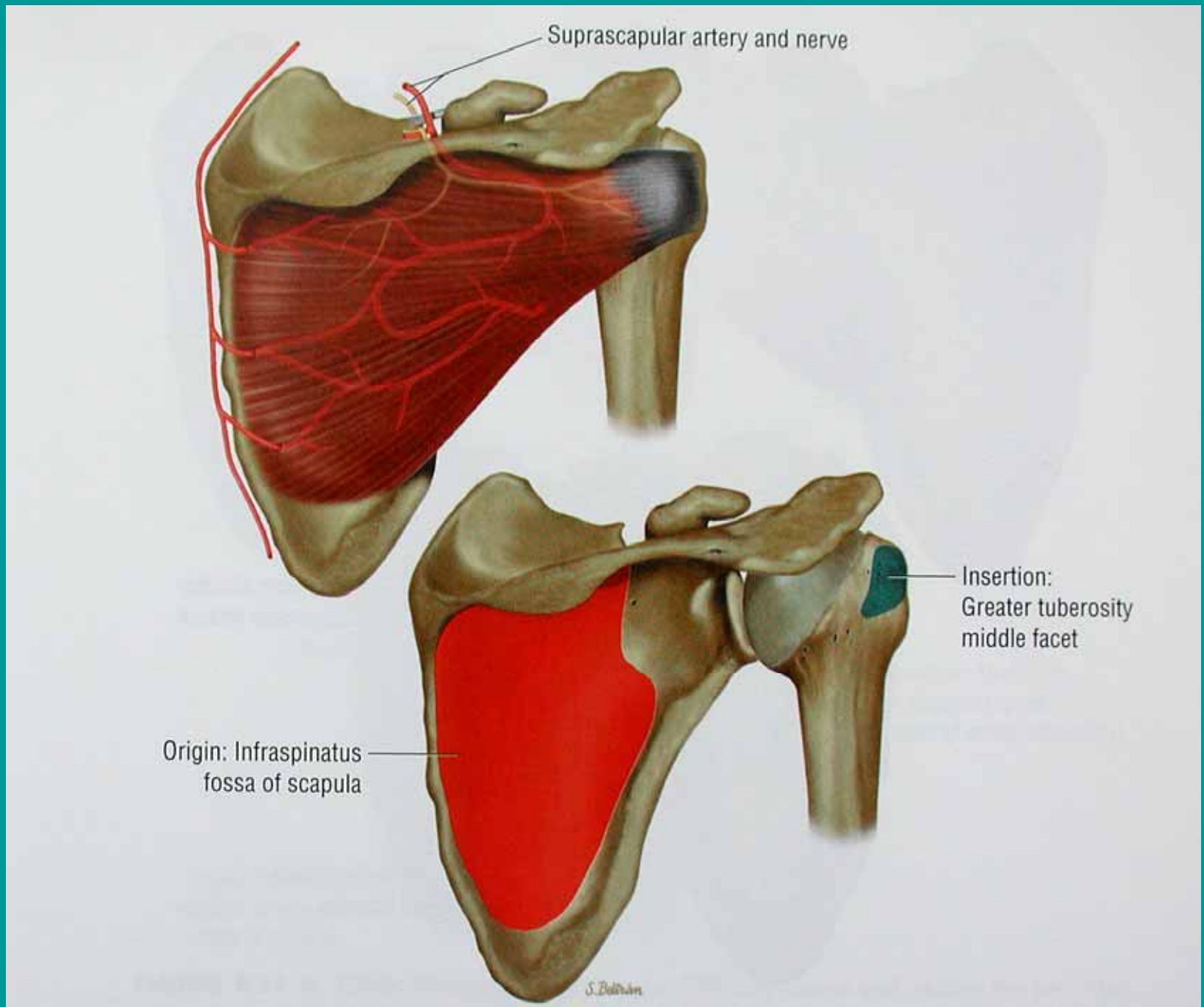
- The Basics:
- Anatomy: Musculature, Tendons of the Rotator Cuff, Simple biomechanics
- Cuff Tears
- Impingement
- Labroligamentous Complex
- Labral lesions: those acronyms. “ARRGH”
- Nerve compression lesions

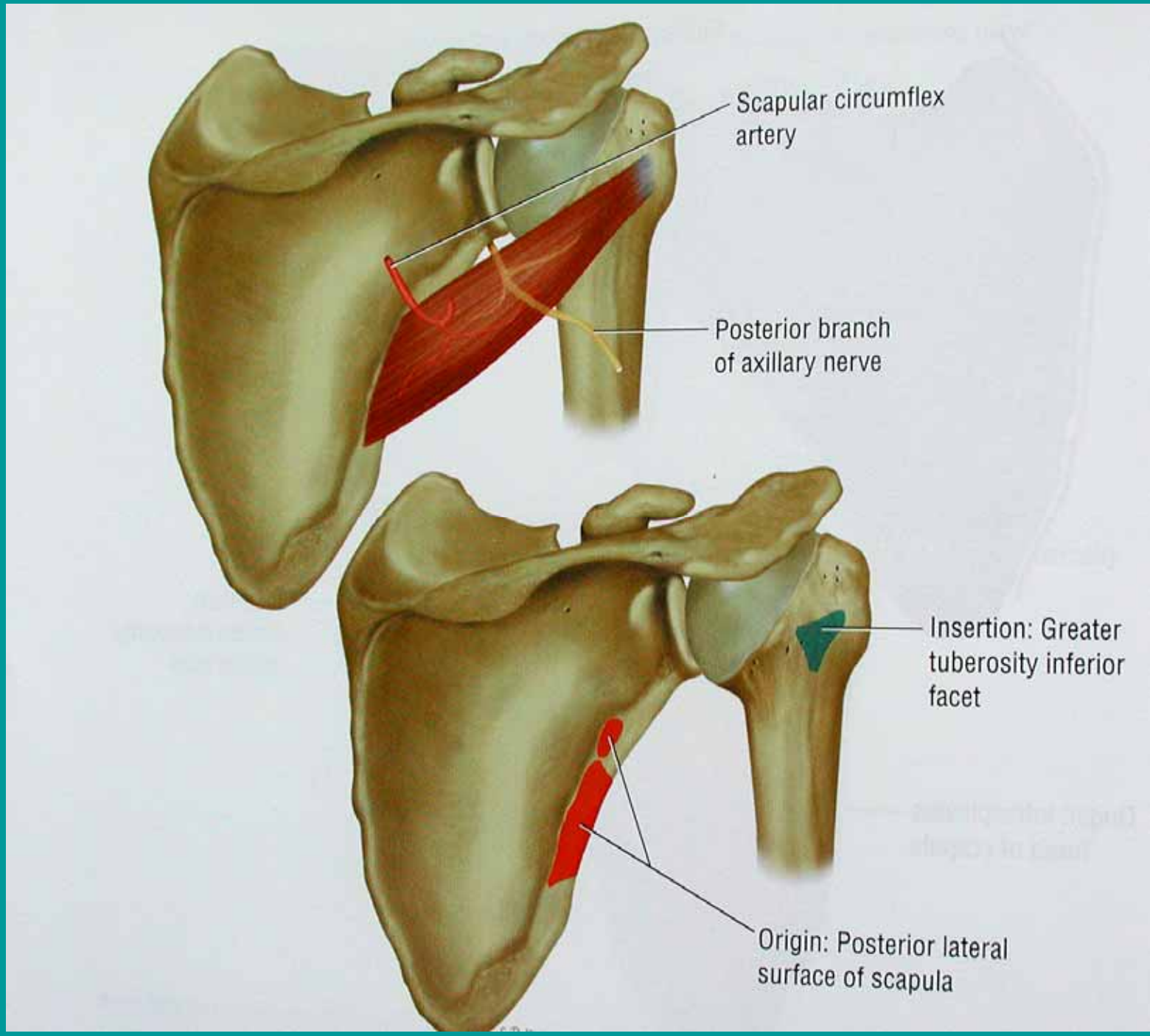
Shoulder: Anatomy, Imaging

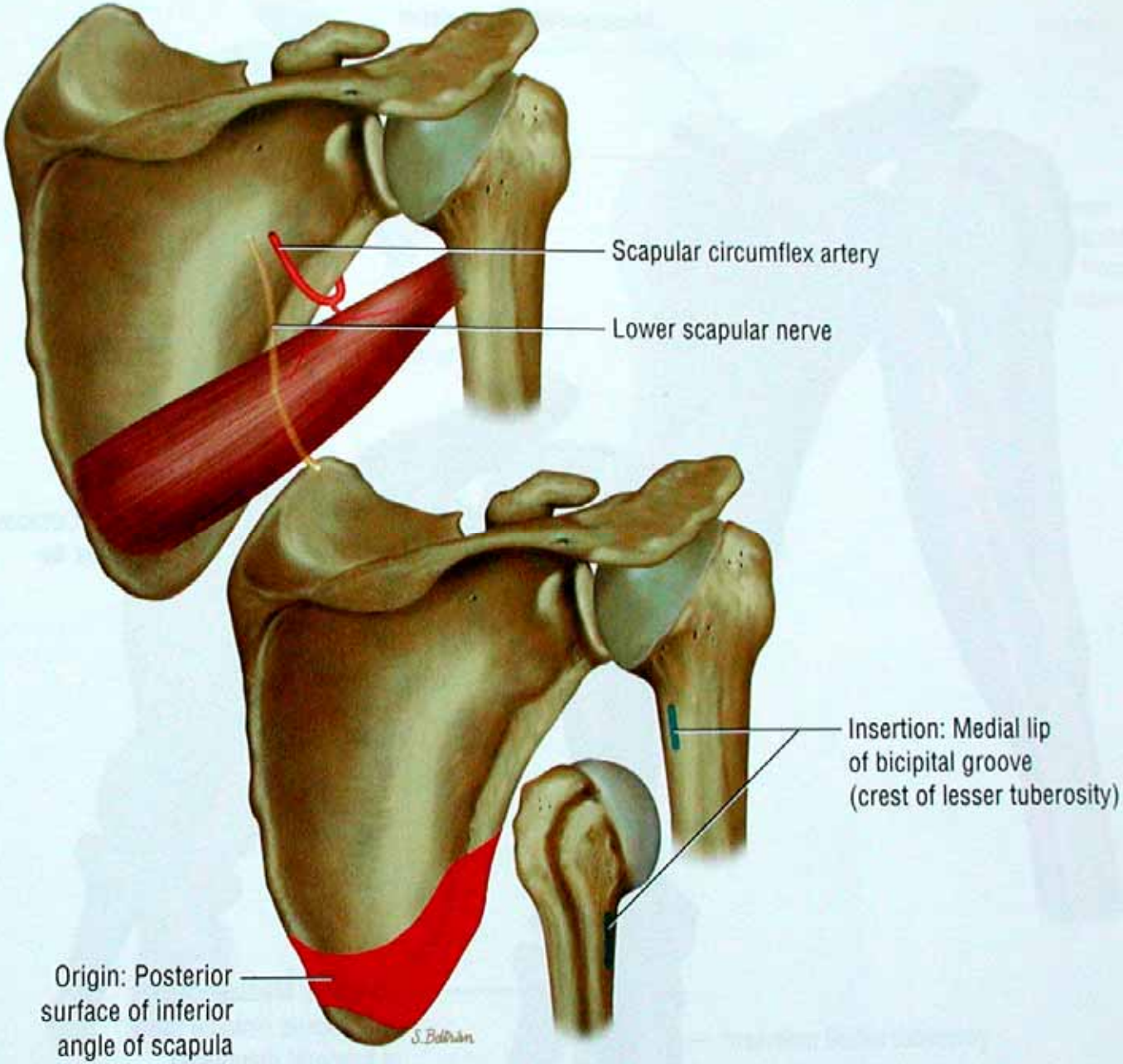


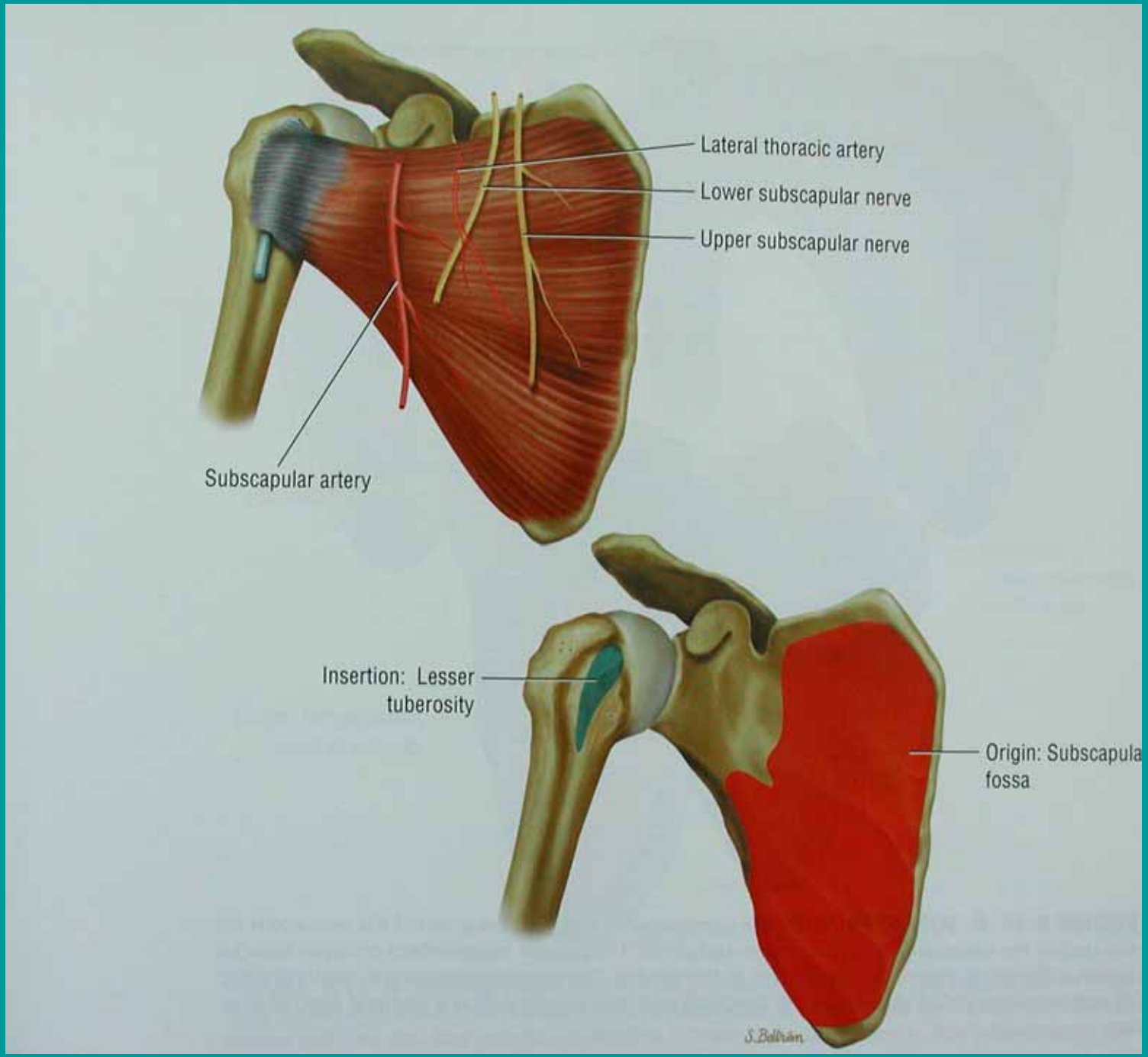

Forward flexion
Extension

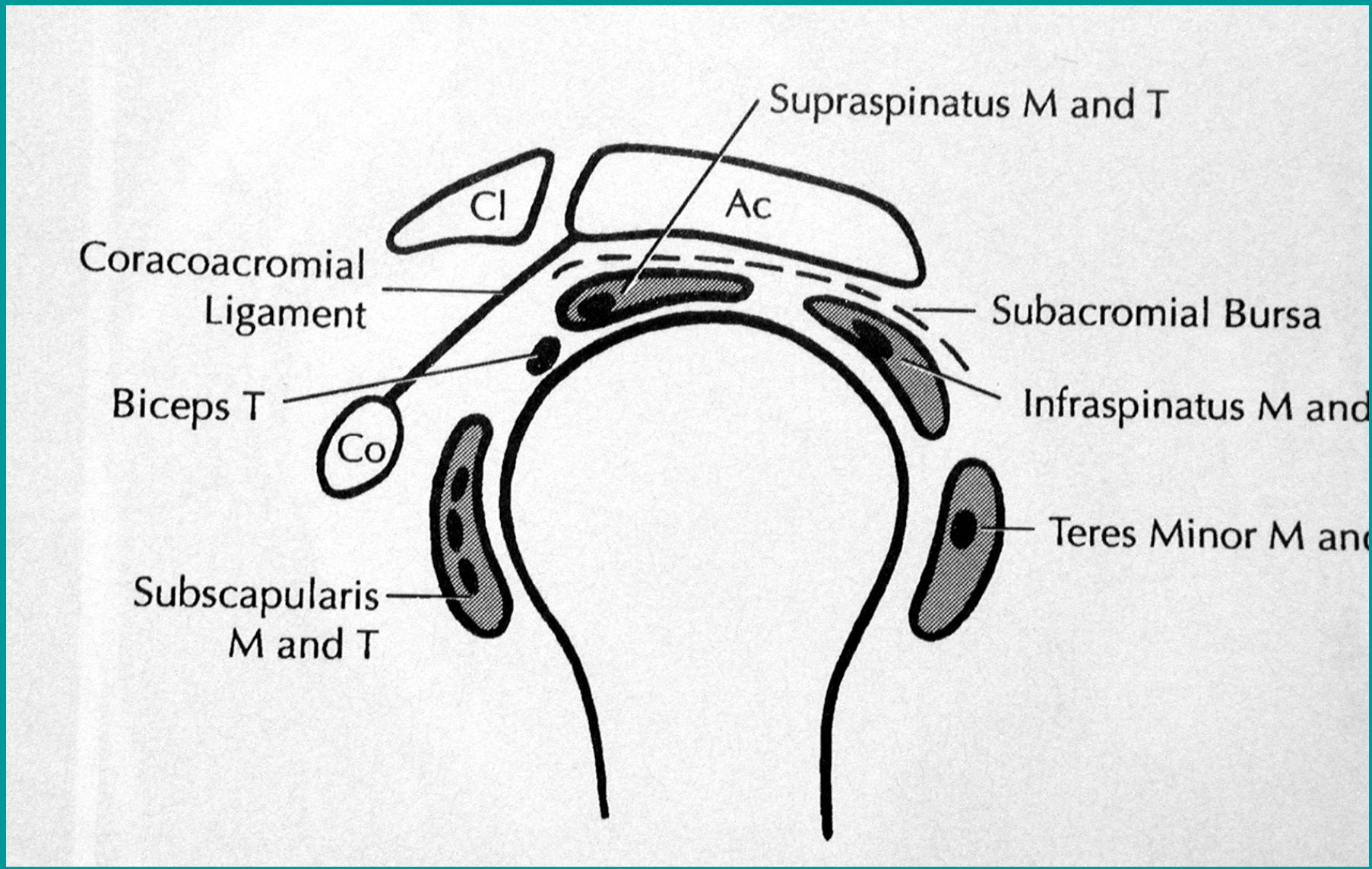

Suprascapular artery and nerve
Origin: Supraspinatus
fossa of scapula
Insertion:
Greater tuberosi


Suprascapular artery and nerve
Insertion:
Greater tuberosity
middle facet
Origin: Infraspinatus
fossa of scapula


Scapular circumflex artery
Posterior branch of axillary nerve
Insertion: Greater tuberosity inferior facet
Origin: Posterior lateral surface of scapula


Scapular circumflex artery
Lower scapular nerve
Insertion: Medial lip of bicipital groove (crest of lesser tuberosity)
Origin: Posterior surface of inferior angle of scapula


Lateral thoracic artery
Lower subscapular nerve
Upper subscapular nerve
Subscapular artery
Insertion: Lesser tuberosity
Origin: Subscapula fossa


Supraspinatus M and T
Cl
Ac
Coracoacromial
Ligament
Subacromial Bursa
Biceps T
Infraspinatus M and
Co
Teres Minor M and
Subscapularis
M and T


LOC: -87.31
THK: 4 SP: 4
HFS
AR
PL
CARDIAC
EC: 1
SE
FA: 90
TR: 3800
TE: 73.15
ACQ:256\256
Page: 4 of 18
Z: 1
C: 610
W: 1084
DFOV:16x16cm
Compressed 5:1
IM: 4 SE: 6
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cm


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LOC: -94.09
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CARDIAC
EC: 1
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ACQ:256\256
Page: 6 of 18
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DFOV:16x16cm
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IM: 7 SE: 6


