Shoulder Instability; Humeral bone loss (Remplissage procedure), Glenoid bone loss (Latarjet procedure)

Duncan B. Ackerman, MD

The Bone & Joint Center

TUBS (Traumatic Unilateral dislocations with a Bankart lesion requiring surgery)

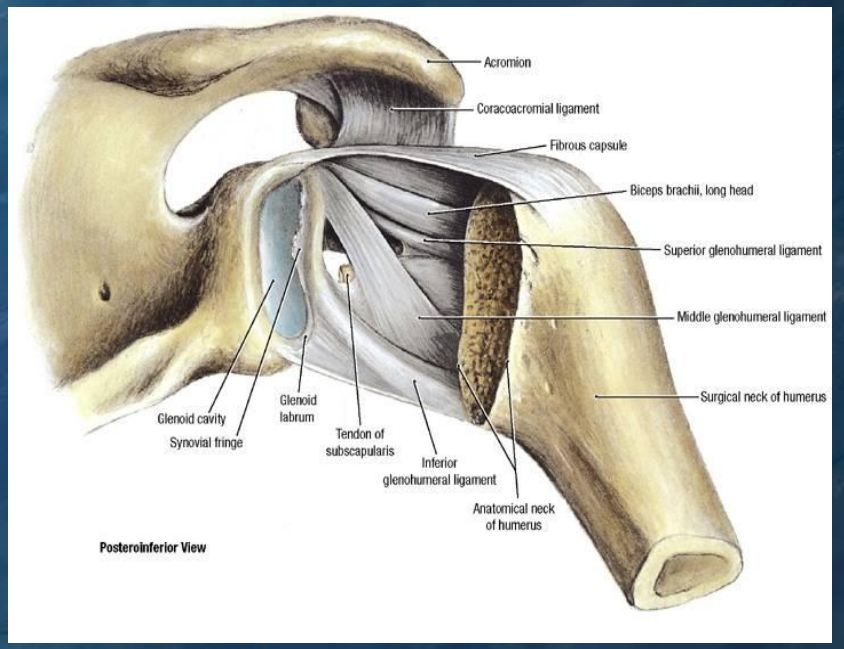
- Traumatic Shoulder injuries generally occur with anterior force to the shoulder in abducted externally rotated position

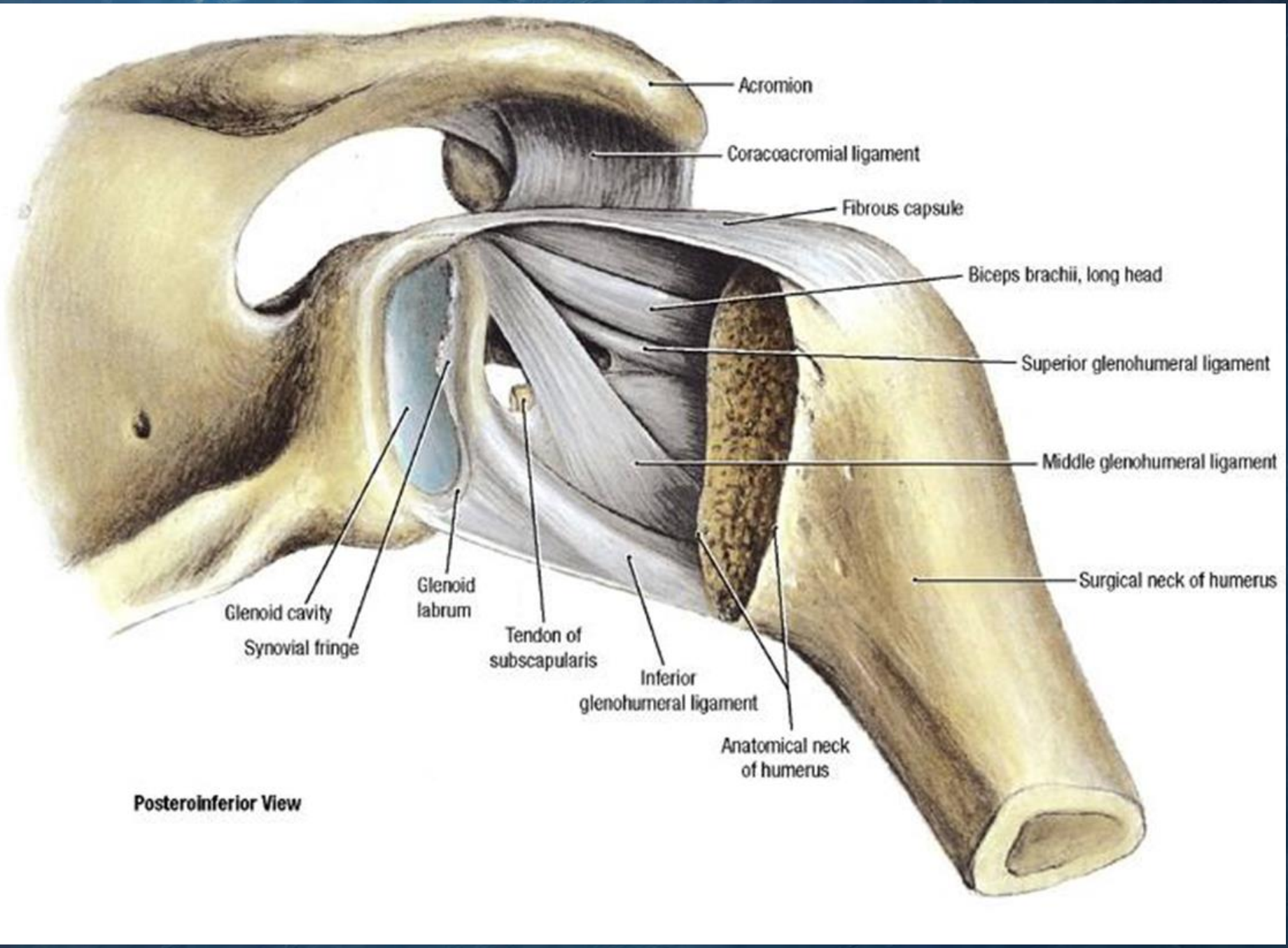
Epidemiolgy

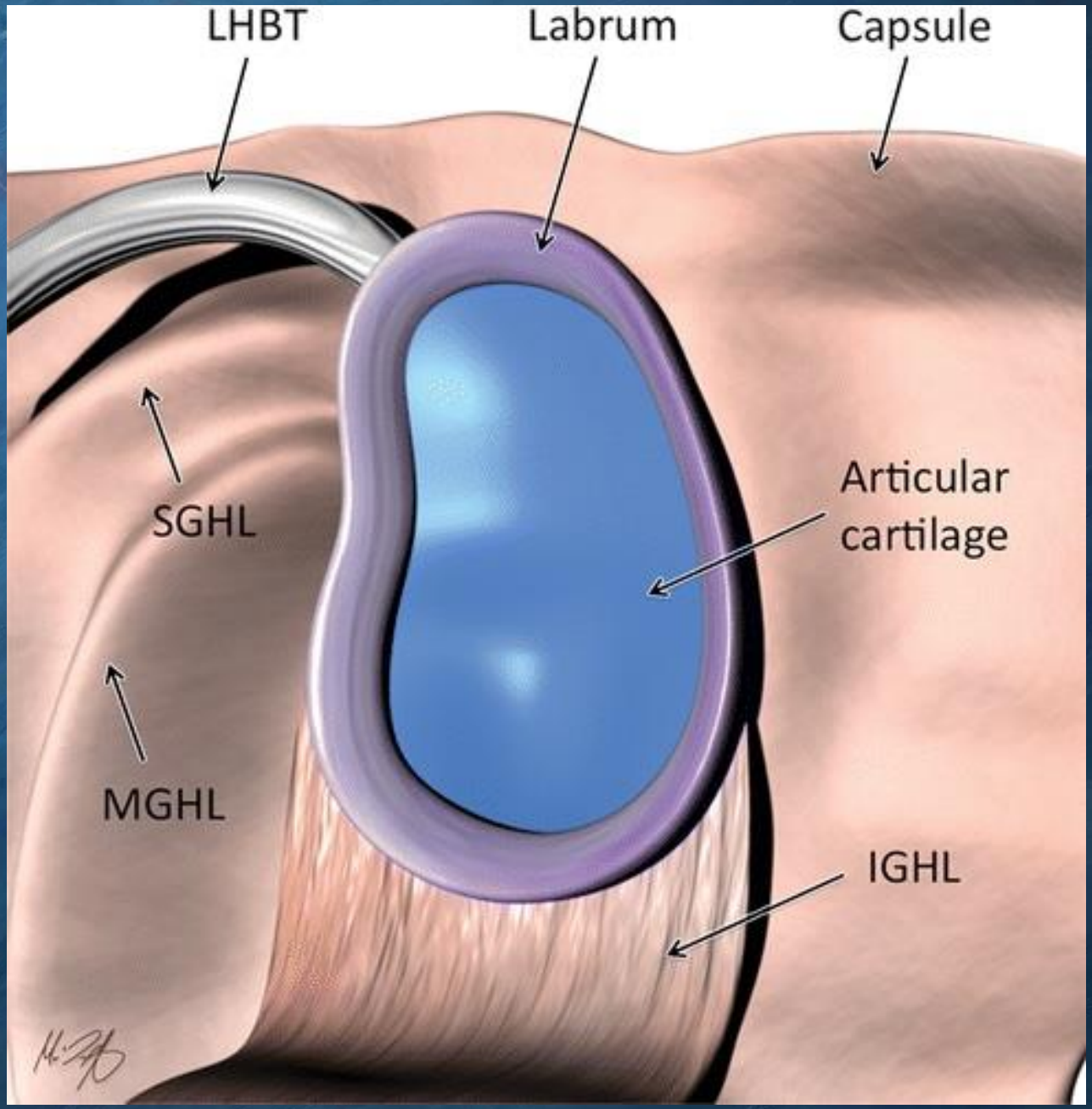
- One of the most common shoulder injuries
  - 1.7% annual rate in general population
  - High recurrence rate that correlates with age at dislocation
    - 90% chance of recurrence in age <20
    - Risk factors contact athletes, military

Anatomy

- Static Restraints
  - Bone anatomy
  - Capsule
  - Glenohumeral ligaments
  - Labrum
    - Contributes to 50% of glenoid depth

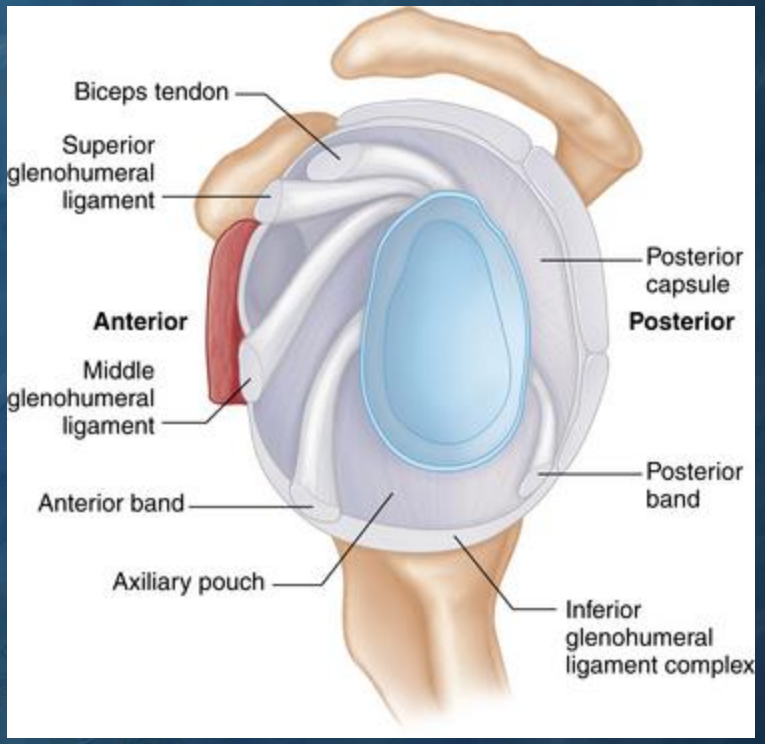



Acromion
Coracoacromial ligament
Fibrous capsule
Biceps brachii, long head
Superior glenohumeral ligament
Middle glenohumeral ligament
Surgical neck of humerus
Glenoid cavity
Synovial fringe
Glenoid labrum
Tendon of subscapularis
Inferior glenohumeral ligament
Anatomical neck of humerus
Posteroinferior View


LHBT
Labrum
Capsule
SGHL
Articular cartilage
MGHL
IGHL

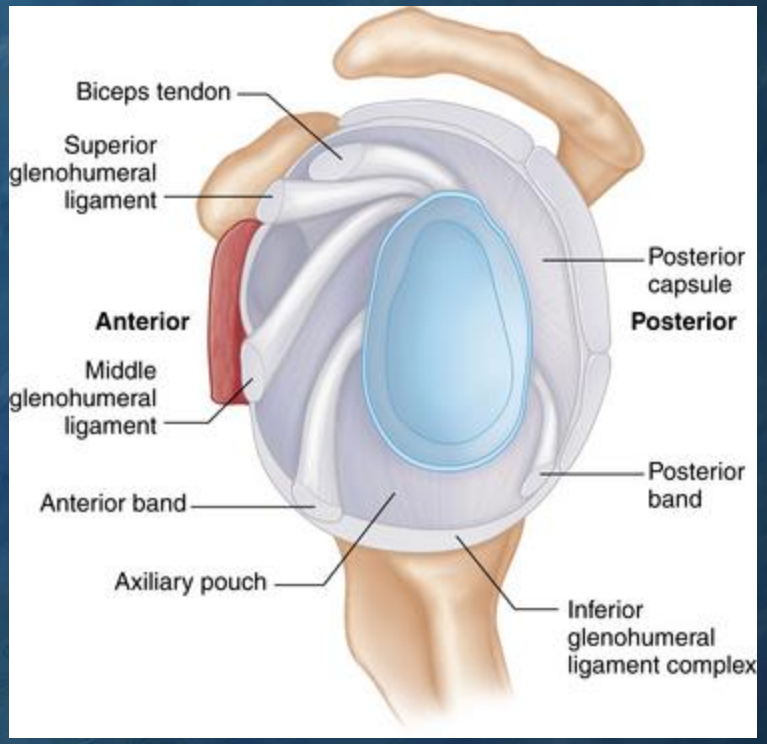
Anatomy

- Anterior band of IGHL (main restraint)
  - Provides static restraint with arm in 90 degrees of abduction and external rotation



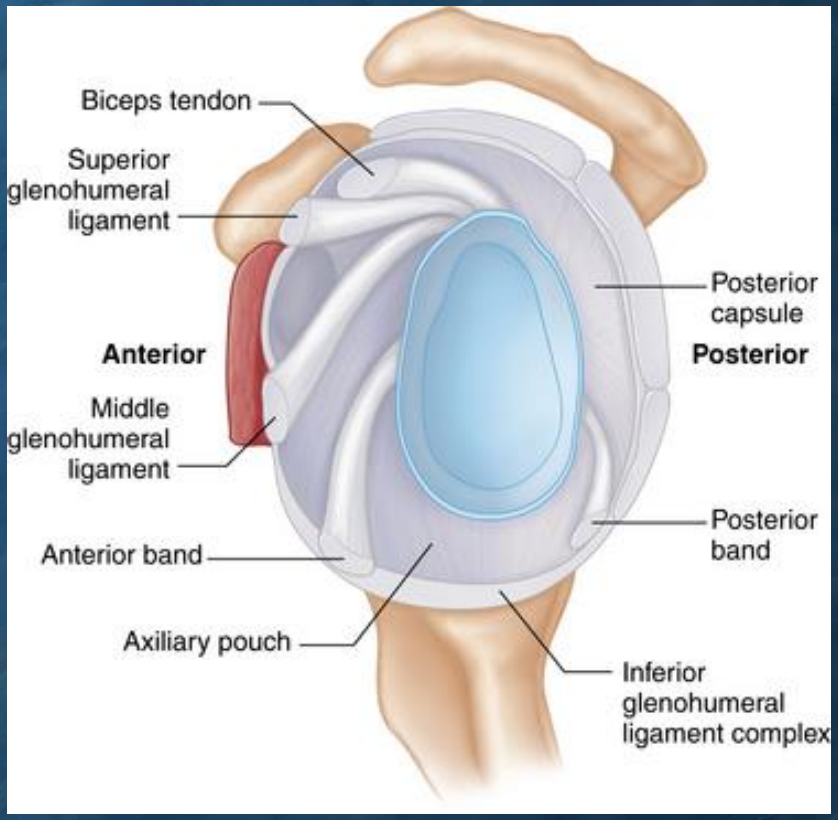
Anatomy

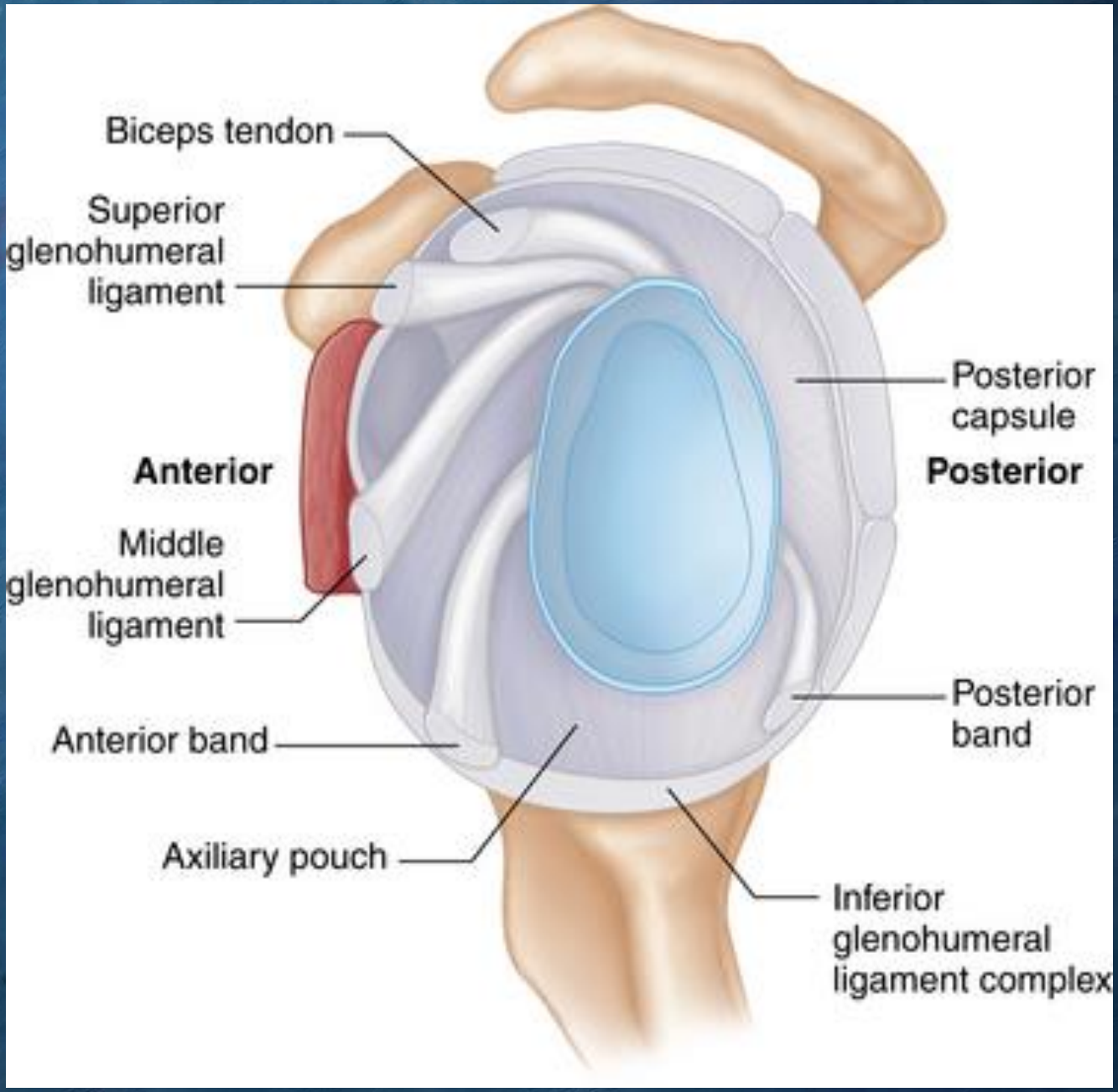
- MGHL
  - Provides static restraint with arm in 45 degrees of abduction and external rotation



Anatomy

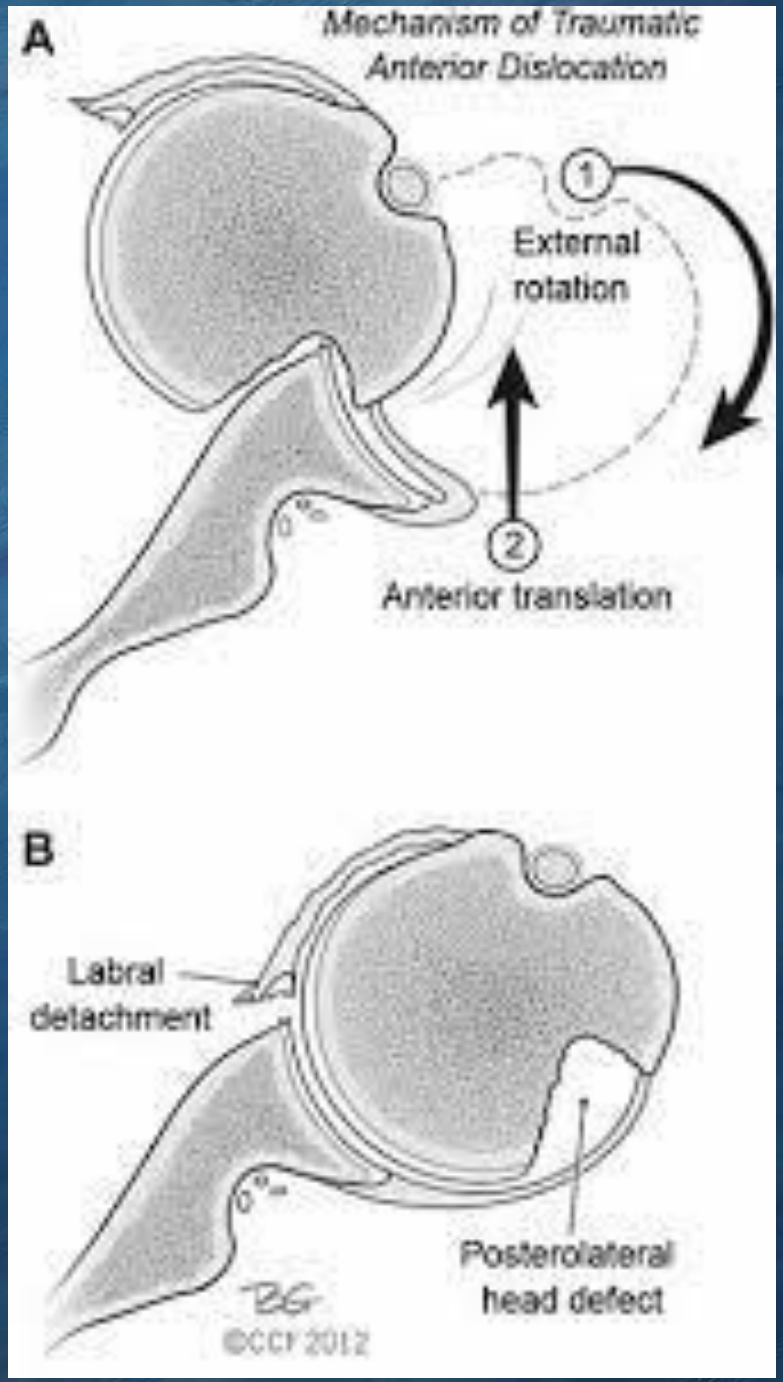
- SGHL
  - Provides static restraint with arm at the side

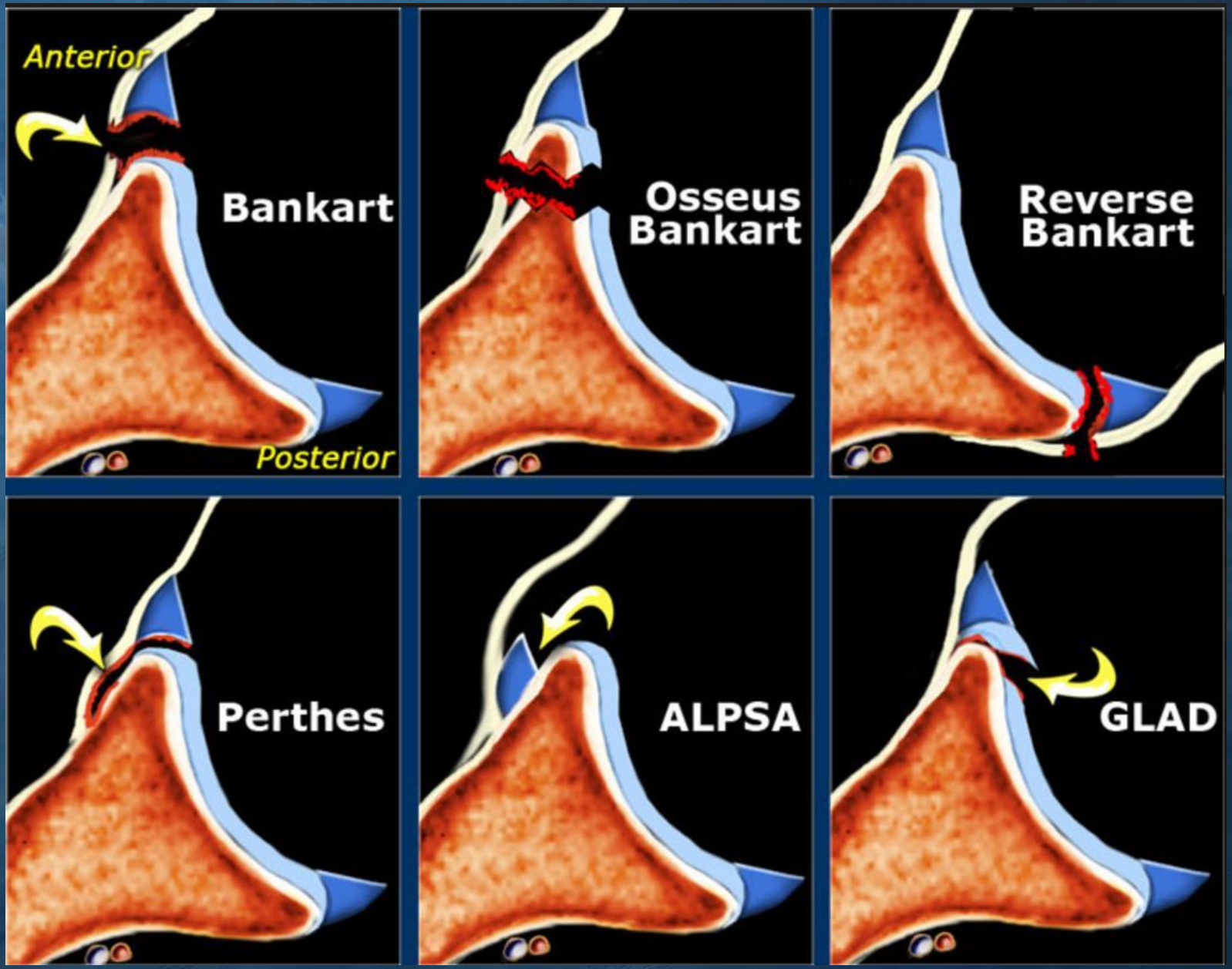



Biceps tendon
Superior glenohumeral ligament
Posterior capsule
Anterior
Posterior
Middle glenohumeral ligament
Posterior band
Anterior band
Axiliary pouch
Inferior glenohumeral ligament complex

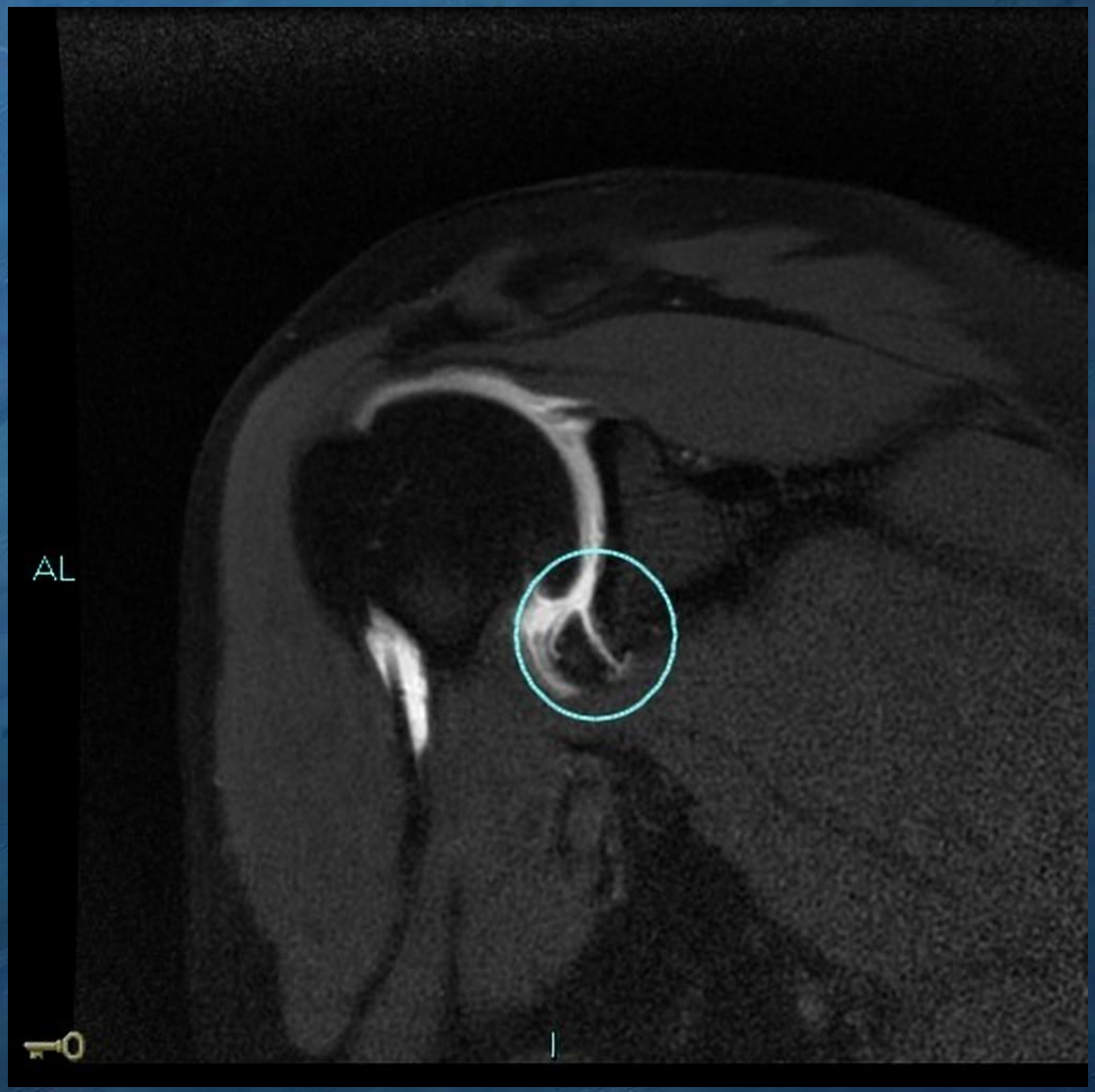
Pathoanatomy

- Often bipolar injury with injury to anterior labrum and humerus
- Labral Tear
- Possible Hill-Sachs

