

Shoulder Pathologies in Overhead Athletes



**Remy Flückiger, Beat K. Moor and Matthias Zumstein
Shoulder, Elbow & Orthopedic Sports Medicine
Department of Orthopedic Surgery and Traumatology
University of Berne, Switzerland
remy.flueckiger@insel.ch**

SOCIAL BURDEN

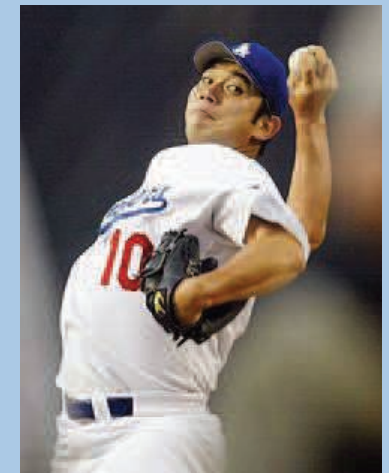
- Shoulder complains 3rd cause of musculoskeletal symptoms
- Up to 70% of shoulder pain due to disorders of the RC

Bunkert; Curr Orthop , 2002, 16:223-33

Urwin; Ann Rheum Dis 1998, 57:649-55

Mitchell; BMJ 2005, 331:1124-8

PREVALENCE IN ATHLETES



HANDBALL

- throwing activity
- ball = ~ 1 pound
- $v =$ up to 80 mph
- 190 throws / game
- 48' 000 throws / yr



MRI Findings in Throwing Shoulders

Abnormalities in Professional Handball Players

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Handball players (av. age = 27 yrs)

- throwing shoulder (TS) (n=30)

= professional repetitive throwing activity

- non-throwing shoulder (NTS) (n=30)

= well trained shoulder, but \emptyset throwing activity

Control (av. age = 29 yrs)

= recreational sports (n=20)

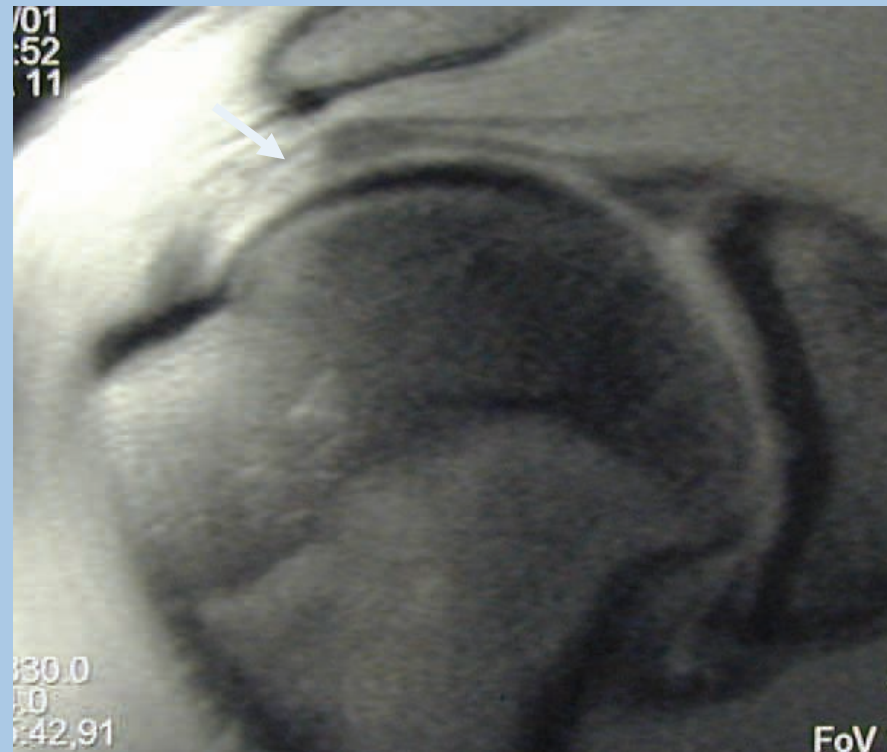
MRI Findings in Throwing Shoulders

Abnormalities in Professional Handball Players

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- throwing shoulder: **93%** (28/30)
- Average/shoulder: **7** (0-13)



TAKE HOME MESSAGES



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- In professional overhead athletes abnormal MRI findings are found in 93% of the throwing shoulders...
- Thus abnormal MRI should be interpreted carefully!!!