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W: 1084
DFOV:16x16cm
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THK: 4 SP: 4
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EC: 1
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TR: 3800
TE: 73.15
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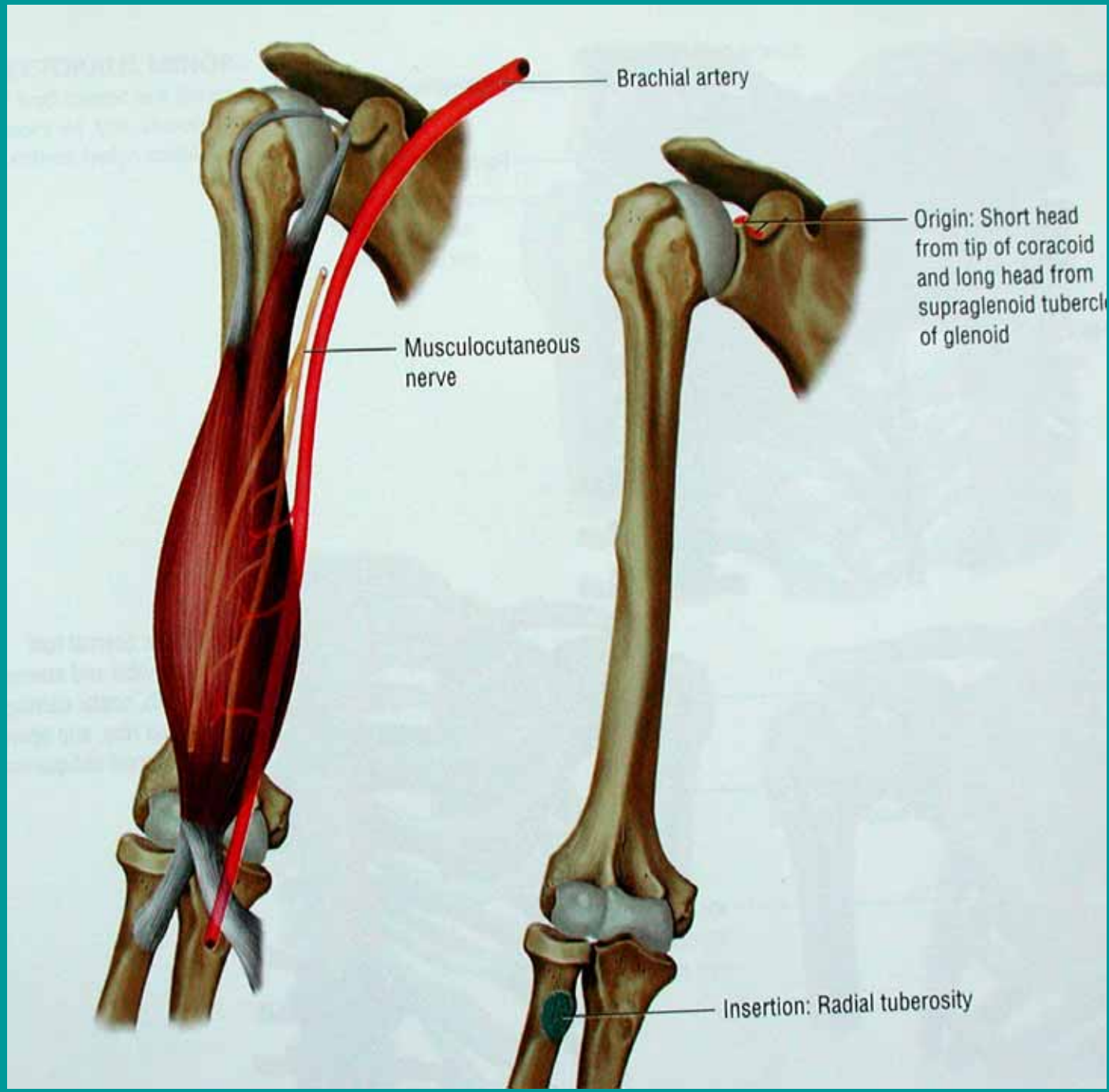
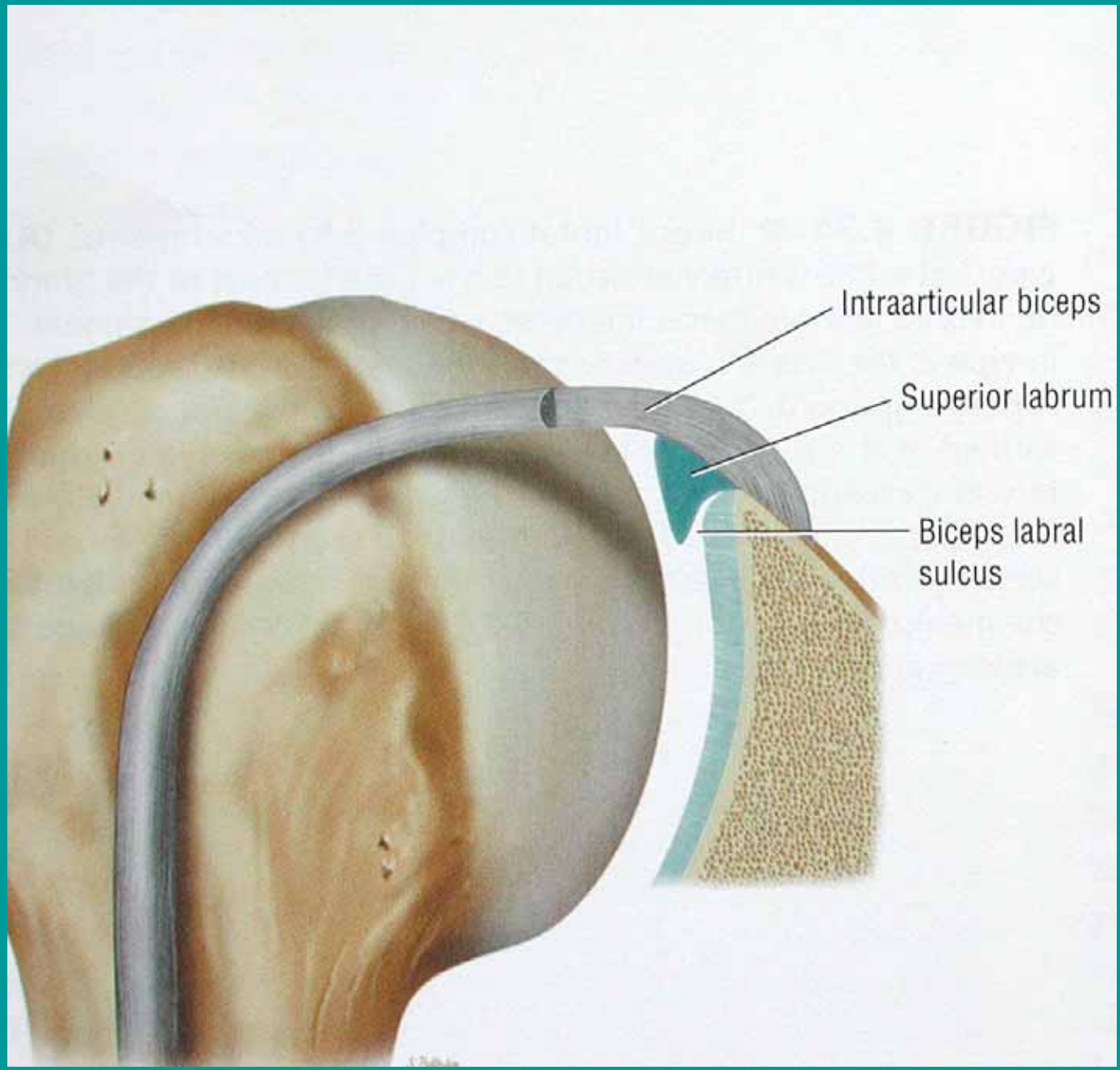
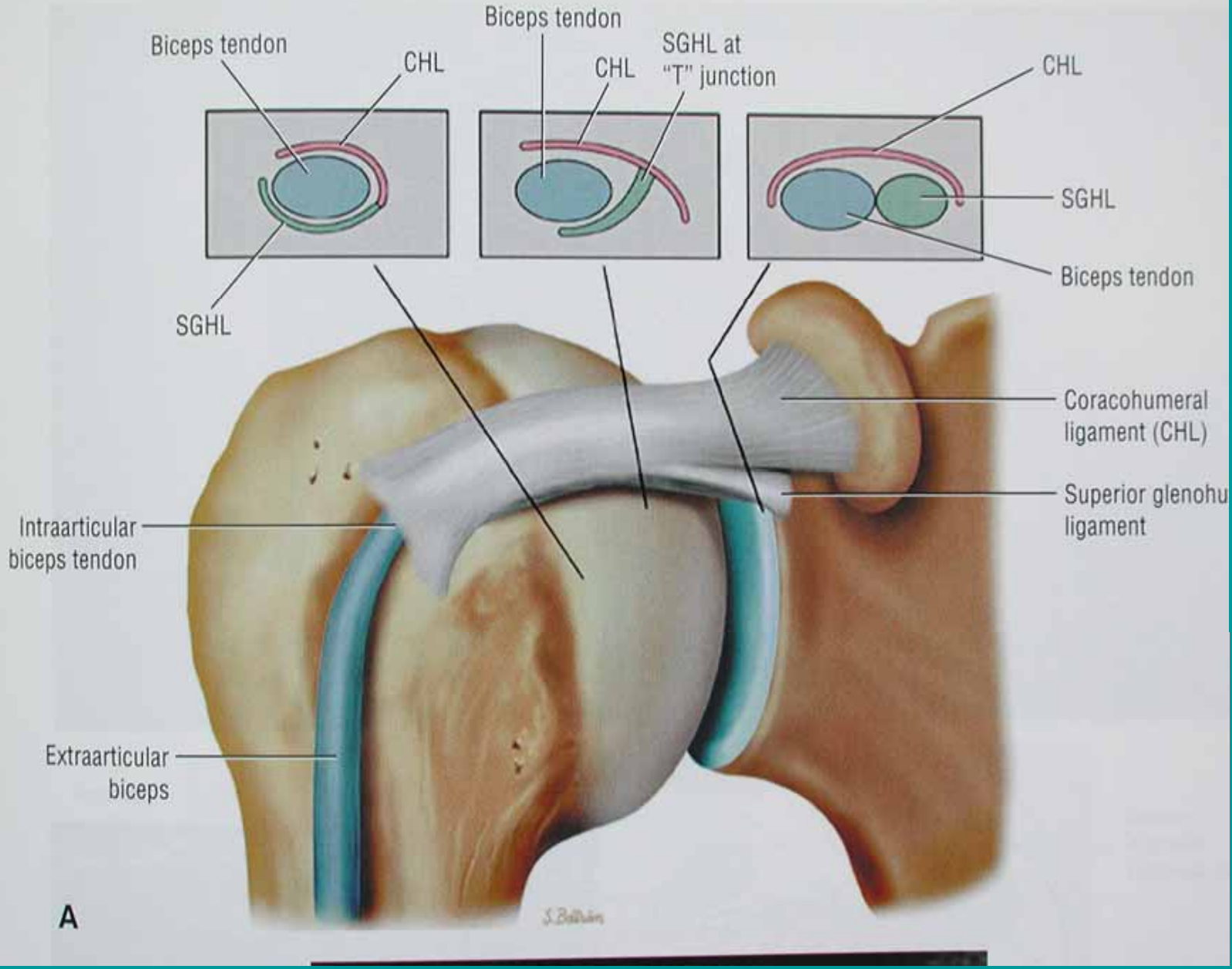
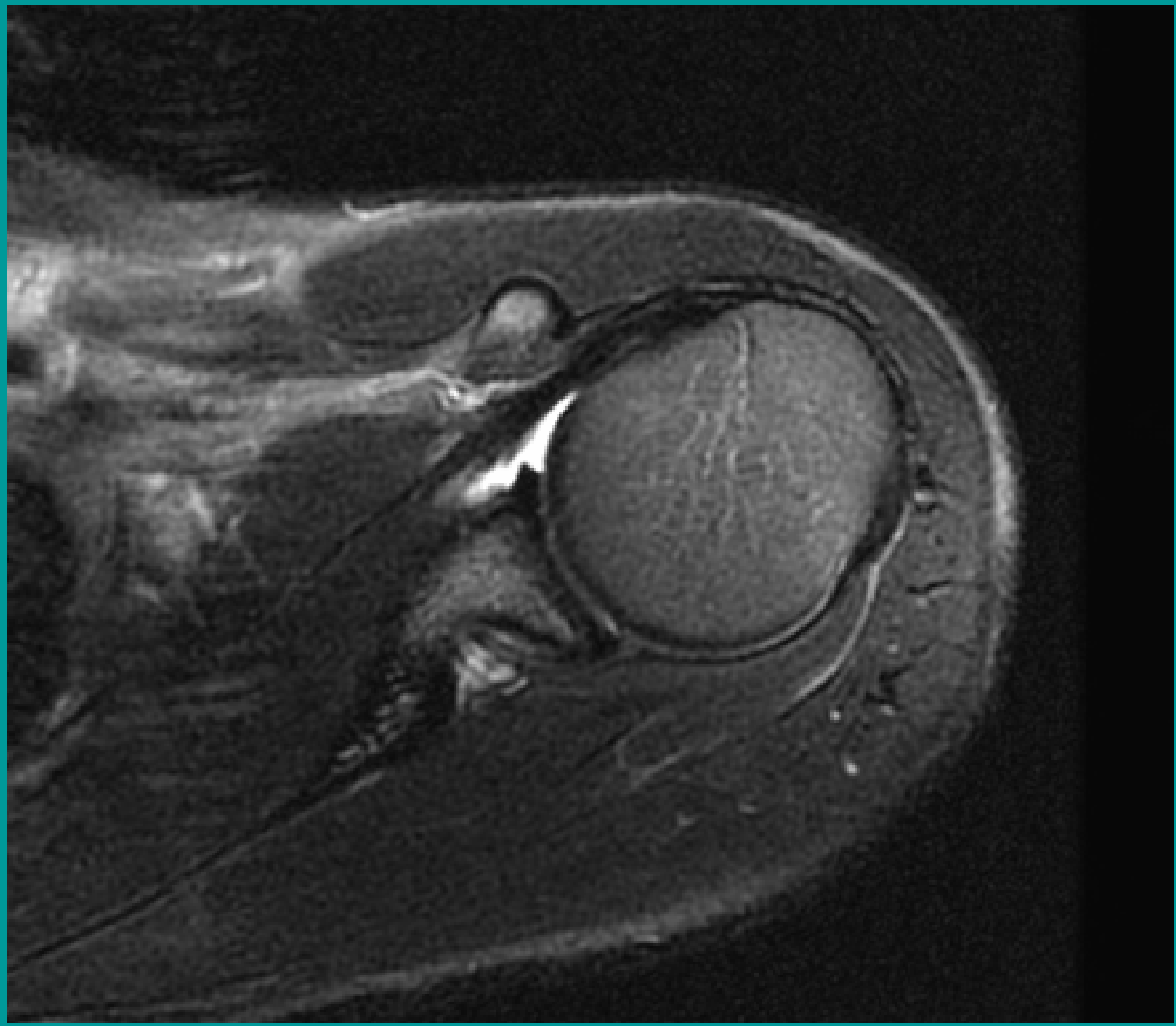
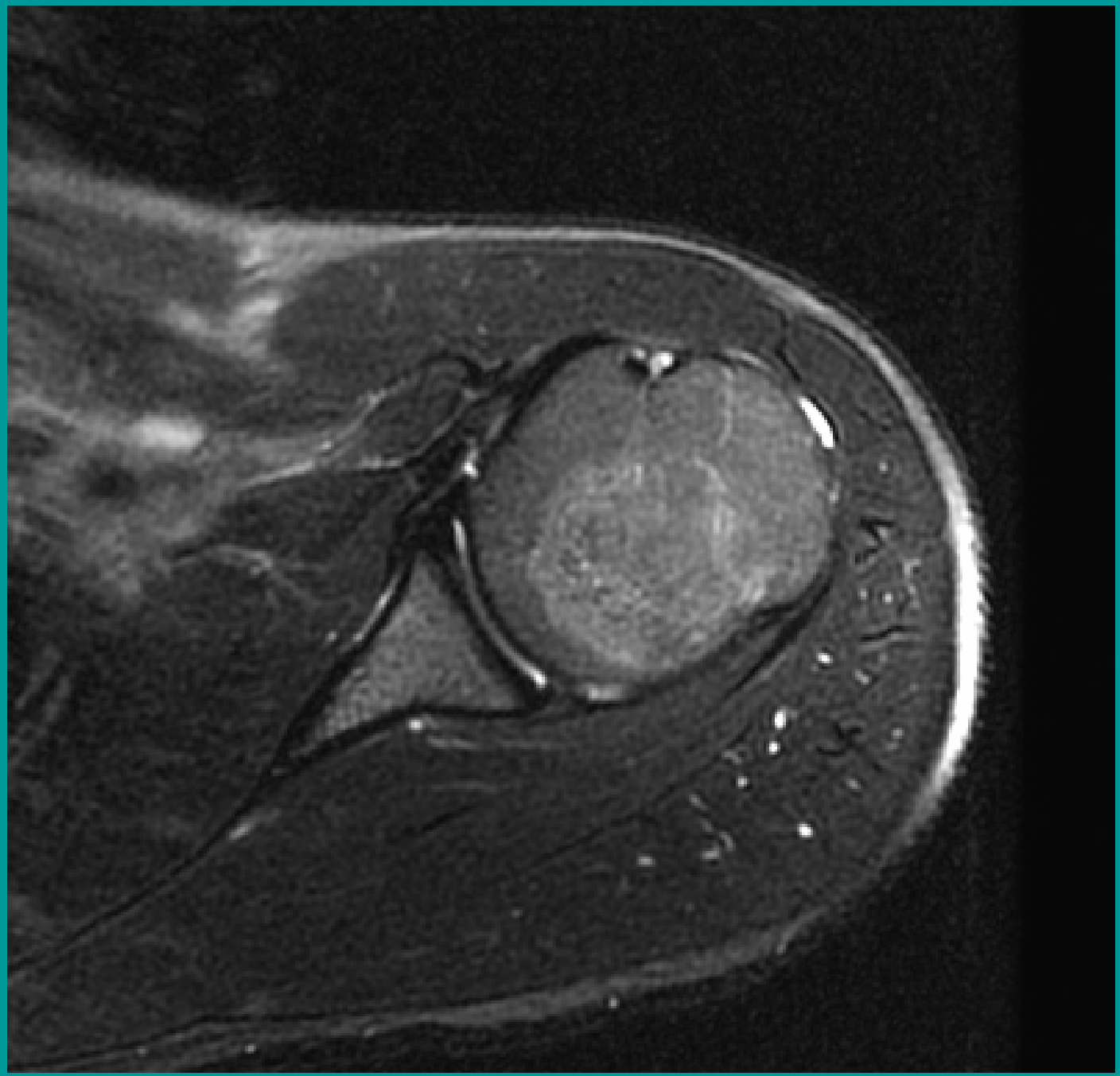

Brachial artery
Musculocutaneous nerve
Origin: Short head from tip of coracoid and long head from supraglenoid tubercl of glenoid
Insertion: Radial tuberosity

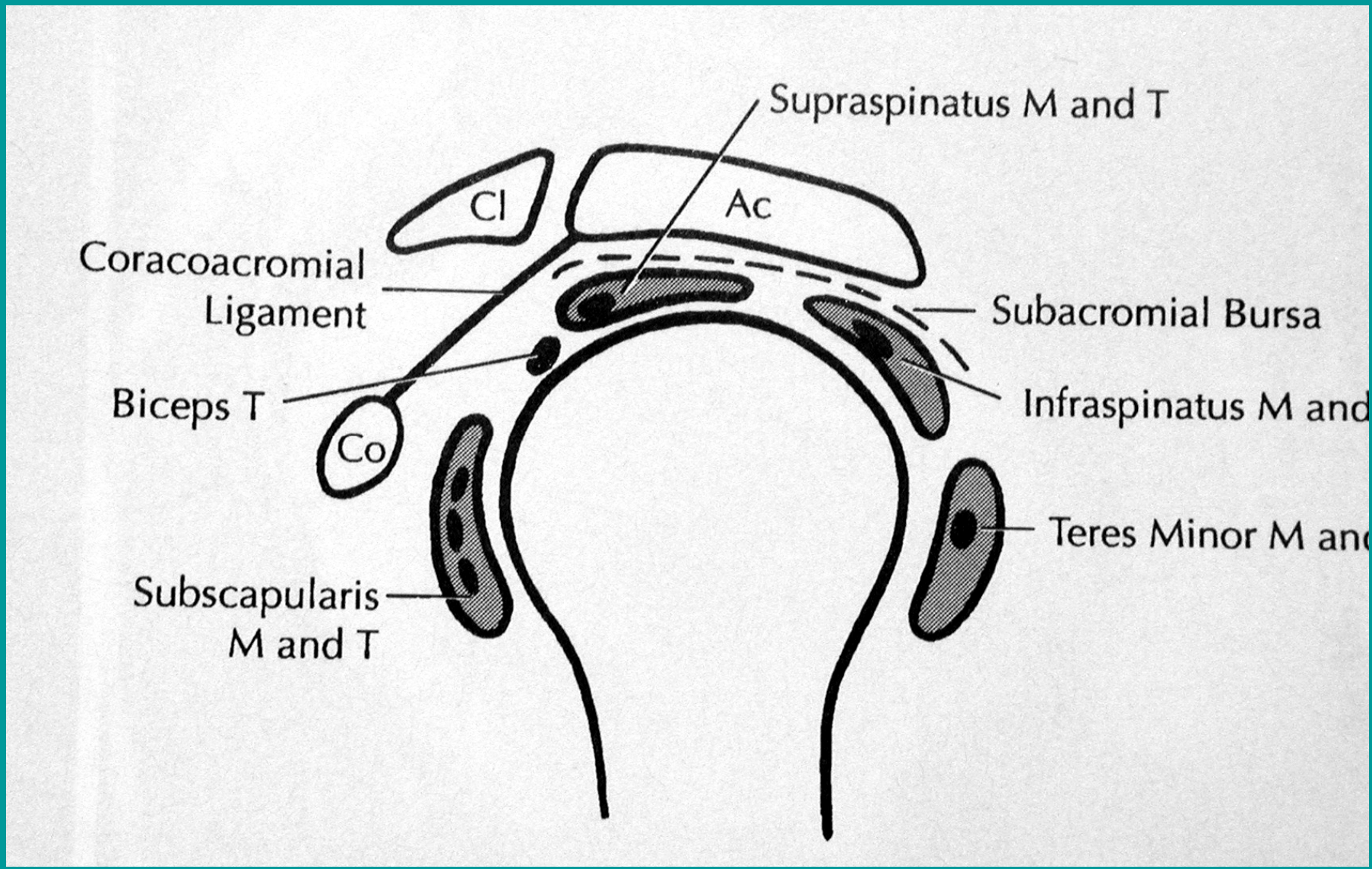

Intraarticular biceps
Superior labrum
Biceps labral sulcus


Biceps tendon
CHL
SGHL
Biceps tendon
CHL
SGHL at
"T" junction
CHL
SGHL
Biceps tendon
Coracohumeral
ligament (CHL)
Superior glenohu
ligament
Intraarticular
biceps tendon
Extraarticular
biceps
A


Page: 17 of 26
Compressed 5:1
IM: 17 SE: 7
cm






Supraspinatus M and T
Cl
Ac
Coracoacromial
Ligament
Subacromial Bursa
Biceps T
Infraspinatus M and
Co
Teres Minor M and
Subscapularis
M and T

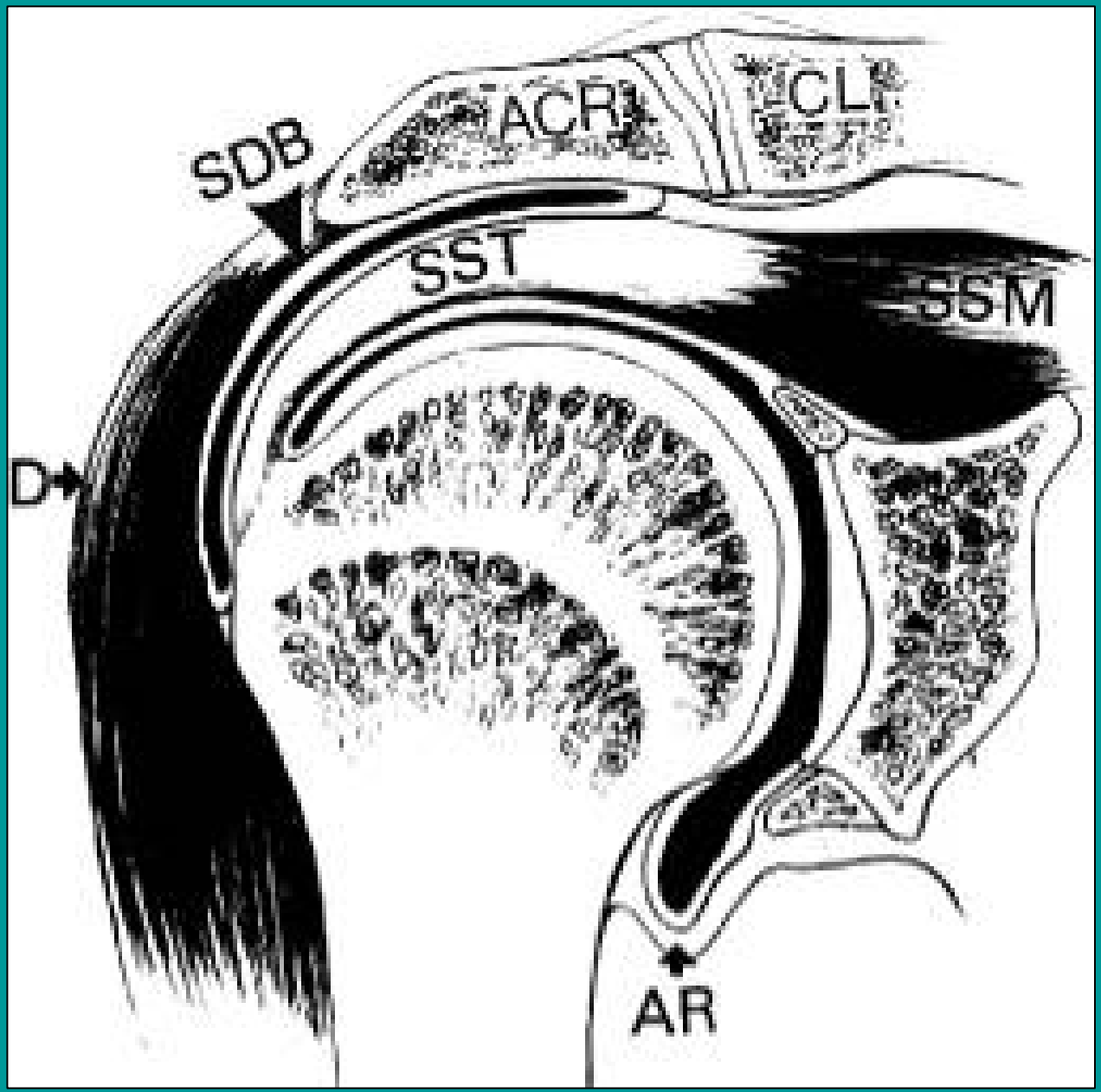
Rotator Cuff Tears

- Anterior Supraspinatus in older patients
- Small articular surface tears in younger
- Greater eccentric forces
- Articular side fibers are weaker.
- Less vascularized
- Supraspinatus> Infraspinatus> Subscapularis> Teres minor.

Rotator Cuff Full Thickness Tear

- Tendon discontinuity
- Fluid signal in tendon gap
- +/- Retraction of muscle, tendon

- 2^0 Signs: muscle atrophy (High T1 signal)
- Subacromial/subdeltoid bursal fluid


SDB
ACR
CLI
SST
SSM
D
AR

Rotator Cuff Partial Tears

- High Signal on bursal or joint surface of tendon
- T2 signal higher than muscle (~ that of joint fluid)

- Degeneration= intrasubstance high signal, not as high as joint fluid

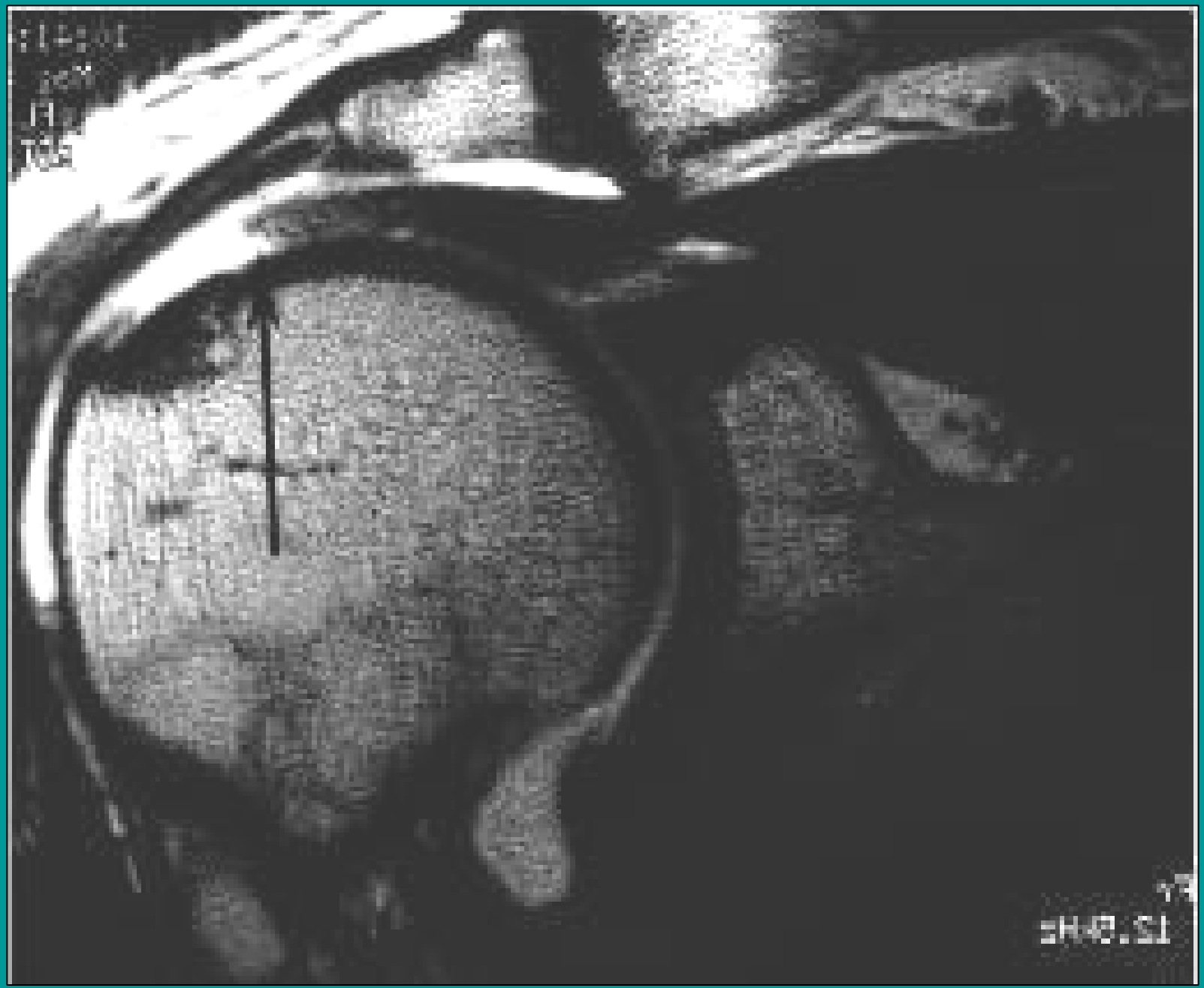
Degeneration/Partial Tear

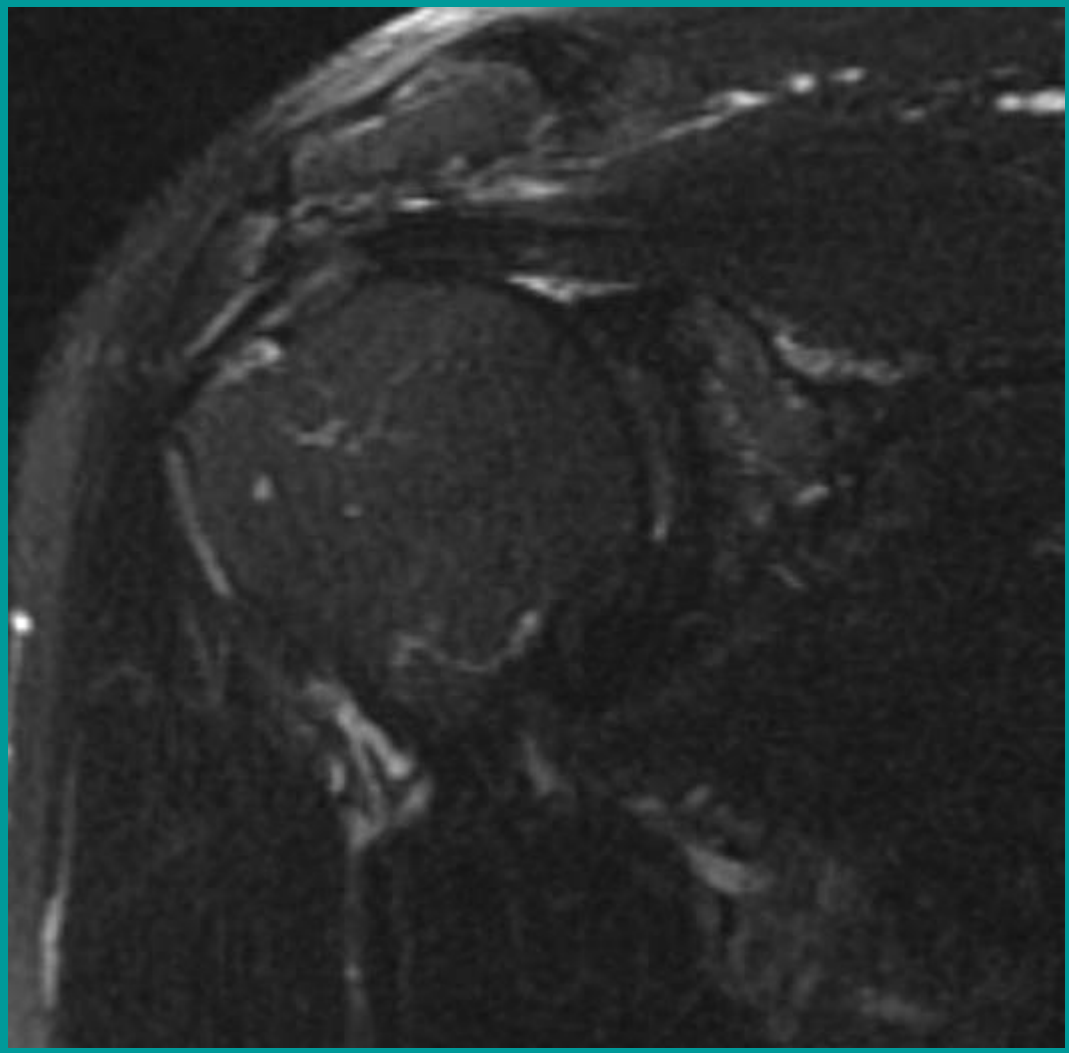
- Generally indistinguishable on T1WI
- T1WI:Intermediate signal, ***IN*** the tendon
- T2WI: Isointense with muscle = degeneration
- T2WI: Isointense with fluid = partial tear