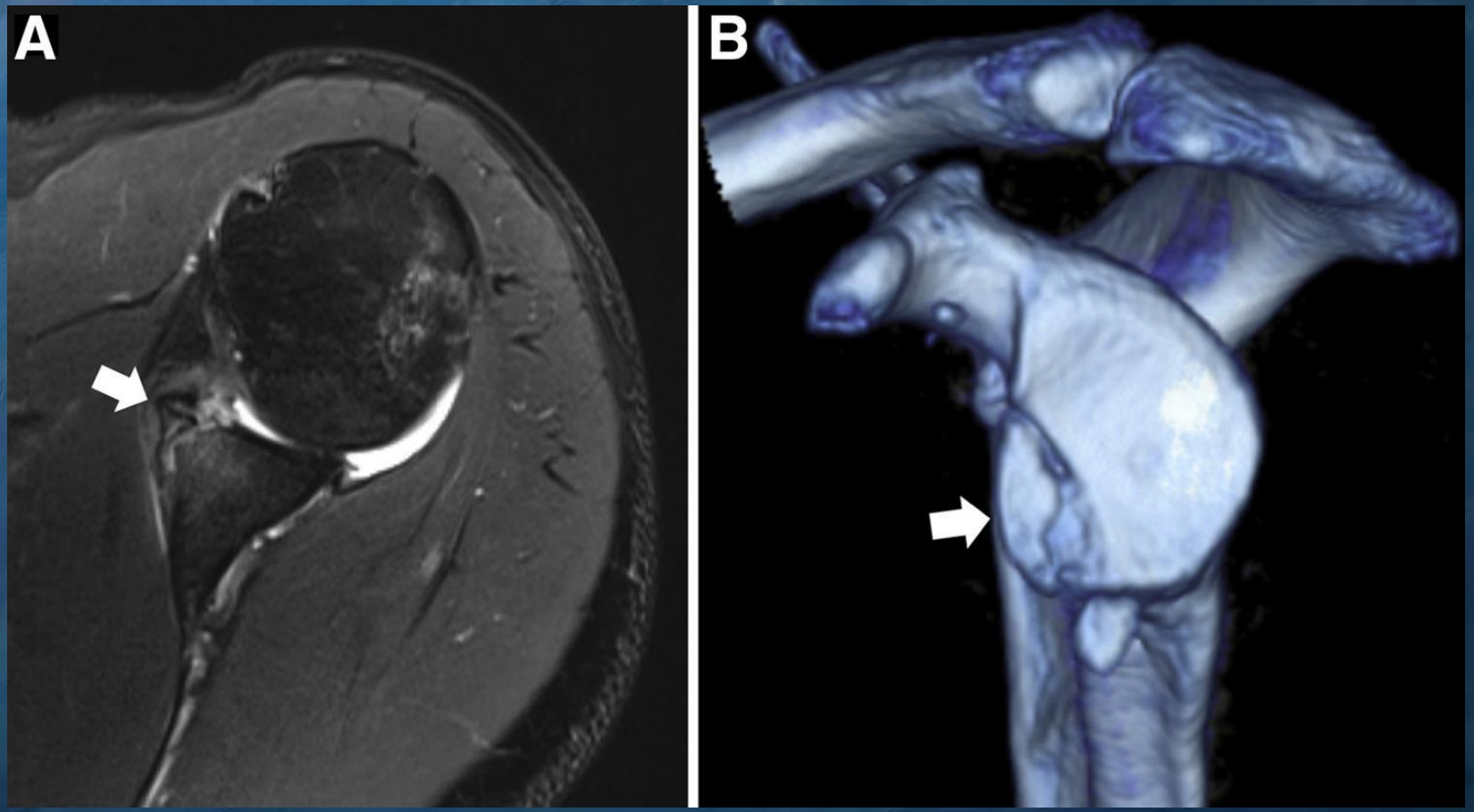

A
Mechanism of Traumatic Anterior Dislocation
1
External rotation
2
Anterior translation
B
Labral detachment
Posterolateral head defect
BG
©CCF 2012


Anterior
Bankart
Posterior
Osseus Bankart
Reverse Bankart
Perthes
ALPSA
GLAD

Bankart Lesion

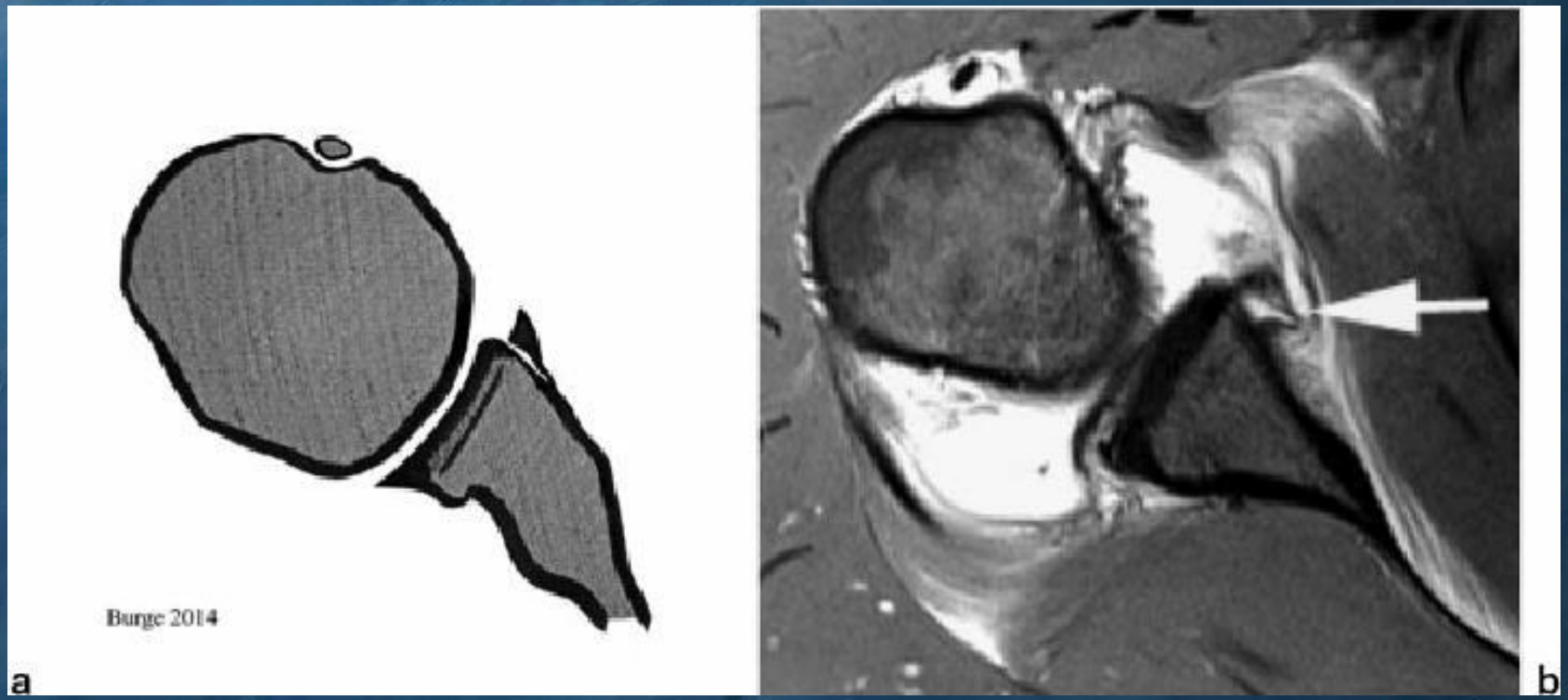


Bony Bankart



GLAD Lesion

ALPSA Lesion



Treatment
Nonoperative

- Acute reduction +/- immbolization
  - Management of 1st time dislocators controversial
  - ASES recommendations are for surgical intervention for athletes age 14-30 at the end of season if have positive apprehension and bone loss
  - Immobilzation – no benefit of immobilization >1 week for decreasing recurrence rates

Treatment
Nonoperative

- Physical Therapy
  - Strengthening of dynamic stabilizers (rotator cuff and scapular stabilizers)
  - Return to sport 7-21 days
  - Military and overhead contact athletes have high rate of recurrent instability

Nonoperative Treatment

- Risk factors for re-dislocation
  - Age < 20 (greatest risk)
  - Male
  - Contact Sports
  - Hyperlaxity
  - Glenoid bone loss > 20-25% (<13.5%)
  - Greater tuberosity fractures

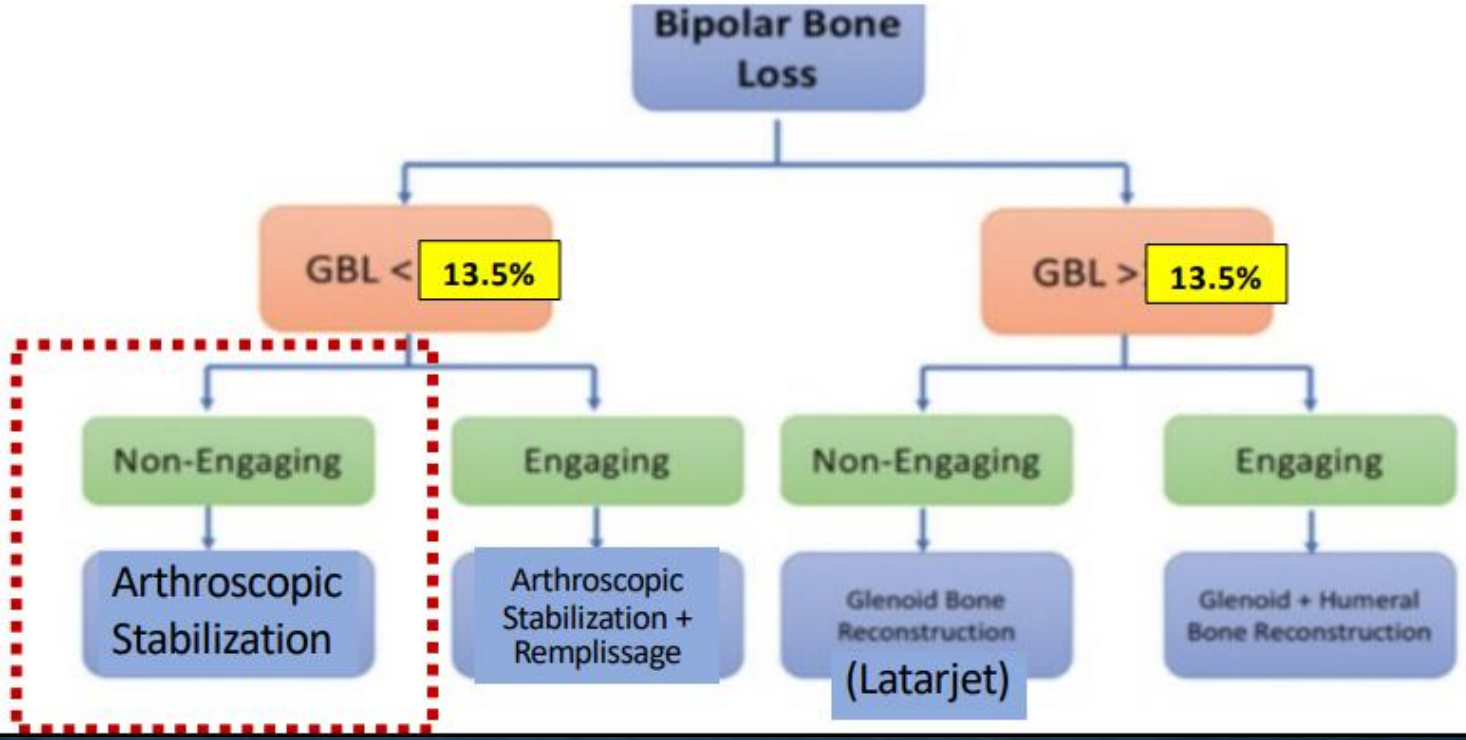
Treatment algorithm

Glenoid defect	Hill Sach	Treatment
<25 %	On track	Arthroscopic Bankart Repair
<25%	Off track	Arthroscopic Bankart repair and remplissage
>25%	On track	Latarjet
>25%	Off track	Latarjet, with remplissage or humeral bone graft

Am J Sports Med. 2019 Aug;47(10):2484-2493. doi: 10.1177/0363546518791555. Epub 2018 Aug 27.

Management of Recurrent Anterior Shoulder Instability With Bipolar Bone Loss: A Systematic Review to Assess Critical Bone Loss Amounts.

Gowd AK[1], Liu JN[2], Cabarcas BC[1], Garcia GH[1], Cvetanovich GL[3], Provencher MT[4], Verma NN[1].



Arthroscopic Labral (Bankart) repair

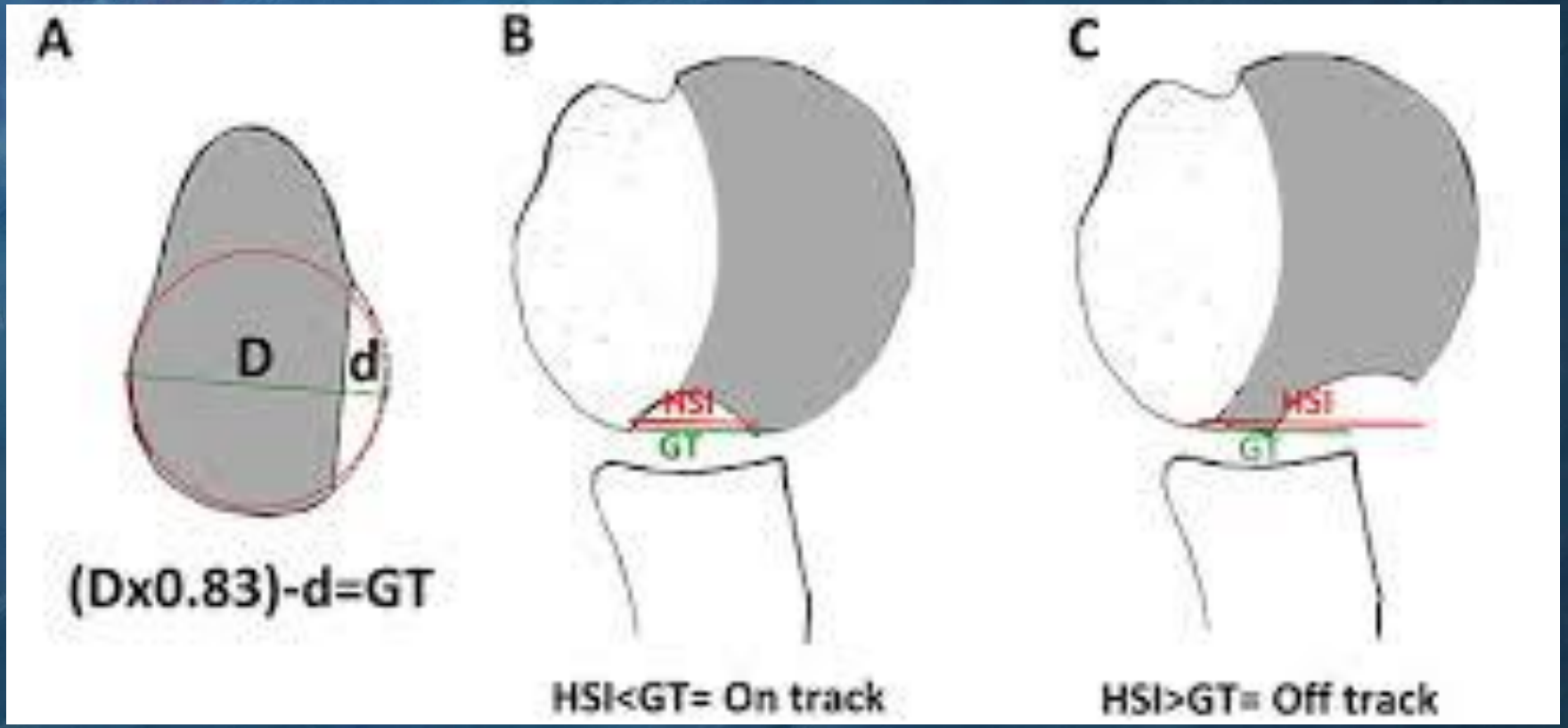
- Relative indications
  - 1st time traumatic dislocation with bankart lesion on MRI younger than 25-30 years
  - High demand athletes
  - Recurrent dislocation/subluxation following nonop treatment
  - < 20-25% bone loss (may be less 13.5% have high rate recurrent instability)
  - Remplissage if Hill-Sachs "off track"

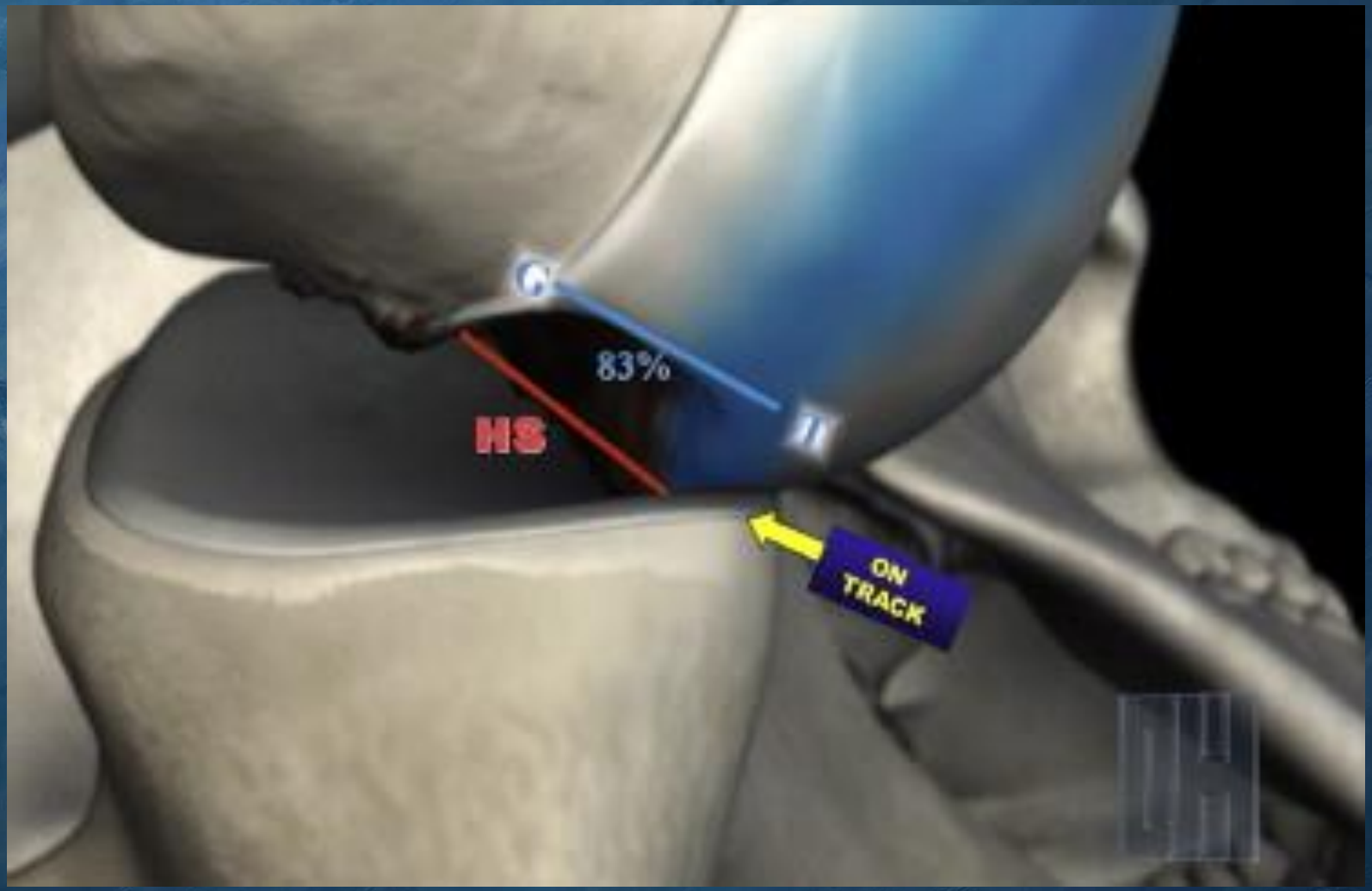
Hill Sachs

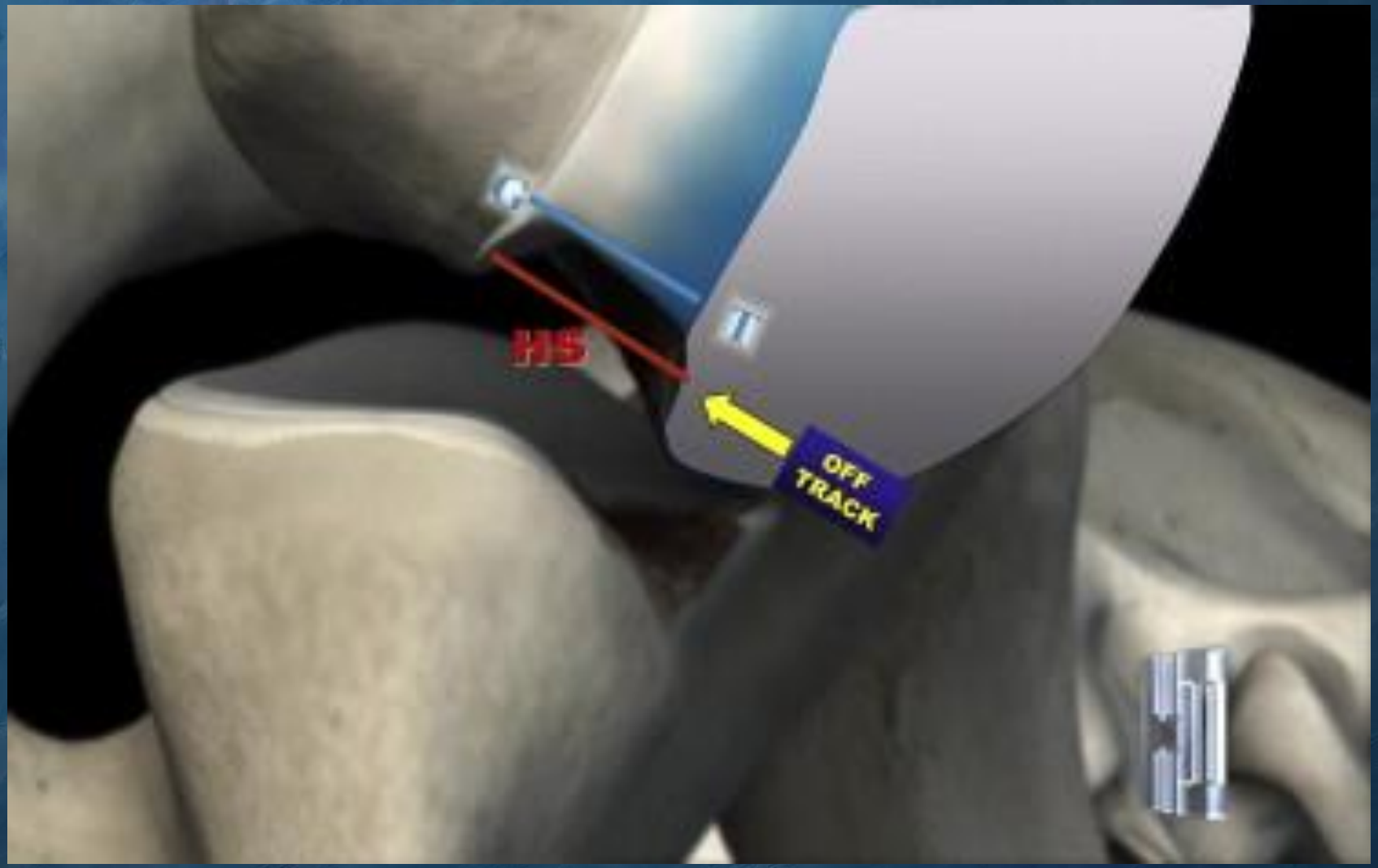
- "Off track" versus "On track" – previous language "Engaging" versus "Non-engaging"
- "Off track" – Hill sachs will "engage" on the glenoid if the size of the Hill-Sachs defect > glenoid articular track
- "On track" – Hill Sachs will NOT engage if the Hill Sachs defect < glenoid articular track