QUESTION

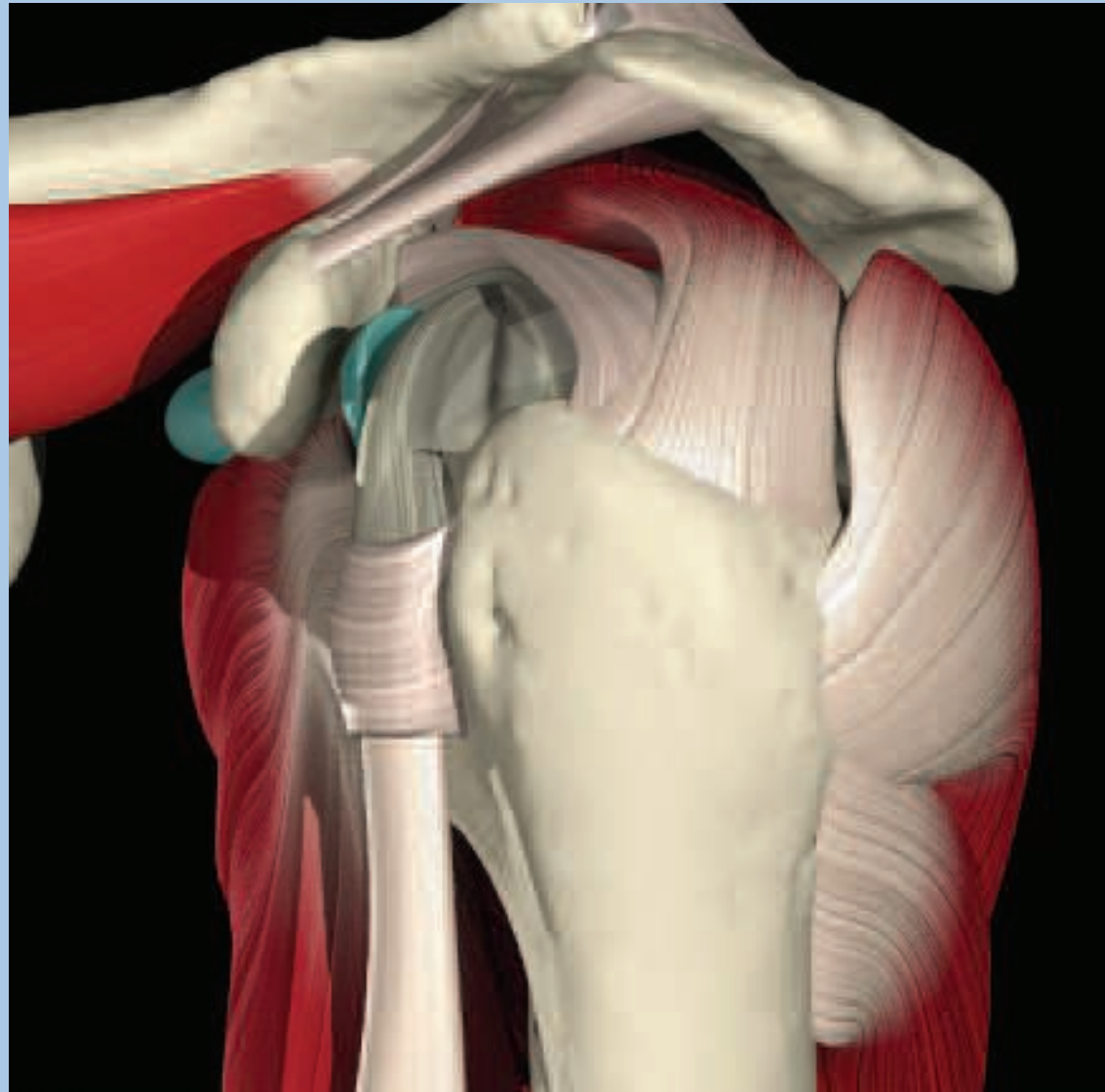
- Which are the pathological lesions?
- Do they correlate to the clinical symptoms?

SHOULDER PROBLEMS IN ATHLETES

Acute versus chronic injuries:

- Rotator cuff lesions
- Pathologies of the biceps tendon
- Extra- or intraarticular anatomical conflicts
- Glenohumeral instability
- Acromioclavicular instability

ROTATOR CUFF TEARS (RCTs)