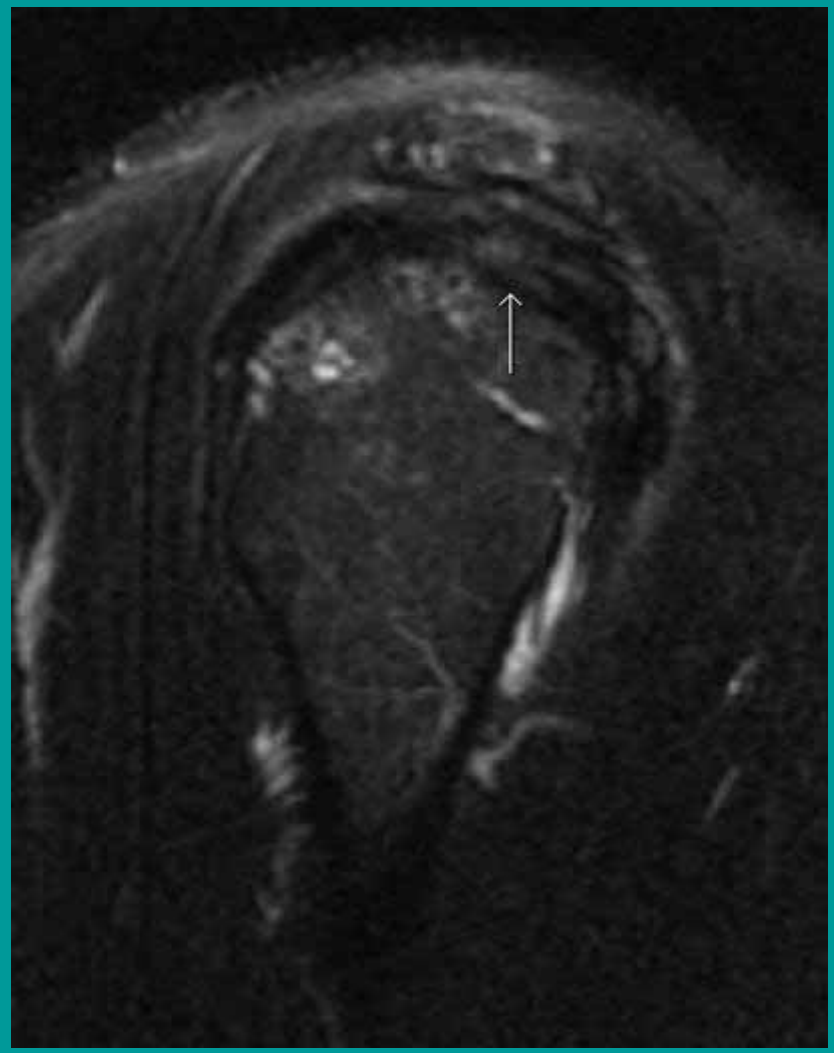
Magic Angle Effect

- Similar signal to partial tear, tendonopathy
- *Focal, not diffuse
- *Typically ~1 cm. from tendon insertion at greater tuberosity
- *Occurs on short TE images (TE~< 30, typically T1 SE; GRE)
- *No thinning, thickening, irregularity of tendon


CH



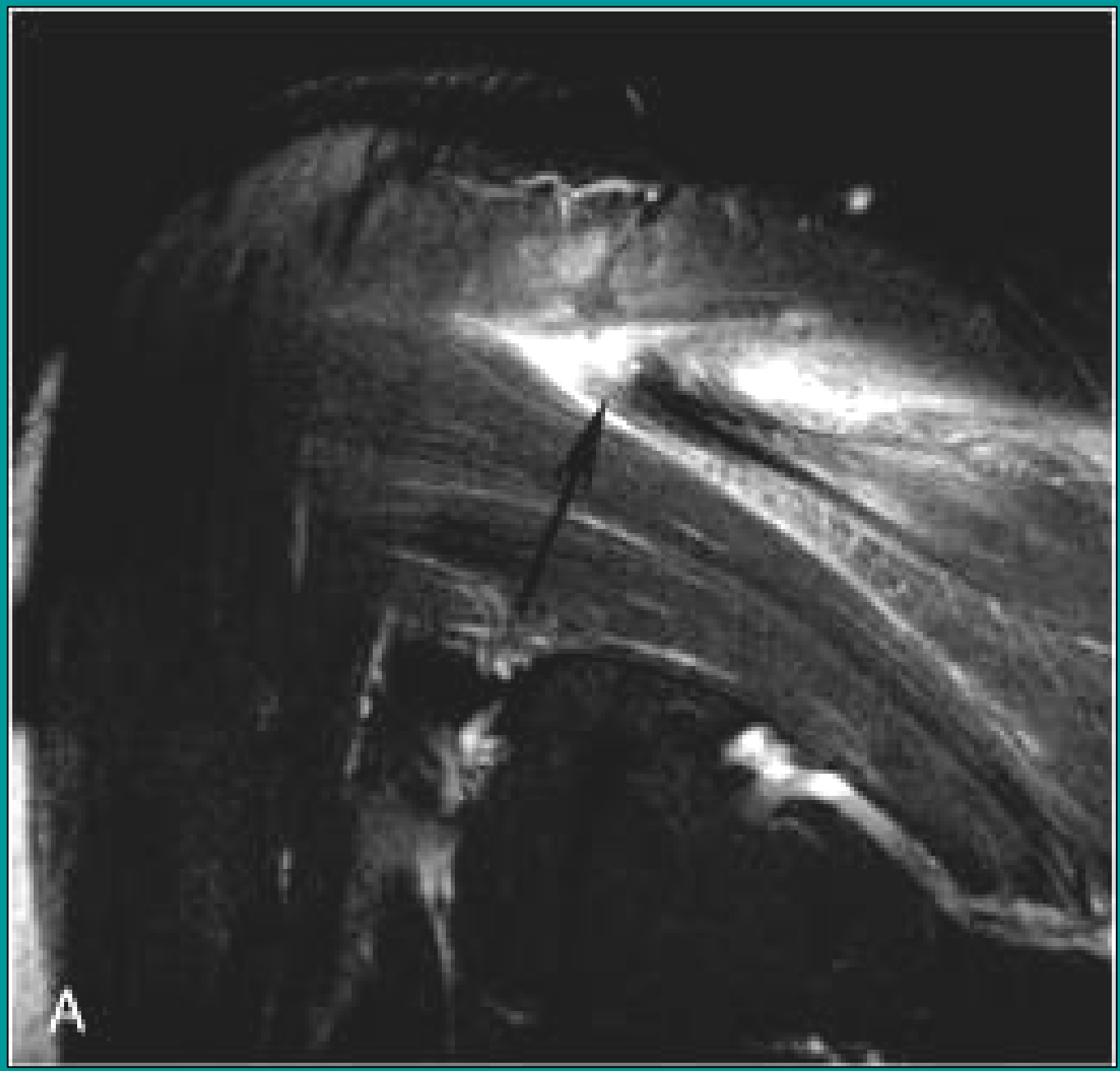





SP
SL

Infraspinatus tears

- ~35% of Supraspinatus tears also involve infraspinatus.
- Isolated tear of Infraspinatus is more common in throwing athlete injuries
- Have worst post-op prognosis.
- Cannot be repaired with ‘scope.

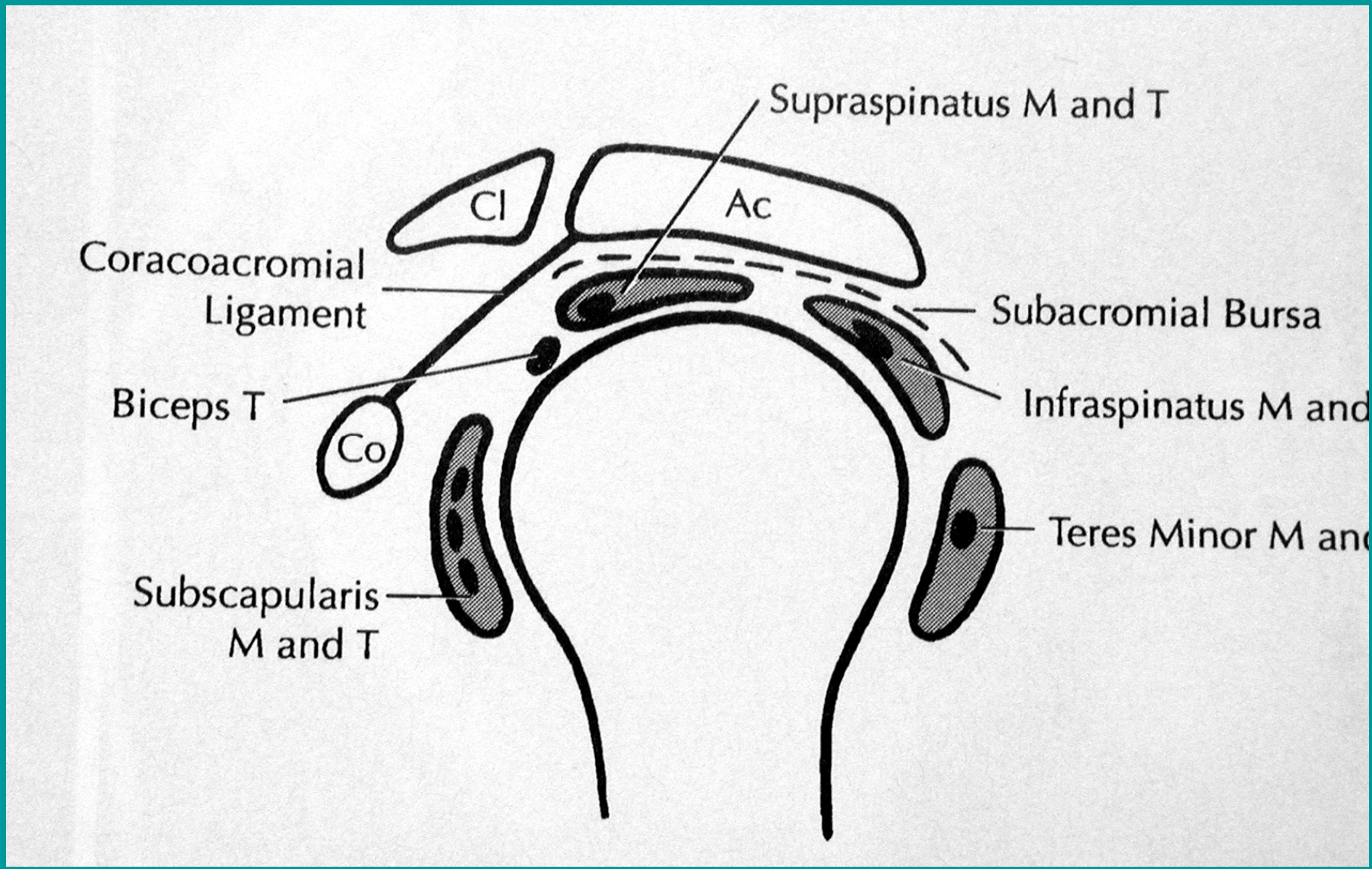

A

Teres minor tears

- Uncommon
- Associated with posterior shoulder instability
- Associated with tears of the posterior capsule

Subscapularis tears

- Mechanisms: hyperextension with external rotation of adducted arm
- Secondary to coracoid impingement
- Anterior dislocation
- Stress from chronic supraspinatus tears.
- Associated with biceps tendon pathology
- Cysts and edema in lesser tuberosity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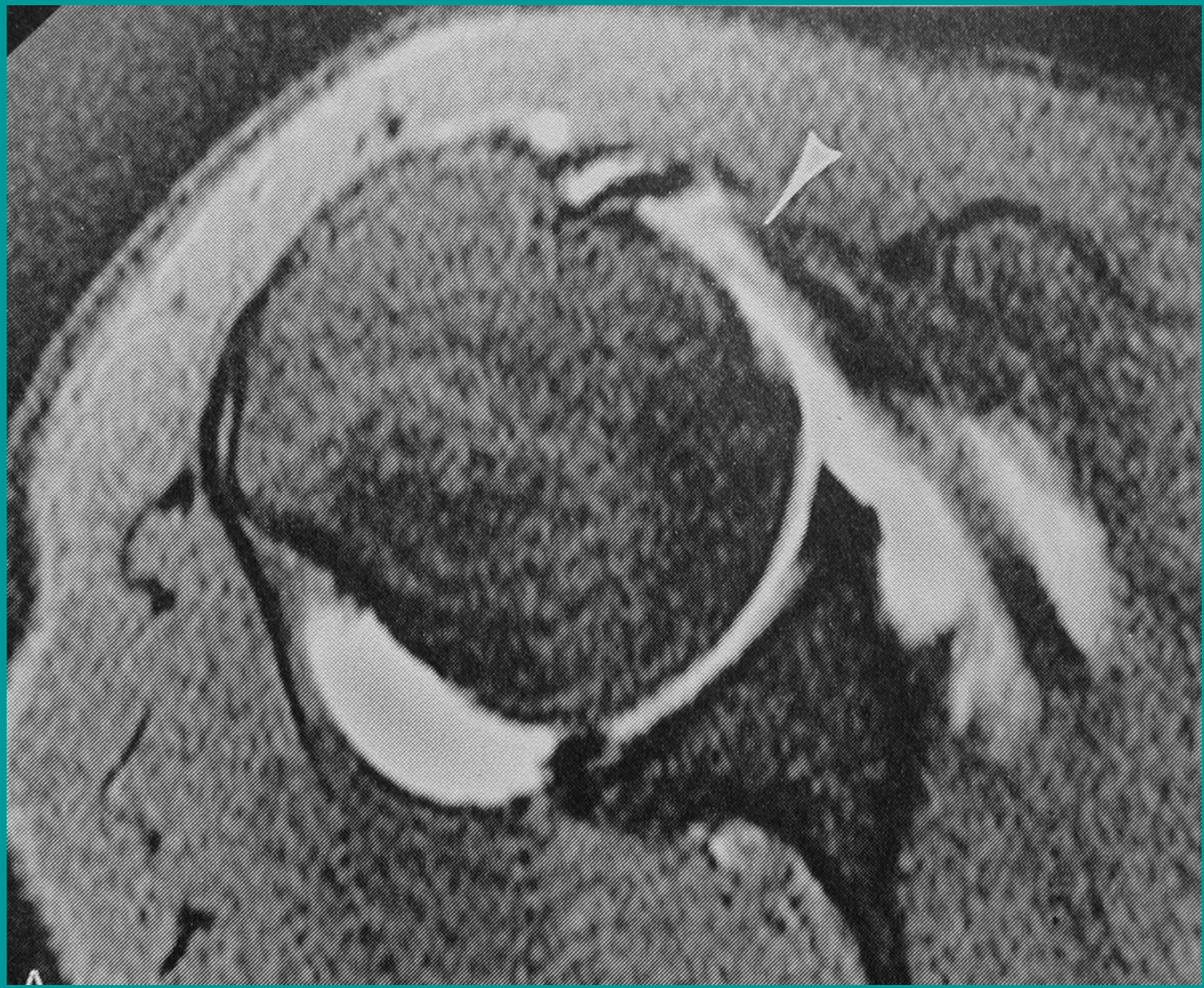
M and T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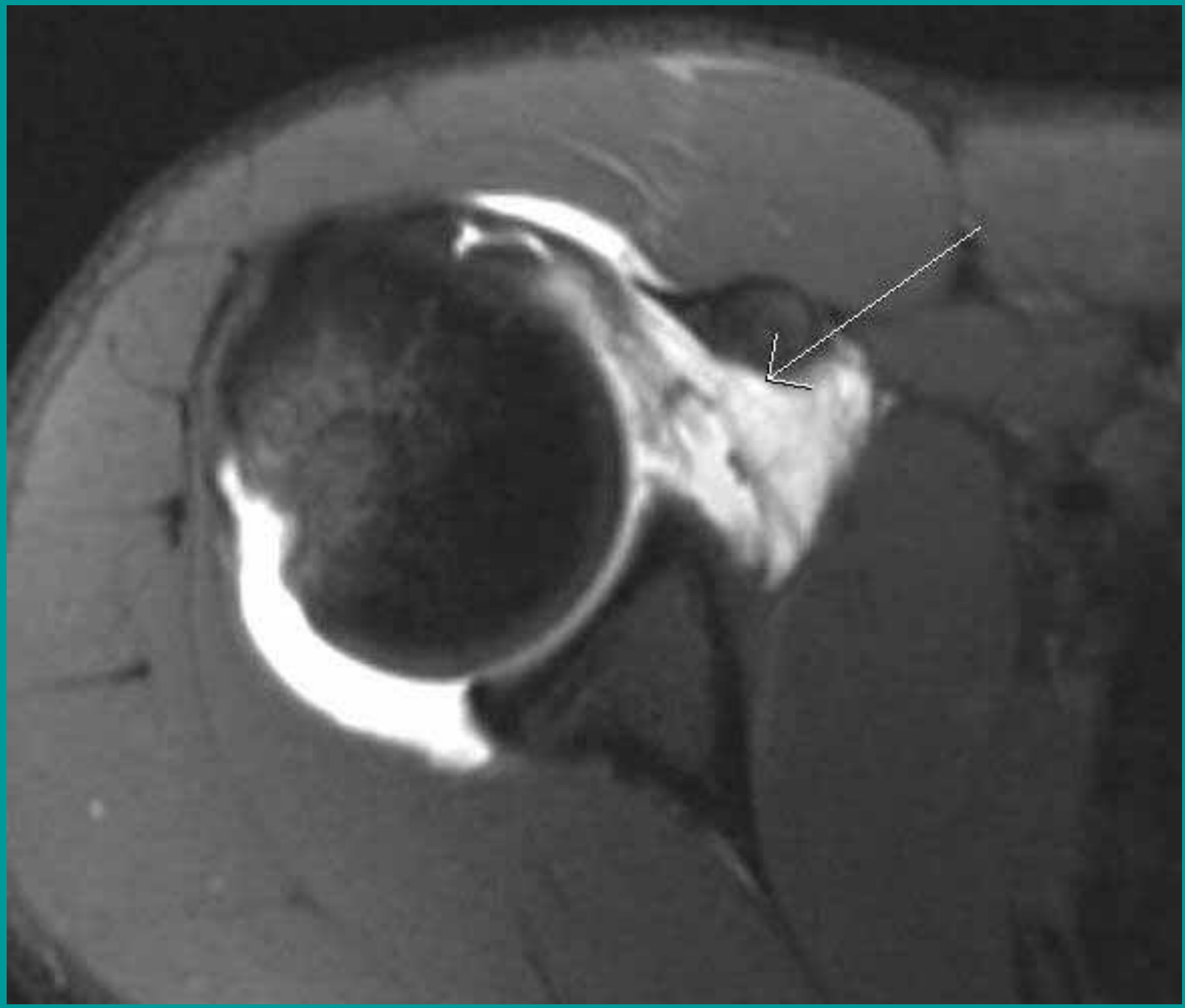
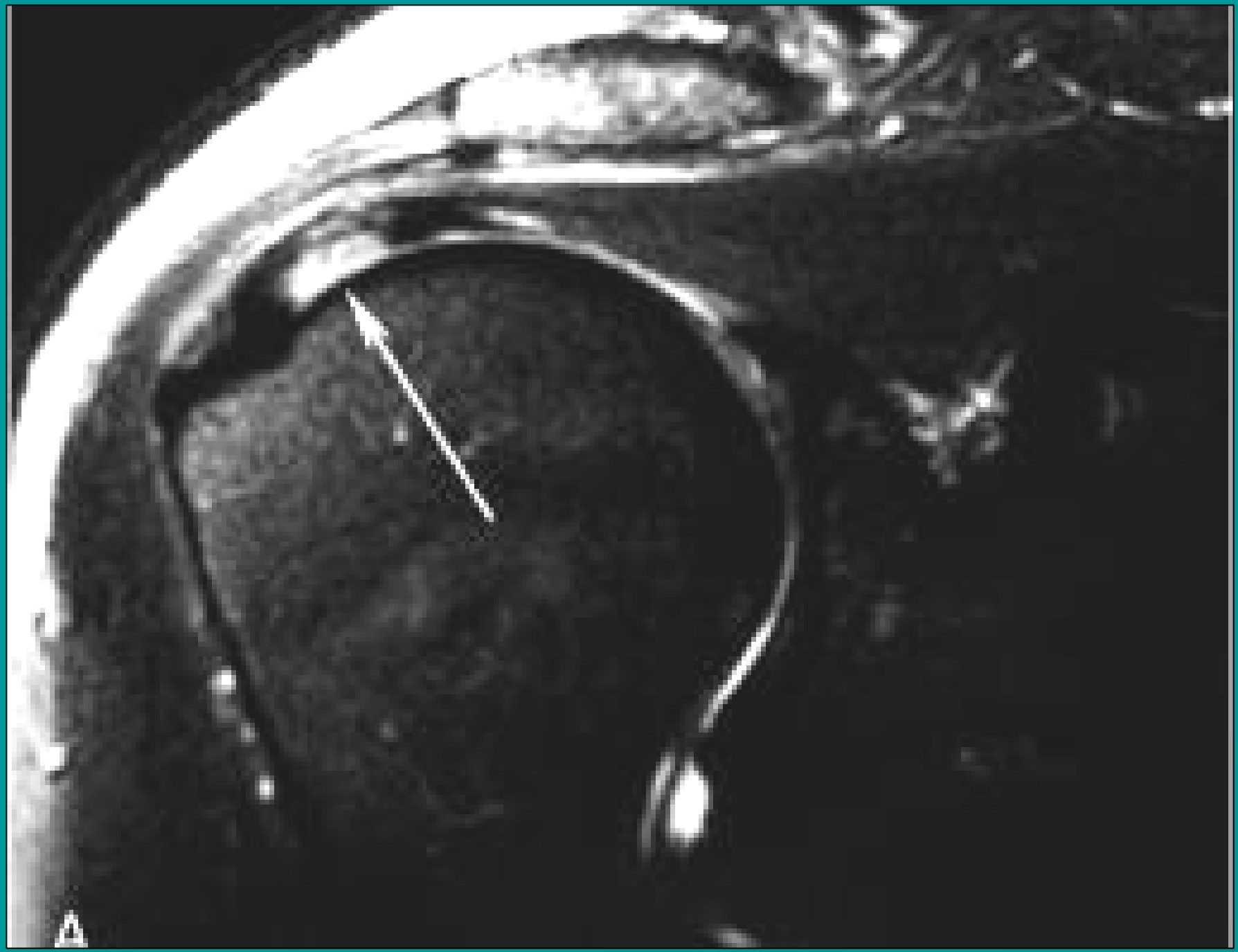




Biceps, Long Head

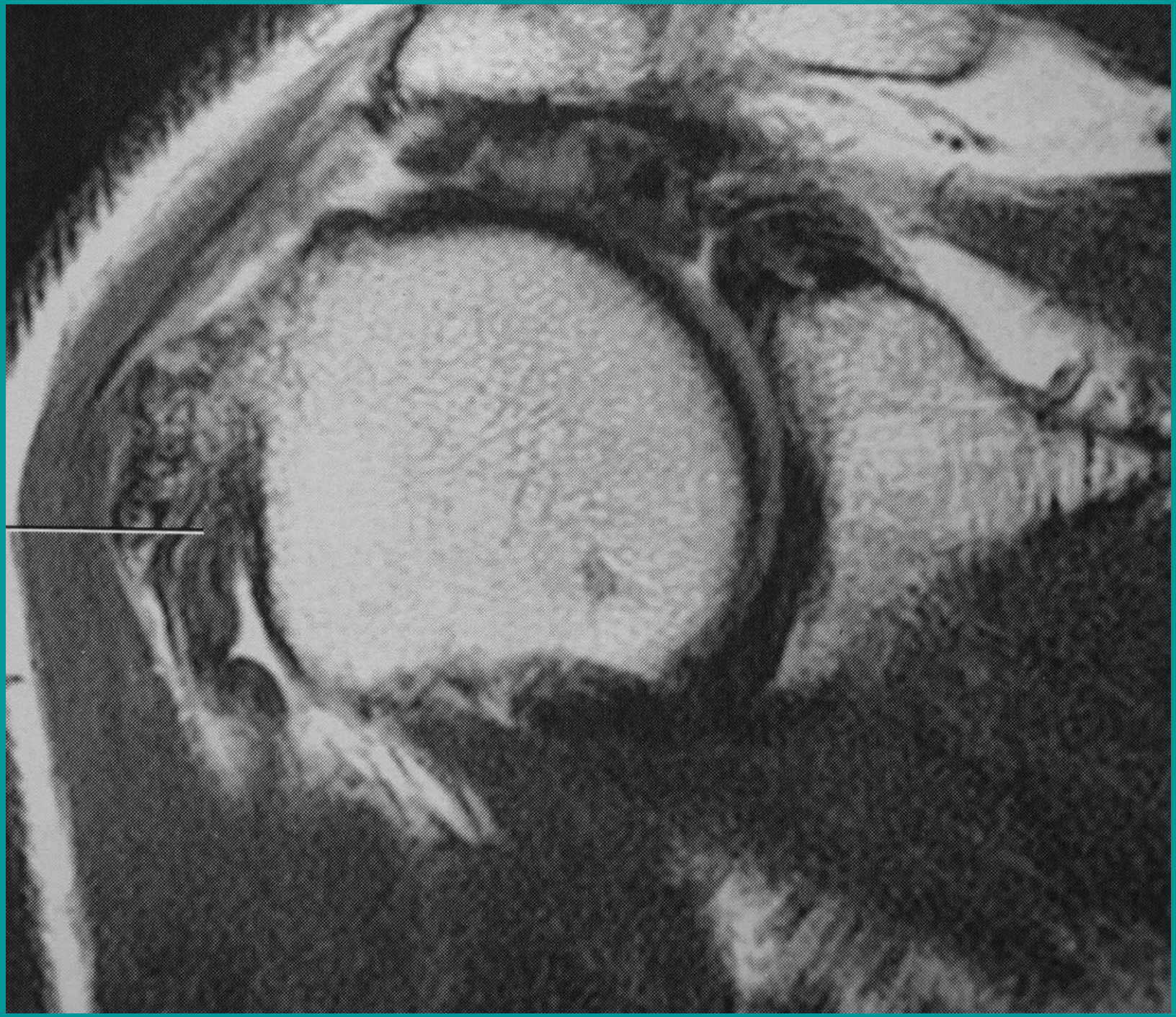
- Empty bicipital groove (axial images)
- Retraction of distal tendon fragment.
- Torn fragment found medial to the bicipal groove, deep or superficial to suscapularis tendon.
- Differentials: biceps subluxation, dislocation