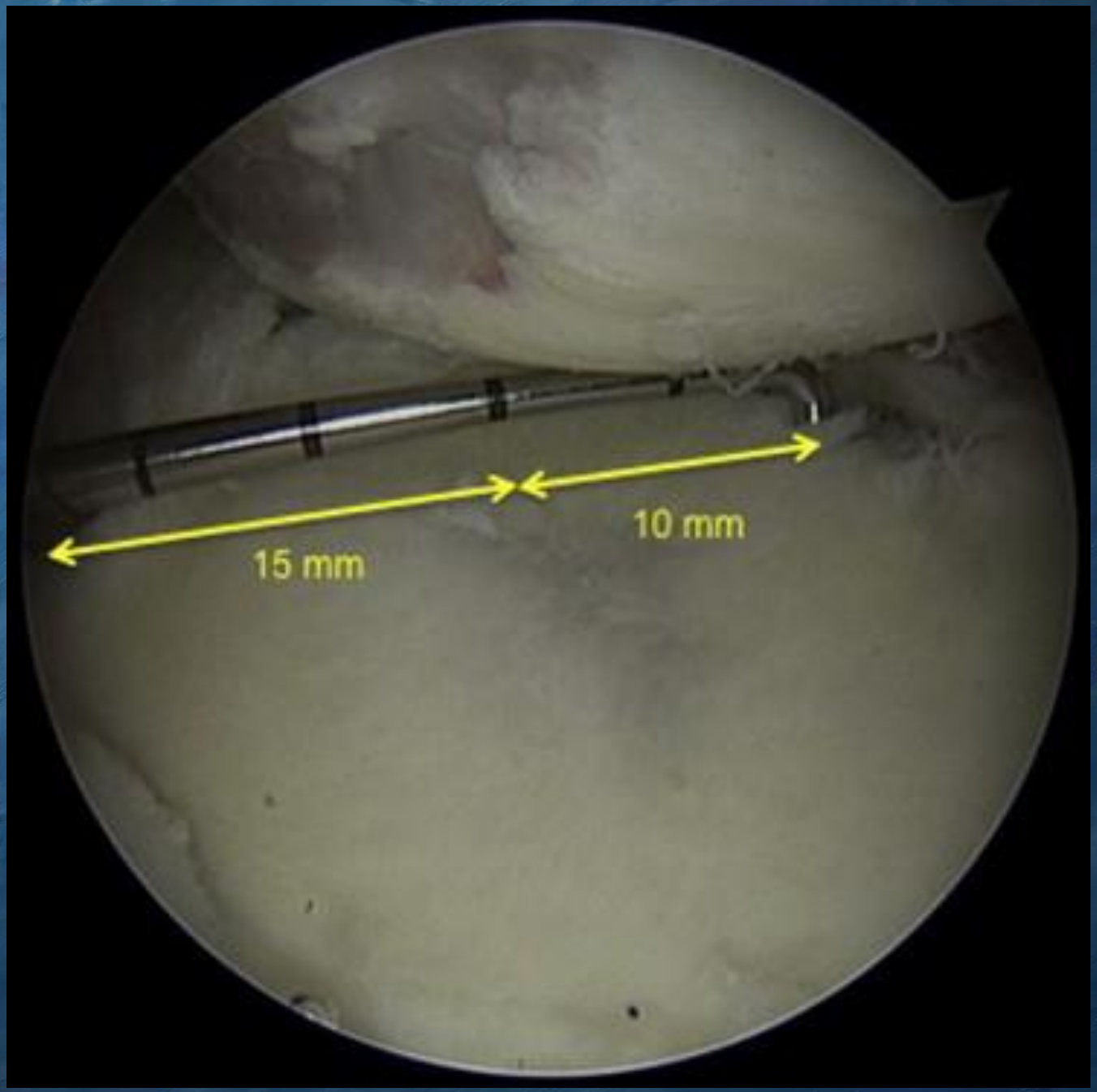
Hill Sachs

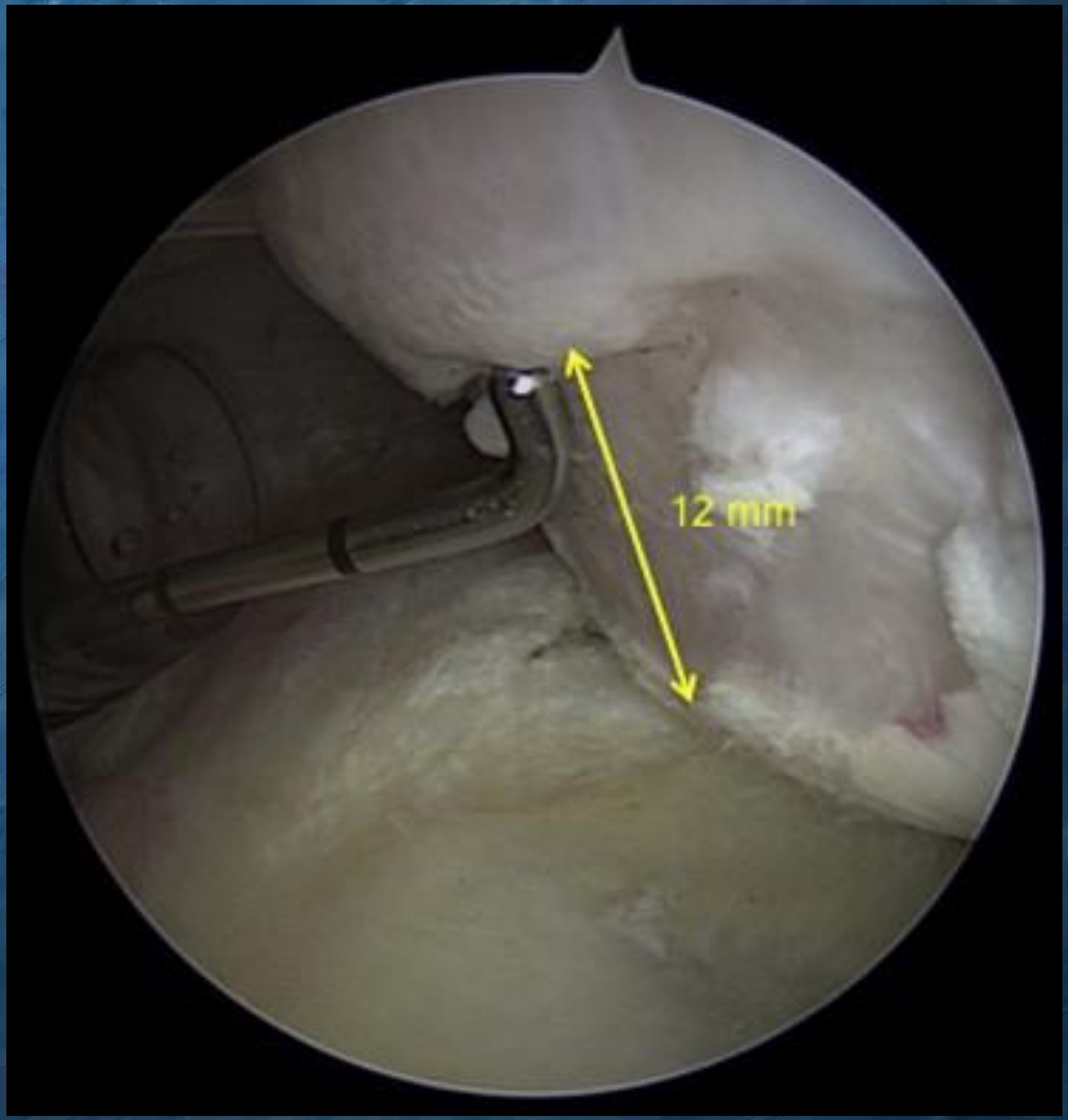
- Surgical Goal – Convert on off-track lesion into an on-track lesion

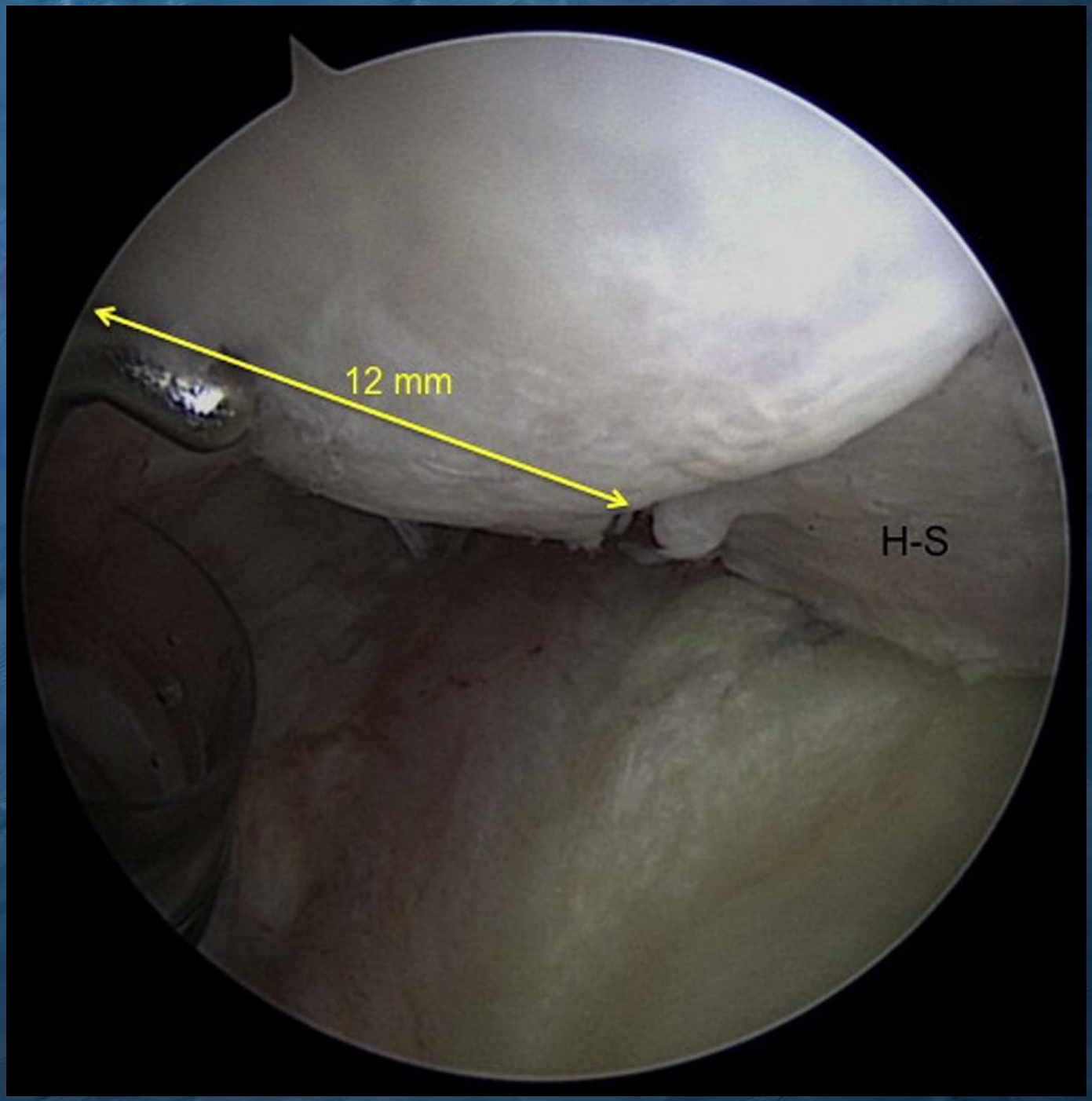

A
D
d
(Dx0.83)-d=GT
B
HSI
GT
HSI<GT= On track
C
HSI
GT
HSI>GT= Off track

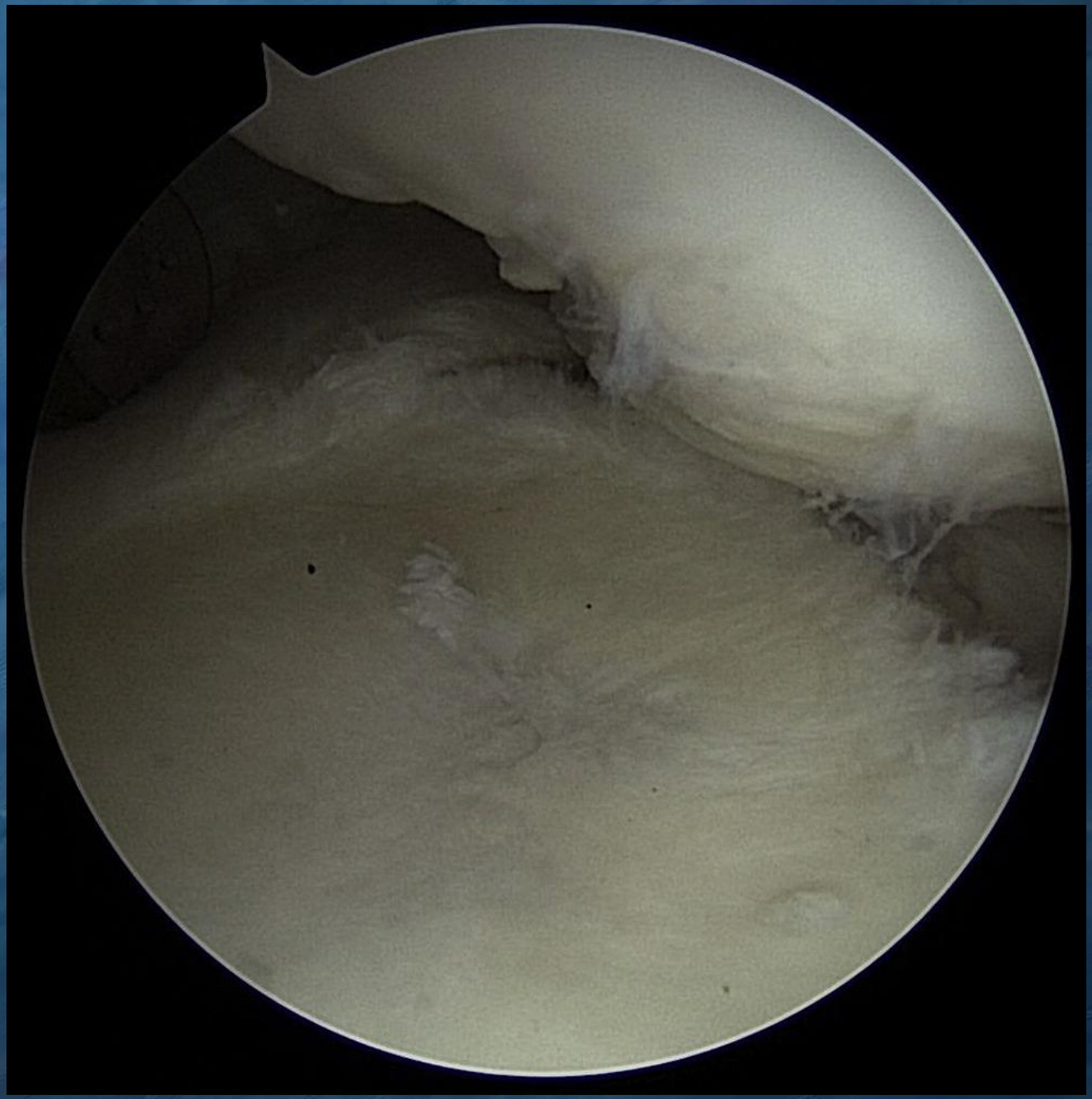

83%
HS
ON
TRACK

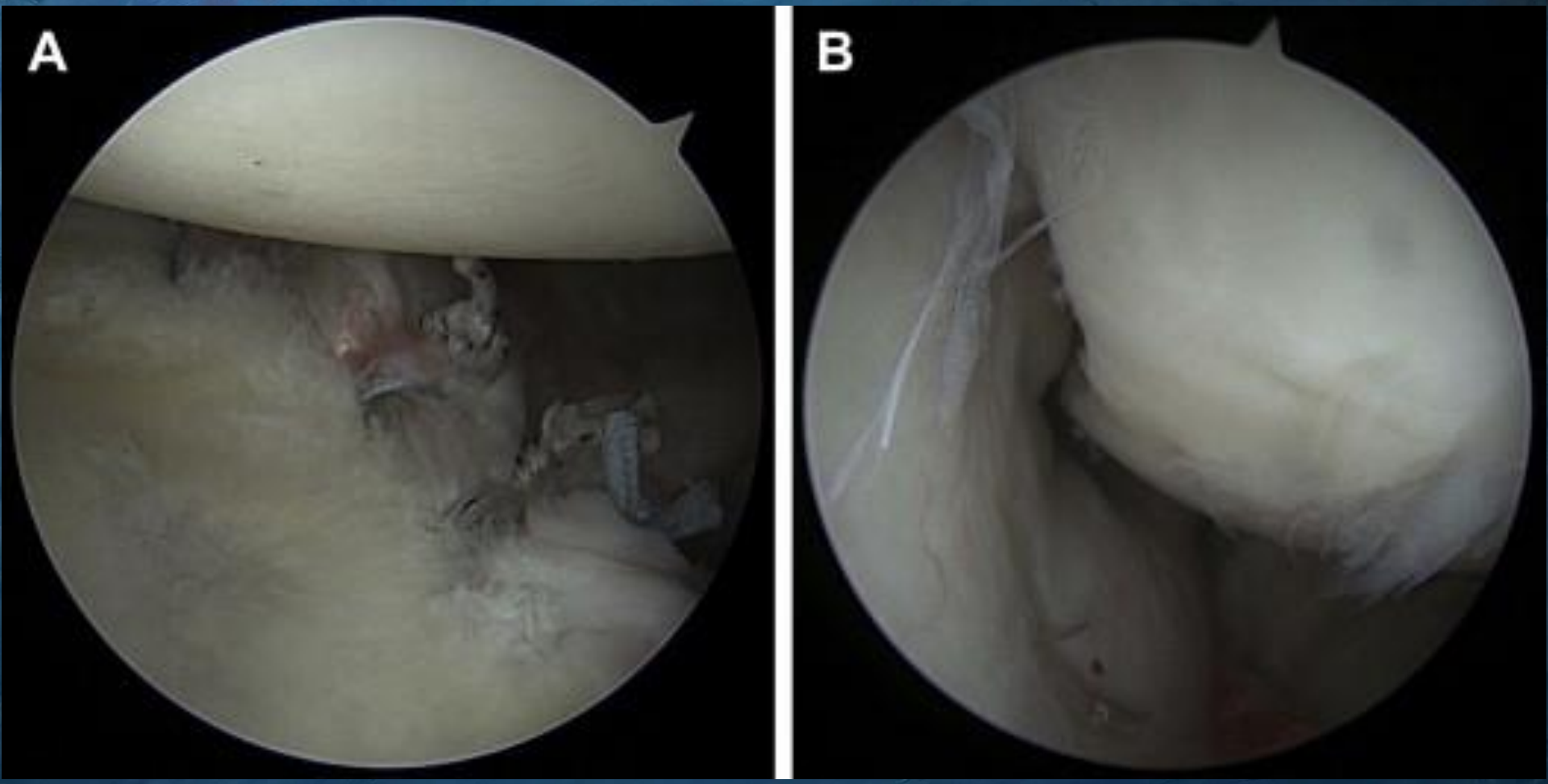

HS
OFF
TRACK

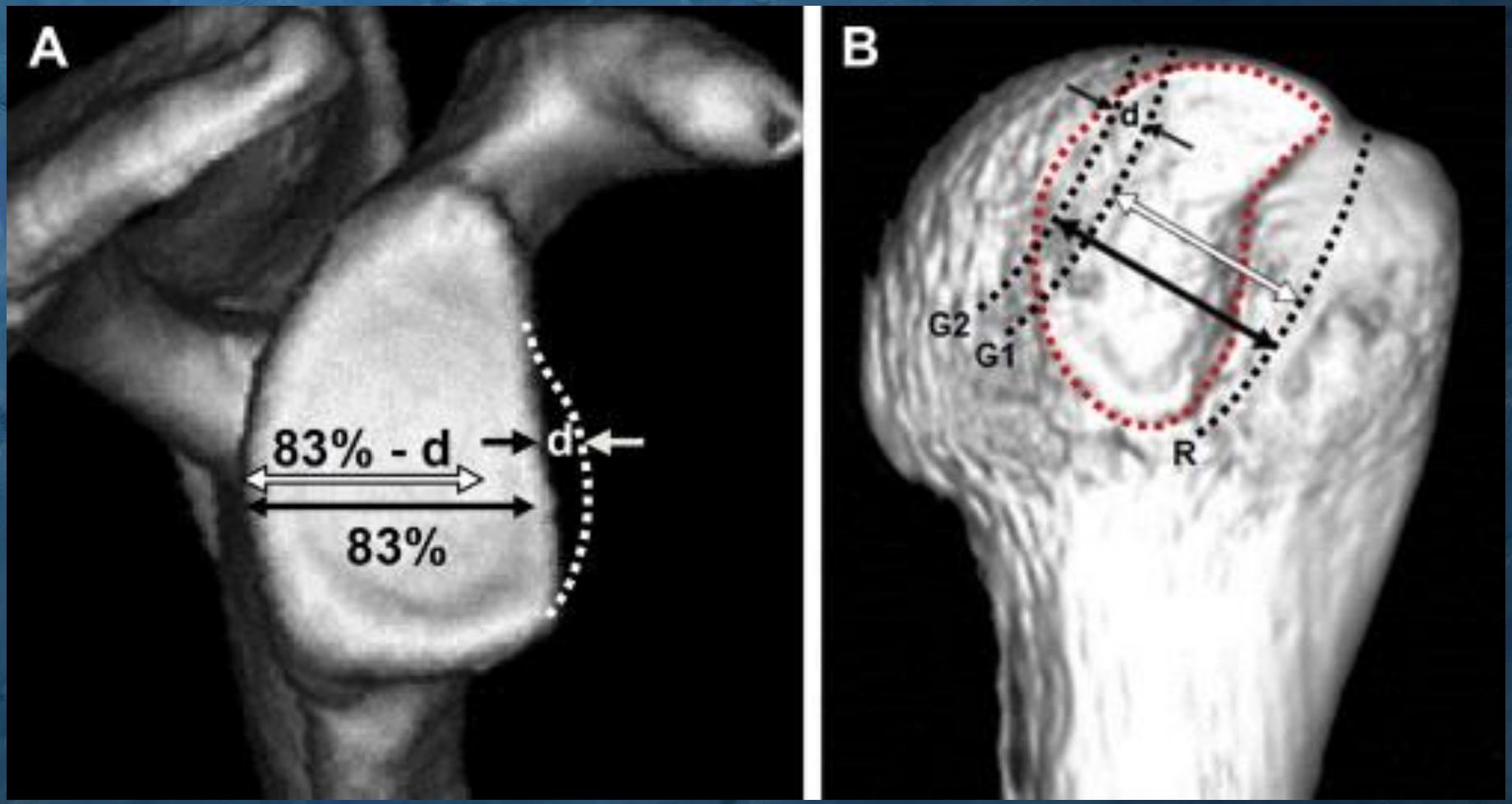

15 mm
10 mm


12 mm

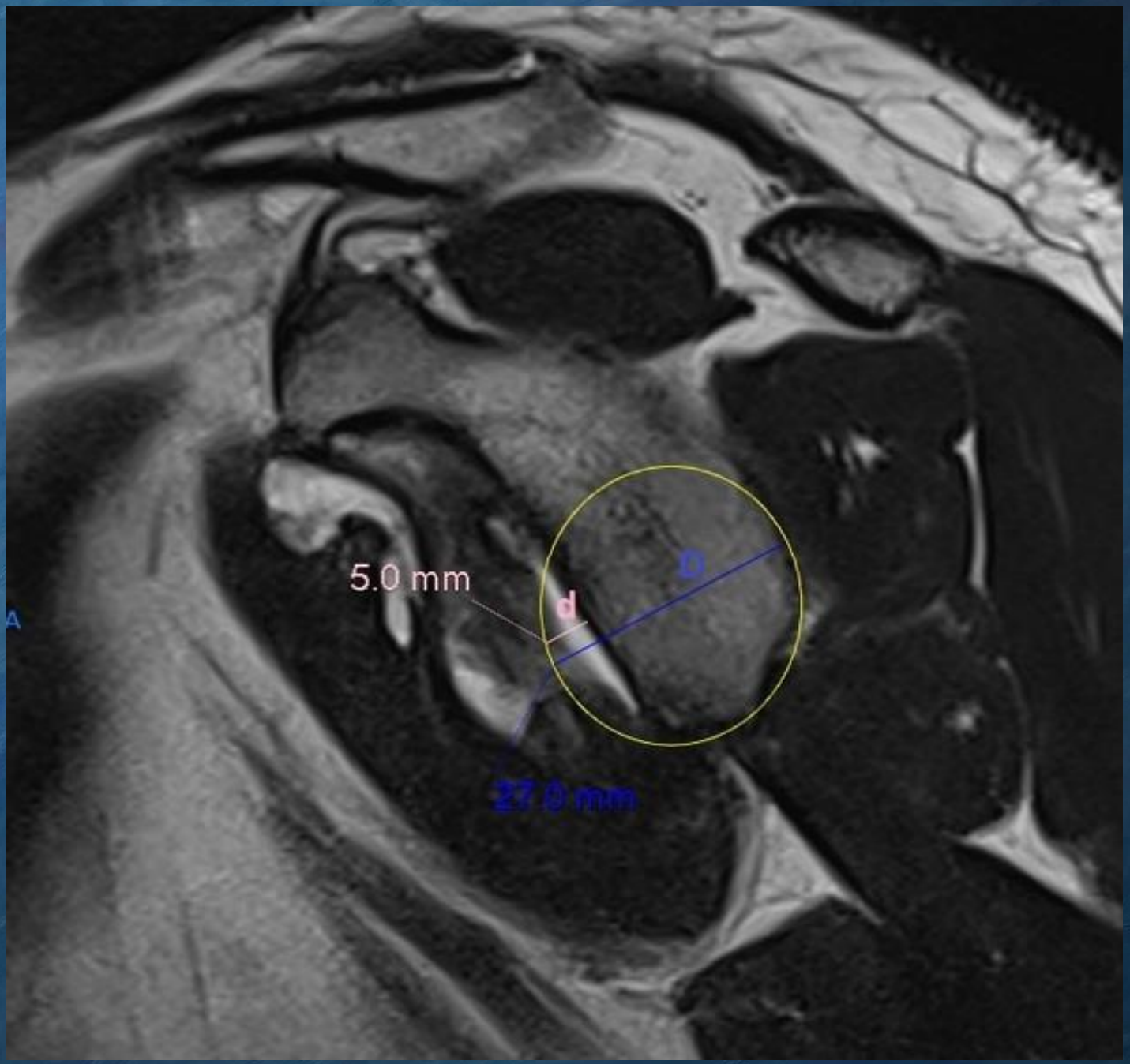

12 mm
H-S

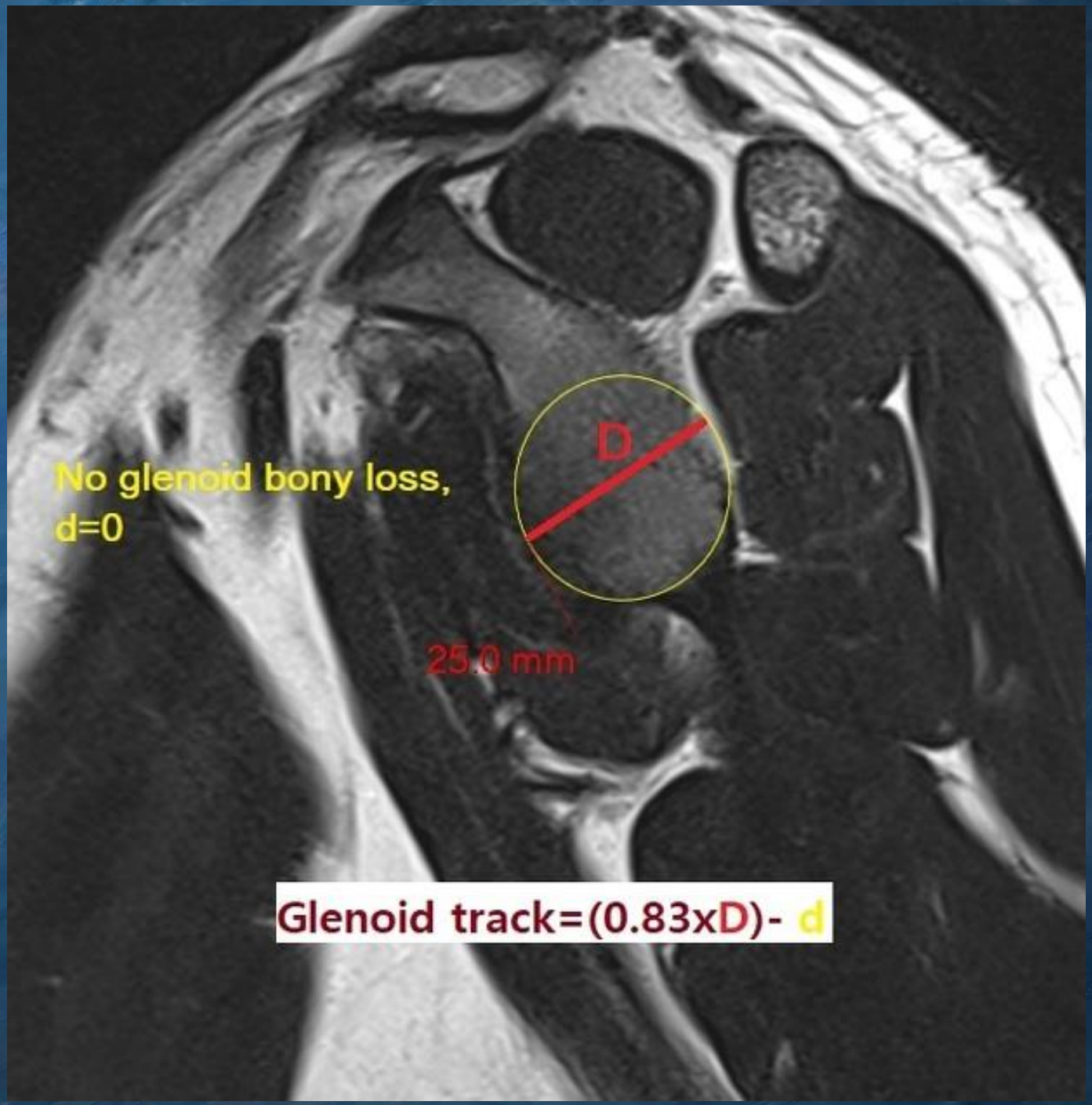



A
B

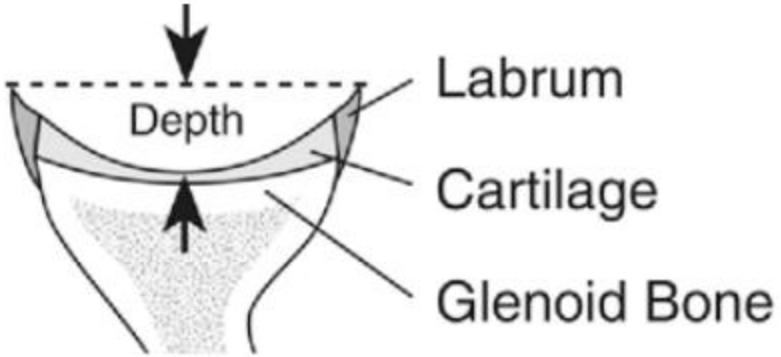

A
83% - d
d
83%
B
d
G2
G1
R


22.9 mm (2D)
F
A
P

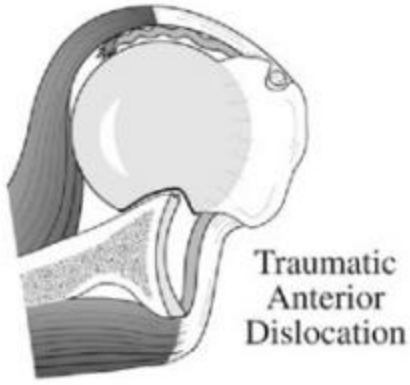

5.0 mm
d
D
27.0 mm

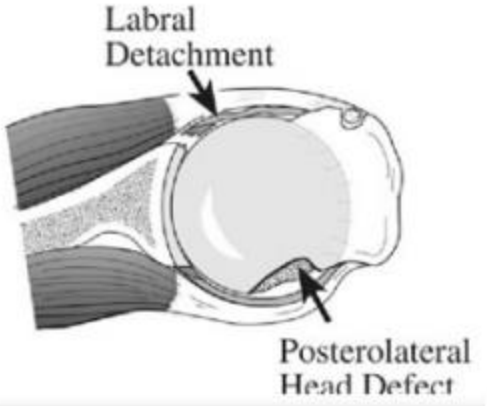

No glenoid bony loss,
d=0
D
25.0 mm
Glenoid track=(0.83xD)- d

Remplissage

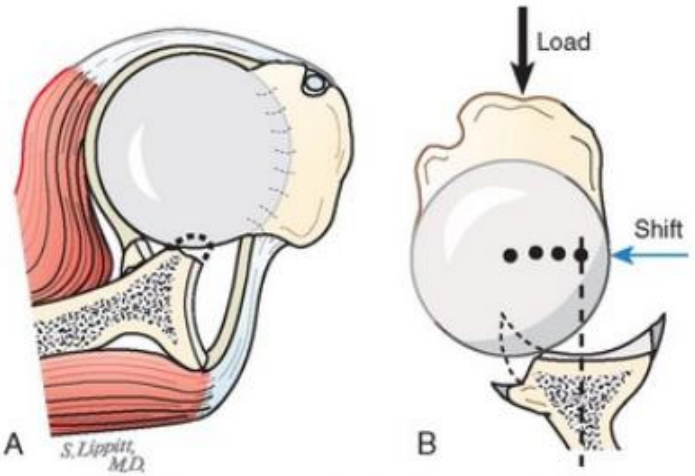


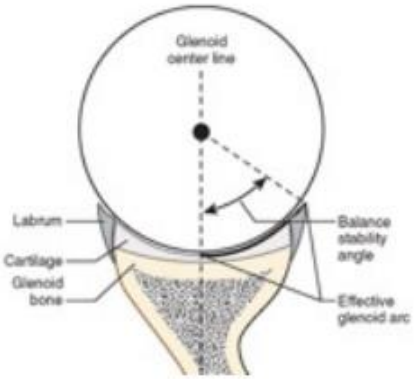
Publisher : Saunders;
1st edition (March 14, 1994)





Effective Glenoid Arc



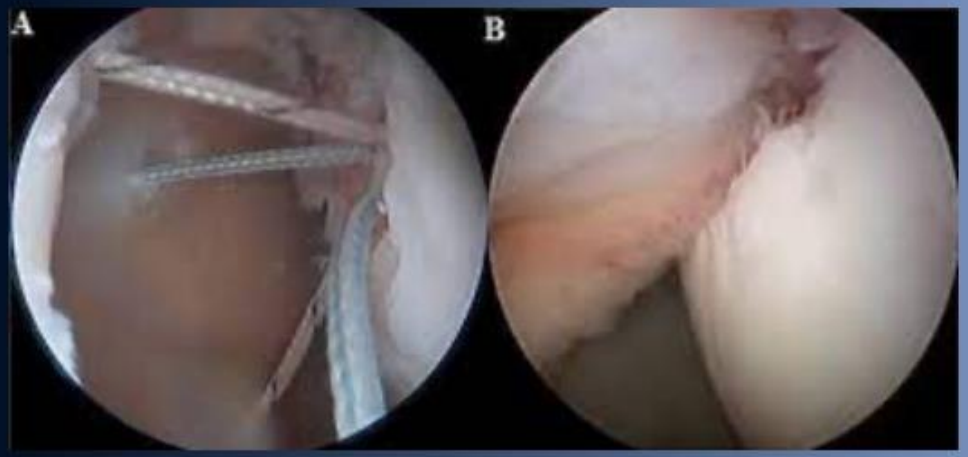


- Arc of the glenoid able to support the net humeral joint reaction force
- Balance stability angle - maximal angle that the net humeral joint reaction force can make with the glenoid center line before dislocation occurs.
- The shape of the bone, cartilage, and labrum all contribute to the effective glenoid arc and the balance stability angle.