Biceps tear

- Biceps Anchor
- Tendon
- Longitudinal tendon split
- Musculotendinous junction
- +/- retraction

Biceps, Long Head

- Completely torn in 7 % of cases of supraspinatus tear in adults
- Partial tear or degeneration in ~ 33 %
- Younger patients: acute, traumatic, at musculotendinous junction
- Associated with dislocation of subscapularis tendon, transverse humeral ligament (lesser-to-greater tuberosity)



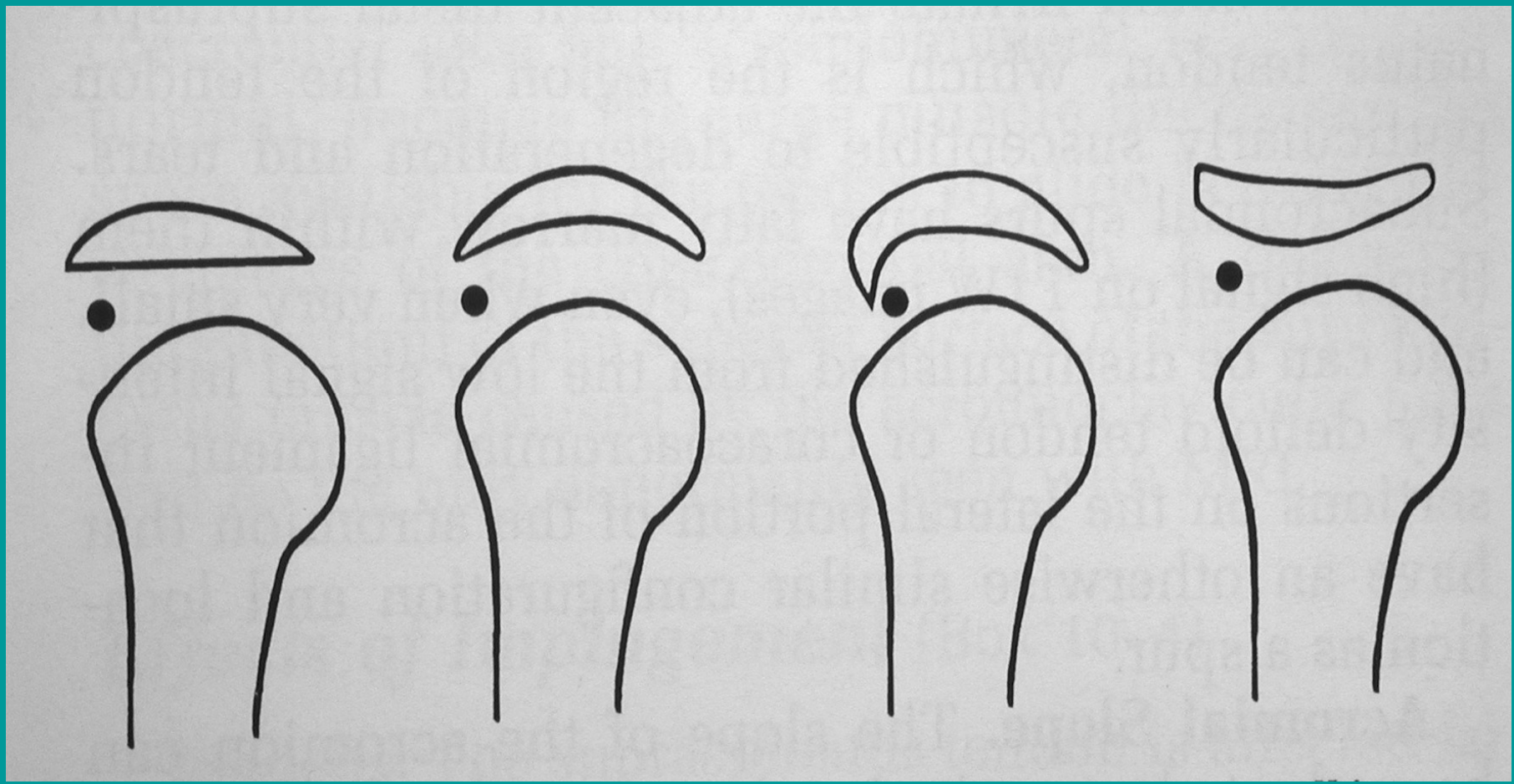

SP
SL

Shoulder Impingement

- Acromial shape
- Inferior acromial offset, tilt
- Post-traumatic A-C joint disease (DJD)
- Os acromiale
- Thick coraco-acromial ligament
- Muscle enlargement;weightlifters, swimmers

Shoulder Impingement

- High Signal: degeneration/ partial tears
- Abnormal Shape: thin, thick, irregular: partial tears
- Discontinuity: complete tear
- Subacromial/subdeltoid bursa fluid
- DJD of glenohumeral joint



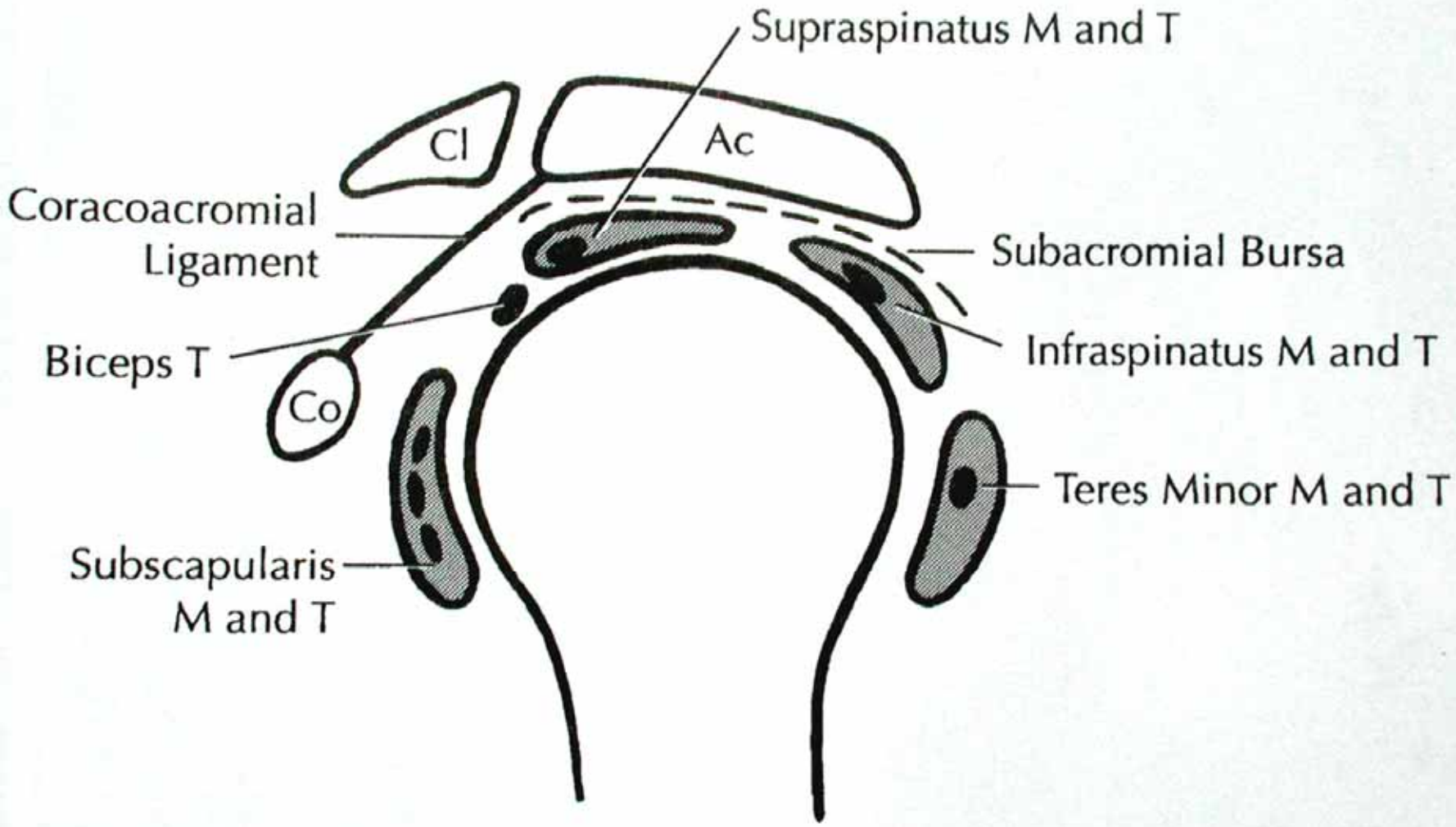
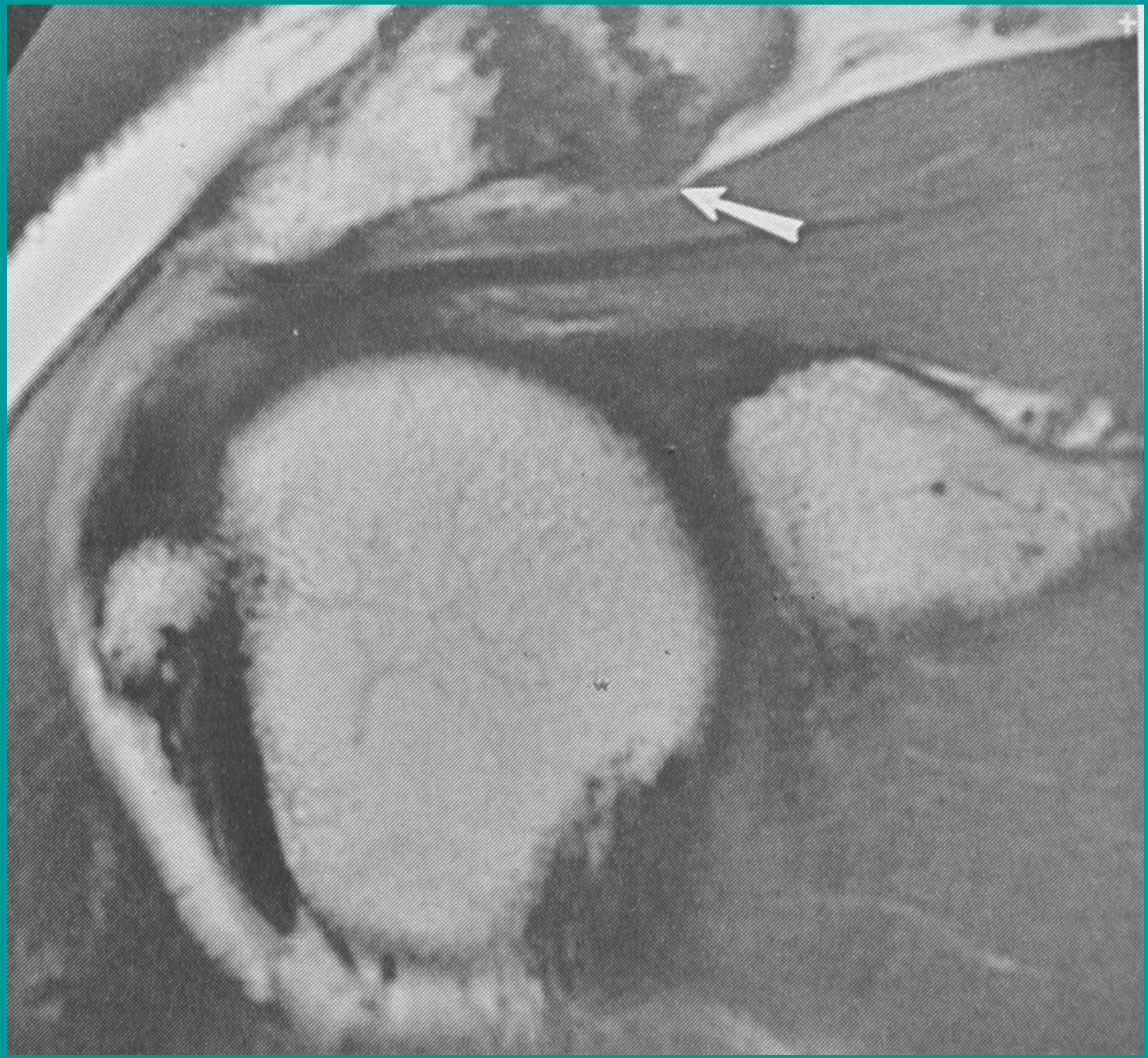
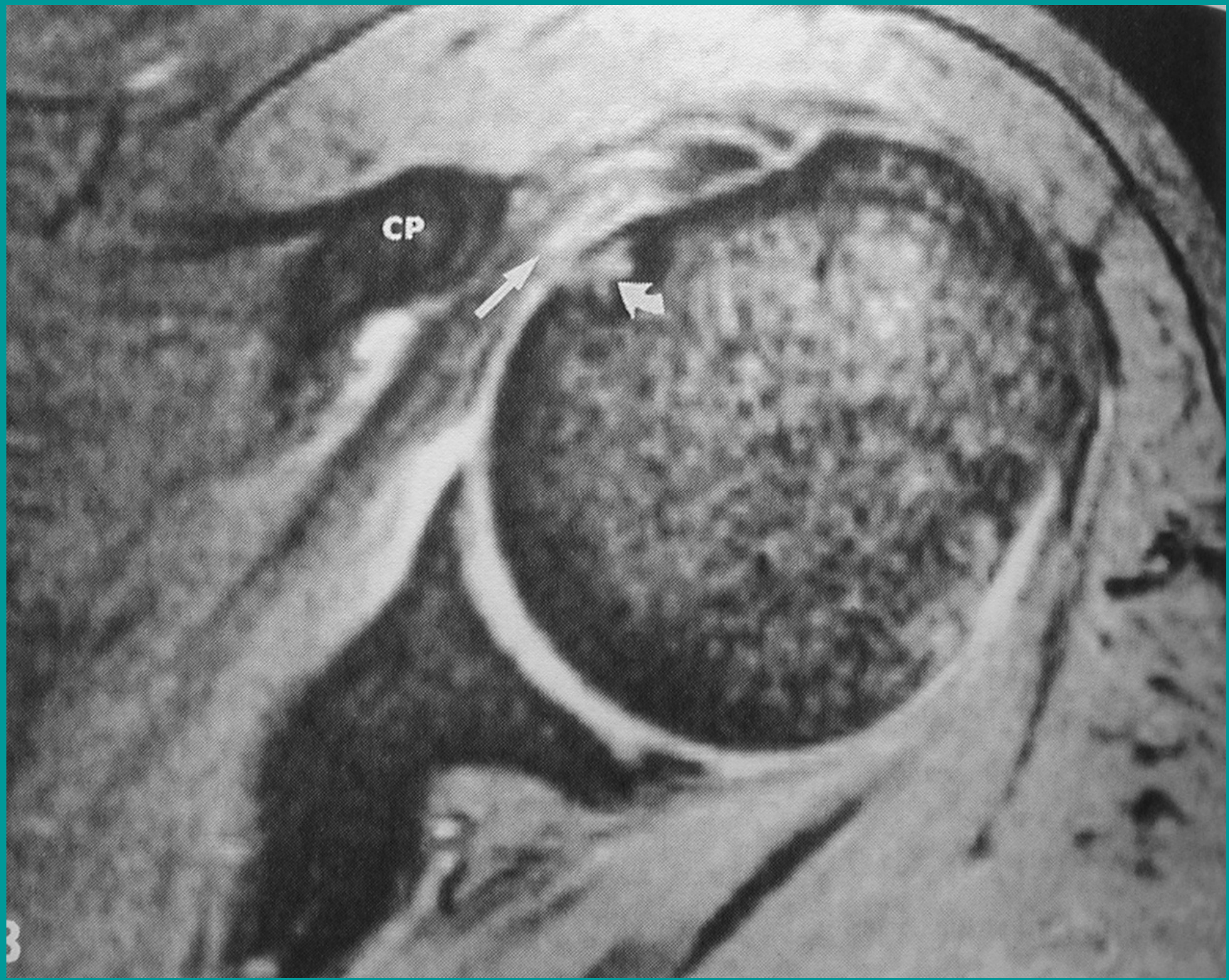


Figure 10–8. CORACOACROMIAL ARCH.

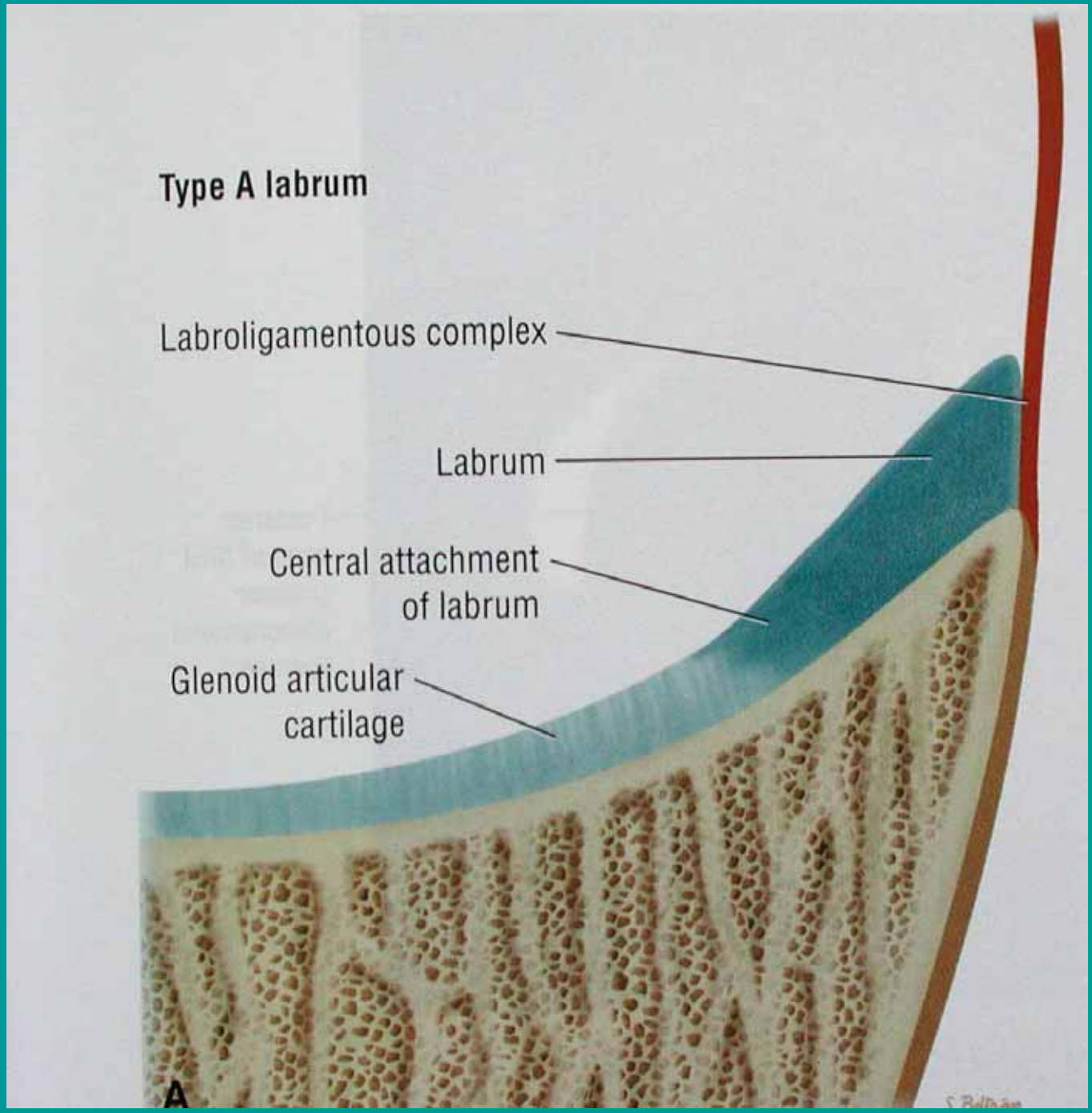


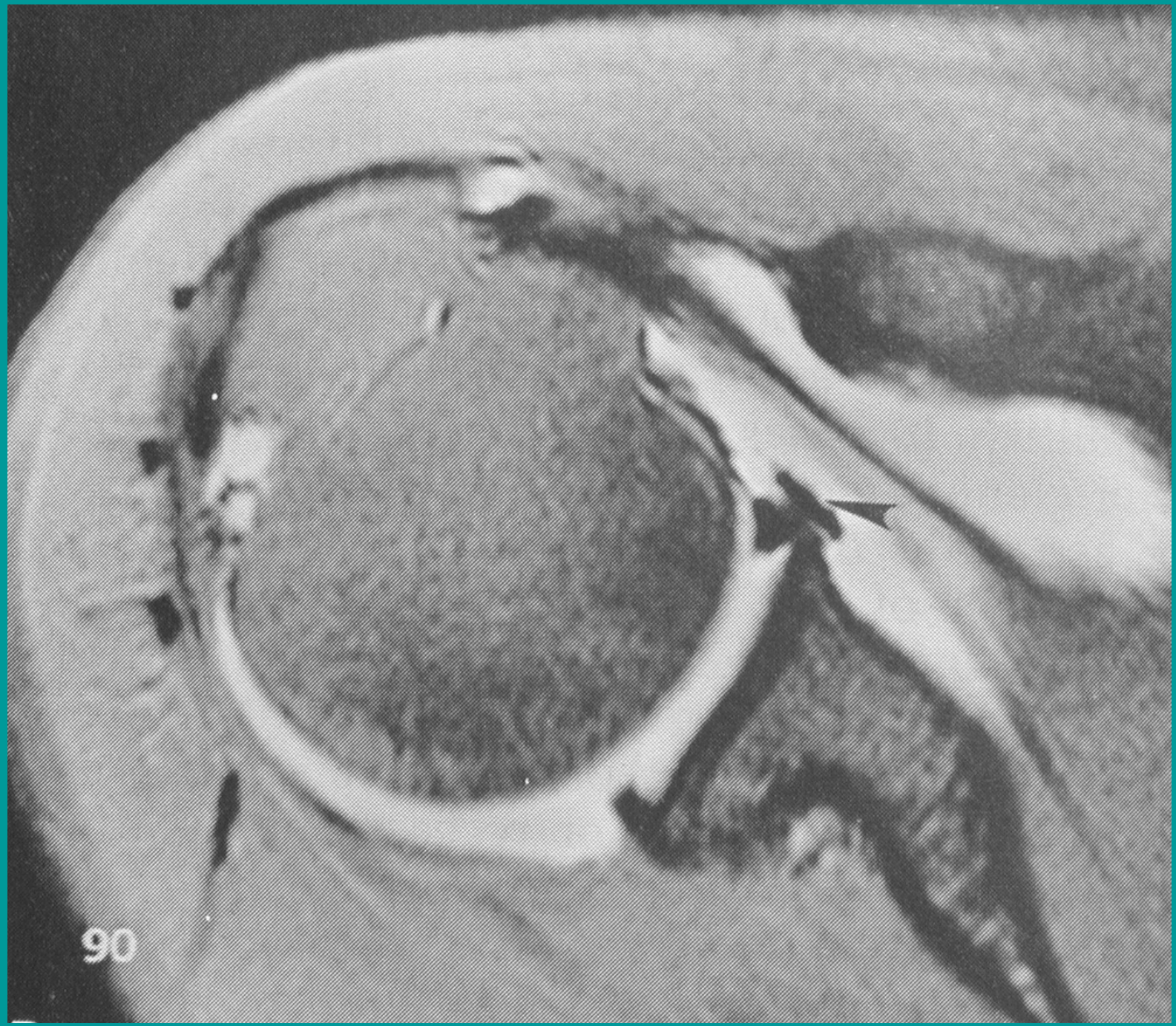

OA
C


CP

Labrum

- Makes up ~ 50% of glenoid fossa depth.
- Broadens the diameter of the glenoid.
- Less firmly attached in younger individuals
- Bankhart lesion more common under 25.
- More strongly attached in midlife.
- Degeneration with age.
- Small amount of joint fluid & negative pressure in the joint.


Type A labrum
Labroligamentous complex
Labrum
Central attachment of labrum
Glenoid articular cartilage
A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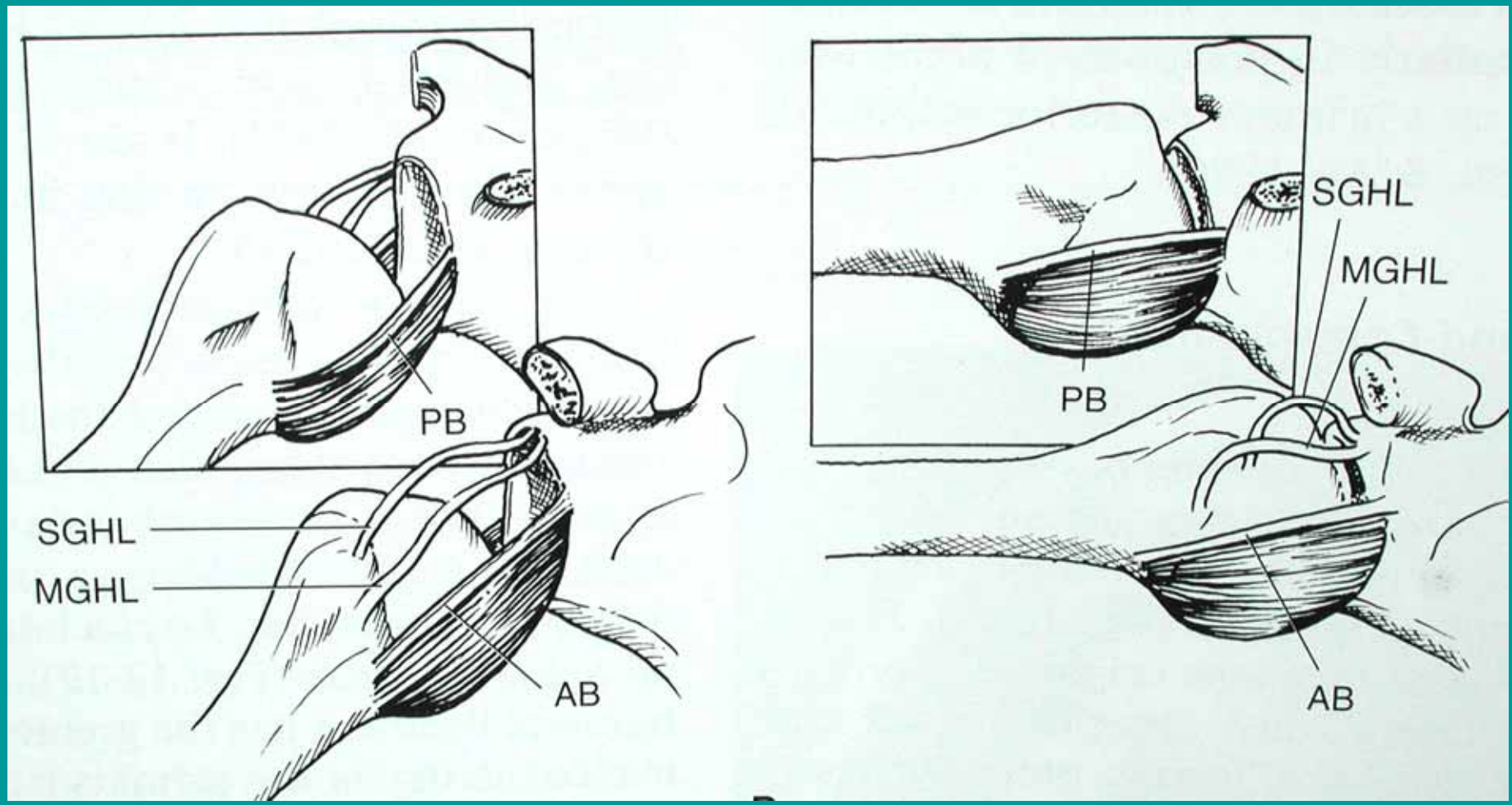
B

Labral anatomy

- Labroligamentous complex.
- The labrum is intimately associated with:
- Biceps tendon (long head)
- 3 Glenohumeral ligaments
- Joint capsule
- Cortical bone & glenoid periosteum

Glenohumeral ligaments

- Thickenings of joint capsule anteriorly + one posterior band (inferior GHL).
- Superior GHL extends from anterior surface of the glenoid superiorly to the lesser tuberosity of the humerus & blends with fibers of coracohumeral ligament at the lesser tuberosity.
- Just anterior to (LH)Biceps tendon.
- Limits inferior subluxation.

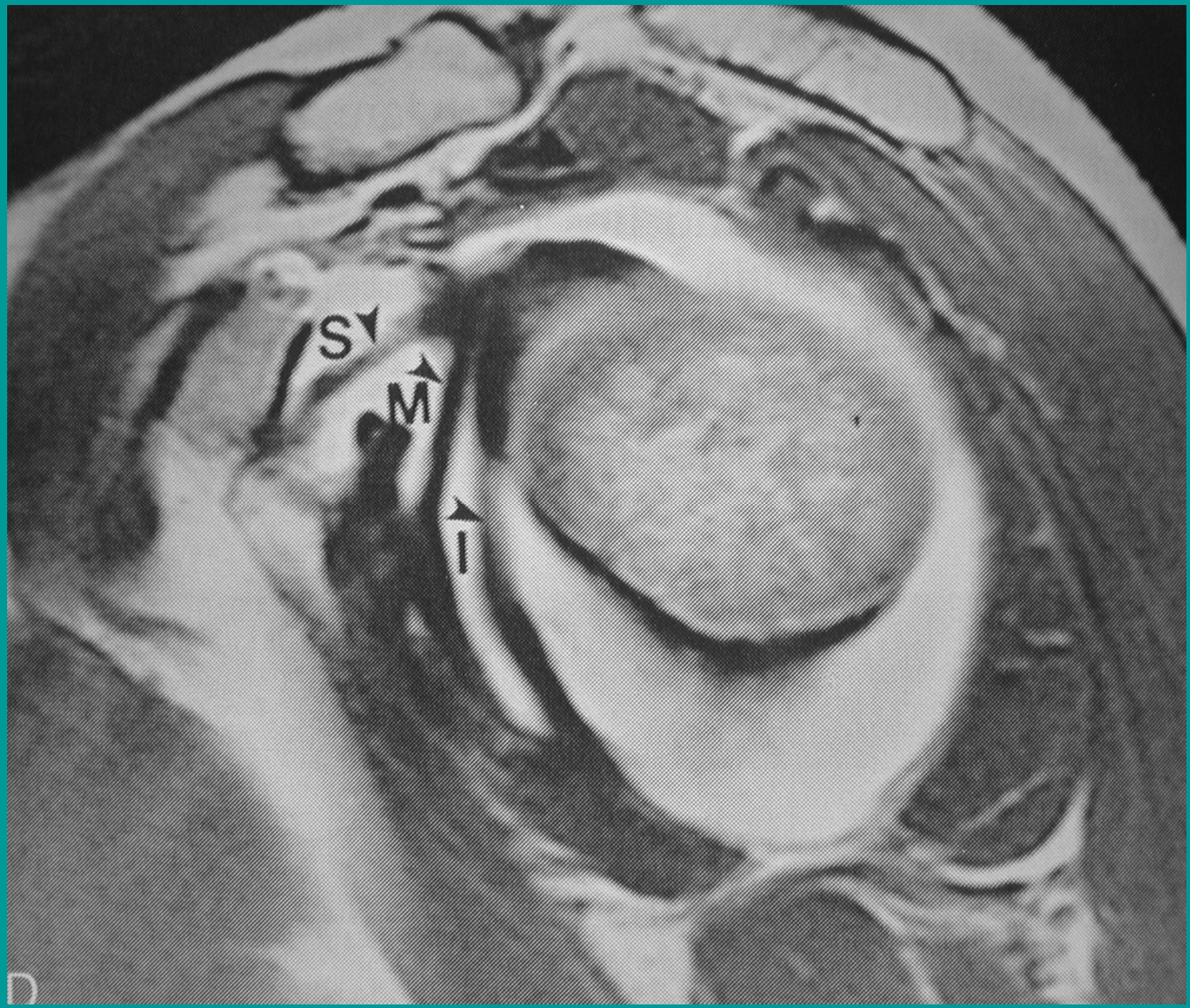

PB
SGHL
MGHL
AB
SGHL
MGHL
PB
AB

Glenohumeral ligaments

- Middle GHL is variable, absent in 30%, runs at level of subscapularis tendon. Assists anterior stability with subscapularis
- Inferior GHL is main stabilizing element of the shoulder.
- Both anterior *and* posterior bands, with an intervening axillary pouch.Major stabilizer against anterior and posterior stress.

Glenohumeral ligaments

- GHL fibers intermix microscopically with fibers of the glenoid labrum
- Bond between labrum and GHL's is strong
- Injury is more likely between labrum and bone (labral separation) than between the labrum and the GHL's.
- ***AB***duction, ***E***xternal ***R***otation (***ABER***) position tenses the anterior limb of IGHL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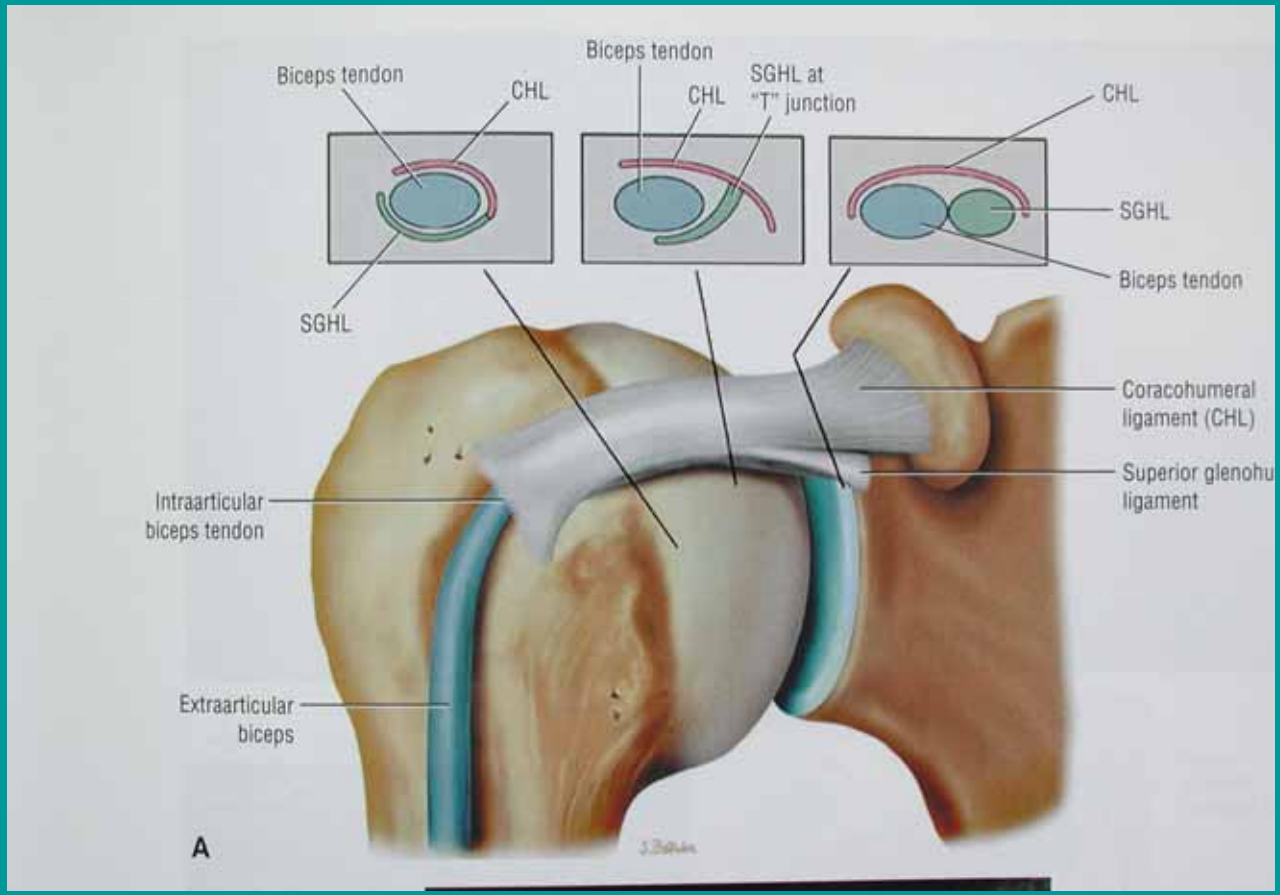
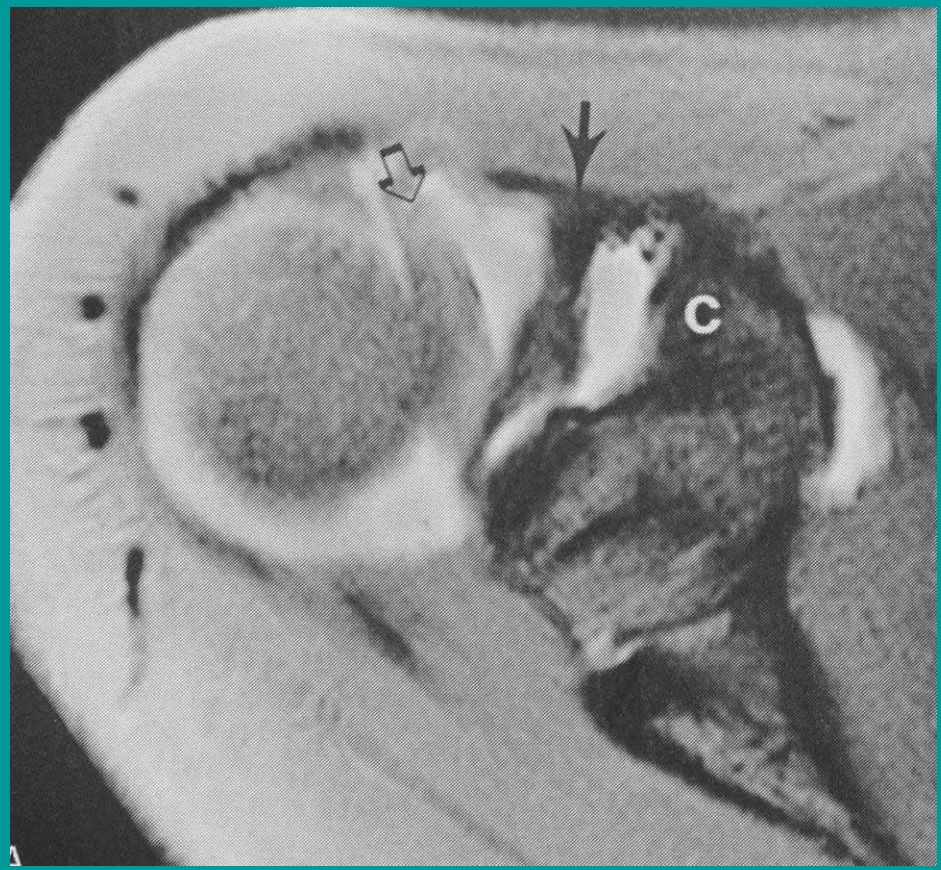

Biceps tendon
CHL
Biceps tendon
CHL
SGHL at
"T" junction
CHL
SGHL
Biceps tendon
SGHL
Coracohumeral
ligament (CHL)
Superior glenohu
ligament
Intraarticular
biceps tendon
Extraarticular
biceps
A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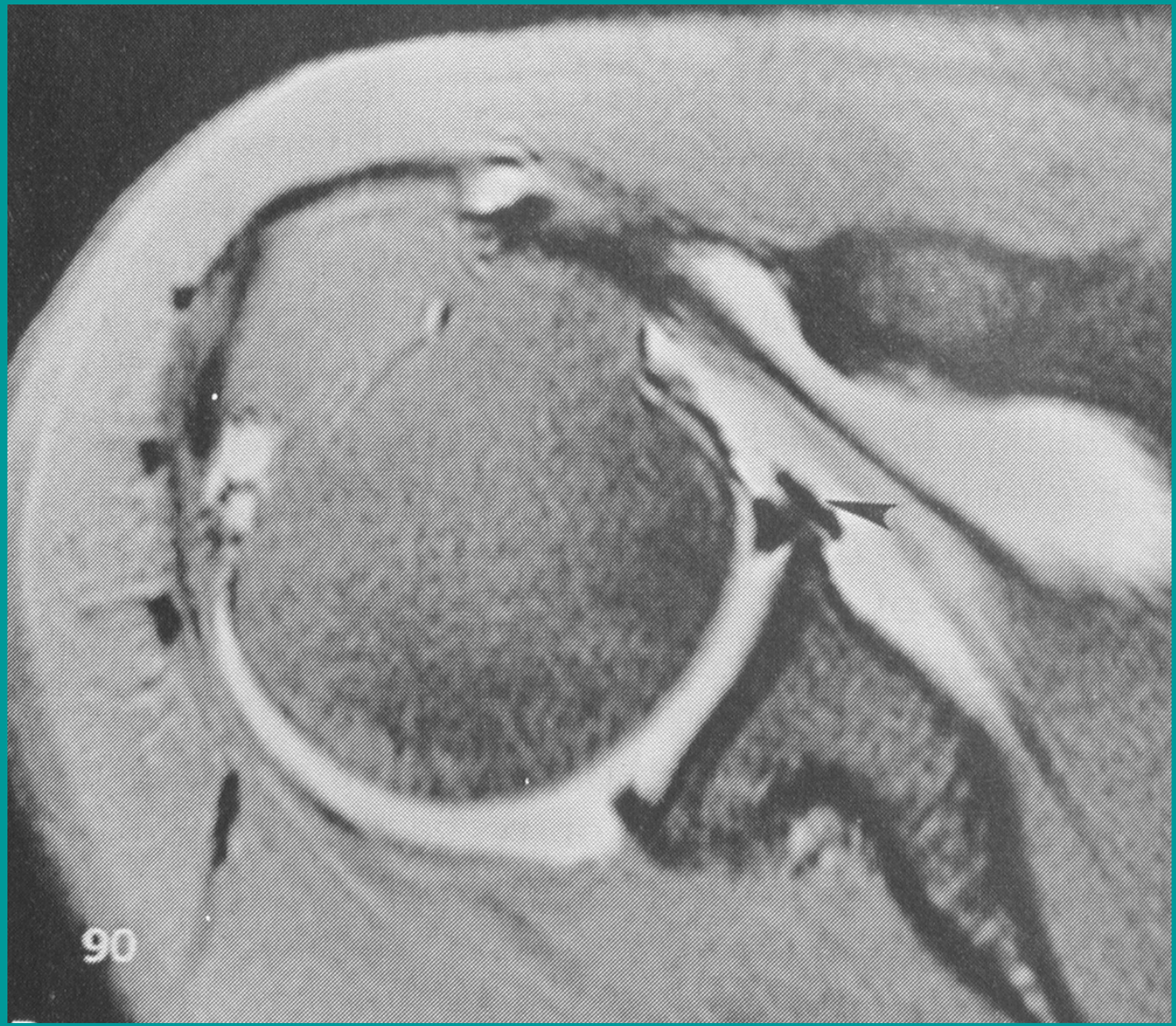
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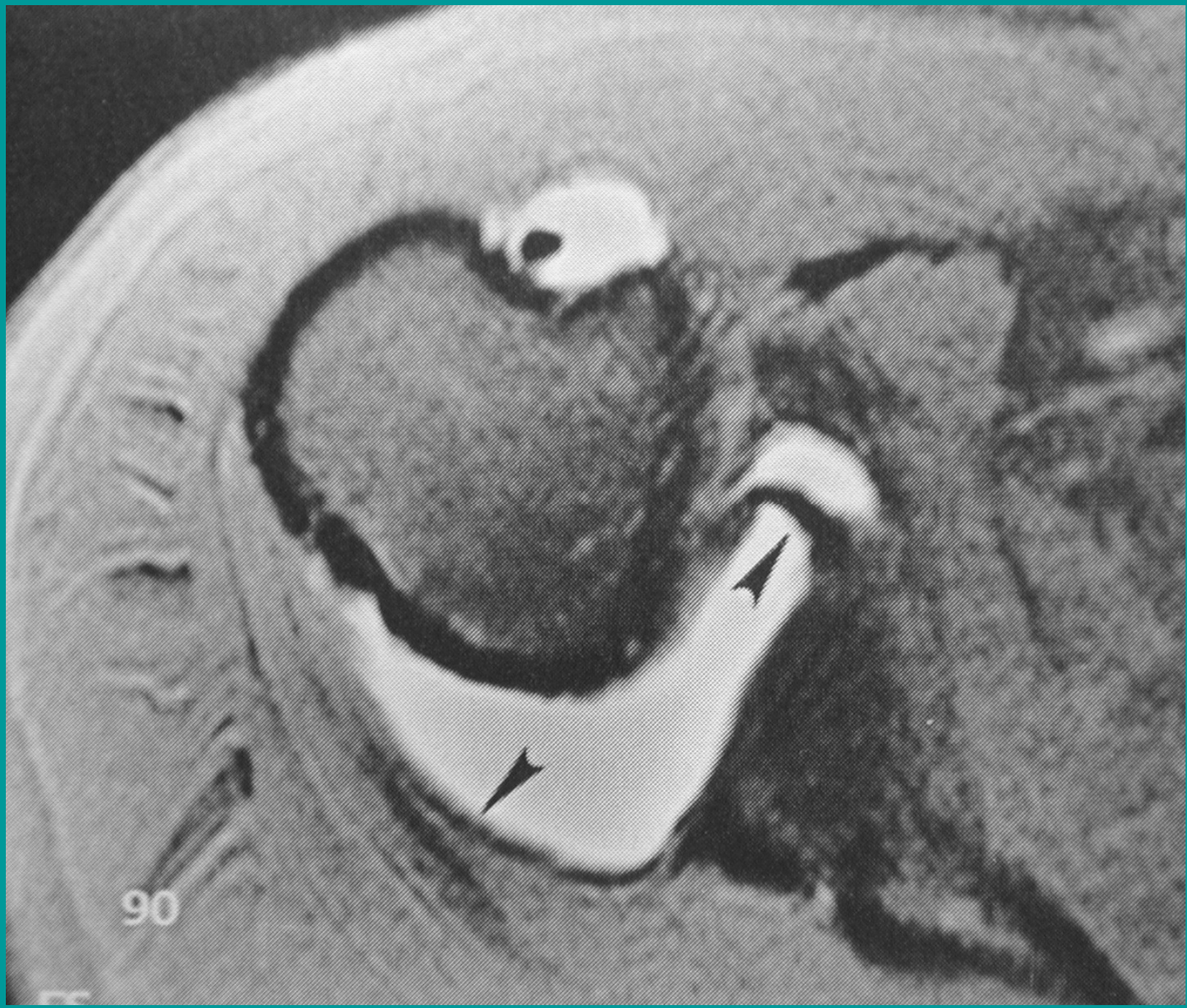
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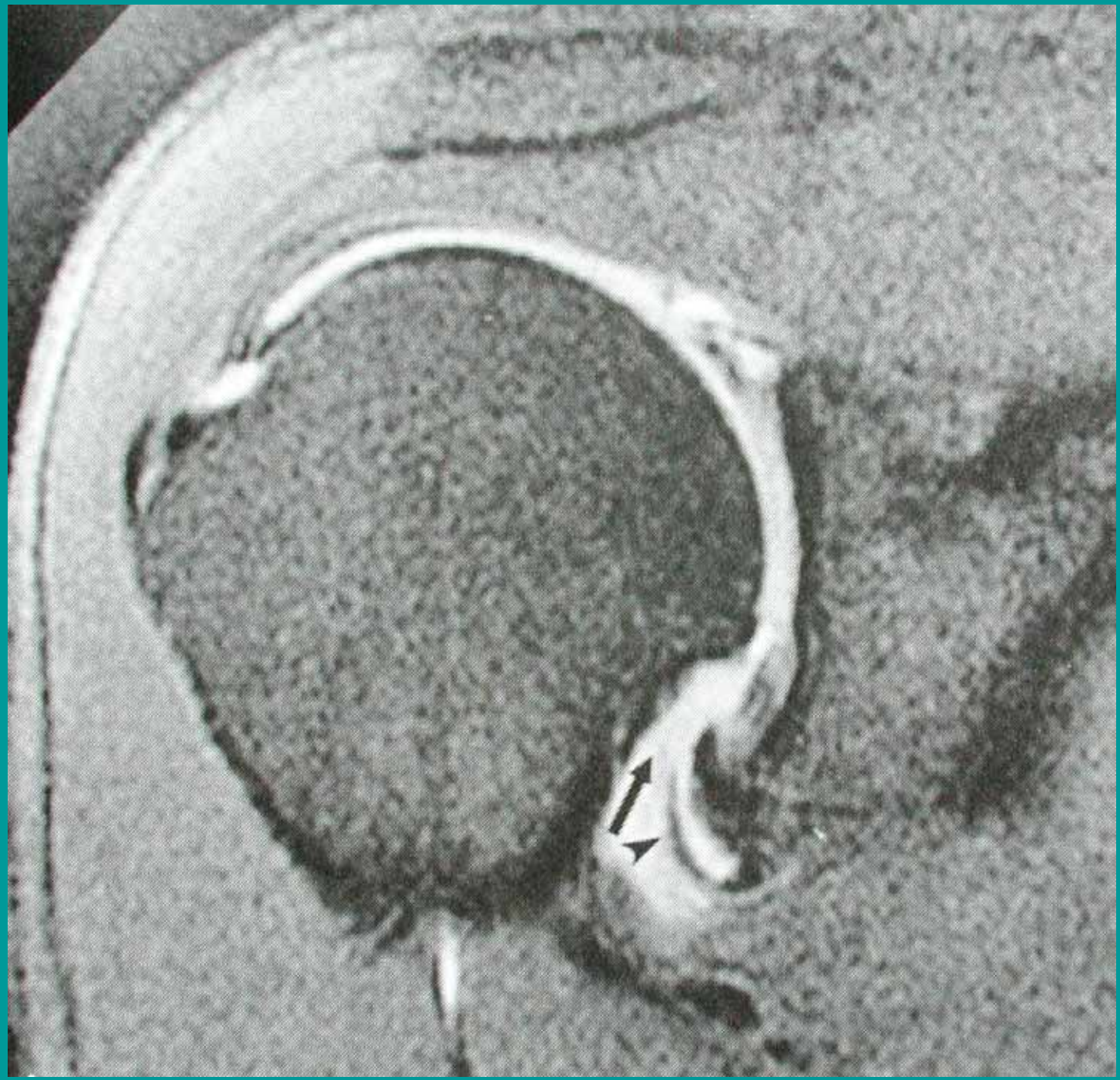


HAGL lesion

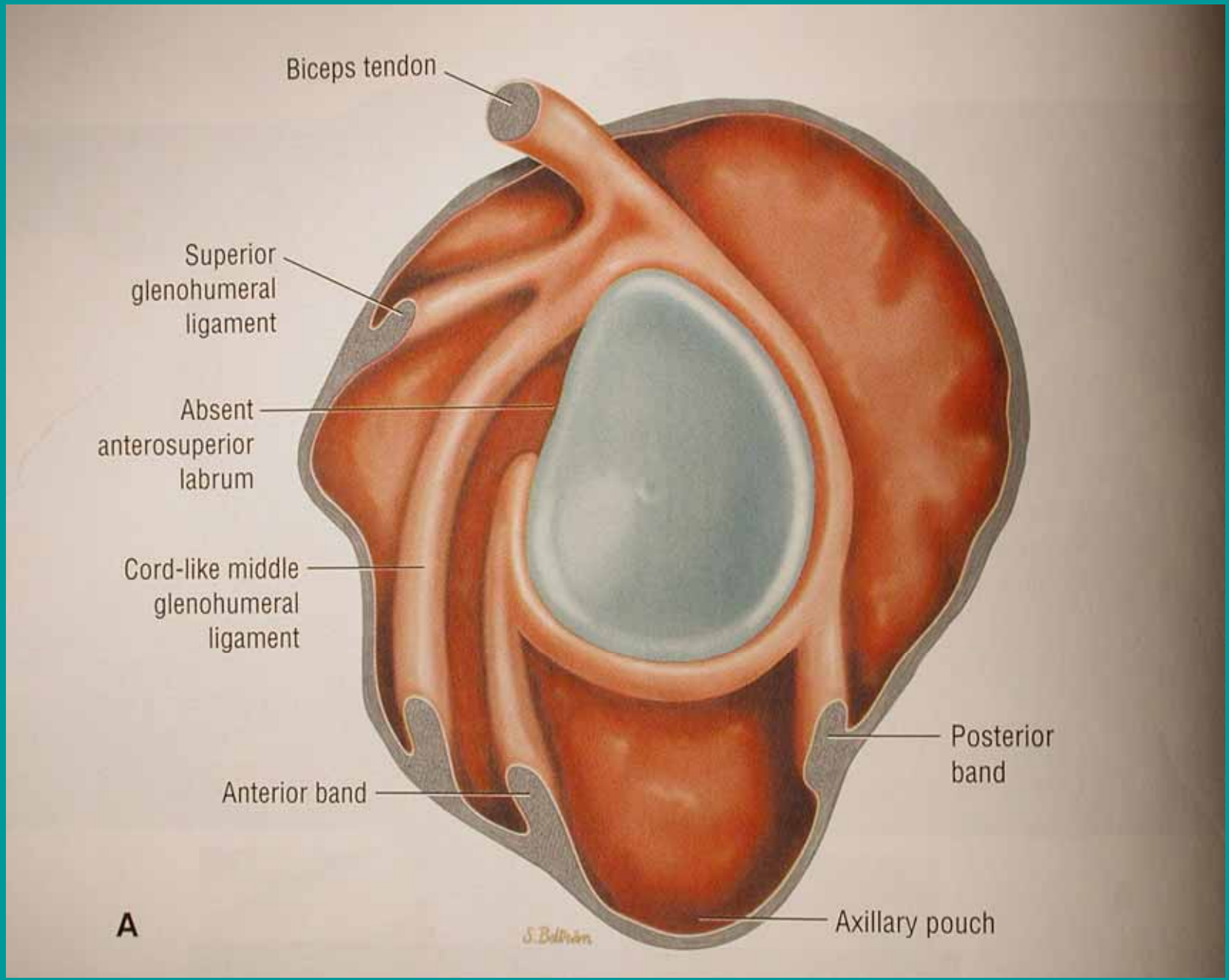
- **H**umeral **A**vulsion if the inferior **G**lenoHumeral **L**igament
- The inferior GHL is the most important stabilizer of the glenohumeral joint.
- Results from shoulder dislocation
- Associated with subscapularis tendon tears
- May avulse a bone fragment: BHAGL