Precursor:
On Tract / Off Tract Concept

Question: What does the word “Remplissage” mean?

1. To repair
2. To reconstruct
3. To Stabilize
4. To Fill
5. To bone graft
6. Fix both sides



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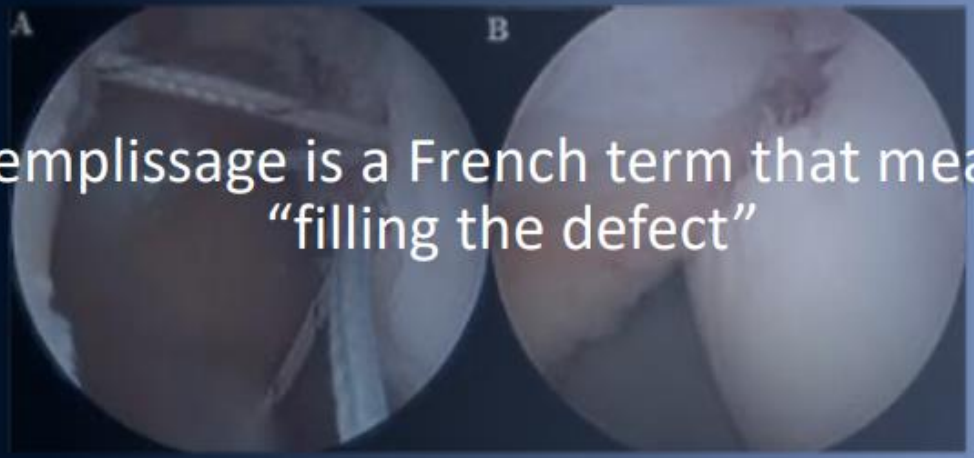
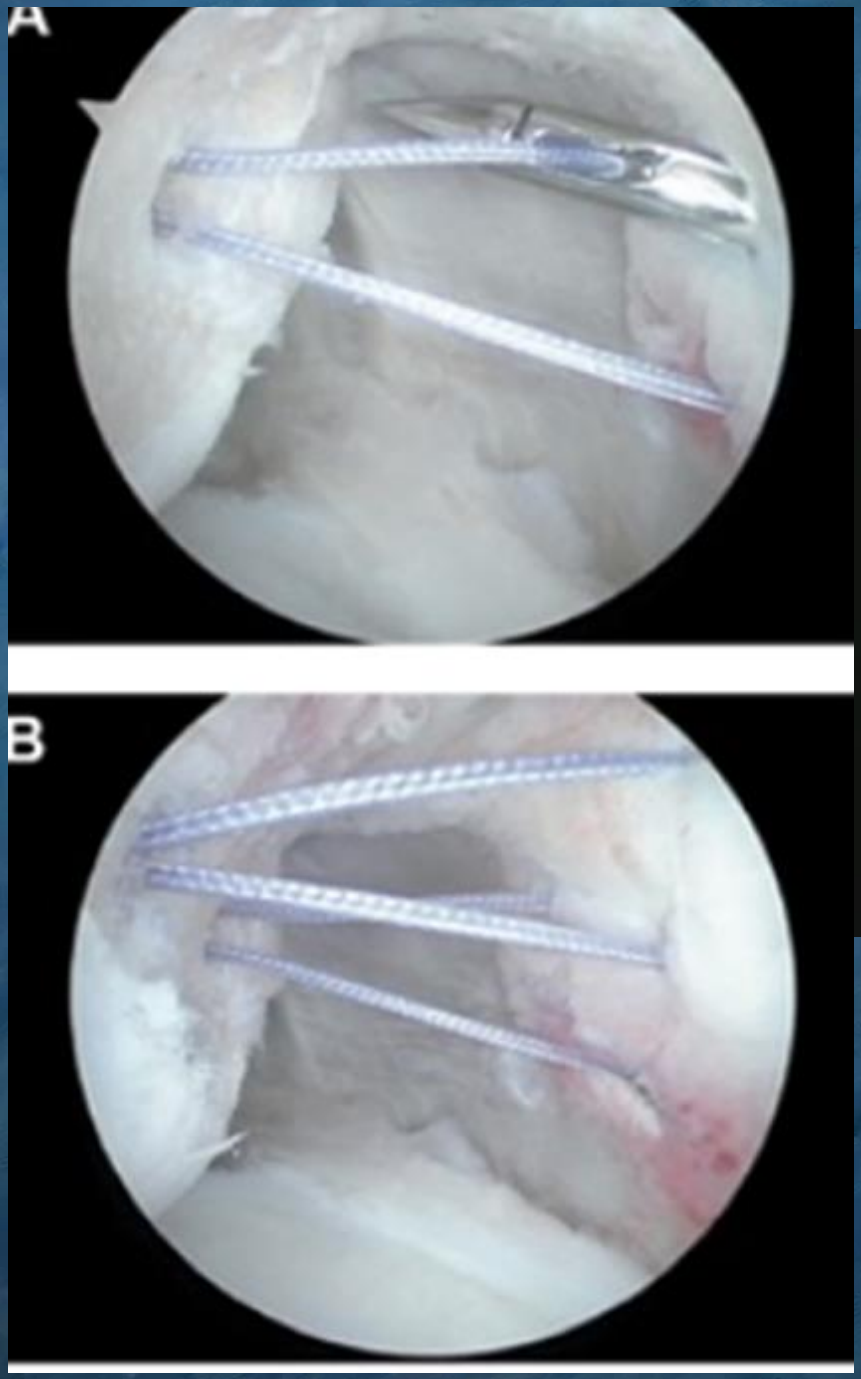
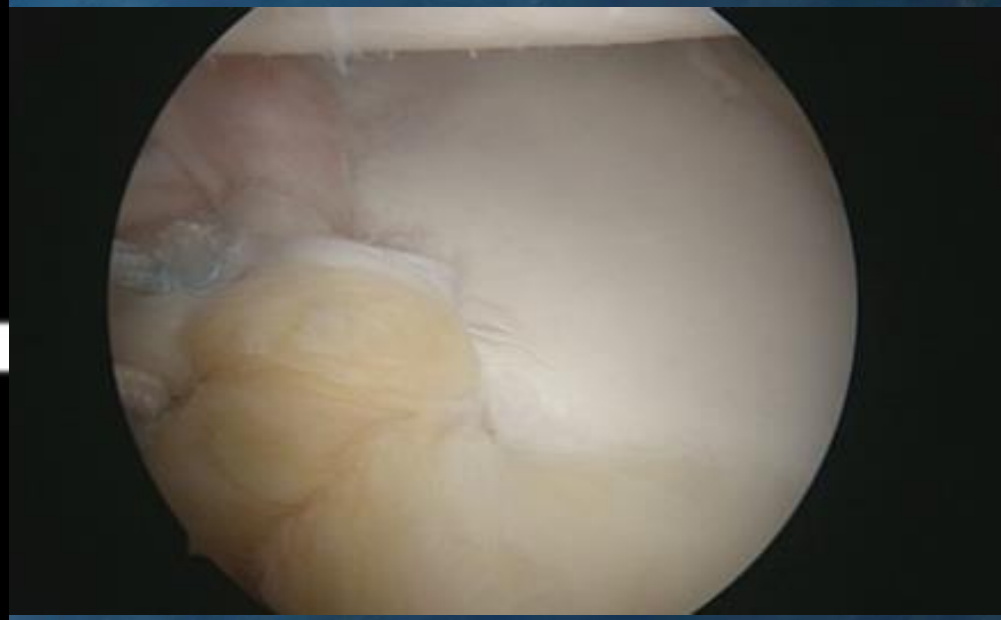


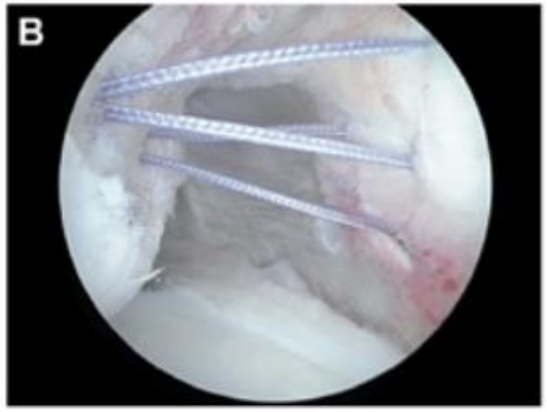
Remplissage is a French term that means "filling the defect"

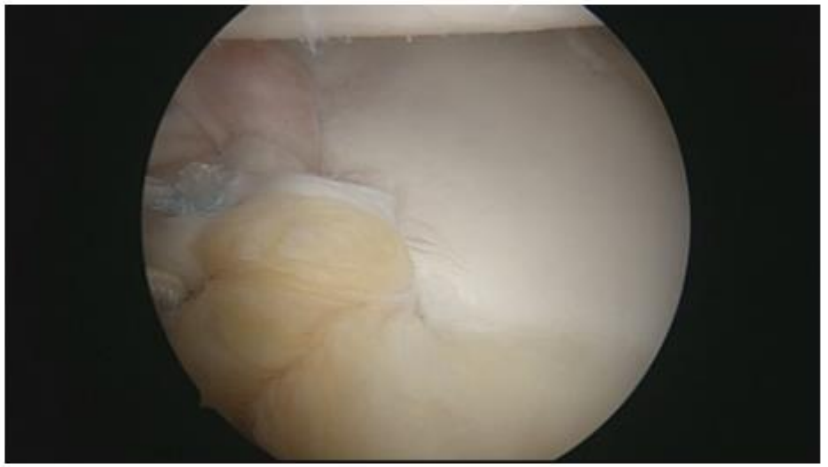

A
B

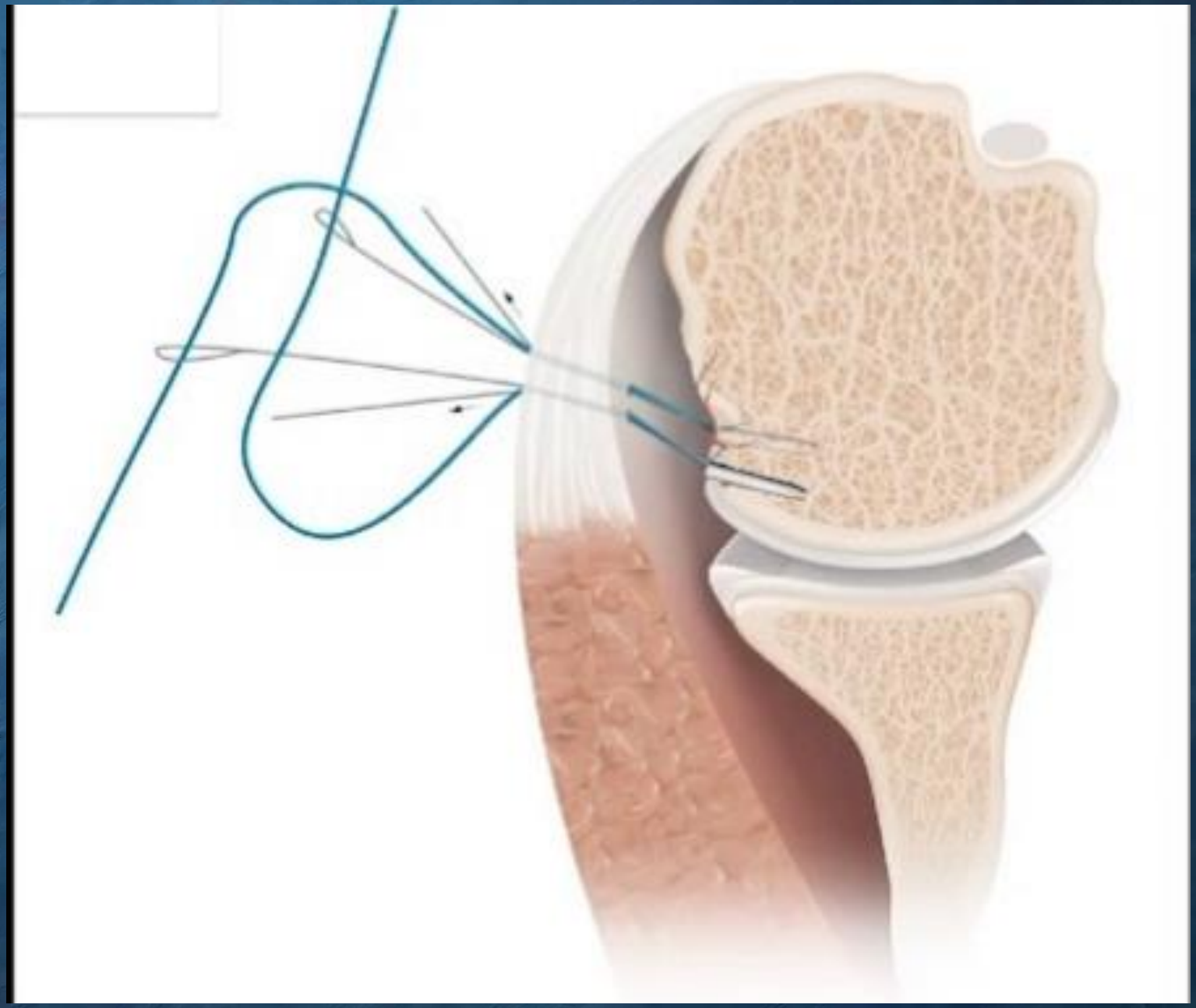


Ideal Patient for Remplissage?

GBL < 13.5% with Engaging or "near" engaging Hill Sachs







REMPLISSAGE

Anterior Shoulder Instability Part II—Latarjet, Remplissage, and Glenoid Bone-Grafting—An International Consensus Statement

Eoghan T. Hurley, M.B., B.Ch., M.Ch., Ph.D., Bogdan A. Matache, M.D., C.M., F.R.C.S.C., Ivan Wong, M.D., F.R.C.S.C., Eiji Itoi, M.D., Ph.D., Eric J. Strauss, M.D., Ruth A. Delaney, F.R.C.S., Lionel Neyton, M.D., George S. Athwal, M.D., F.R.C.S.C., Leo Pauzenberger, M.D., Hannan Mullett, M.Ch., F.R.C.S.I. (Tr & Orth), Laith M. Jazrawi, M.D., and The Anterior Shoulder Instability International Consensus Group

Arthroscopy: The Journal of Arthroscopic and Related Surgery, Vol 38, No 2 (February), 2022: pp 224-233

Table 2. Remplissage

Questions and Answers	Agreement	Consensus
Q: What are the indications for a remplissage procedure?	93%	Strong Consensus
A: The primary relative indications for a remplissage procedure are in the setting of a large Hill-Sachs lesion, either a) off-track on preoperative imaging, or b) engaging at the time of arthroscopy.		
Q: What are the contraindications for a remplissage procedure?	95%	Strong Consensus
A: The primary relative contraindications for a remplissage procedure are relative, but include a) small Hill-Sachs lesion, either on-track on preoperative imaging or nonengaging at arthroscopy, b) severe glenoid bone loss, c) preoperative stiffness, d) infraspinatus compromise, and e) overhead athlete.		
Q: Should a remplissage procedure ever be indicated in isolation?	82%	Consensus
A: A remplissage procedure may be indicated in isolation in the setting of a previous Latarjet procedure with recurrent instability where there is a large Hill-Sachs lesion.		
Q: What prognostic factors should be considered in patients undergoing a remplissage?	98%	Strong Consensus
A: The prognostic factors that are important to consider specifically in those undergoing a remplissage procedure include: a) activity level, b) Hill-Sachs size, c) Hill-Sachs track, d) glenoid bone-loss, and e) connective tissue disorder.		
Q: To what degree are complications a concern following a remplissage procedure? How can complications be reduced?	98%	Strong Consensus
A: Loss of external range of motion is a small concern and unlikely to be clinically significant in most patients. This can be minimized by fixing the tendon via the safe zone and not overmedializing the fixation.		
Q: How should the infraspinatus/posterior capsule be fixed to the Hill-Sachs defect?	98%	Strong Consensus
A: There is no ideal fixation method for the infraspinatus/posterior capsule to the Hill-Sachs defect.		
Q: If knotted anchors are used, should the sutures be tied under direct visualization in the subacromial	97%	Strong Consensus

PRIMARY INDICATIONS:

- Large Hill-Sachs lesion
- Off-track on preop assessment
- Engaging at arthroscopy

Multicenter Study > J Shoulder Elbow Surg. 2023 Jun;32(6S):S99-S105. doi: 10.1016/j.jse.2023.02.011. Epub 2023 Feb 23.

Remplissage reduces recurrent instability in high-risk patients with on-track Hill-Sachs lesions

Albert Lin [1], Aaron E Barrow [1], Shaquille Charles [1], Michael Shannon [1], Michael A Fox [1], Zachary J Herman [1], Justin J Greiner [1], Jonathan D Hughes [1], Patrick J Denard [2], Pablo Narbona [3], Bryson P Lesniak [1], Dharmesh Vyas [4]

Affiliations + expand

PMID: 36828289 DOI: 10.1016/j.jse.2023.02.011

Randomized Controlled Trial > J Shoulder Elbow Surg. 2021 Jun;30(6):1288-1298. doi: 10.1016/j.jse.2020.11.013. Epub 2020 Dec 26.

Arthroscopic Bankart repair with and without arthroscopic infraspinatus remplissage in anterior shoulder instability with a Hill-Sachs defect: a randomized controlled trial

Peter MacDonald [1], Sheila McRae [2], Jason Old [3], Jonathan Marsh [3], Jamie Dubberley [3], Greg Stranges [3], James Koenig [3], Jeff Leiter [2], Randy Mascarenhas [4], Sharad Prabhakar [5], Treny Sasyniuk [6], Peter Lapner [7]

Affiliations + expand

PMID: 33373683 DOI: 10.1016/j.jse.2020.11.013

Clinical Trial > Arthroscopy. 2023 Mar;39(3):692-702. doi: 10.1016/j.arthro.2022.10.013. Epub 2022 Oct 28.

Remplissage in Addition to Arthroscopic Bankart Repair for Shoulder Instability With On-Track Hill-Sachs Lesions Reduces Residual Apprehension Without External Rotation Limitation

Woojin Yu [1], Hyojune Kim [2], Jeong-Hyeon Seo [1], In-Ho Jeon [1], Kyoung Hwan Koh [3]

Affiliations + expand

PMID: 37194109 DOI: 10.1016/j.arthro.2022.10.013

> Am J Sports Med. 2023 Jan 9;3635465221138559. doi: 10.1177/03635465221138559. Online ahead of print.

Arthroscopic Remplissage Combined With Bankart Repair Results in a Higher Rate of Return to Sport in Athletes Compared With Bankart Repair Alone or the Latarjet Procedure: A Systematic Review and Meta-analysis

William H Davis [1], Jake A DiPasquale [1], Reema K Patel [1], Alexis B Sandler [2], John P Scanaliato [2], John C Dunn [2], Nata Parnes [3 4]

Affiliations + expand

PMID: 36622005 DOI: 10.1177/03635465221138559

Latarjet (Coracoid Transfer) For Glenoid bone loss

- Bony deficiency >20-25%
- With bone loss, excessive stress transferred to anterior soft tissues increasing risk of failure of soft tissue repair alone
- Transfer of coracoid with attached conjoined tendon (short head biceps, pectoralis minor tendon)

Latarjet (Coracoid transfer)

- Triple effect
  - Bone – increases glenoid track
  - Sling – conjoined tendon above the subscapularis
  - Capsule reconstruction/repair

  - Recurrent instability 0-8%
  - Good to excellent results in >90% patients

J Shoulder Elbow Surg (2019) 28, 88–94

ELSEVIER

Journal of Shoulder and Elbow Surgery

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Ninety-day complications following the Latarjet procedure

Rachel M. Frank, MD[a,*], Bonnie Gregory, MD[b], Michael O'Brien, MA[b], Eamon Bernardoni, MD[c], Nikhil N. Verma, MD[b], Brian J. Cole, MD, MBA[b], Gregory P. Nicholson, MD[b], Anthony A. Romeo, MD[d]

133 Patients

75% Male

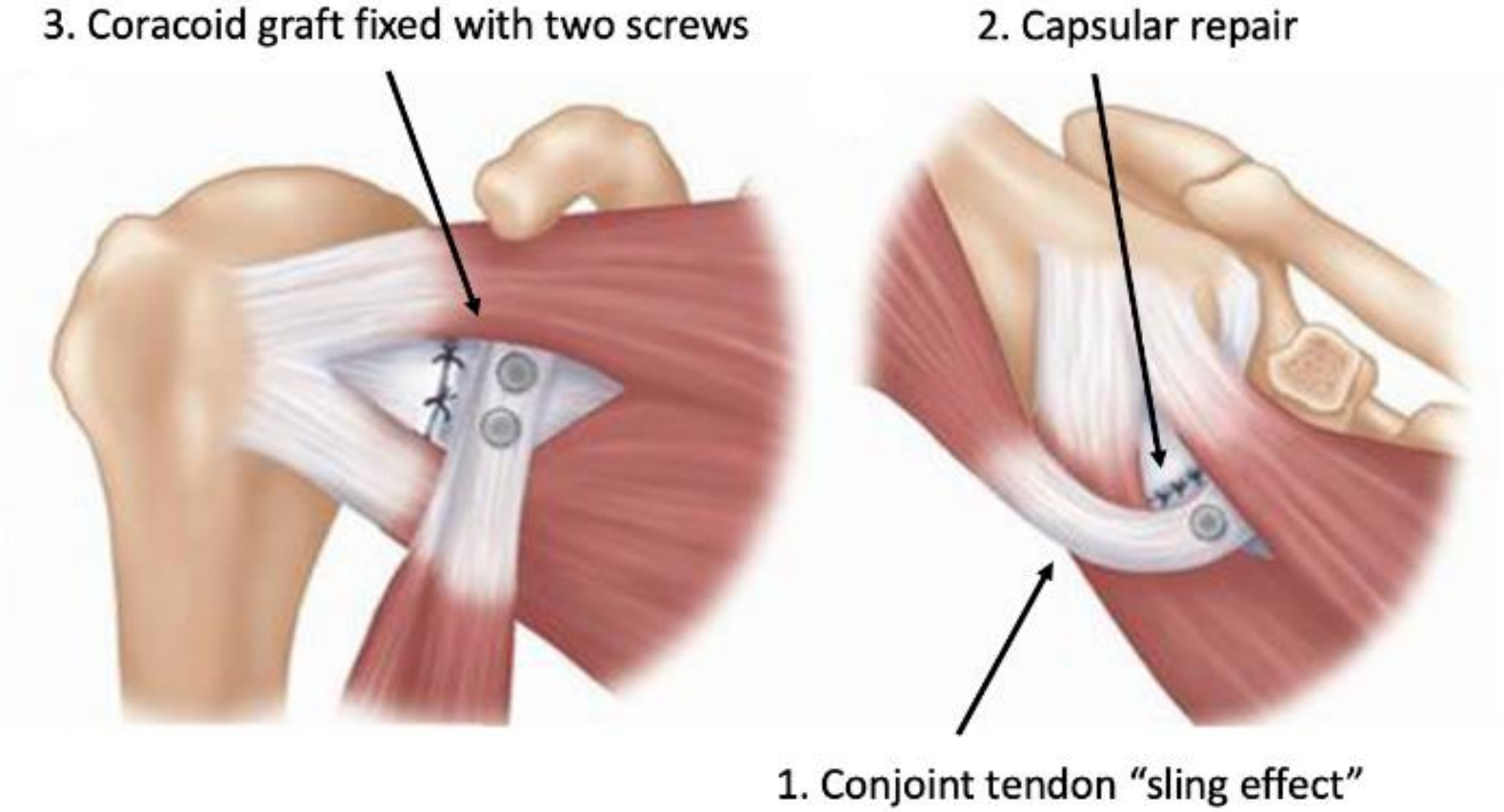
92 Patients had 1-3 Prior Surgeries (70%)

Conclusions

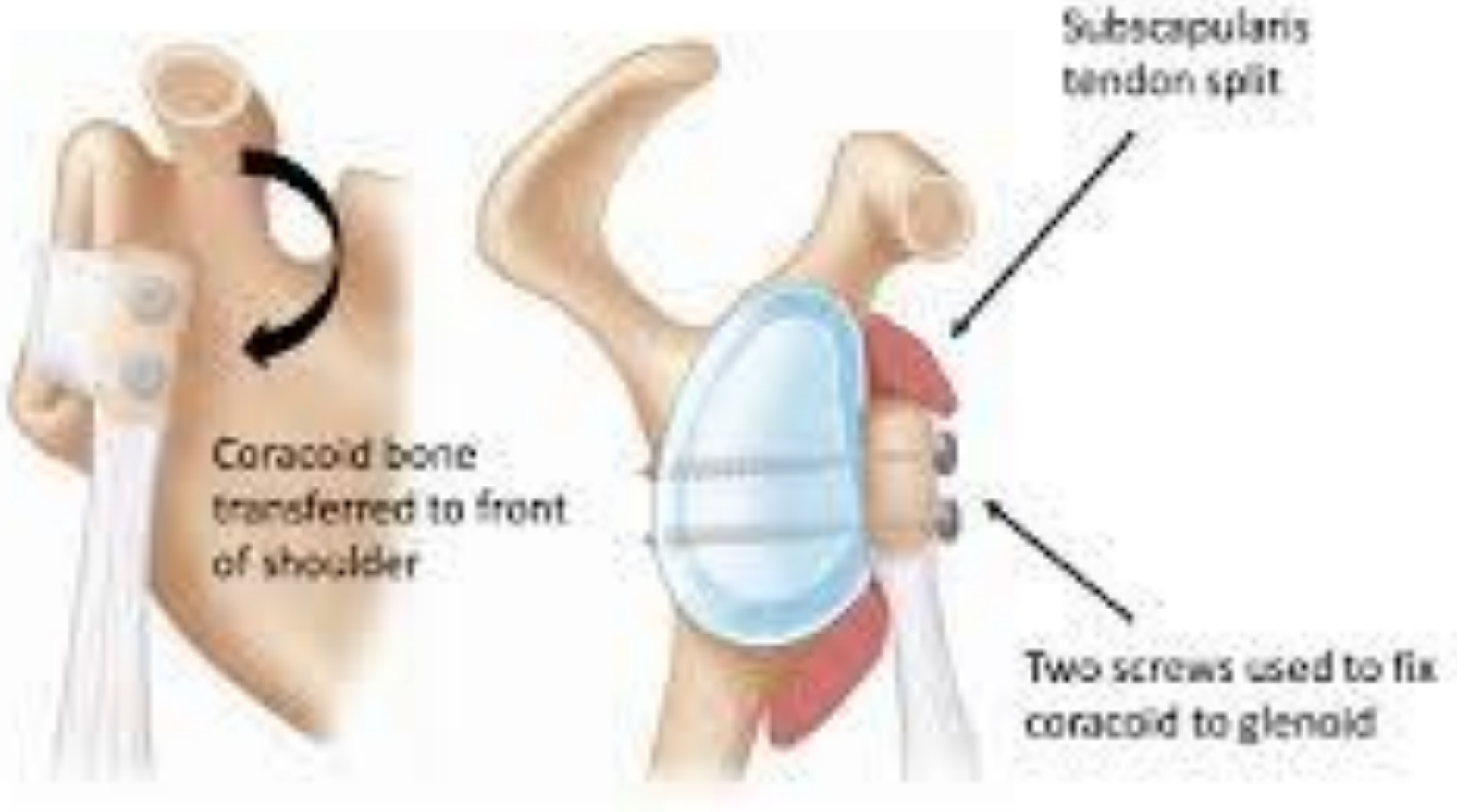
The overall 90-day complication rate following the Latarjet procedure for anterior shoulder stabilization was 7.5%, substantially lower than the previously described rate of 25%. In 6 of the 10 cases, complications led to subsequent surgery, including 2 conversions to arthroplasty, while in the remaining 4 cases, the complications were transient and resolved with nonoperative treatment. This information can be used to counsel patients on the risks of early complications following the Latarjet procedure.