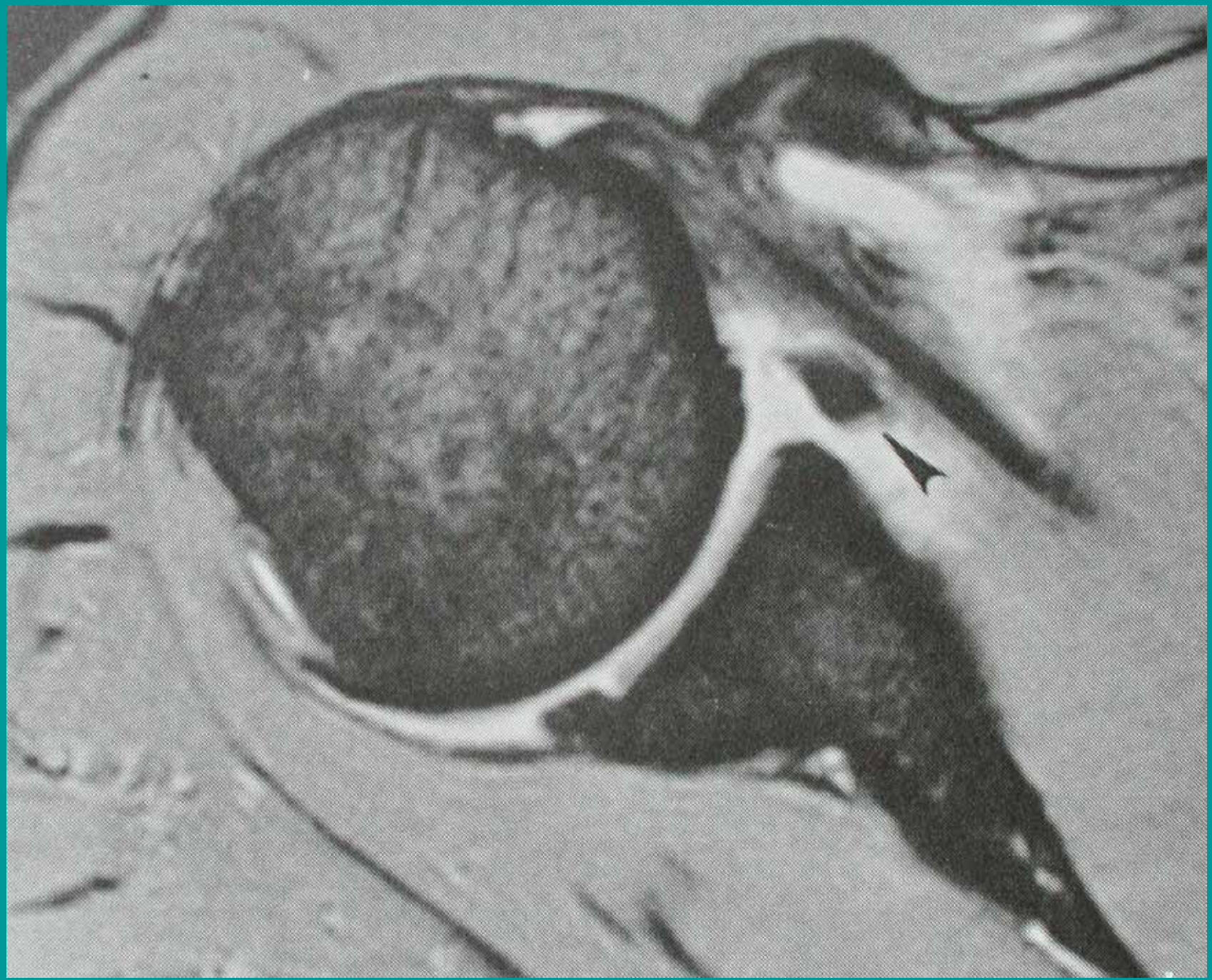
Glenohumeral ligaments

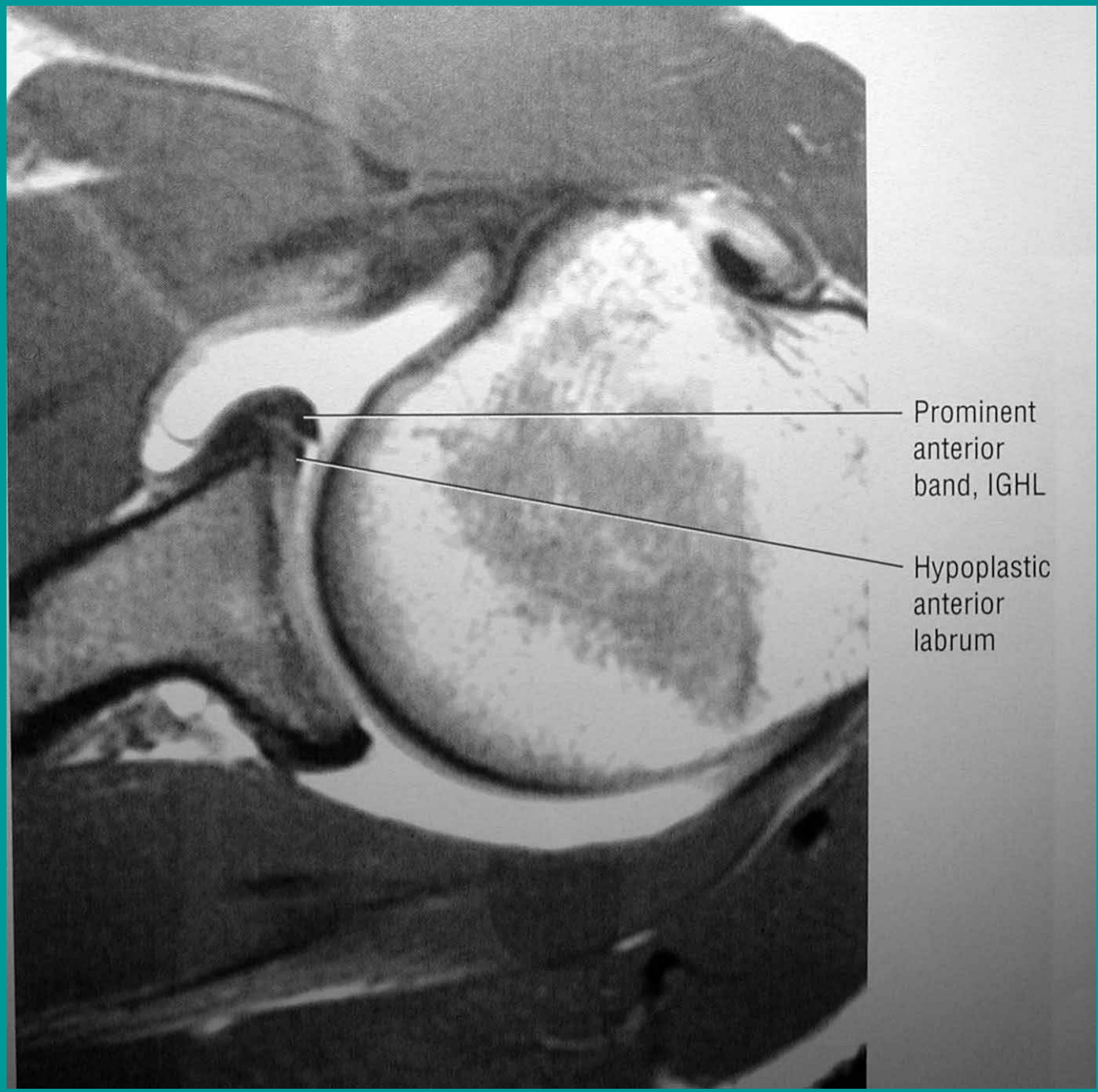
- Middle inferior to SGHL, missing in 30%.
- Inferior GHL is major stabilizing element; anterior & posterior bands, arising from glenoid labrum to surgical neck of humerus; with central axillary pouch

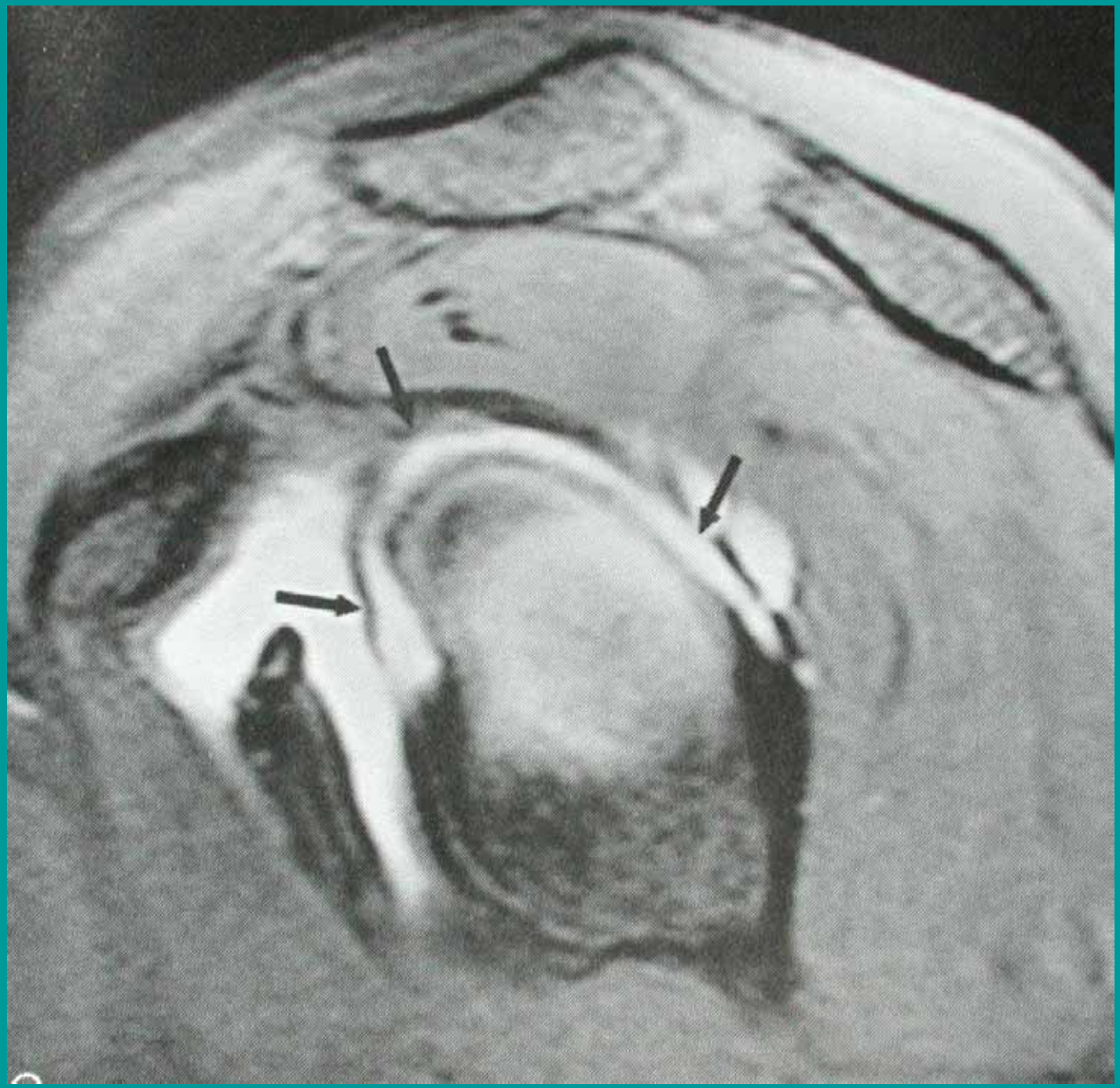
Labroligamentous complex

- Multiple labral variants: tightness of labral attachment; sublabral sulcus; sublabral foramen;free central labral edge (meniscoid)
- Relative hypoplasia of the labrum associated with relative thickening of the adjacent glenohumeral ligaments (e.g. the Buford complex)


Biceps tendon
Superior glenohumeral ligament
Absent anterosuperior labrum
Cord-like middle glenohumeral ligament
Posterior band
Anterior band
Axillary pouch
A



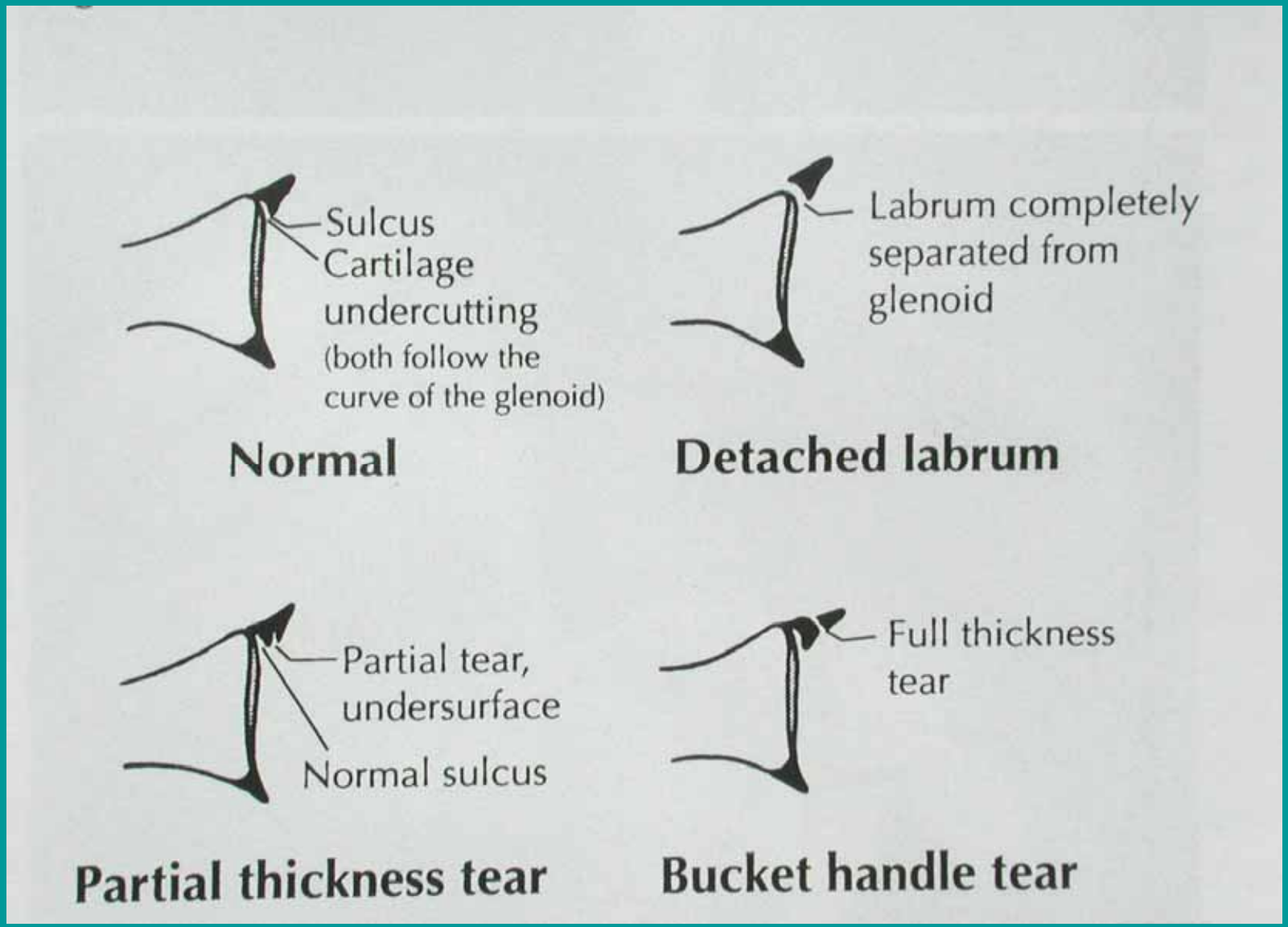

Prominent anterior band, IGHL
Hypoplastic anterior labrum



SLAP Lesions

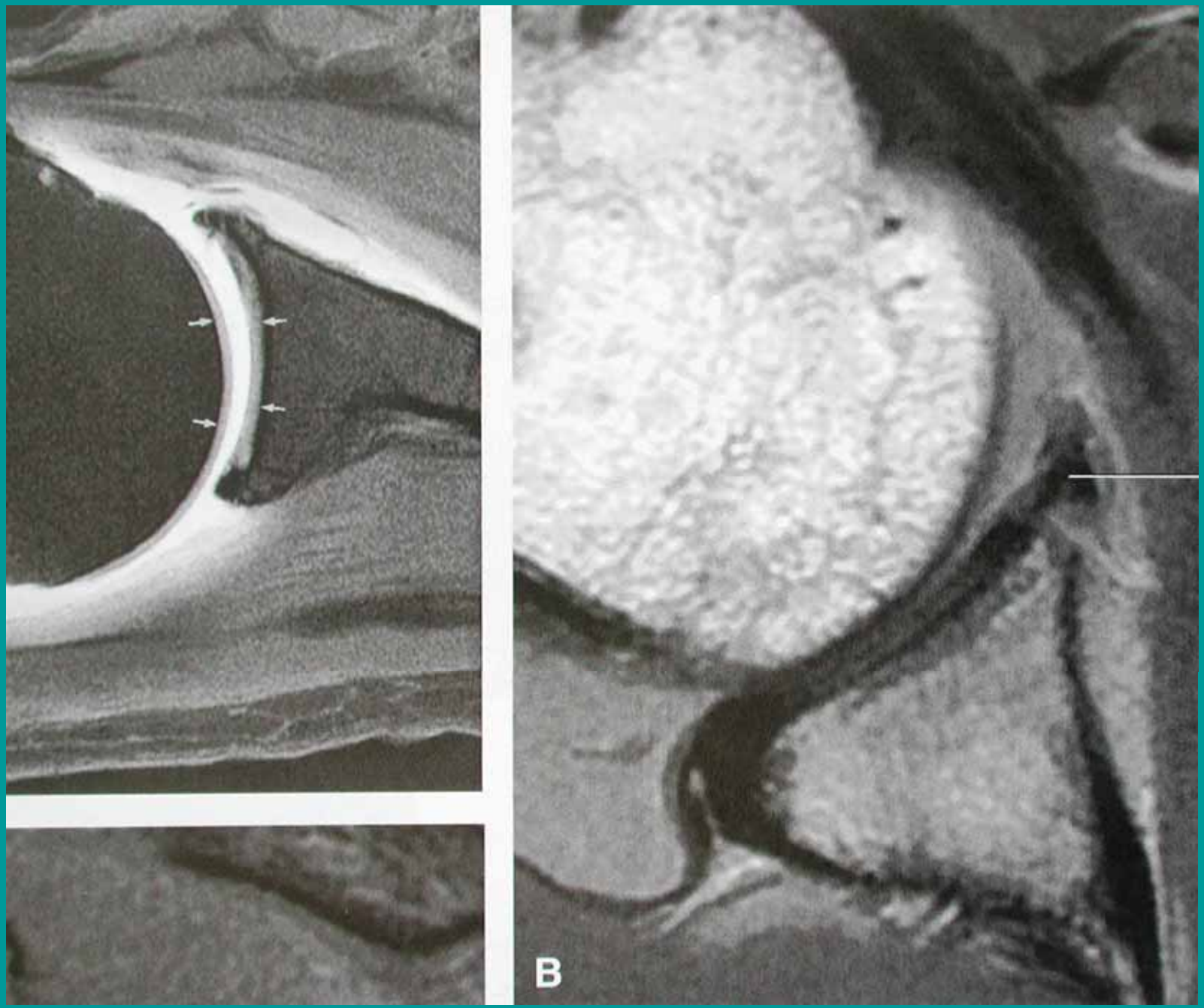
- **S**uperior **L**abral tear with **A**nterior-**P**osterior extension (extends posterior to the biceps-labral anchor)
- Labrum detached from glenoid, or:
- Partial thickness tear of labrum,or:
- Full thickness (bucket handle) tear
- Biceps-labral anchor may be torn or not.
- Not unstable.

Superior Labroligamentous Lesions

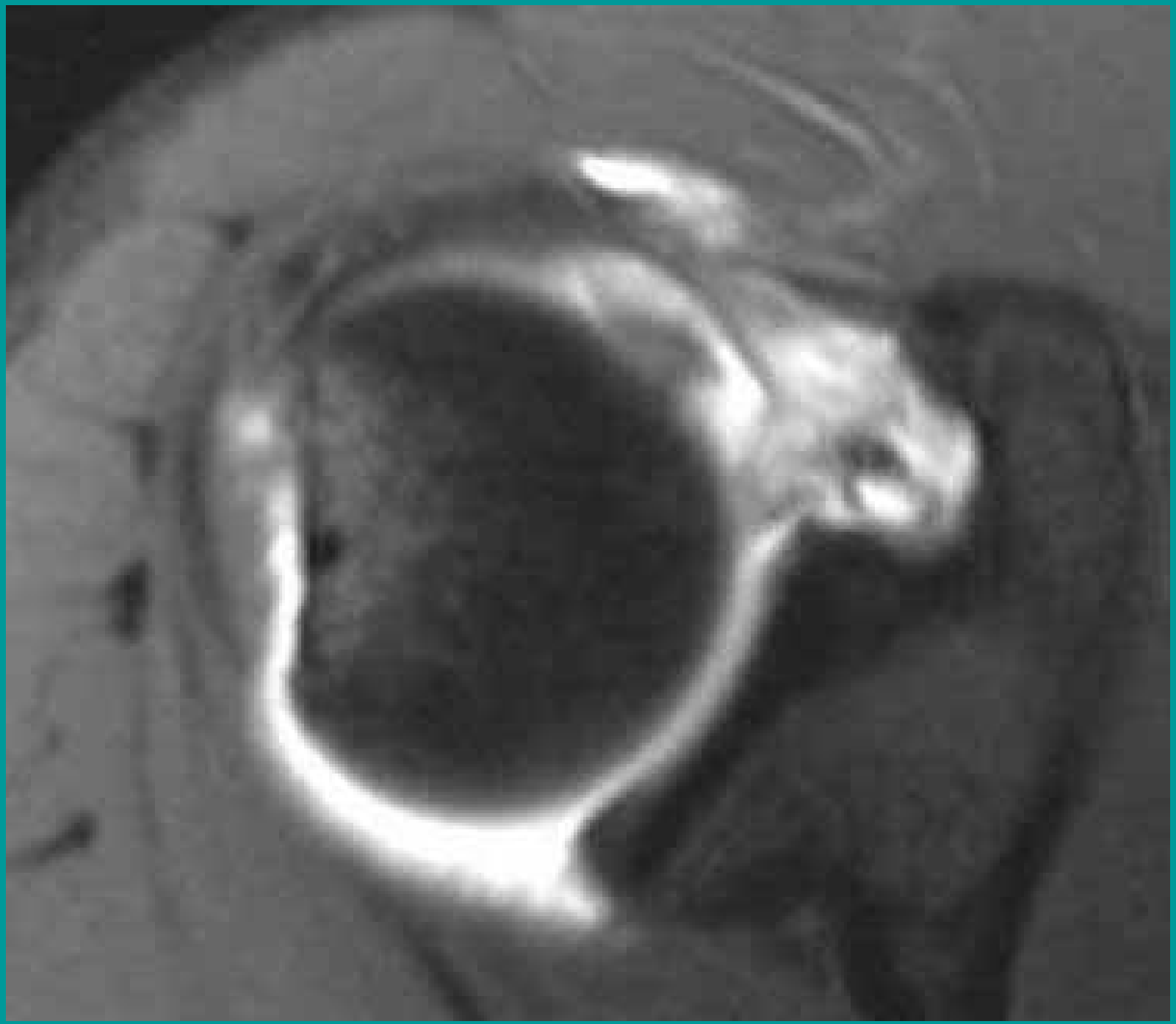


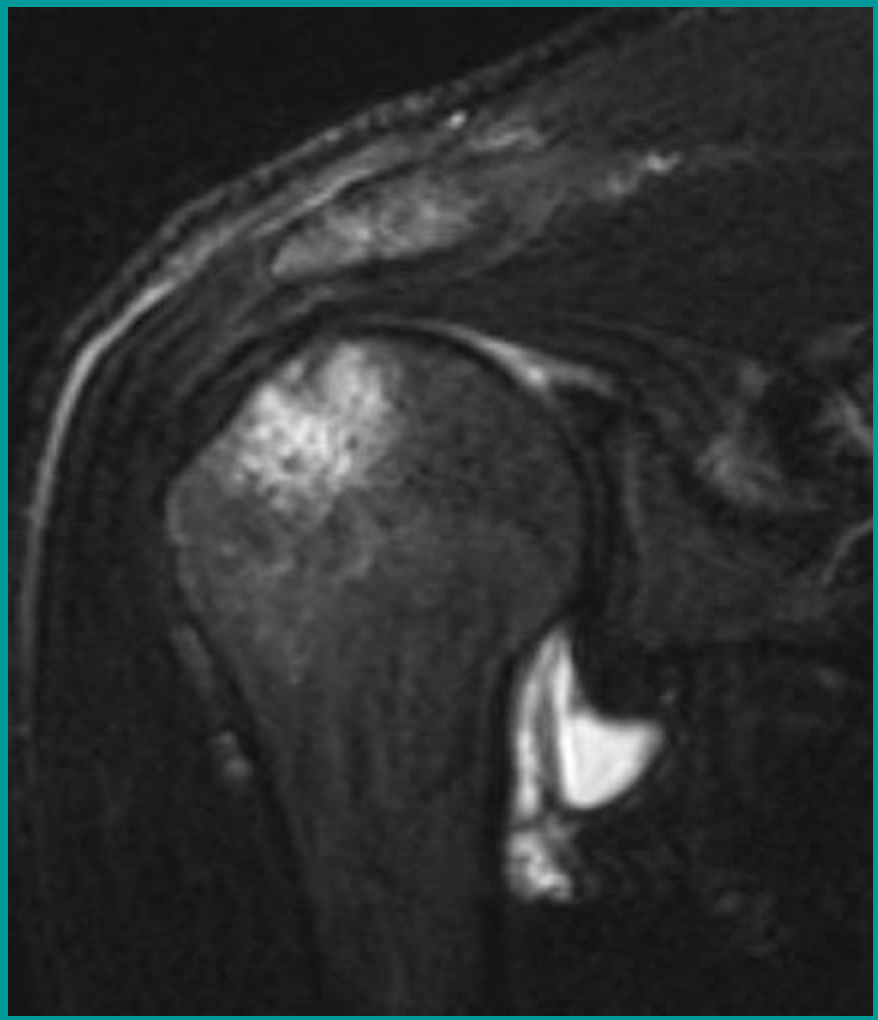
Bankhart lesion

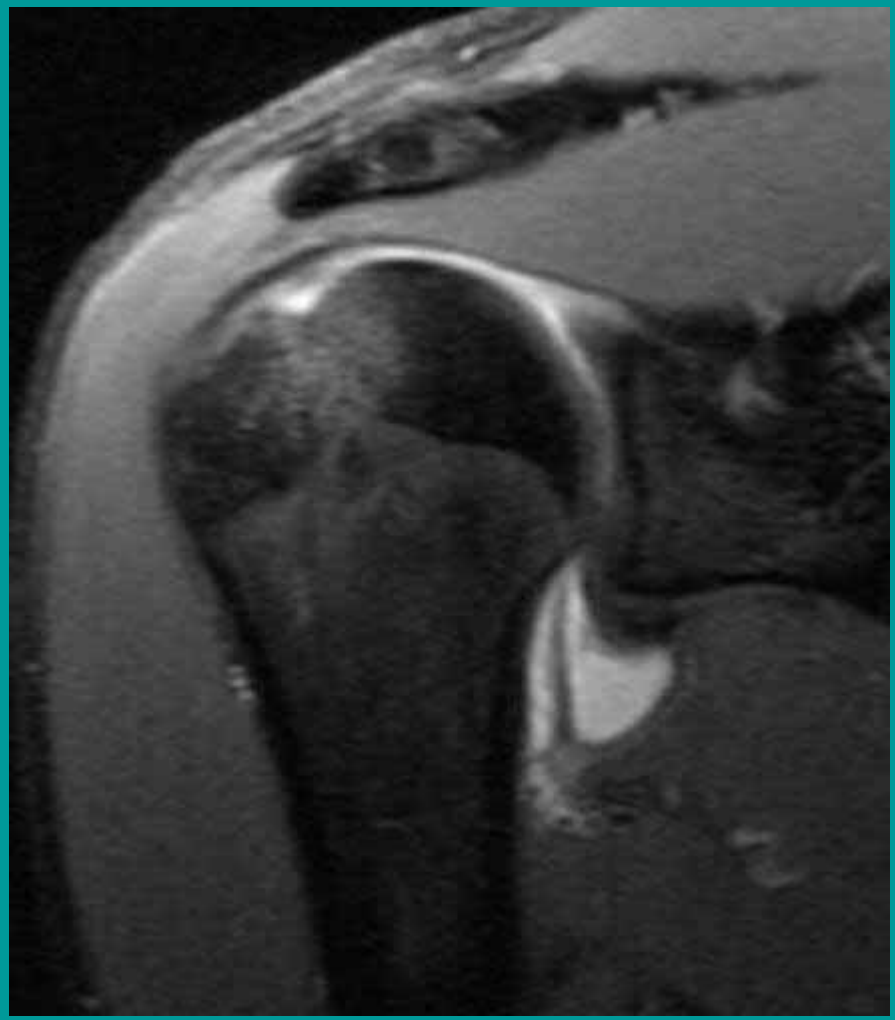
- From anterior humeral dislocation, with detachment of the anterior inferior labrum, with a tear of the of the anterior periosteum.
- The most common lesion after anterior dislocation itself.
- Does not heal spontaneously
- **IS** associated with instability

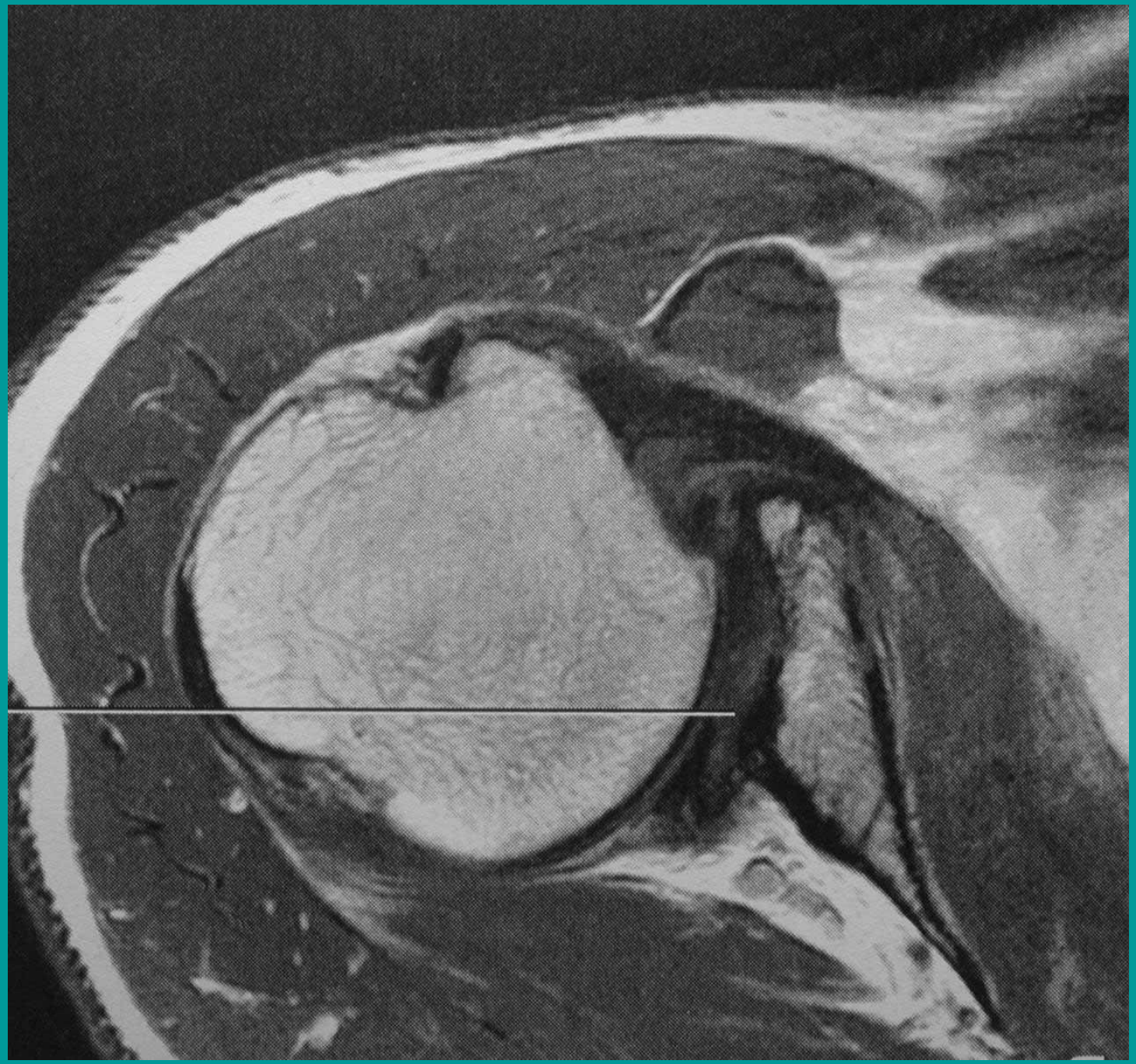

B


C



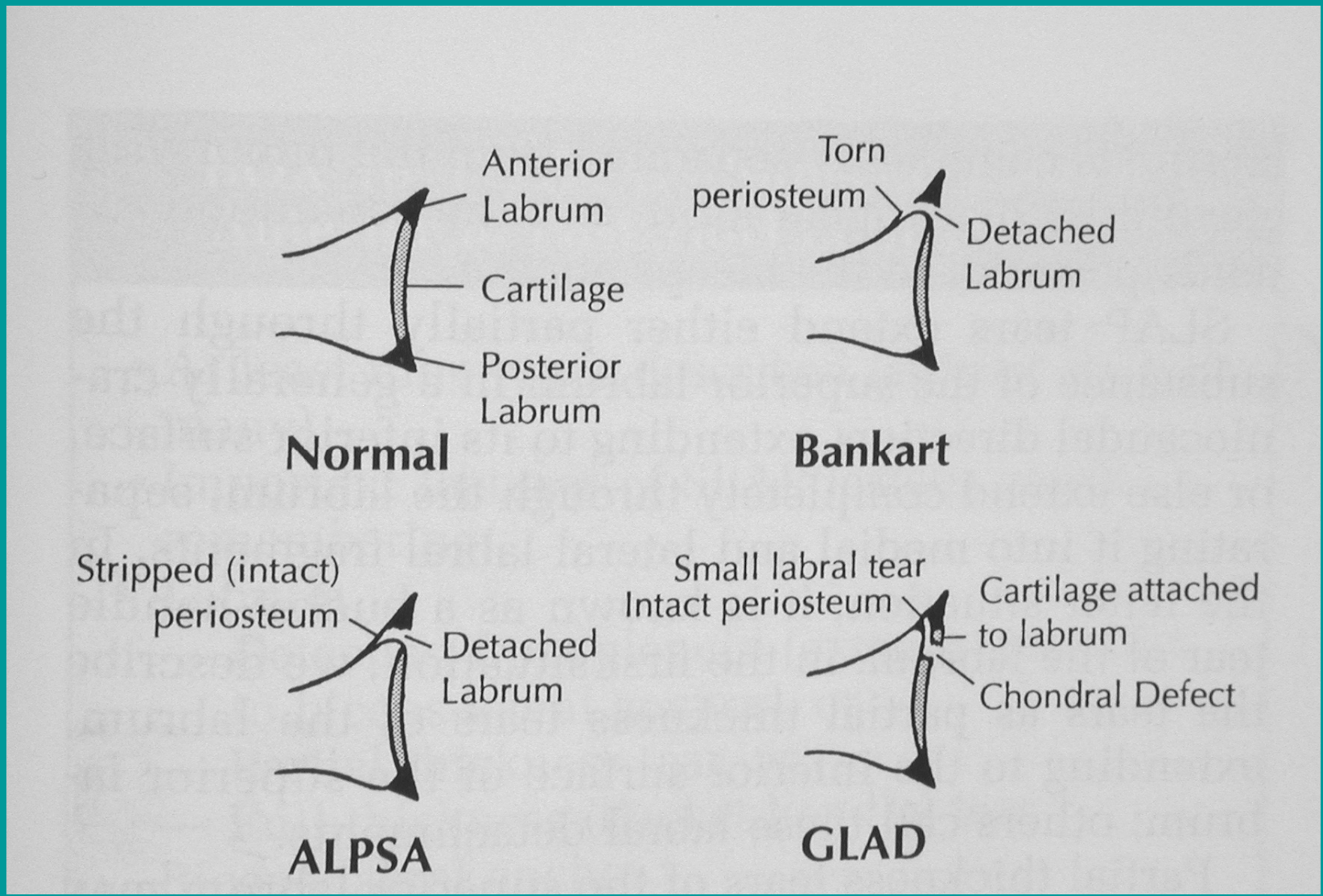


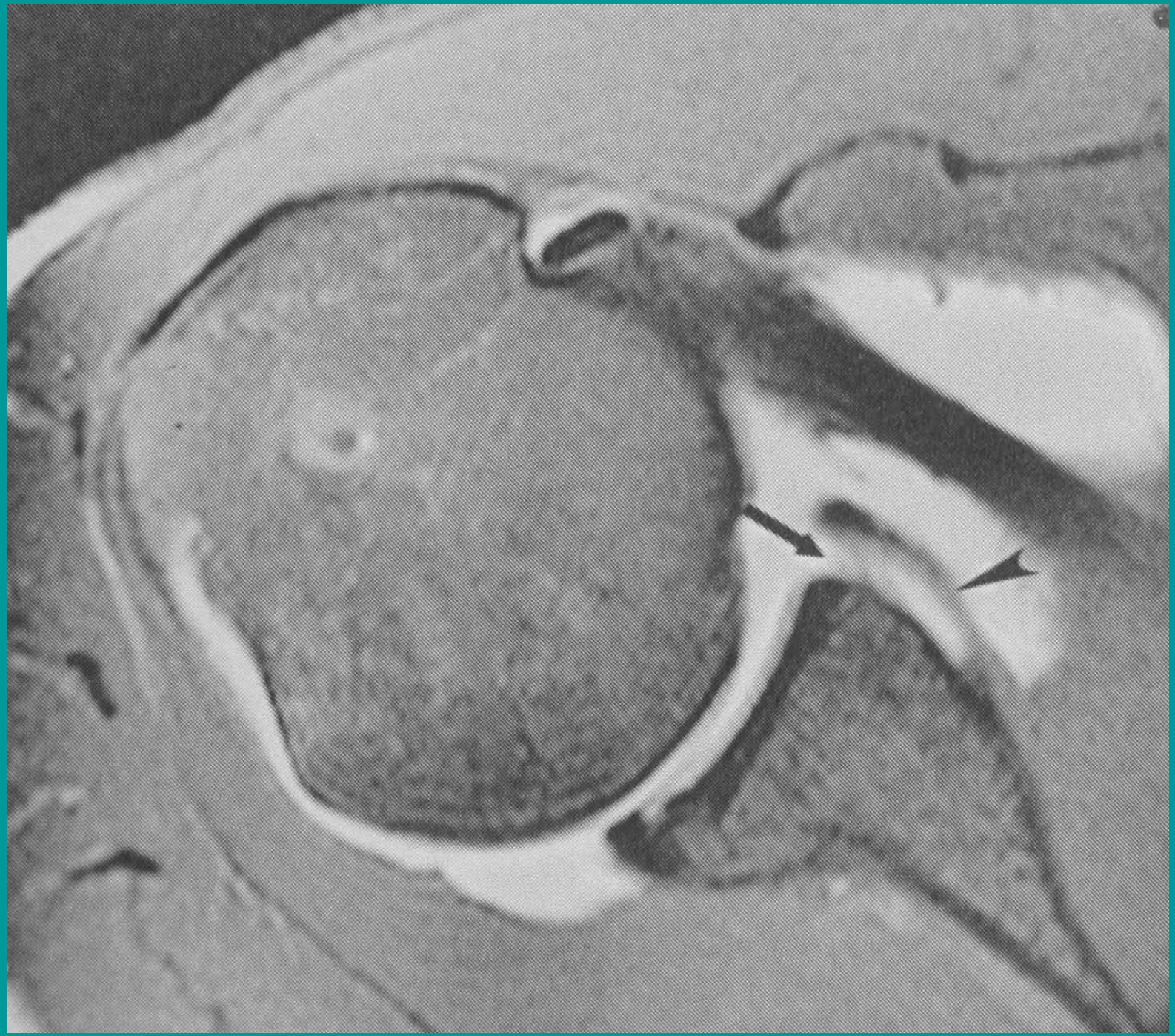





RETRO

Anterior Labroligamentous Lesions

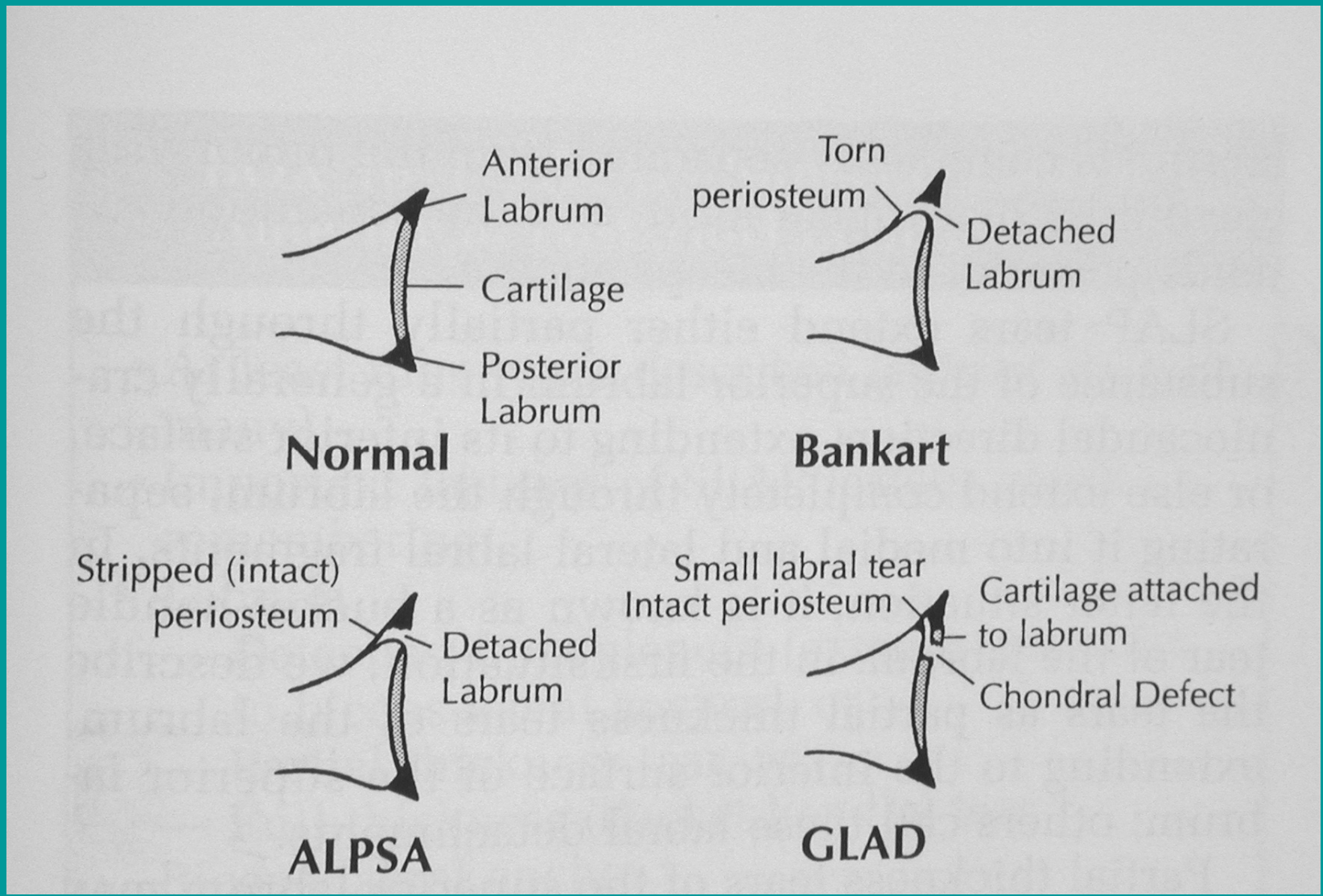




ALPSA lesion

- **A**nterior **L**abroligamentous **P**eriosteal **S**leeve **A**vulsion
- A variant of the Bankhart lesion; the periosteal sleeve is intact.
- Intact periosteum allows the labroligamentous complex to displace medially and rotate inferiorly;requires surgical correction
- Otherwise: labral deficiency, chronic instability

Anterior Labroligamentous Lesions



GLAD Lesion

Gleno-**L**abral **A**rticular **D**isruption

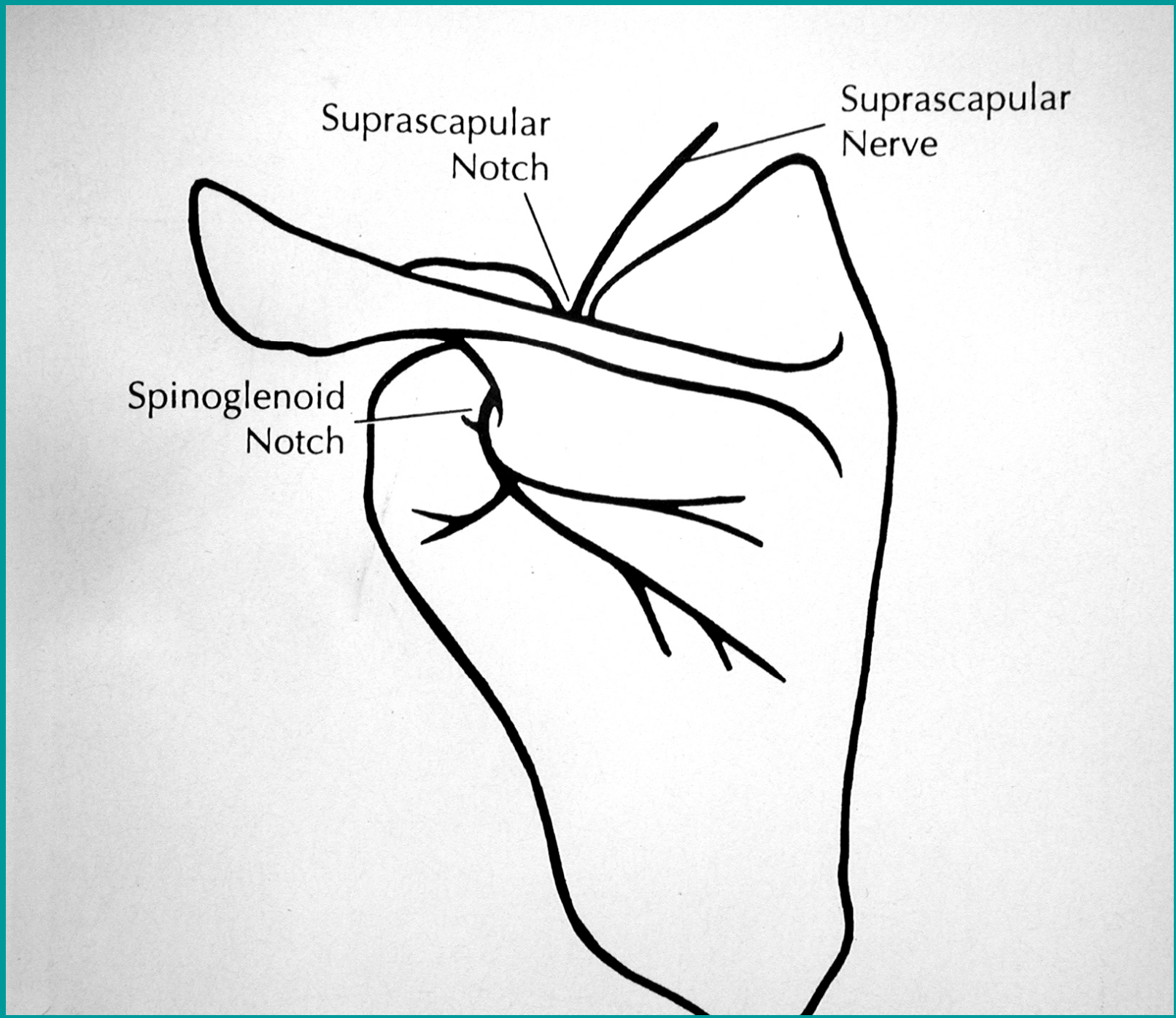
A Bankhart variant.

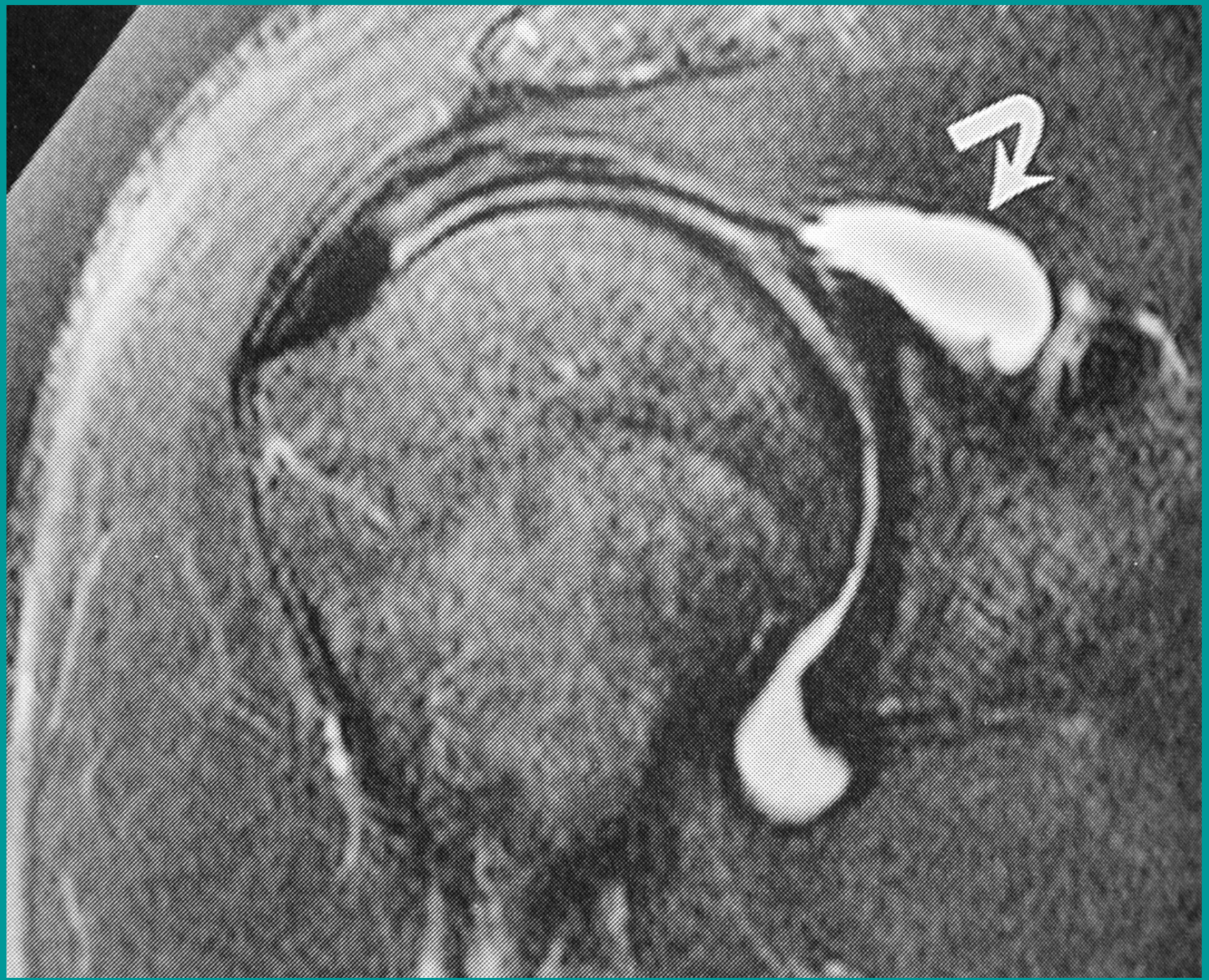
Tear of the anterior inferior labrum with an associated glenoid chondral defect.