Overall: 7.5%
Permanent: 5%

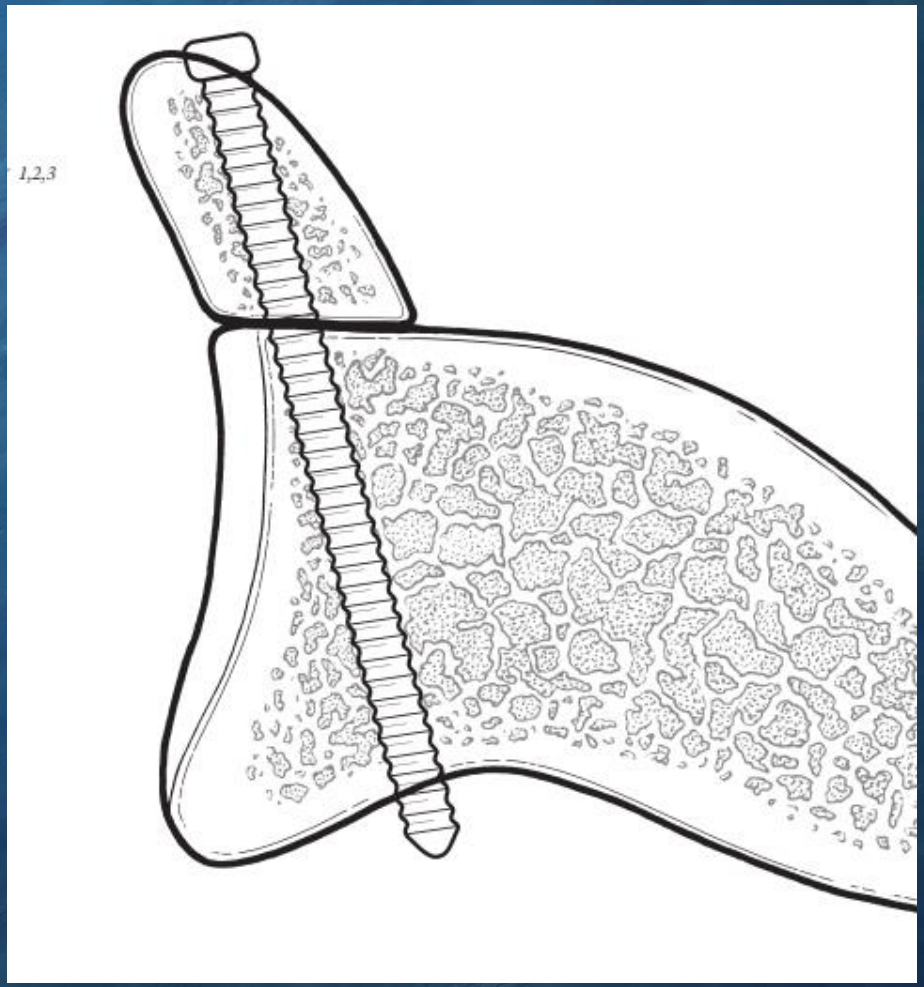
2 recurrent instability, 2 infections, 1 musculocutaneous palsy, 1 persistent pain, 1 dehiscence, 1 hematoma, 1 CRPS, 1 ulnar neuritis

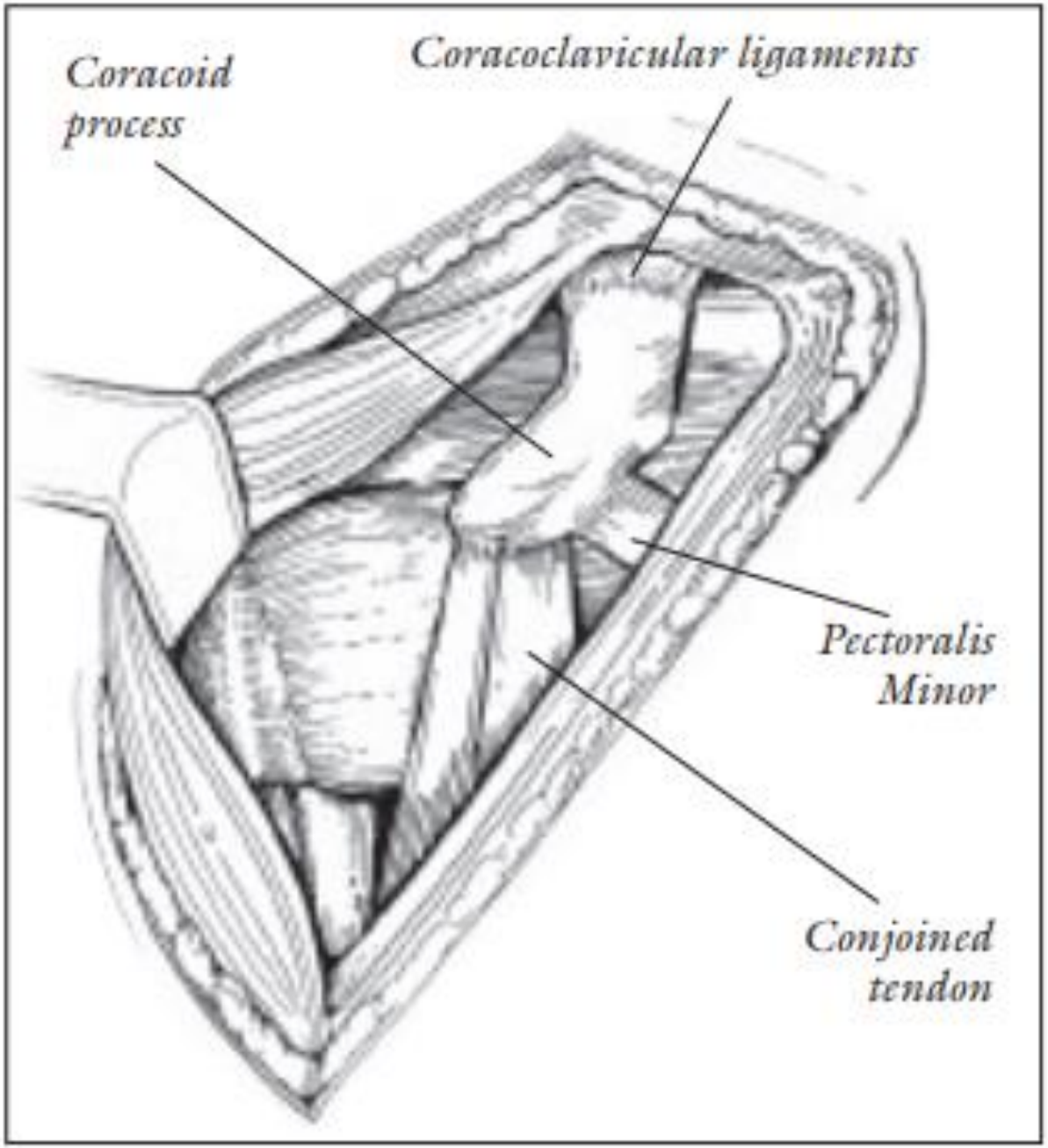


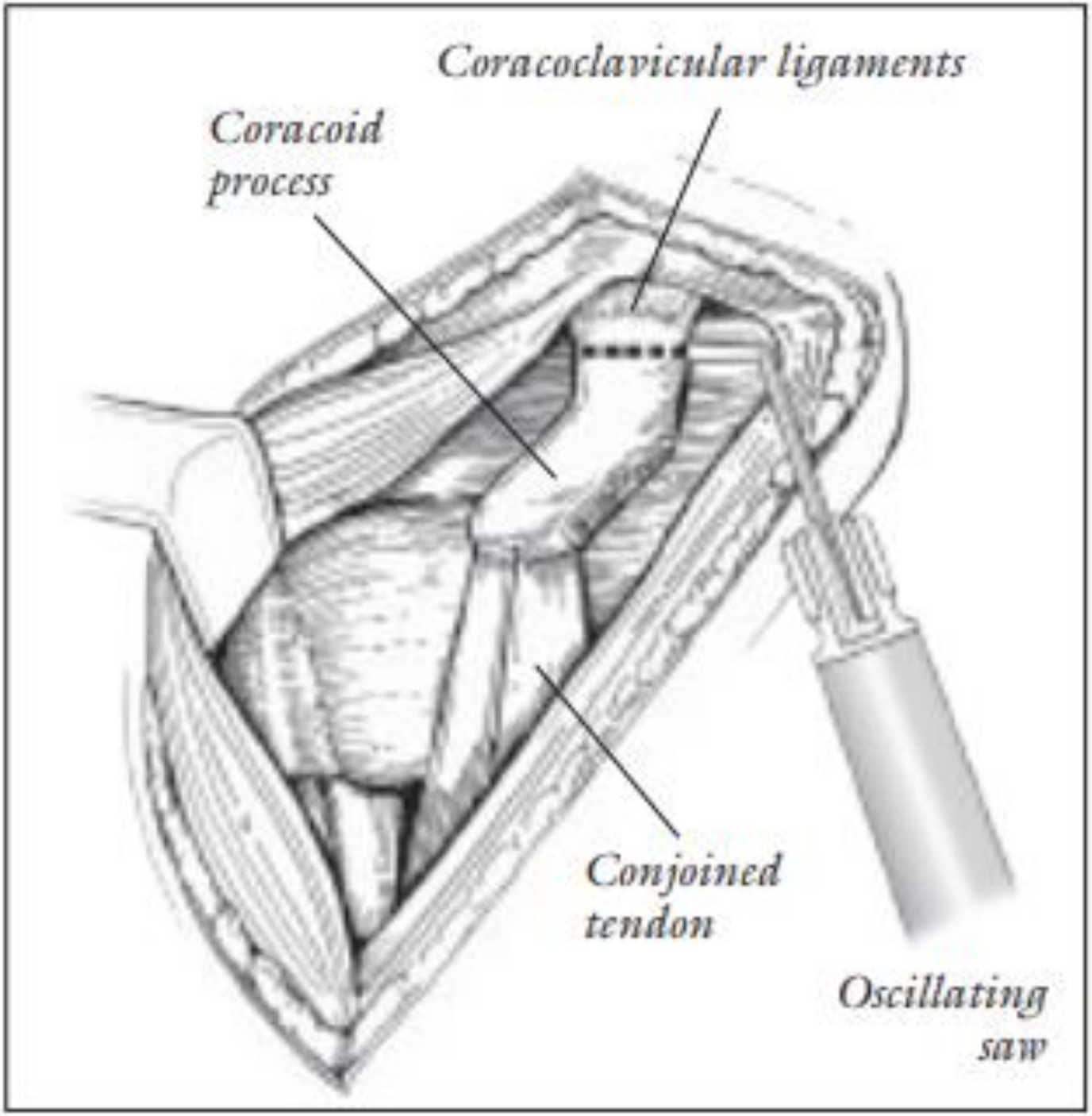
Principles of the Latarjet Procedure

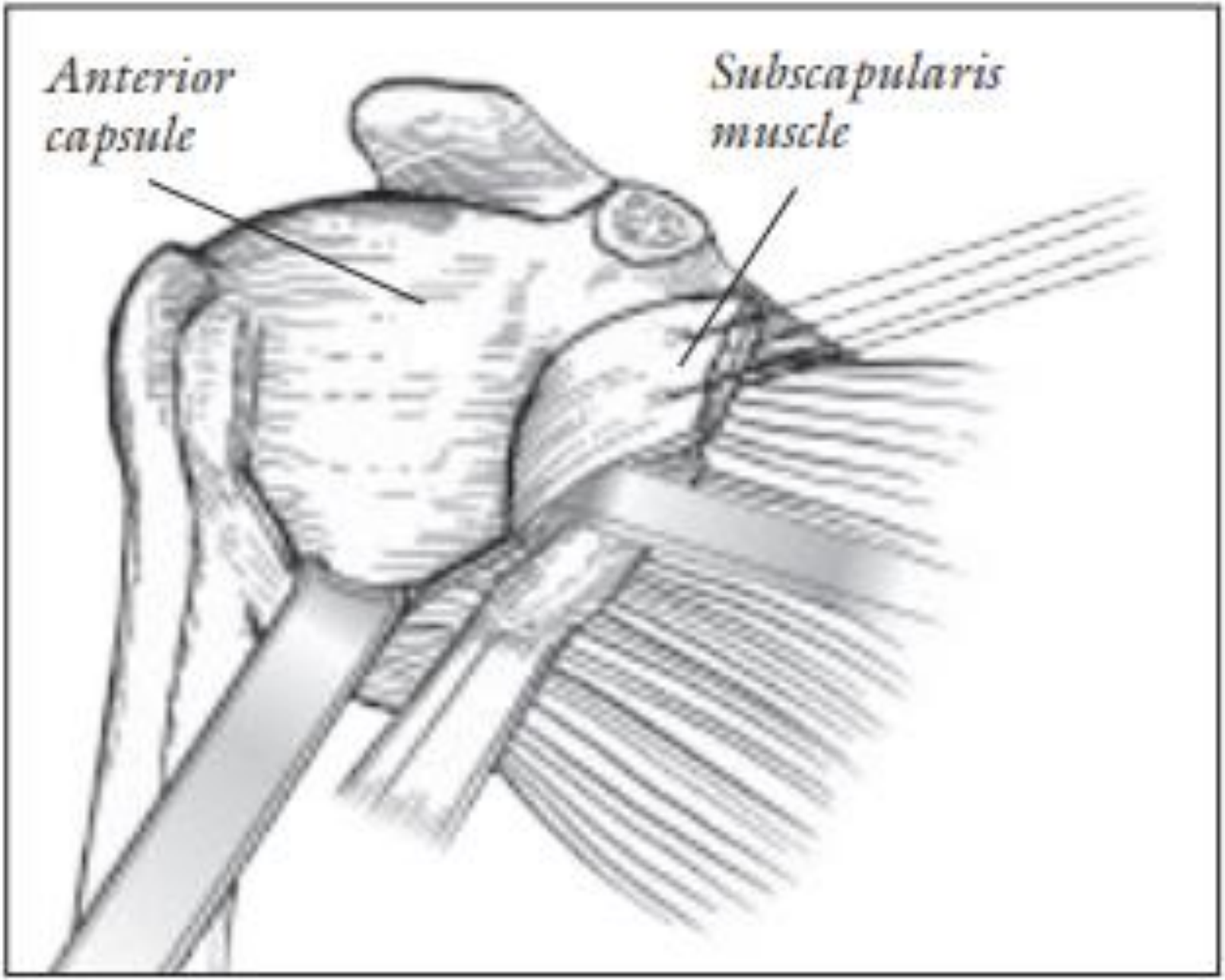

Subscapularis tendon split
Coracoid bone transferred to front of shoulder
Two screws used to fix coracoid to glenoid

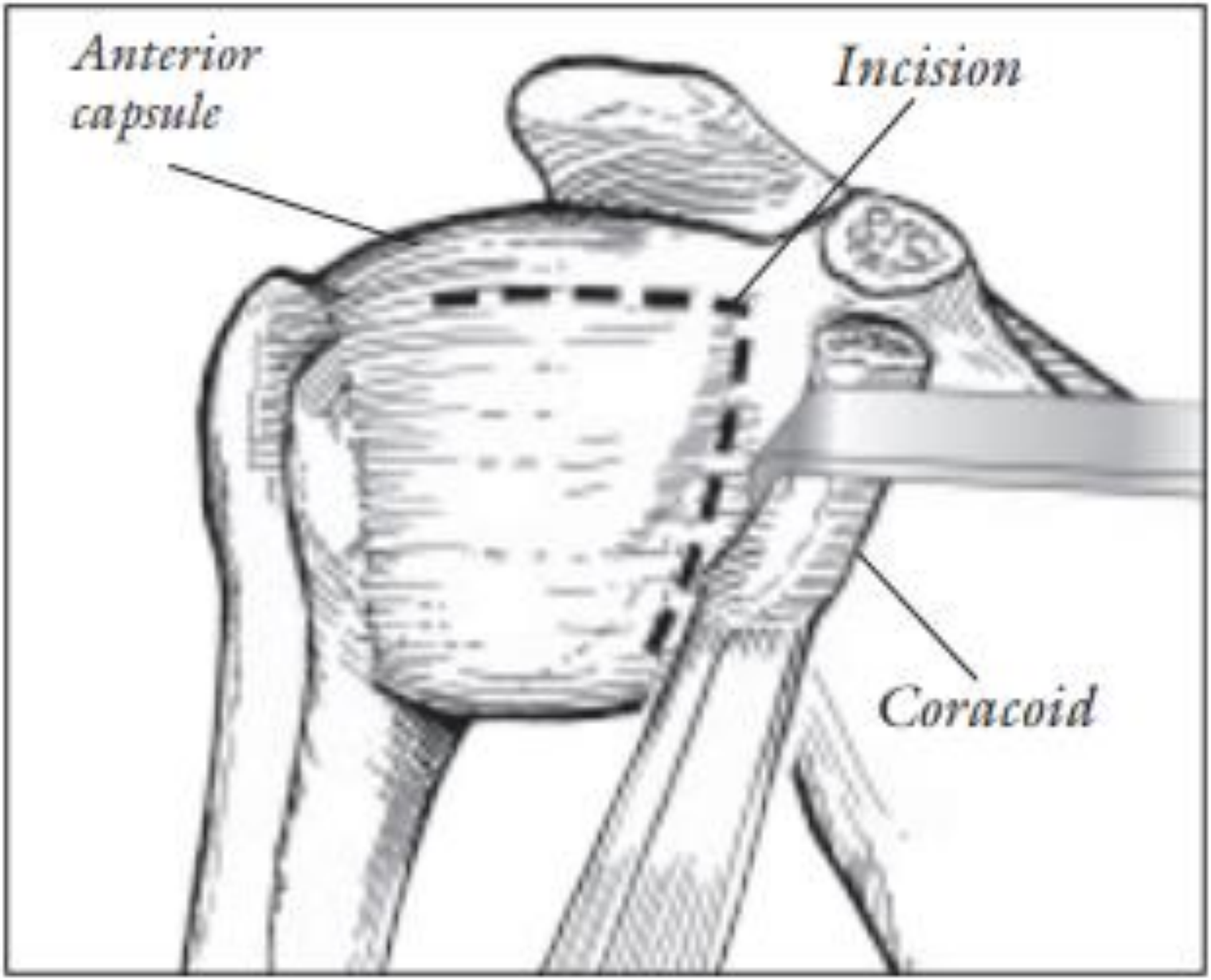
1,2,3

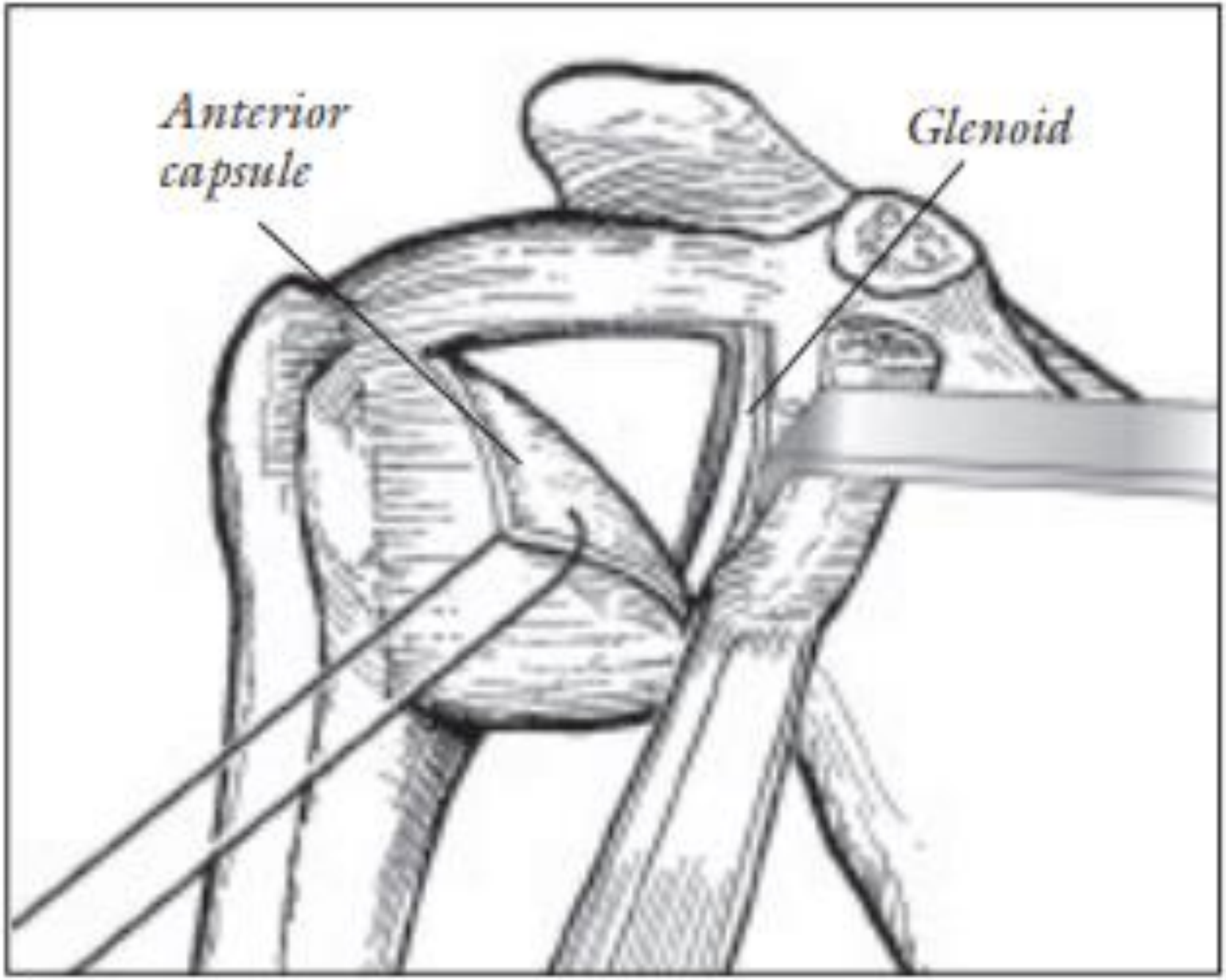


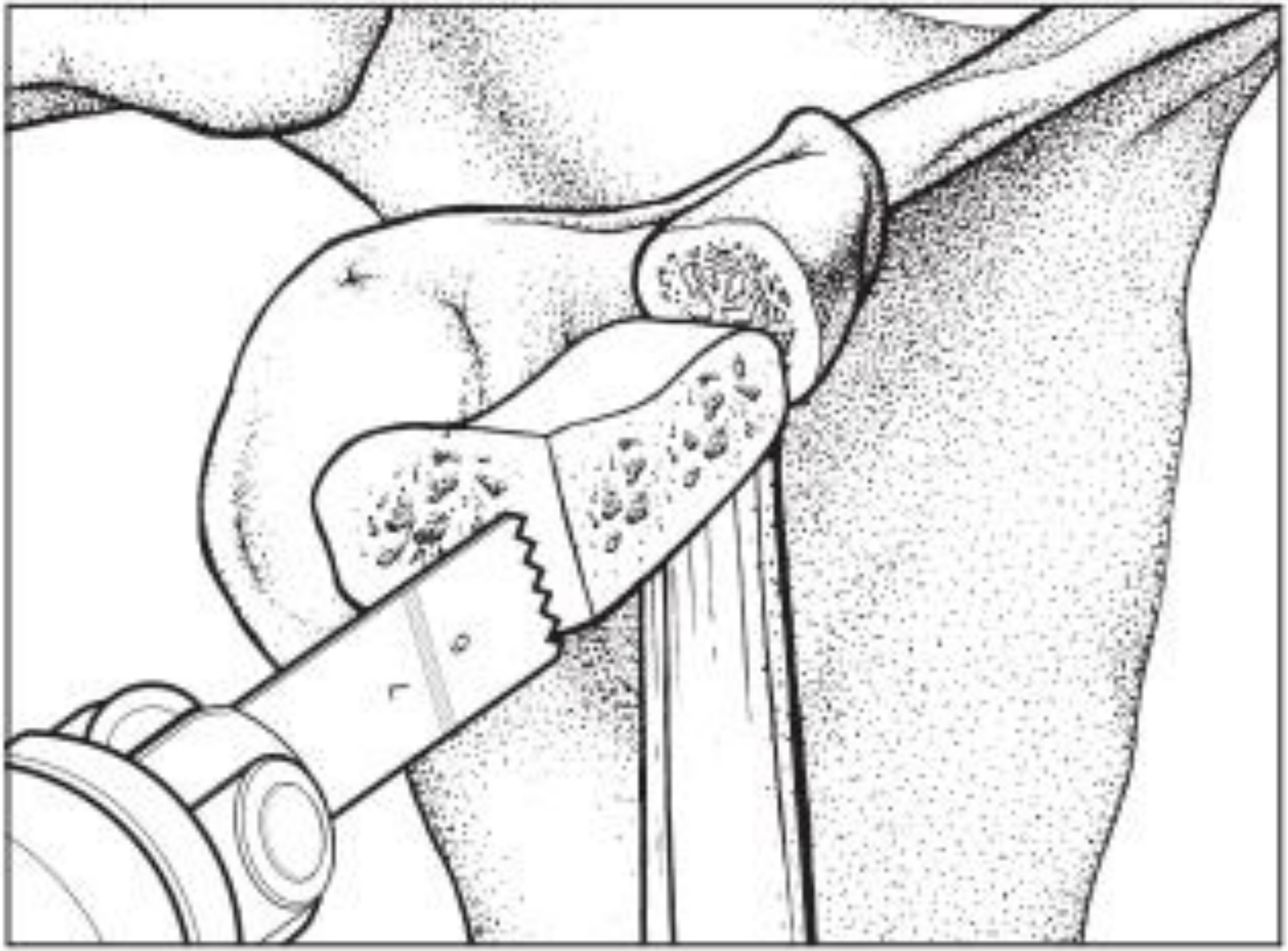

Coracoid process
Coracoclavicular ligaments
Pectoralis Minor
Conjoined tendon

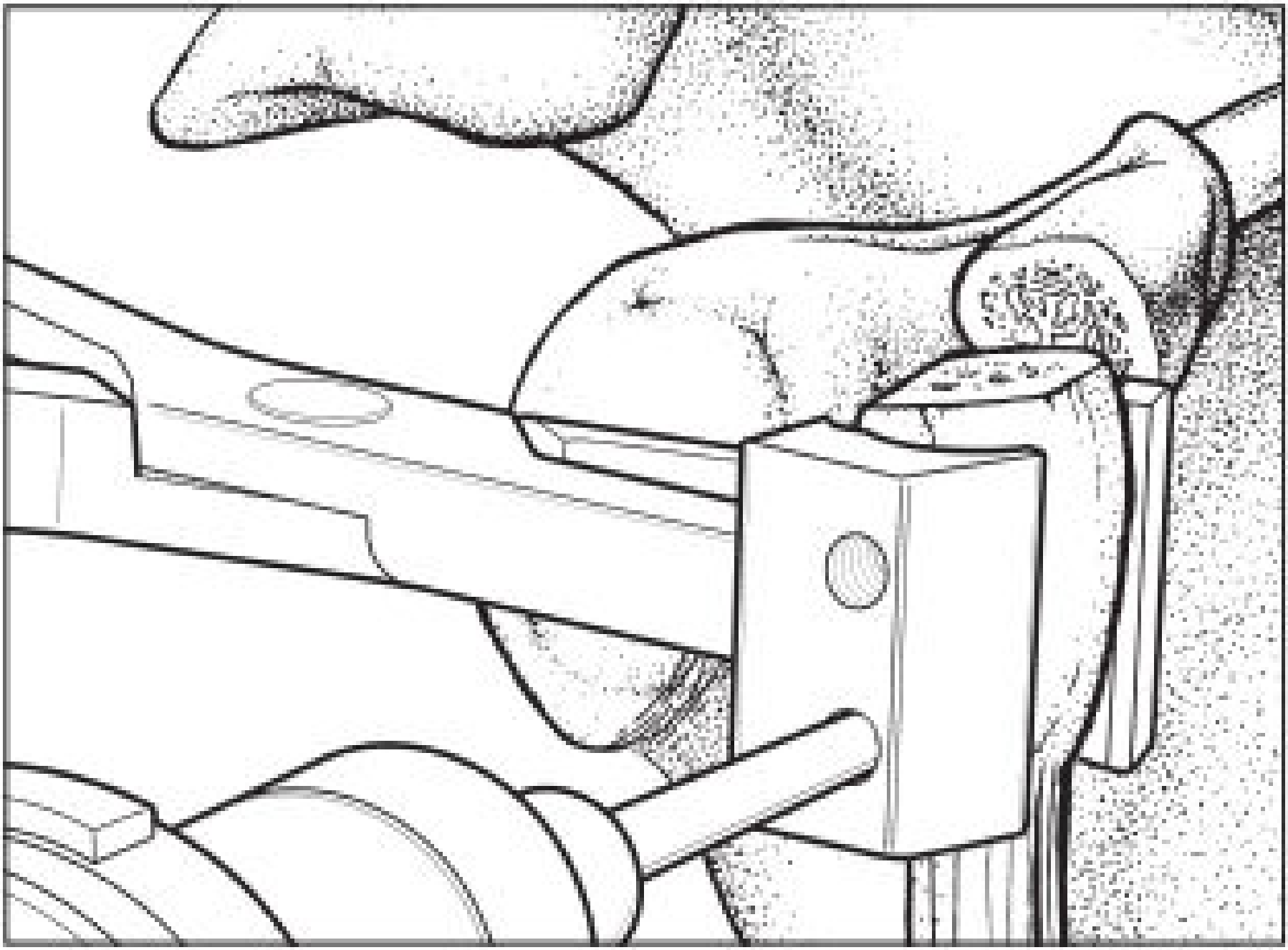

Coracoclavicular ligaments
Coracoid process
Conjoined tendon
Oscillating saw

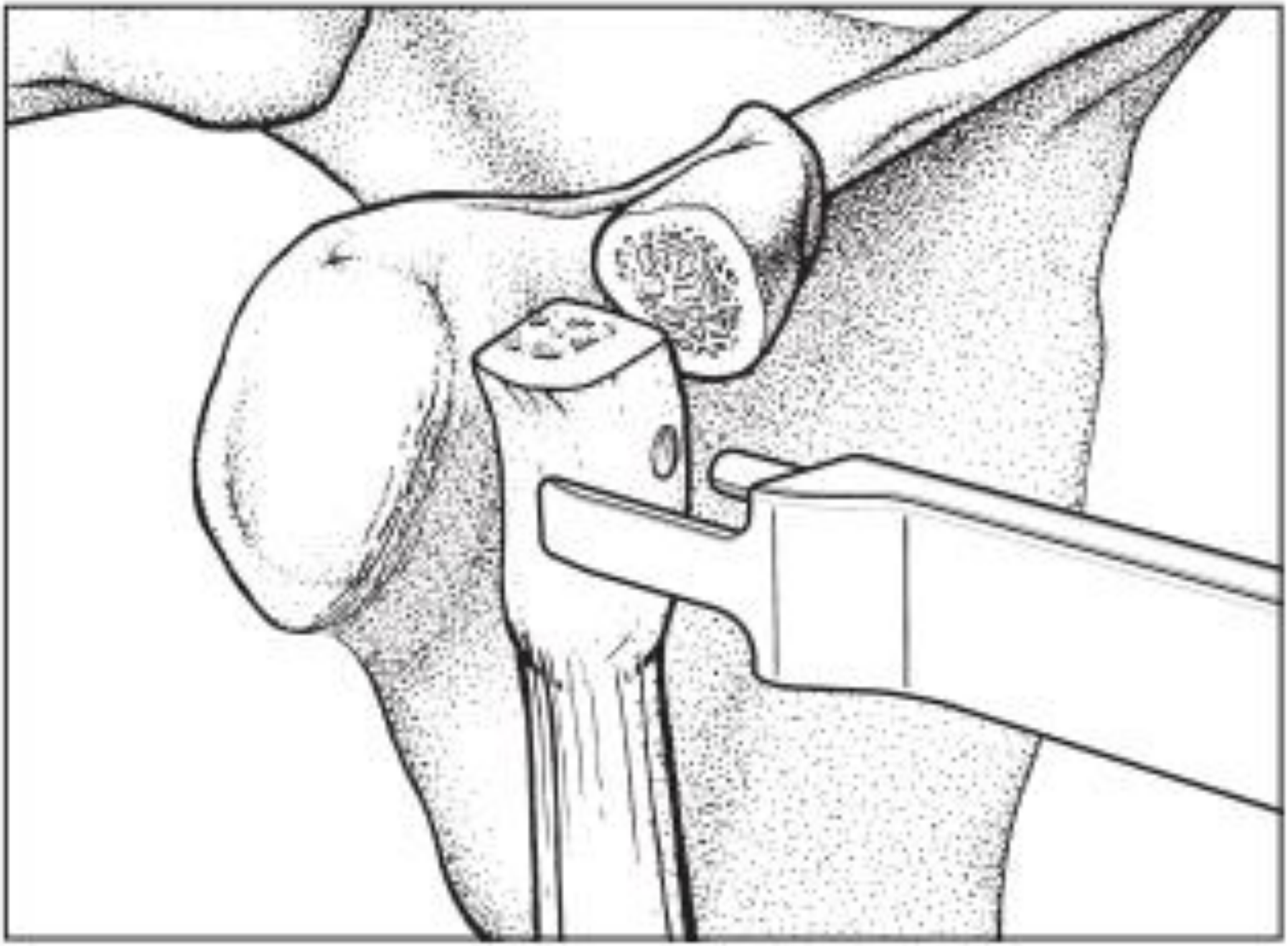

Anterior capsule
Subscapularis muscle

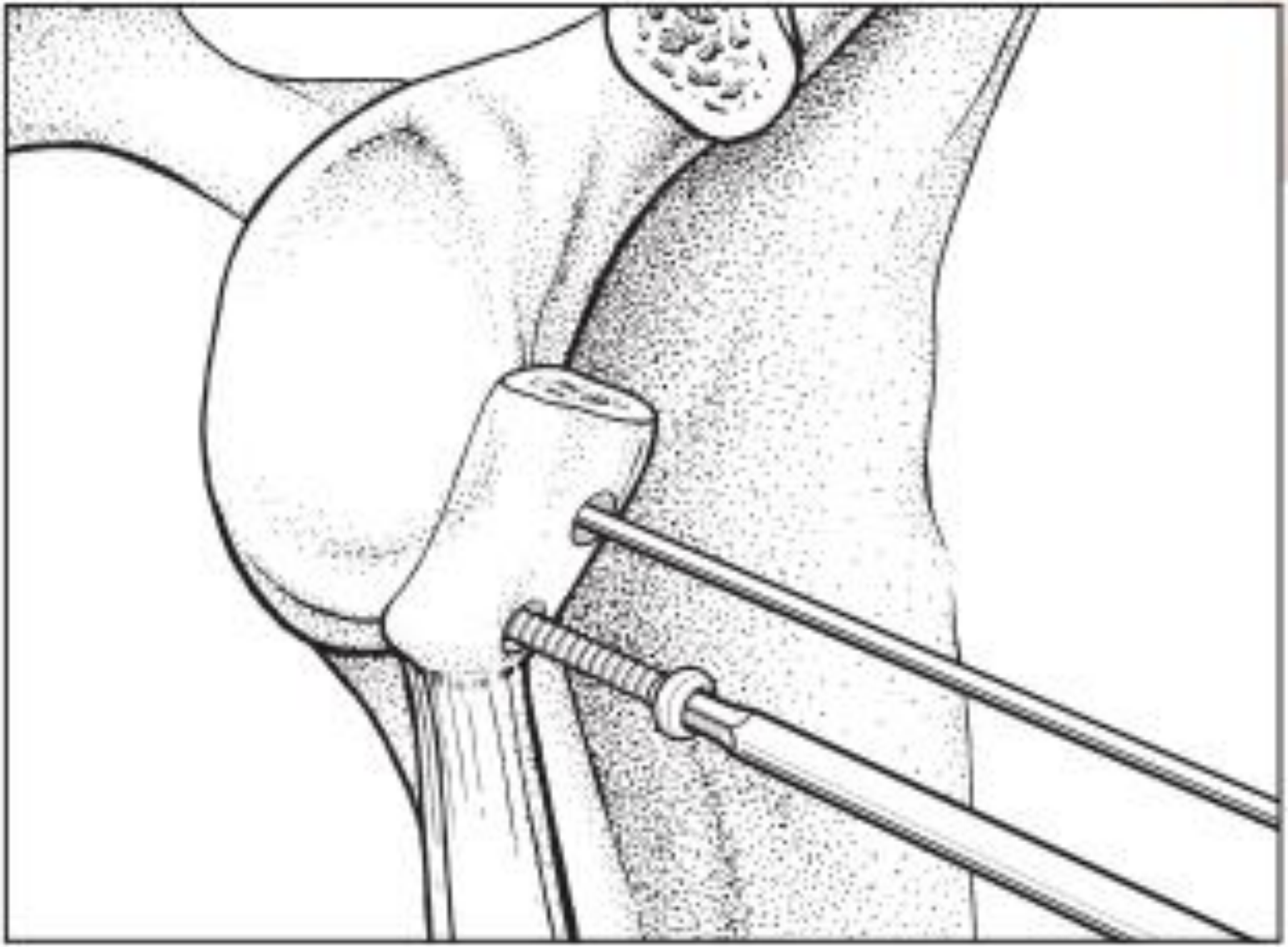

Anterior capsule
Incision
Coracoid

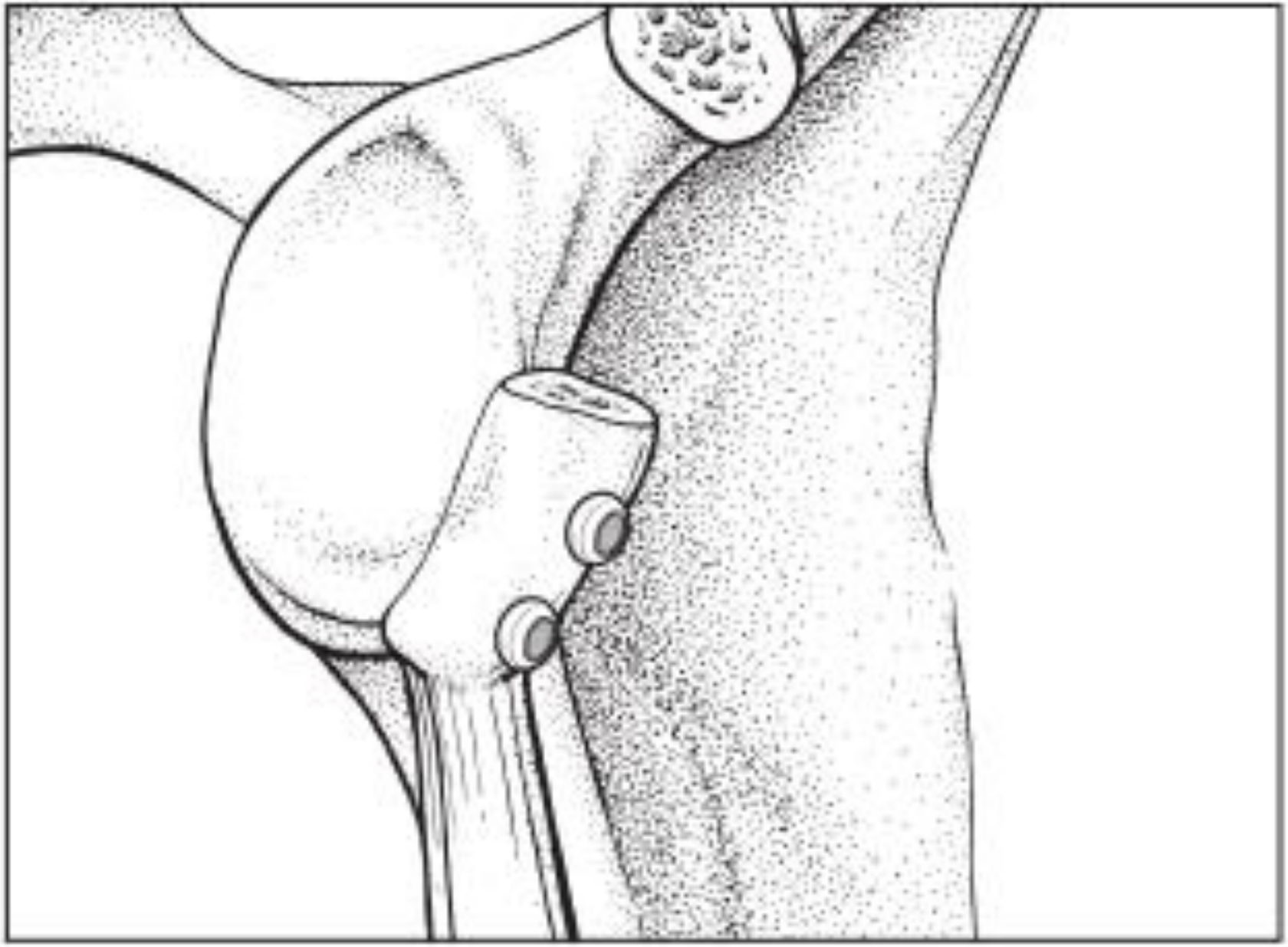

Anterior capsule
Glenoid

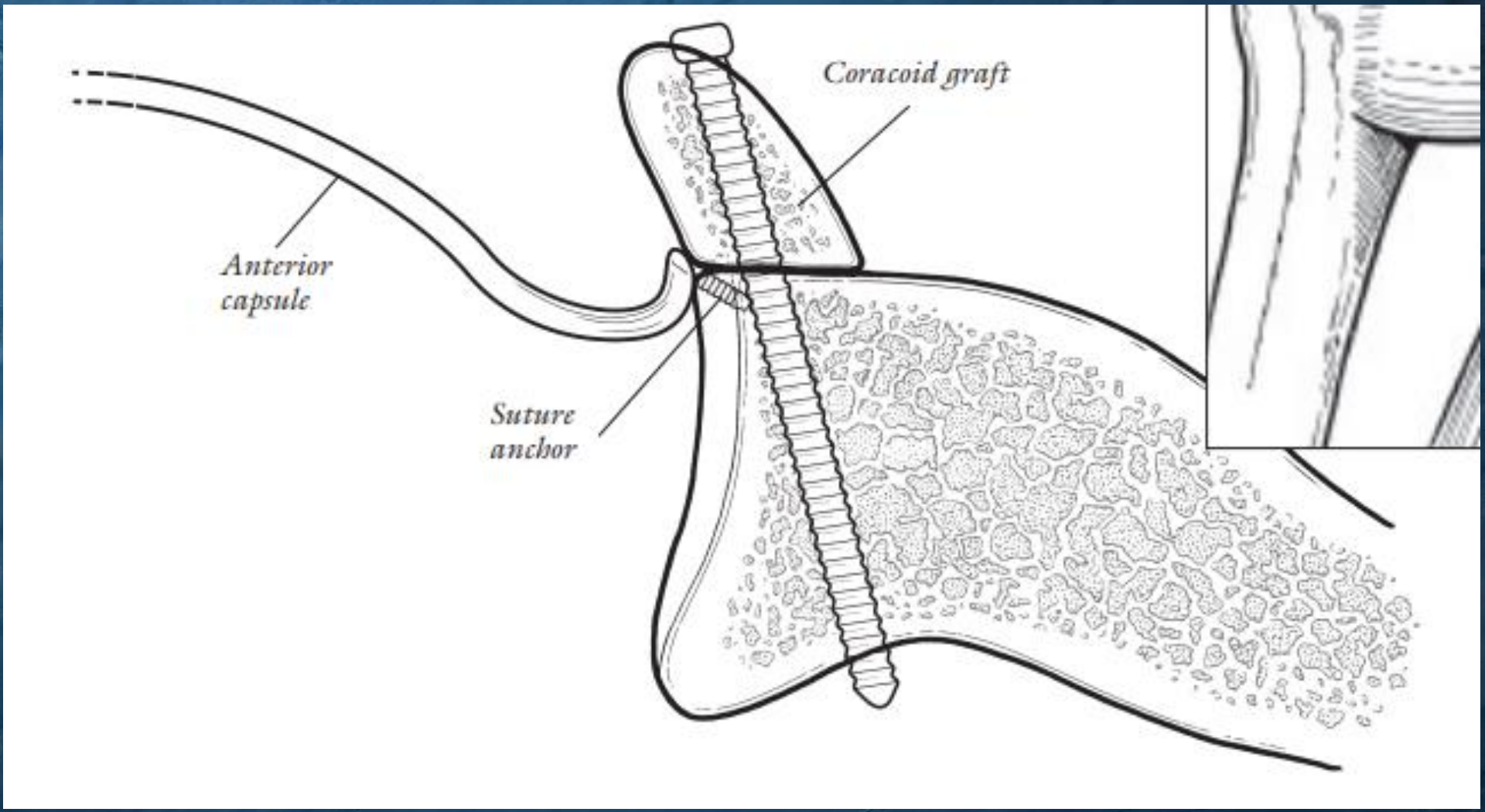


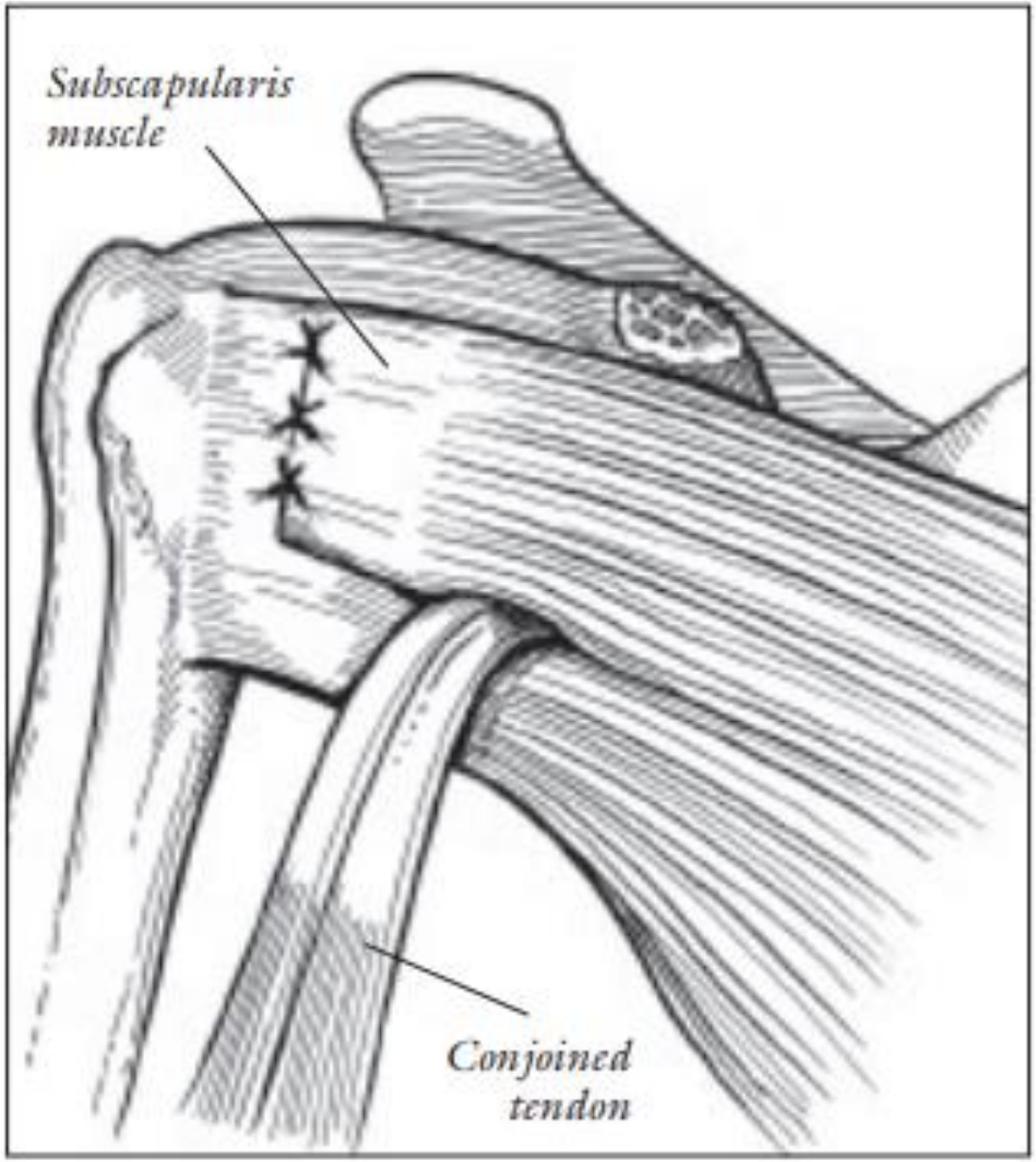









Coracoid graft
Anterior capsule
Suture anchor

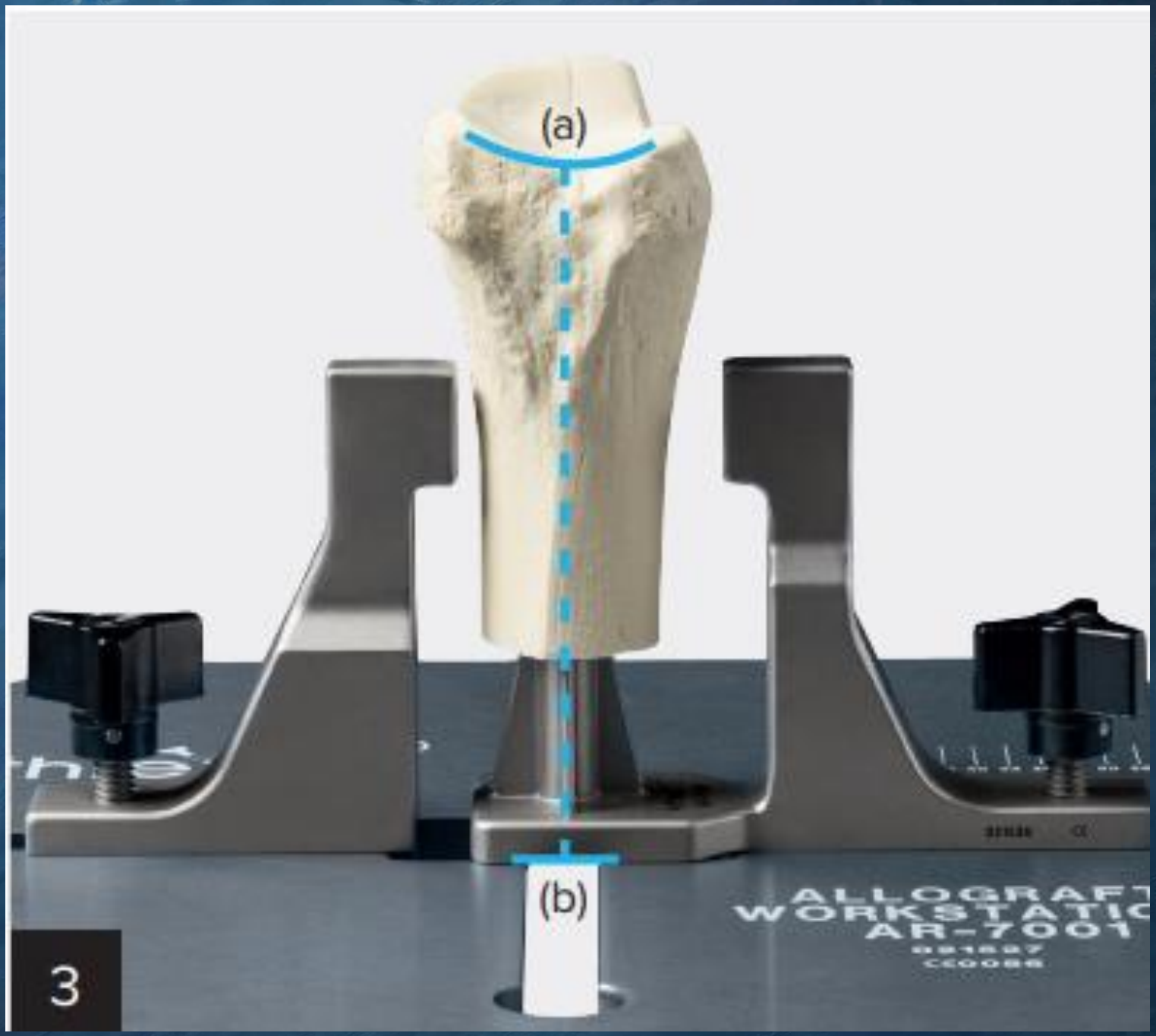

Subscapularis muscle
Conjoined tendon

Autograft/Allograft

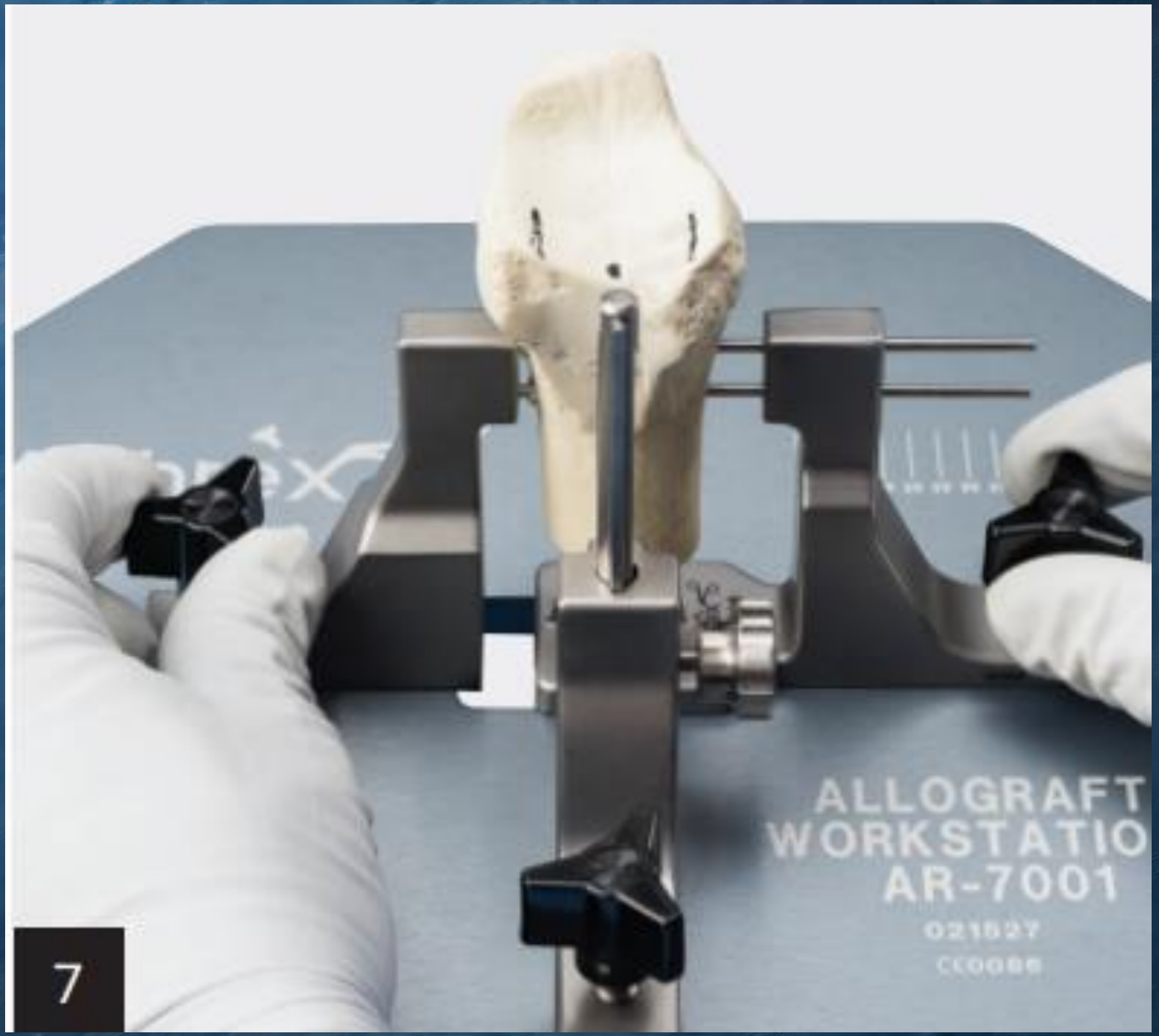
- Iliac crest (autograft)
- Distal tibia (allograft)