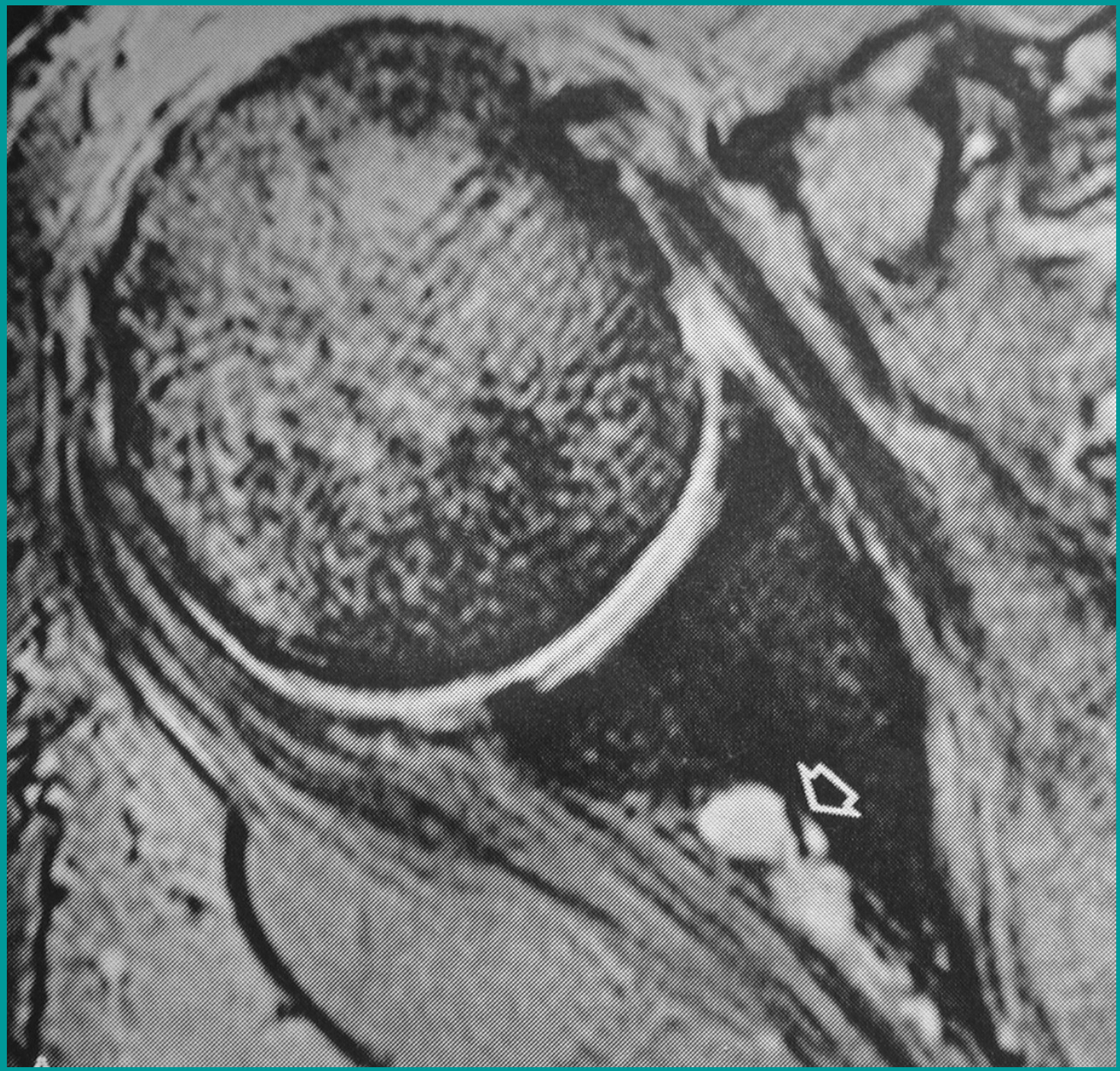
Almost There !

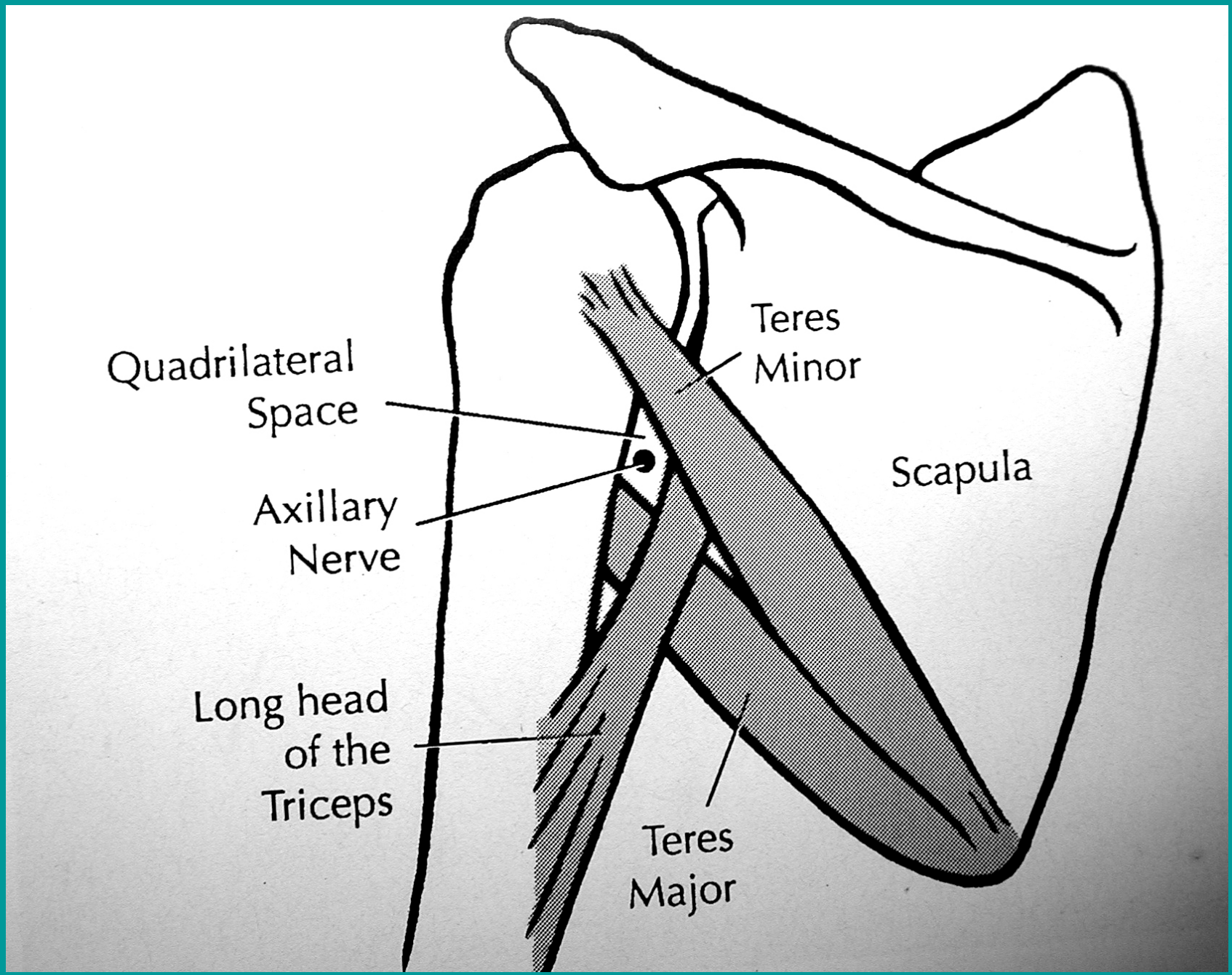
Nerve compression

- Strategic mass lesion: ganglion cyst, S.T. mass, fracture fragments, fibrous bands
- Pain, paresthesias, muscle edema, muscle atrophy
- Early: diffuse high signal: edema
- Late: muscle atrophy: fatty infiltration on T1WI

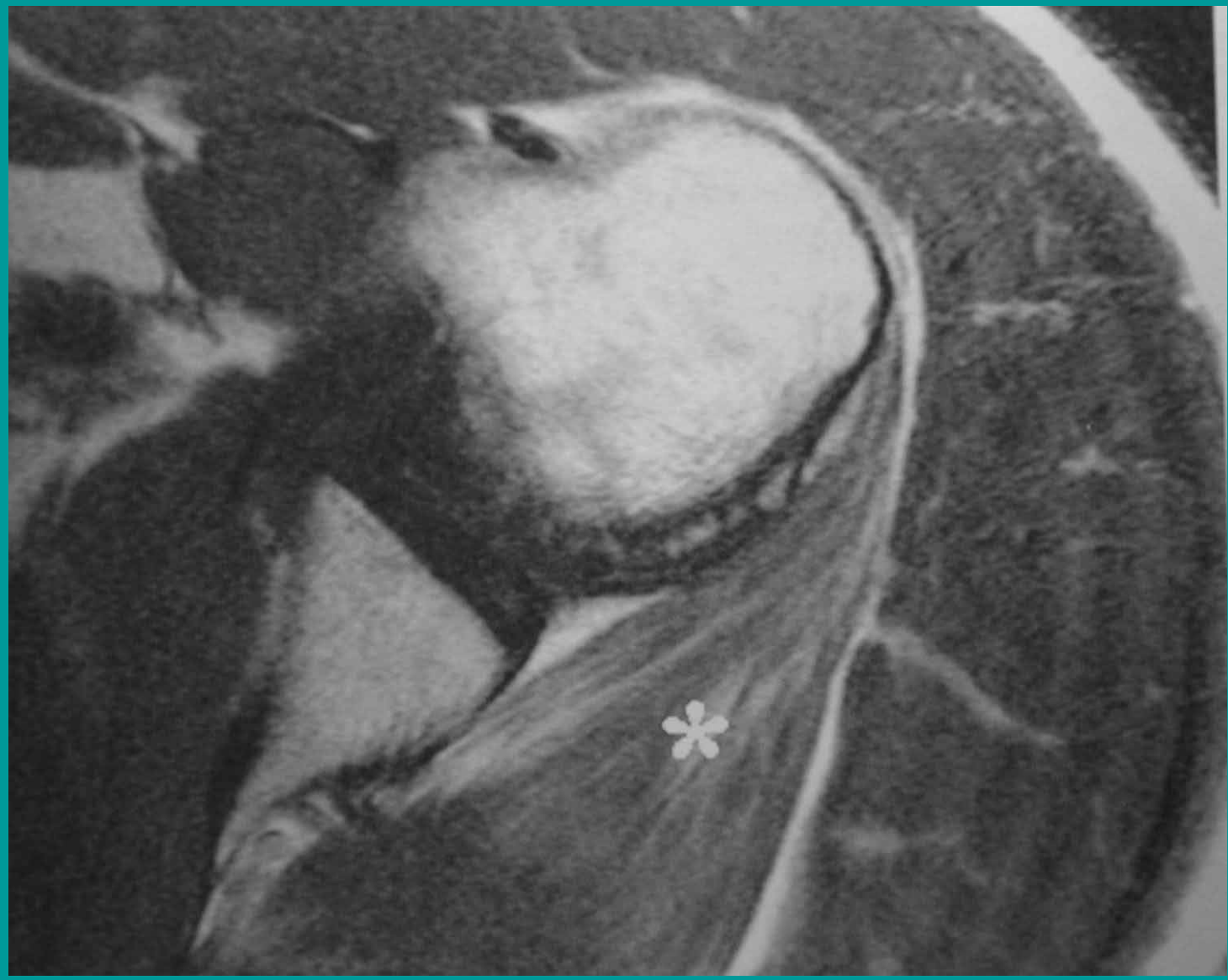

Suprascapular
Notch
Suprascapular
Nerve
Spinoglenoid
Notch


R

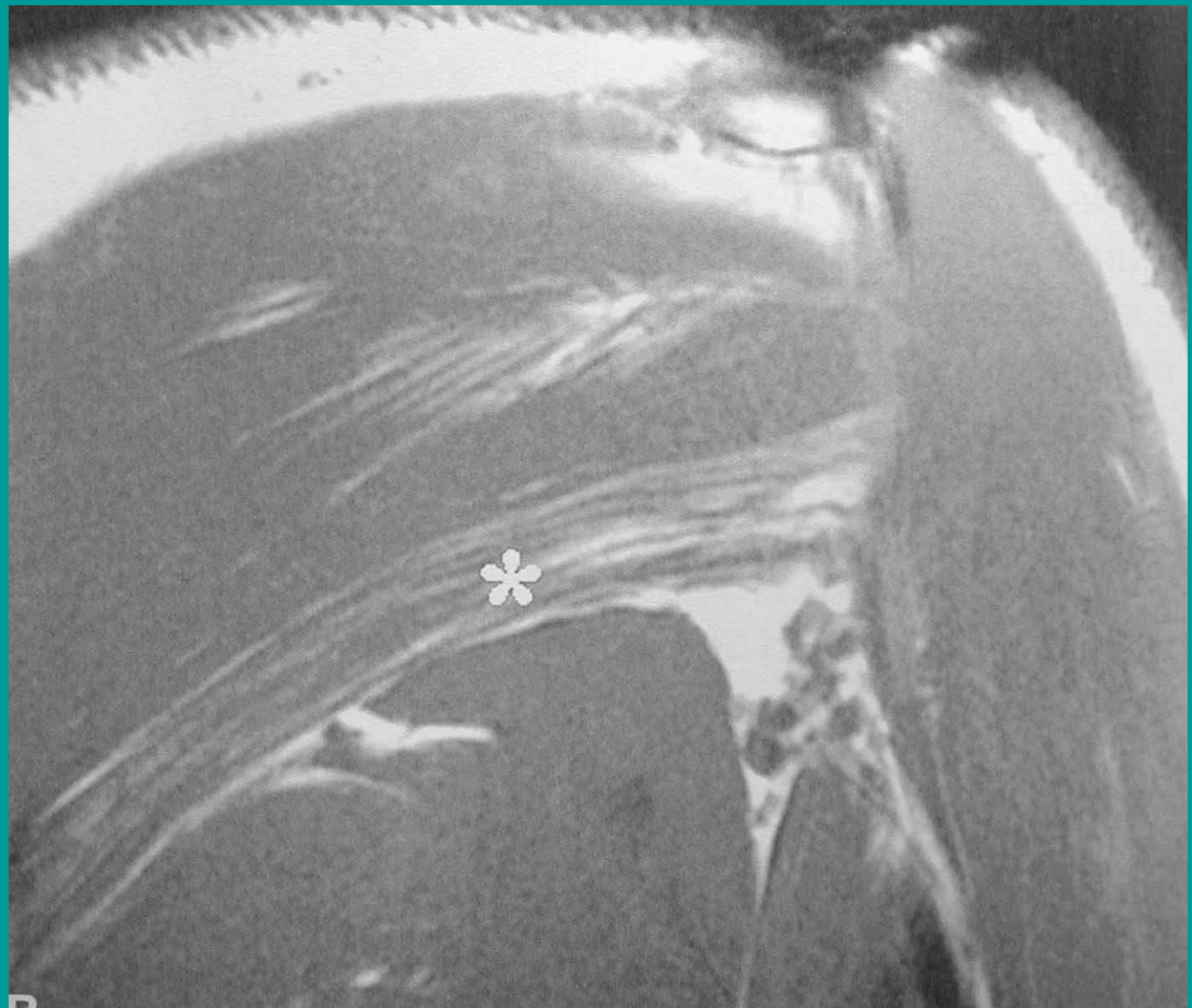



Quadrilateral Space
Axillary Nerve
Long head of the Triceps
Teres Minor
Scapula
Teres Major

Quadrilateral Space

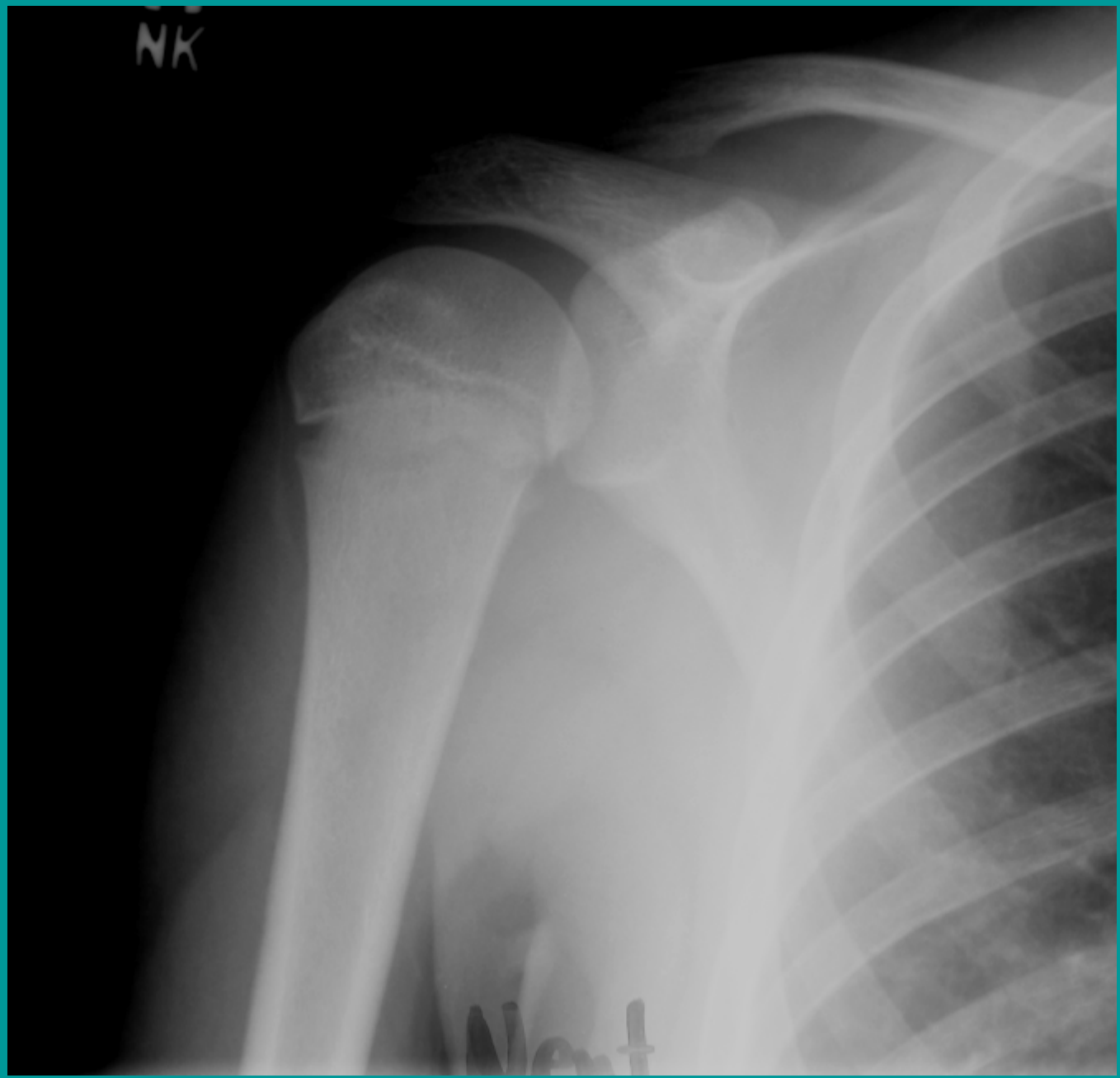


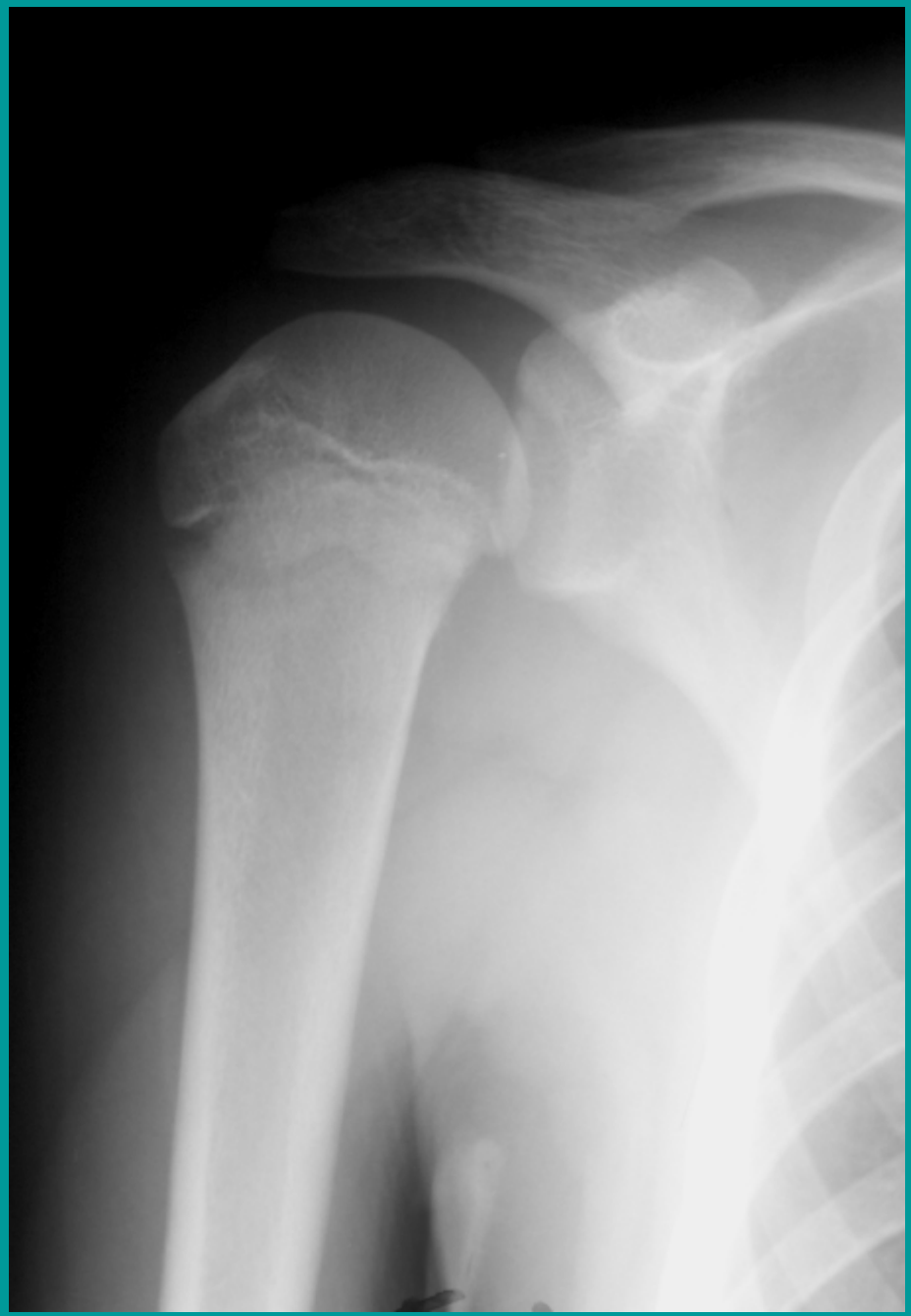
Quadrilateral Space

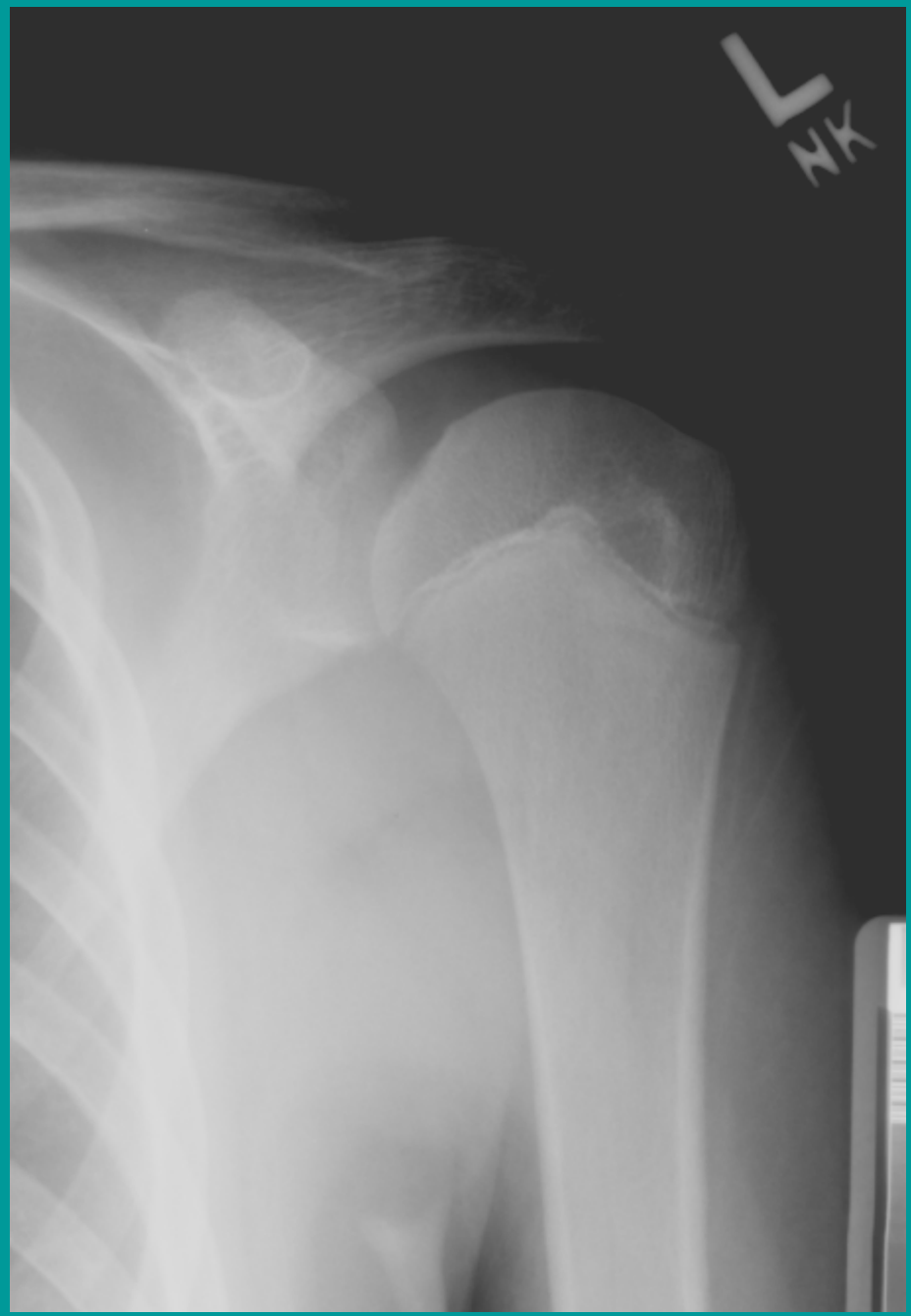


Nerve Abnormalities & Muscle Atrophy

- Suprascapular notch (Suprascapular nerve): Supraspinatus, Infraspinatus m.
- Spinoglenoid notch (Infraspinatus branch) Infraspinatus m.
- Quadrilateral space: (Axillary nerve): Teres minor m., Deltoid m.
- Parsonage Turner s. (Brachial neuritis) Supraspinatus, Infrasinatus, Deltoid


NK

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