- Used when have bony deficiency >20-25%
- Failed Latarjet
- 89% healing rate


1


(a)
(b)
ALLOGRAFT
WORKSTATIO
AR-7001
3


6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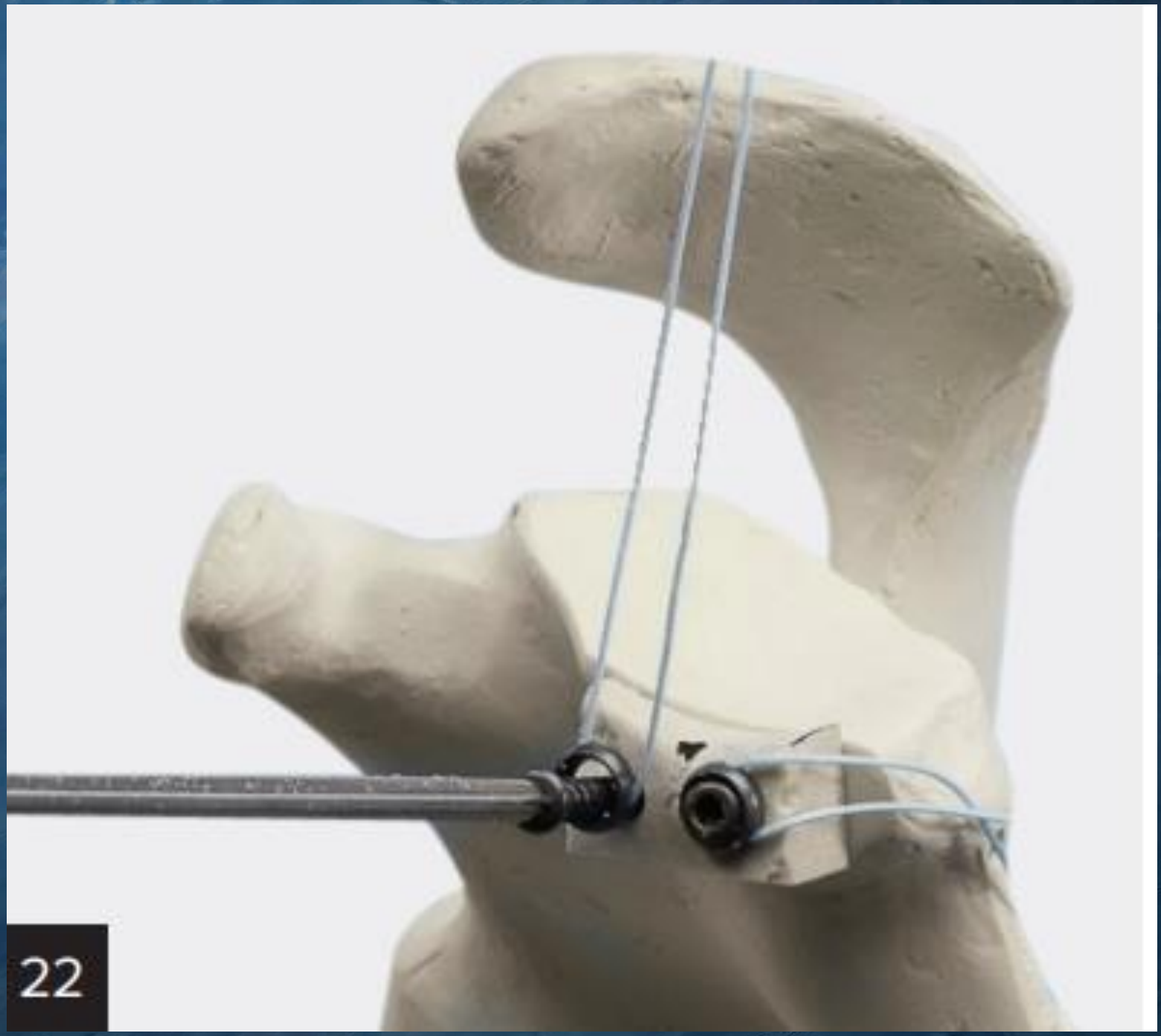
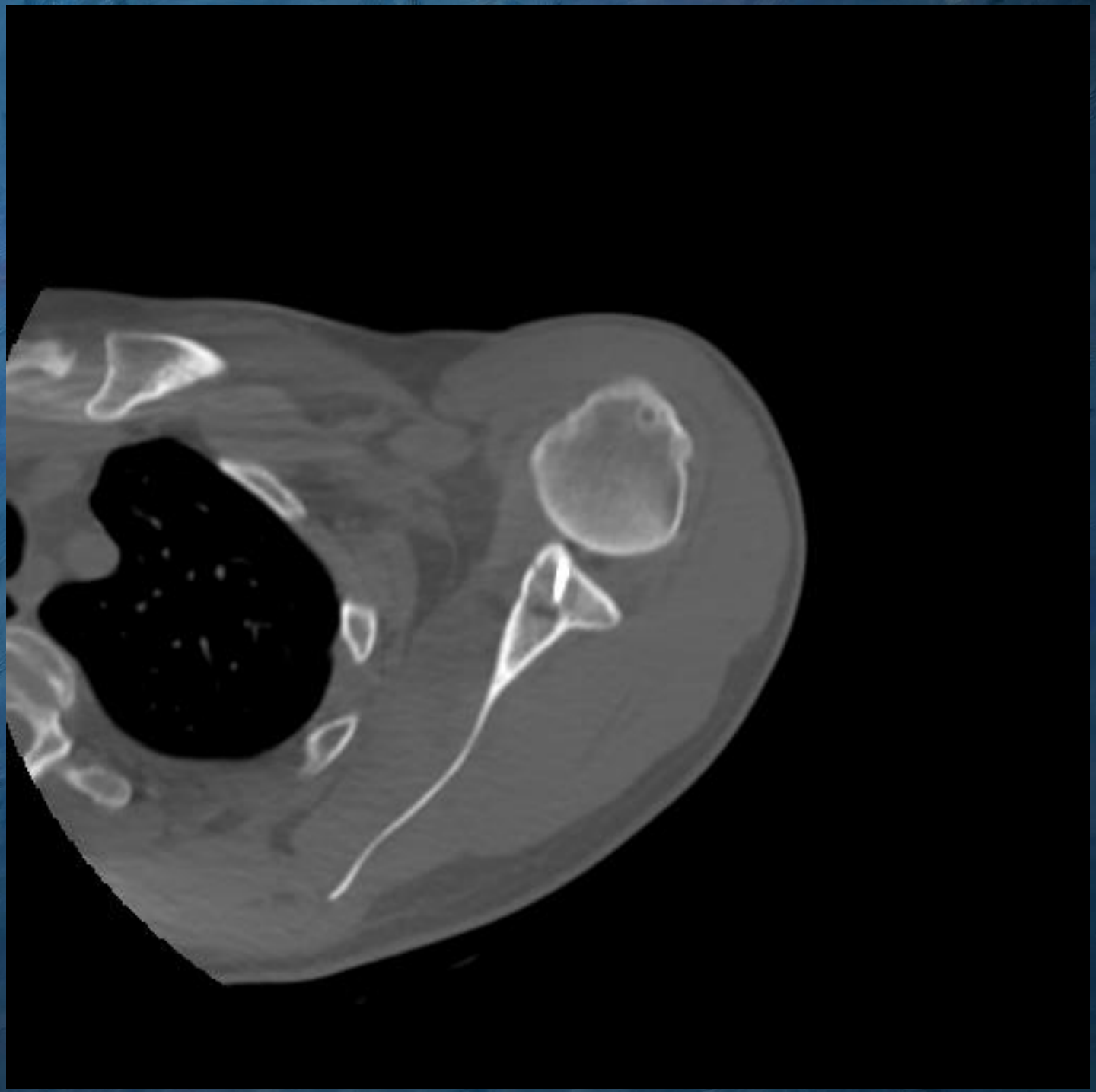
WORKSTATIO
AR-7001

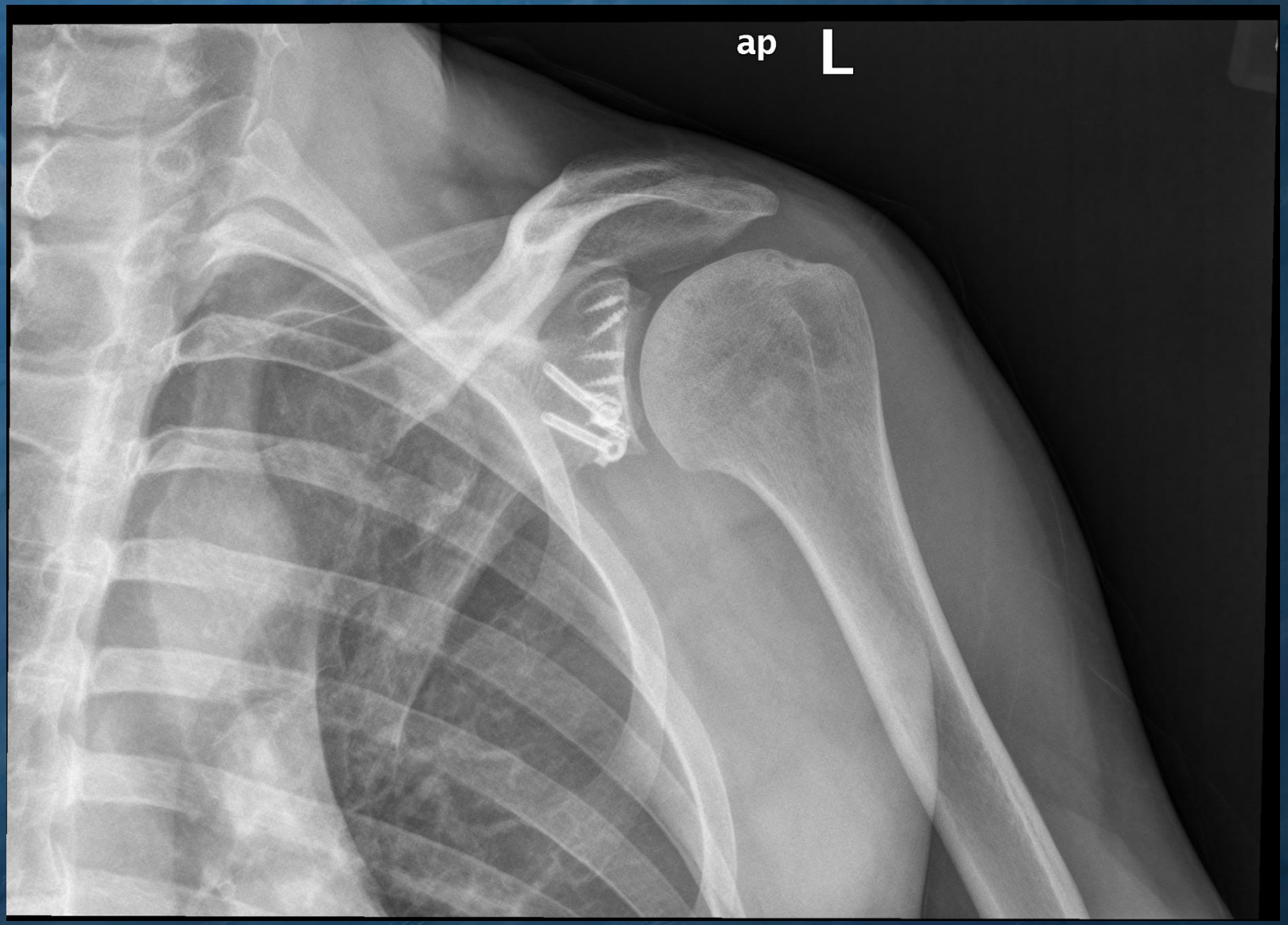

17
Arthrex
AR-7003
ALLOGRAFT
STATION
-7001
021527

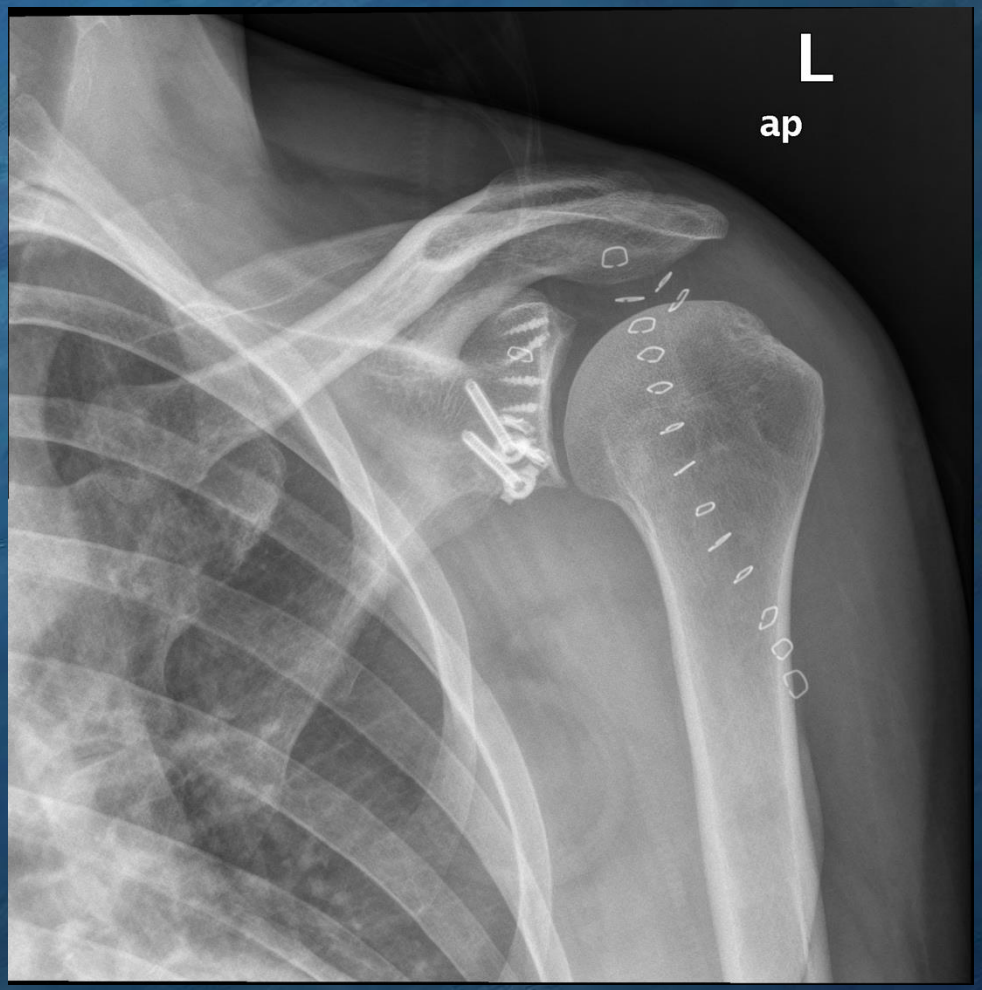

21



39 year old male with history of labral repair




ap
L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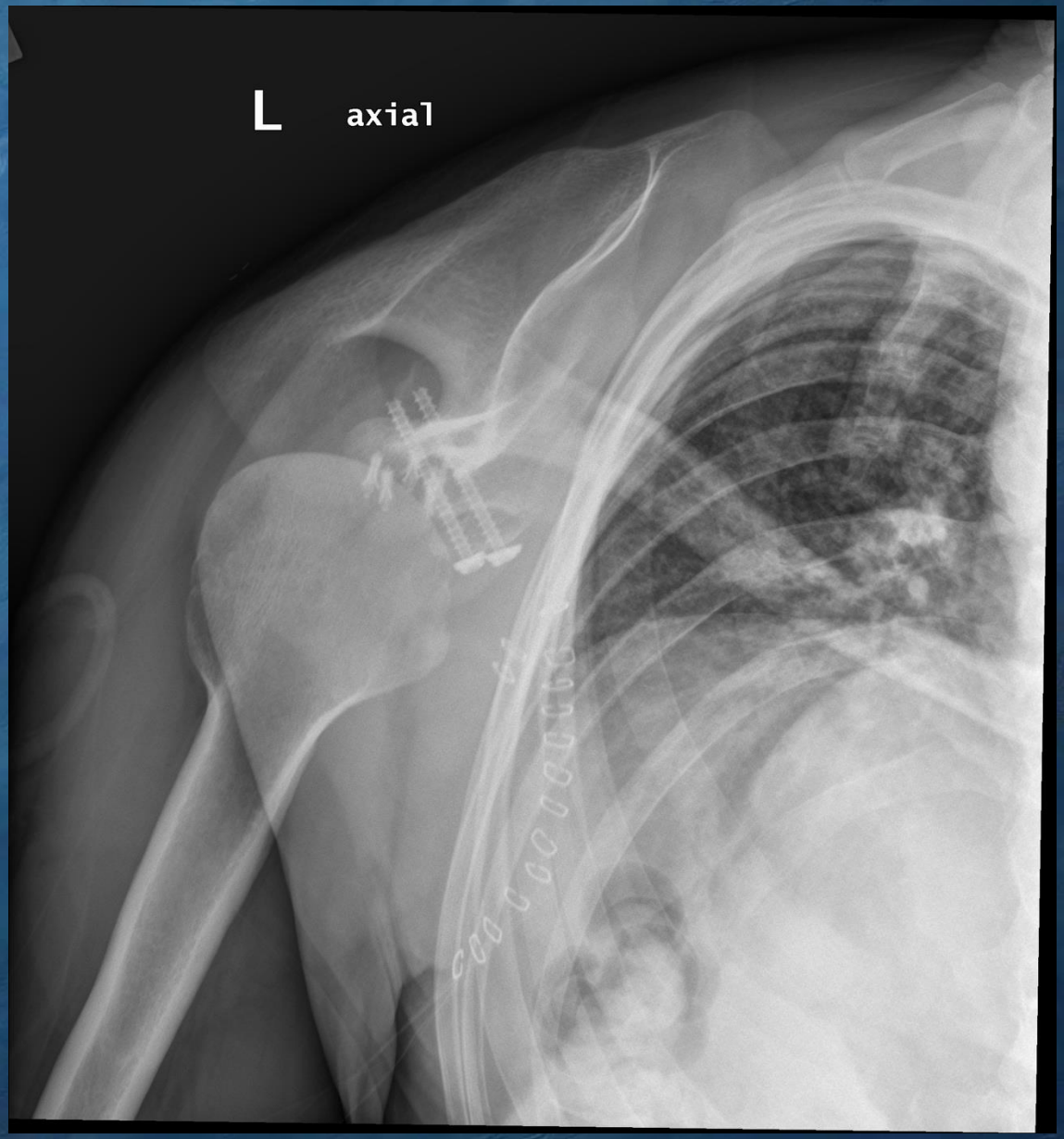
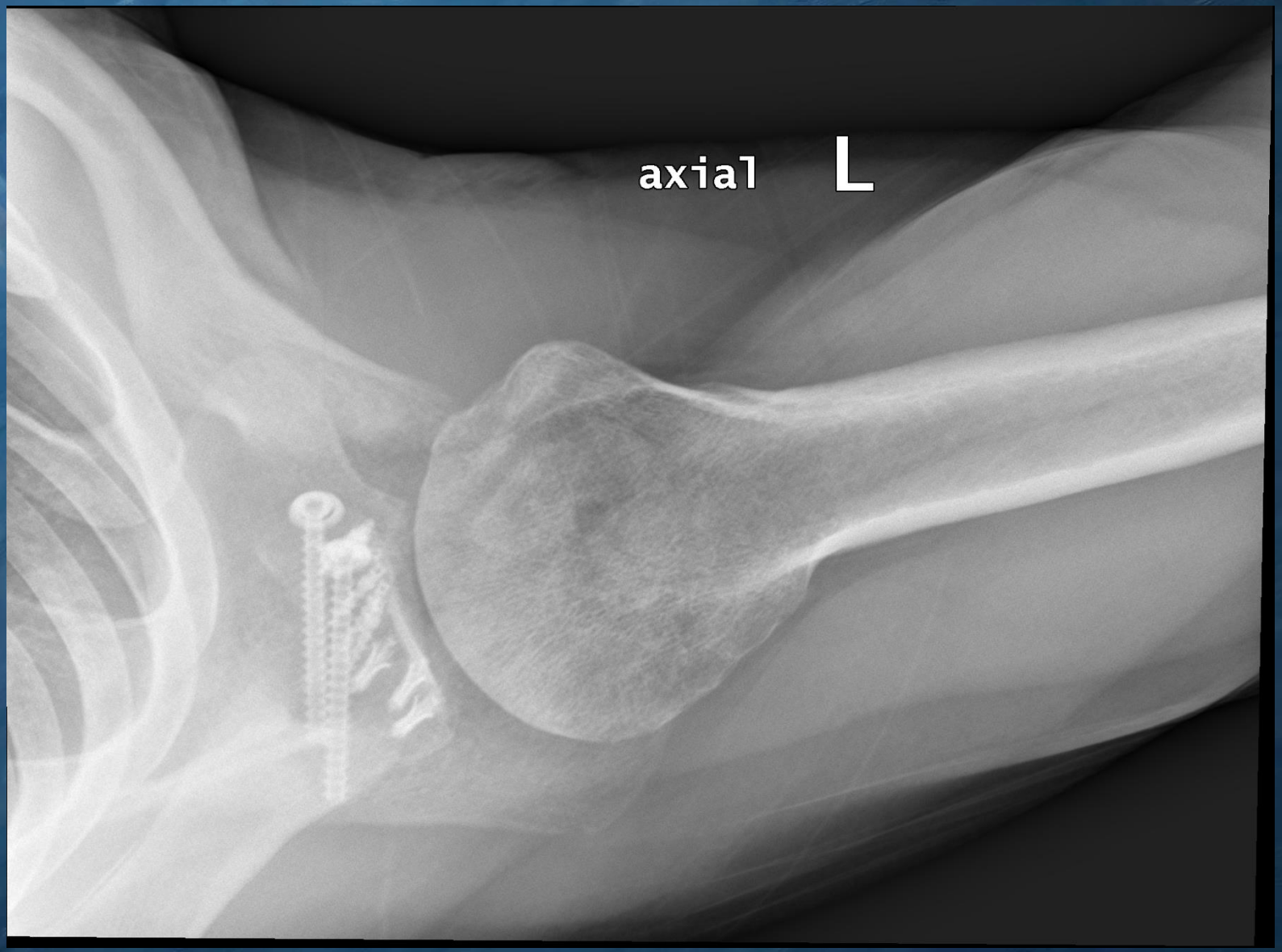
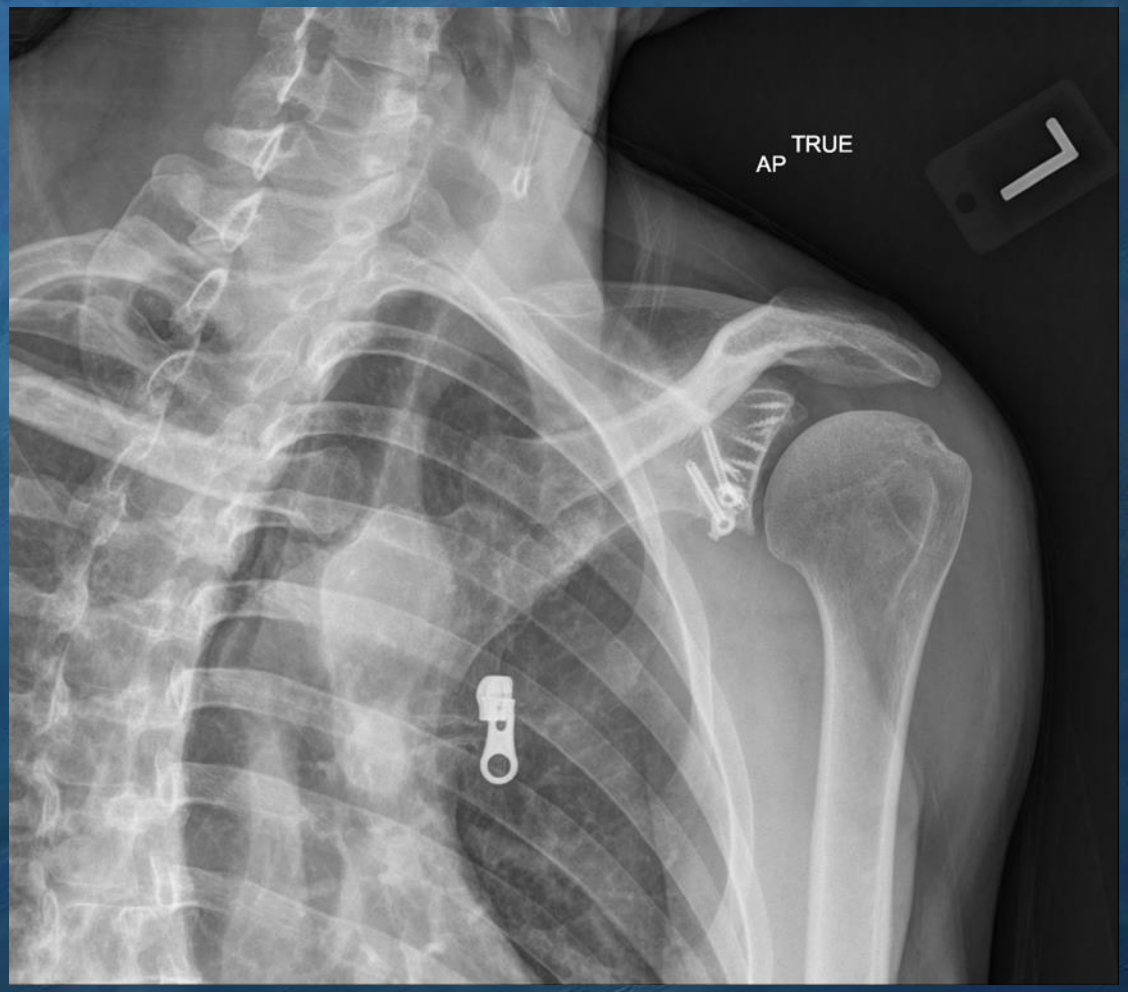
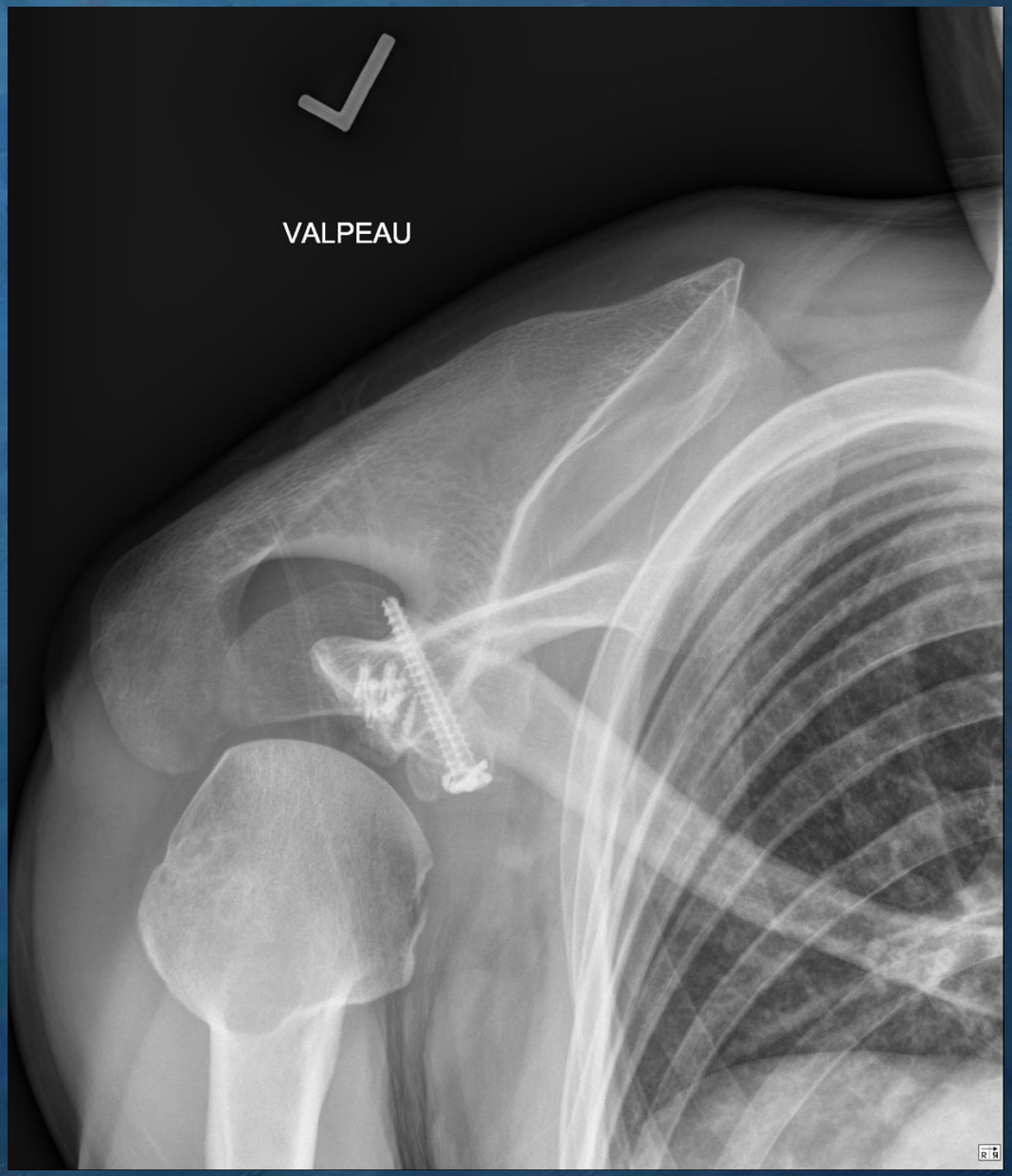

L
axial

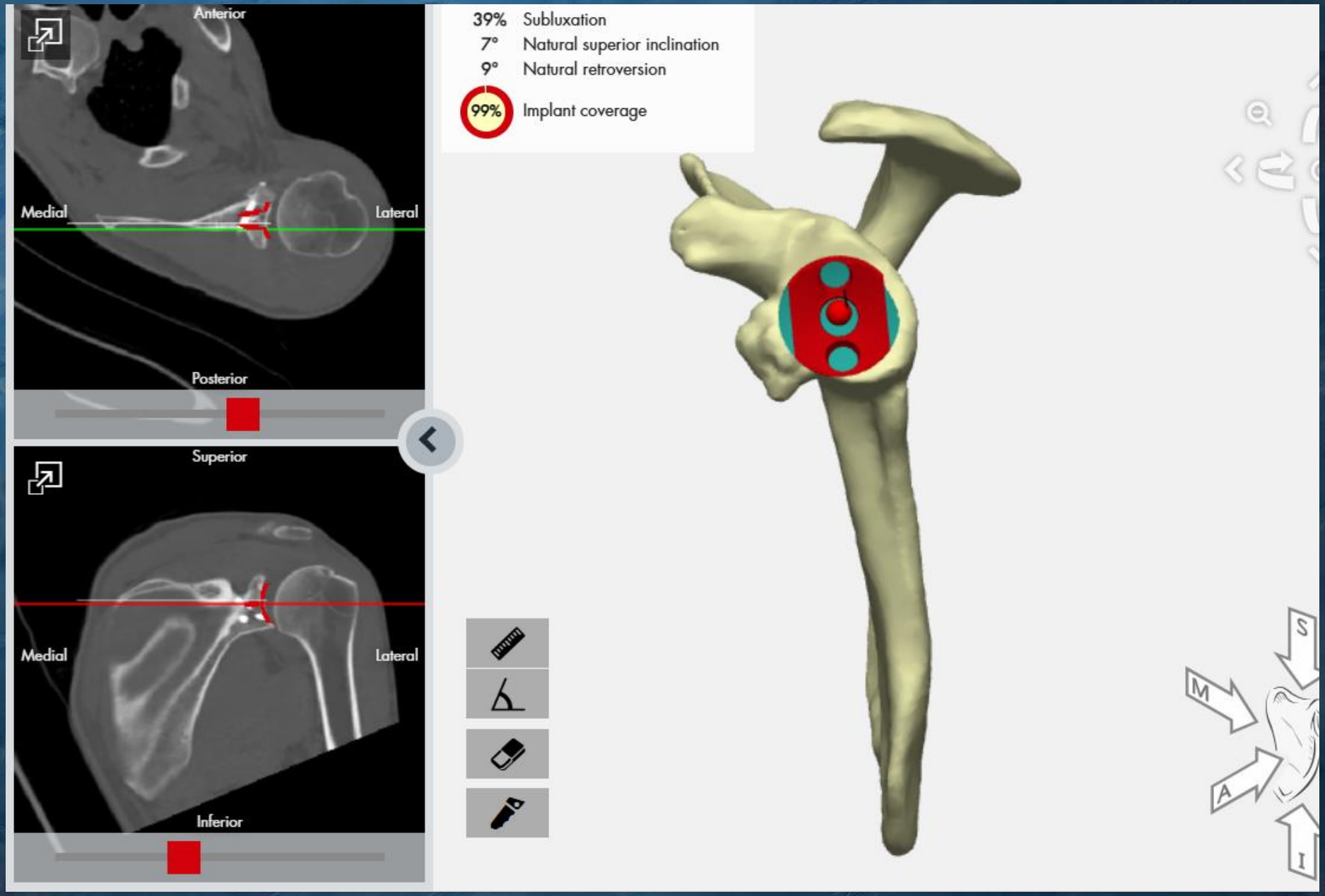

axial
L

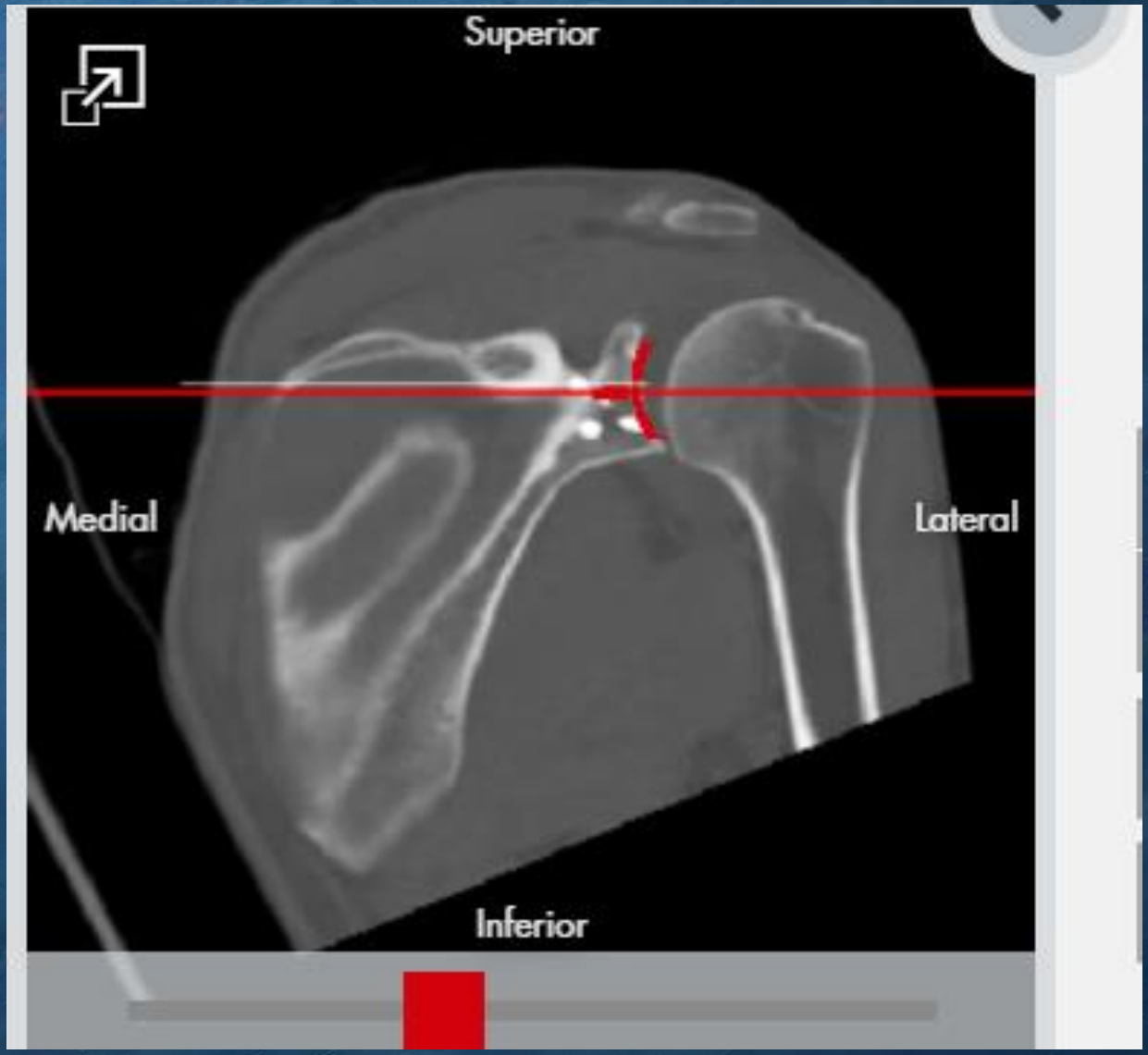
Now 49 with increasing pain and some sense of instability

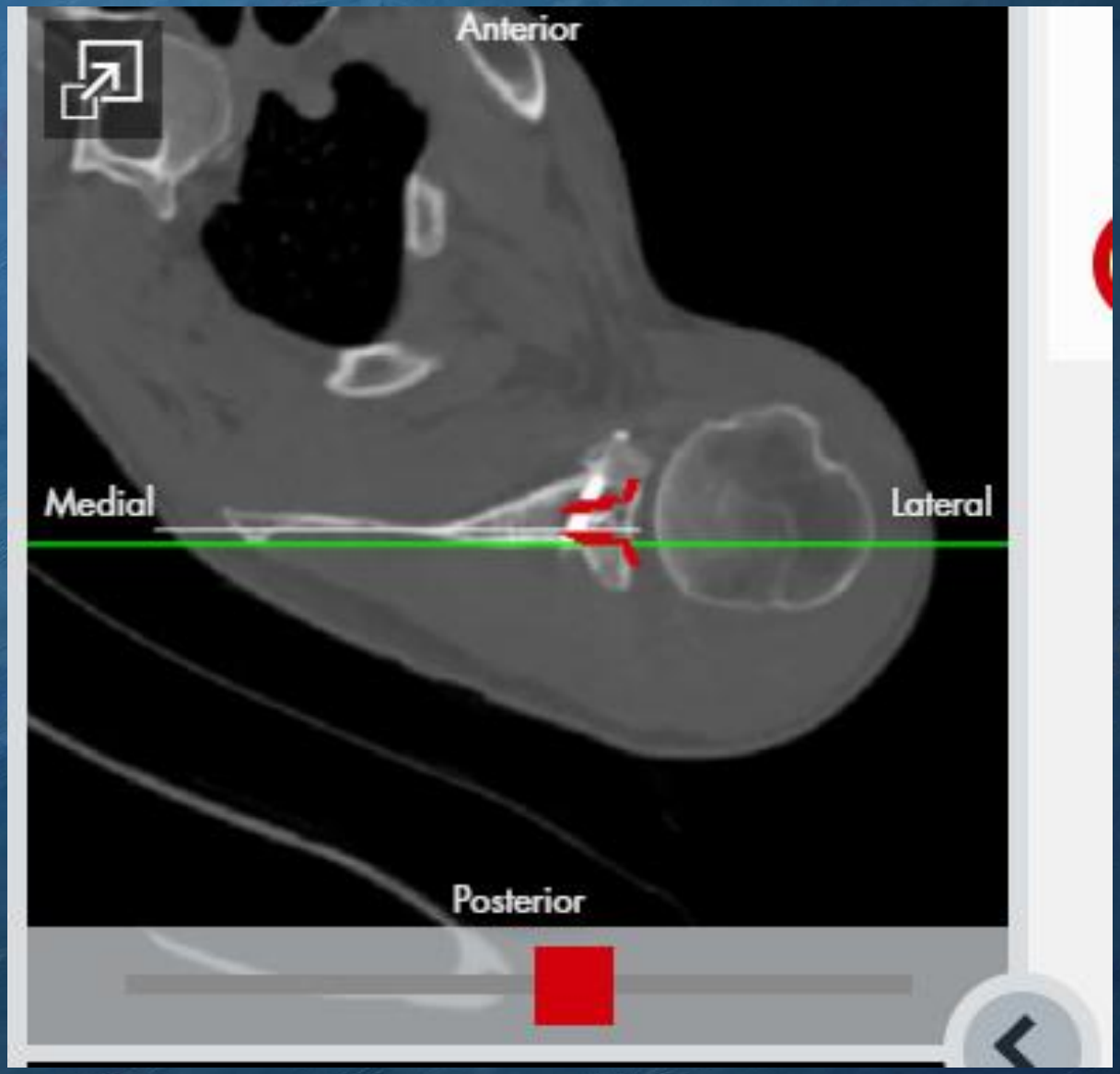


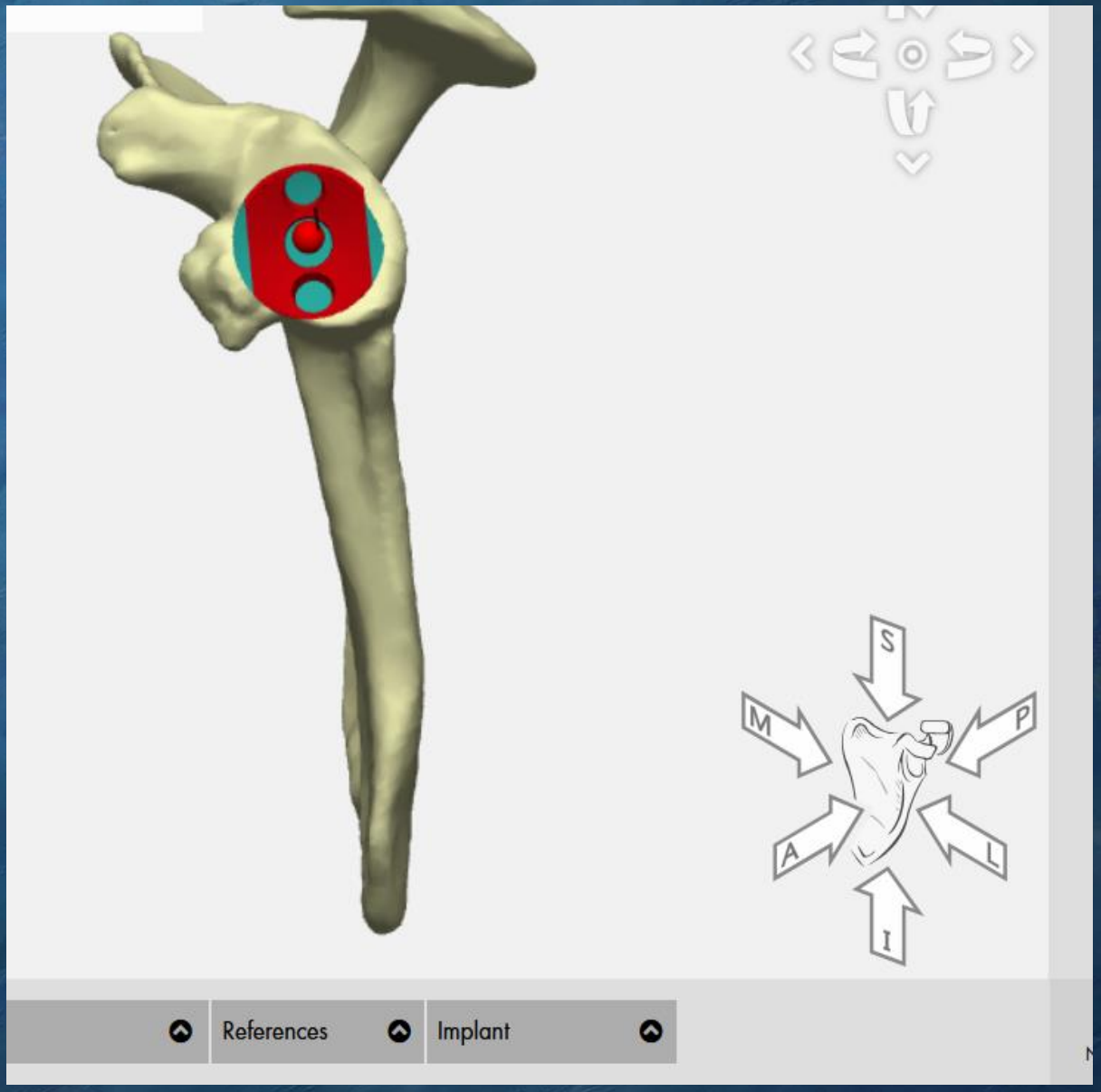
Now What?

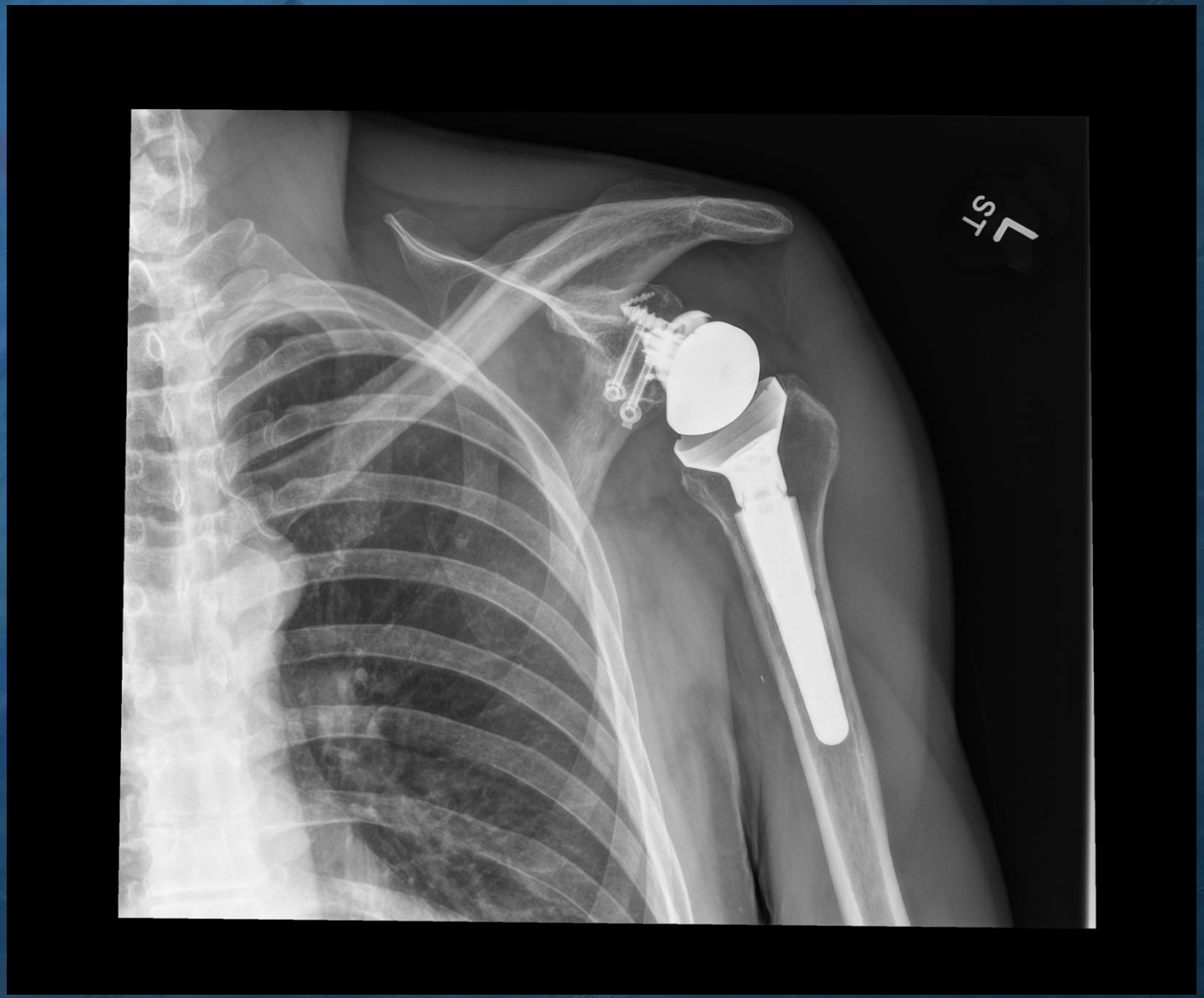

VALPEAU


Anterior
Medial
Lateral
Posterior
Superior
Medial
Lateral
Inferior
39% Subluxation
7° Natural superior inclination
9° Natural retroversion
99% Implant coverage
S
M
A
I


Superior
Medial
Lateral
Inferior

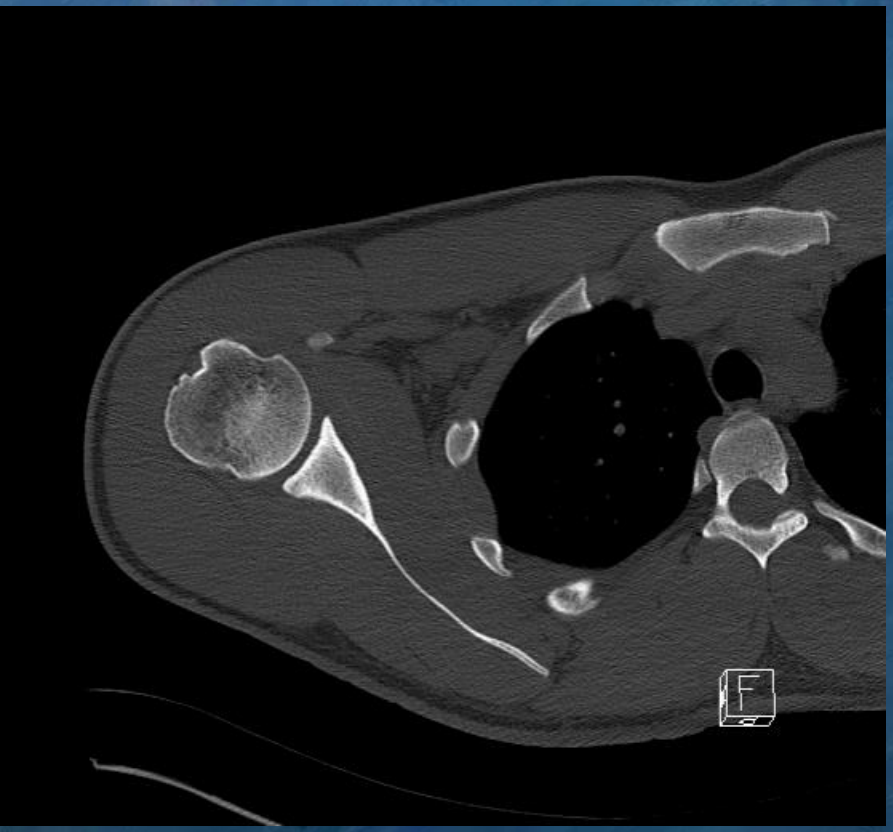

Anterior
Medial
Lateral
Posterior

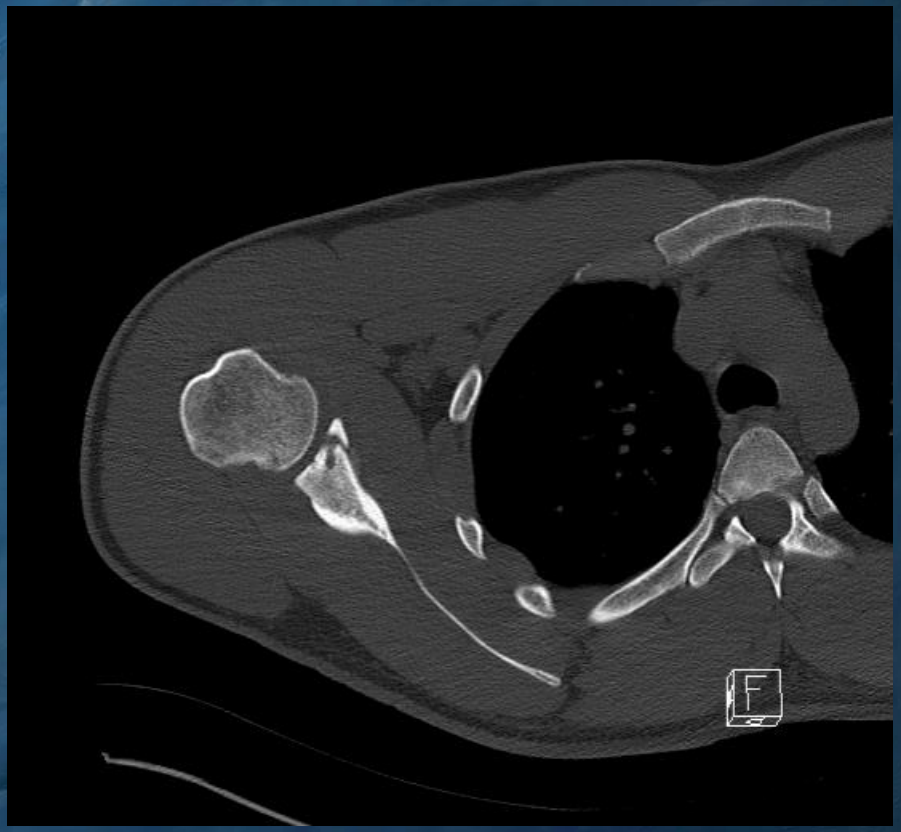

S
M
P
A
L
I
References
Implant


ST


Axial

25 yo athlete






Axial
R
H
A

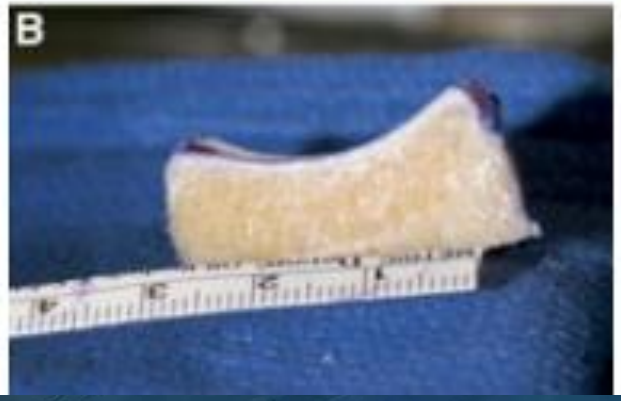
1 year out failed Latarjet

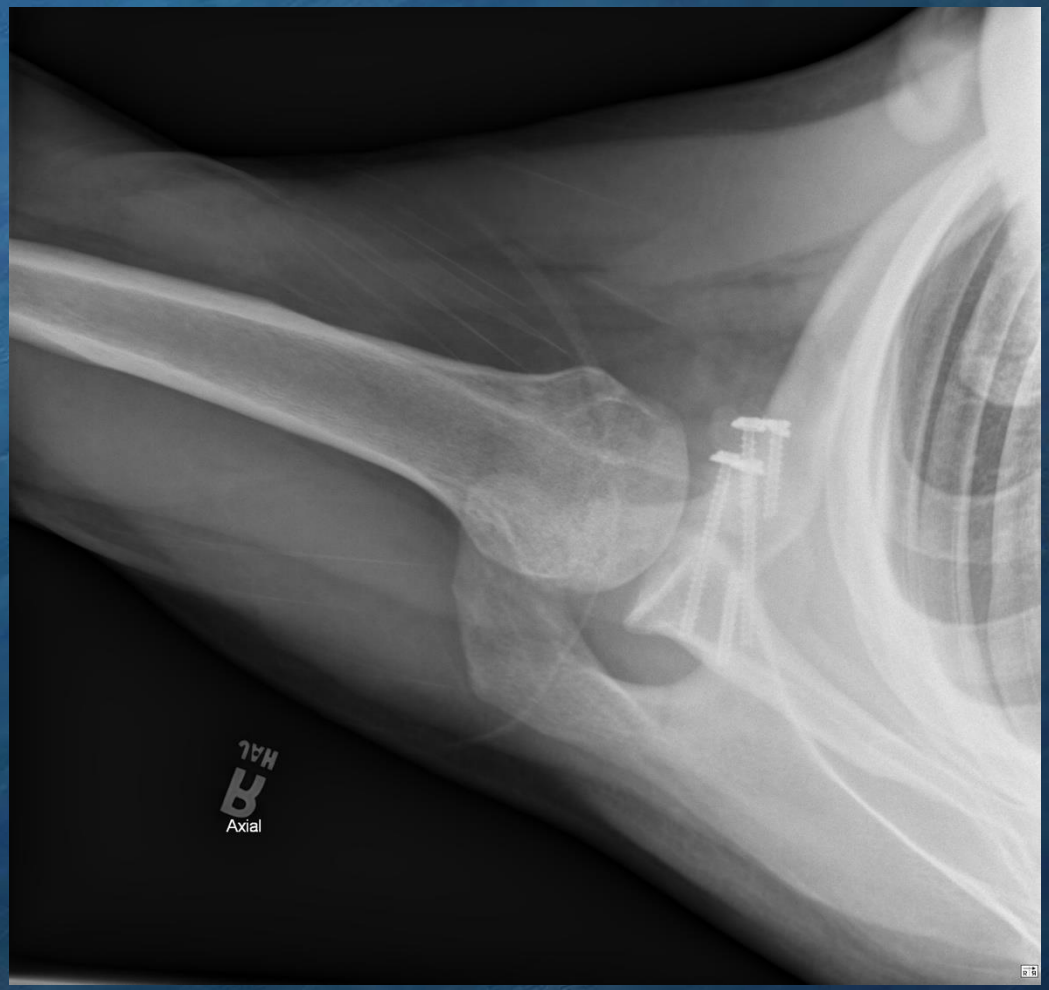
- Now what?


S
P
A
I
Standard 3D
VR: Original Color
Segmented
RAO 56 CRA 0

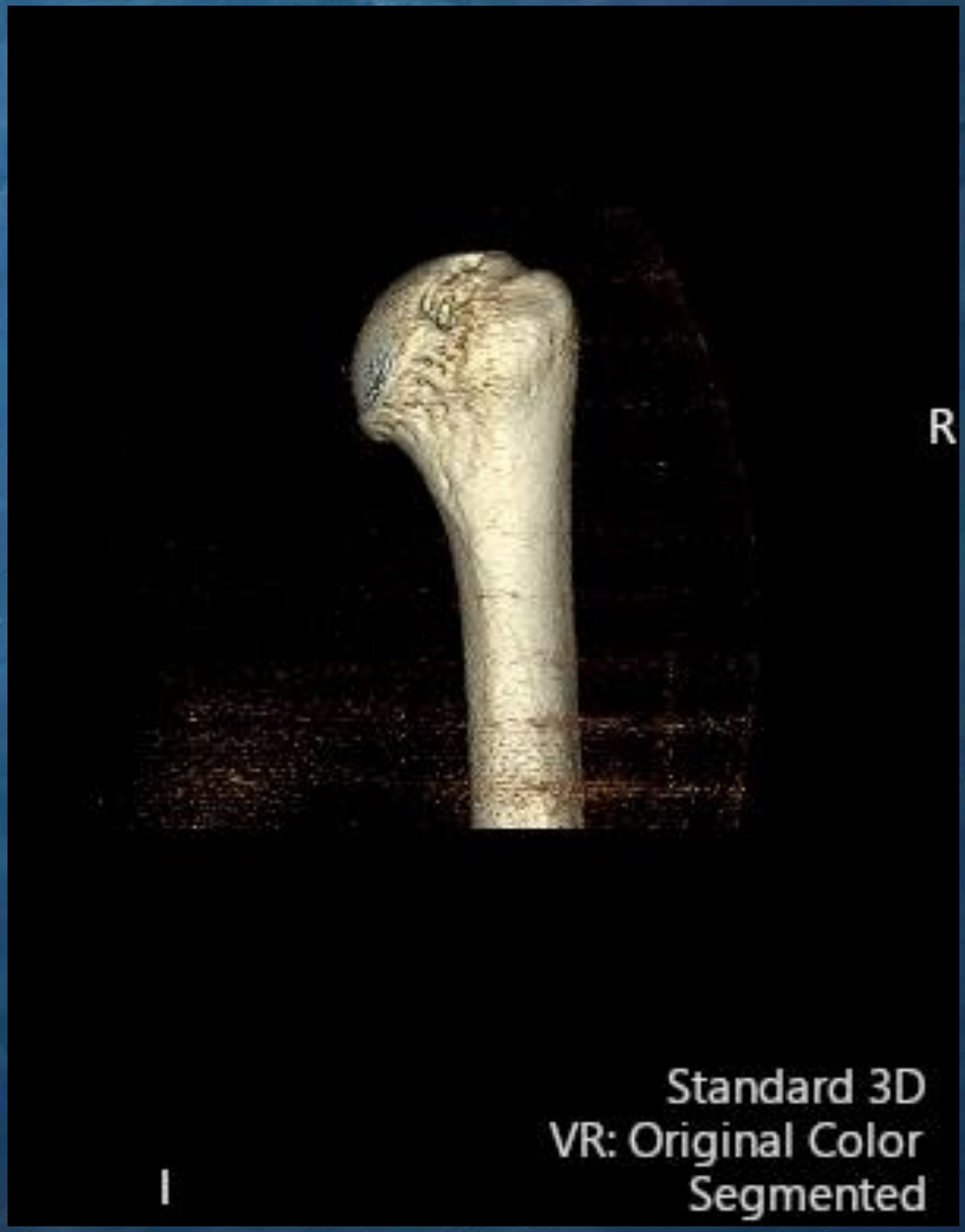
Distal Tibia Allograft

Distal Tibia Allograft




HAL
R
Axial


R
HA
AP


R
Standard 3D
VR: Original Color
Segmented
I

FUTURE Treatment algorithm ?

Glenoid defect	Hill Sach	Treatment
<25 % (<13.5%)	On track	Arthroscopic Bankart Repair (+/- remplissage)
<25% (<13.5%)	Off track	Arthroscopic Bankart repair and remplissage
>25% (<13.5%)	On track	Latarjet (+/- remplissage)
>25% (<13.5%)	Off track	Latarjet, with remplissage or humeral bone graft

Thank You