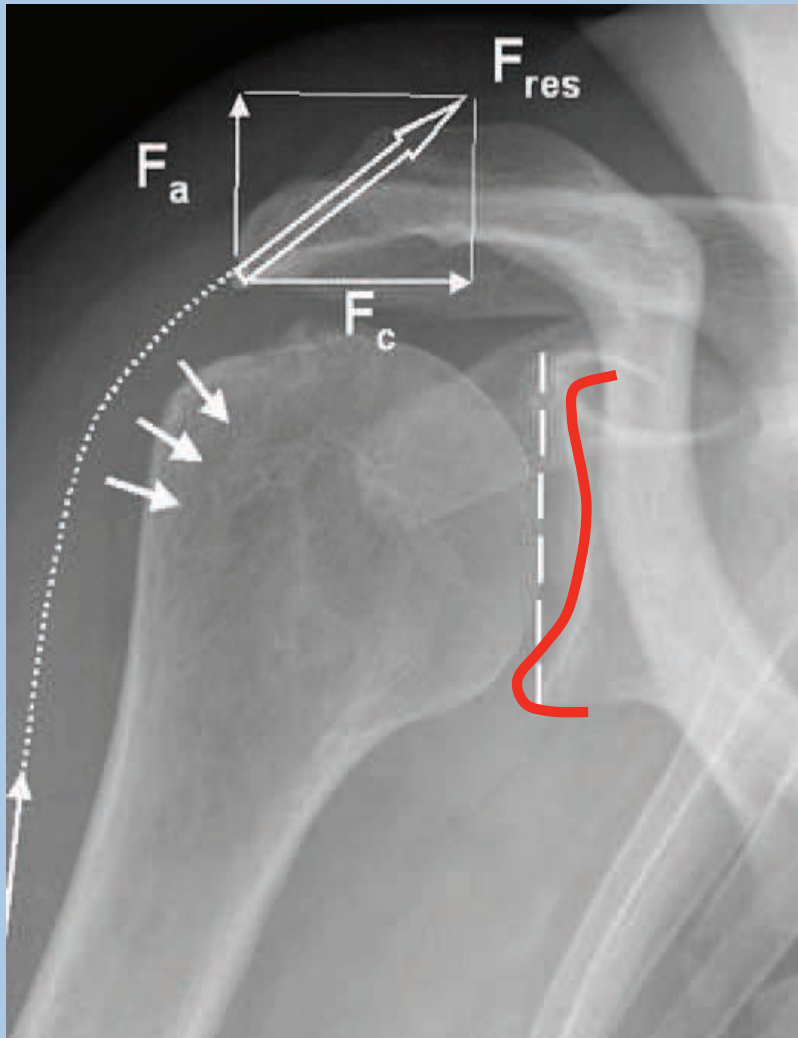


PATHOGENESIS OF RCTs

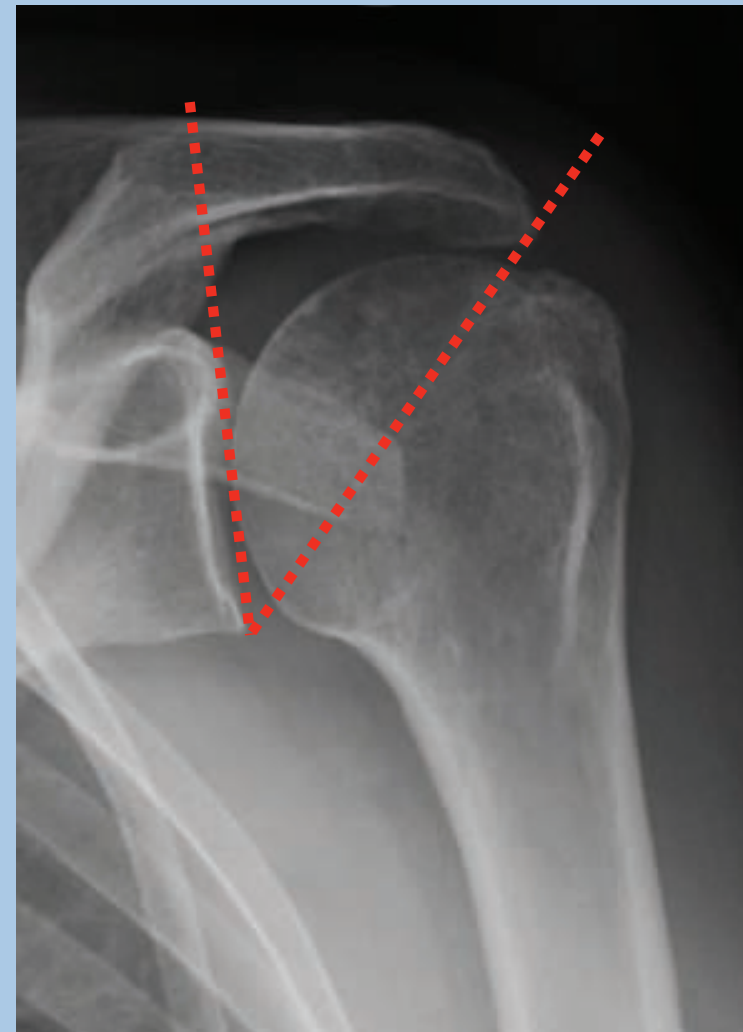
The pathogenesis of RCTs remains unclear

- Intrinsic degeneration (genetic, vascular and cellular)
- Extrinsic impingement

INDIVIDUAL SCAPULAR ANATOMY AND RCTs



Nyffeler; JBJS Am, 2006, 88(4):800-5



Moor; BJJ, 2013, 95-B:935-41

AGING OF THE TENDON



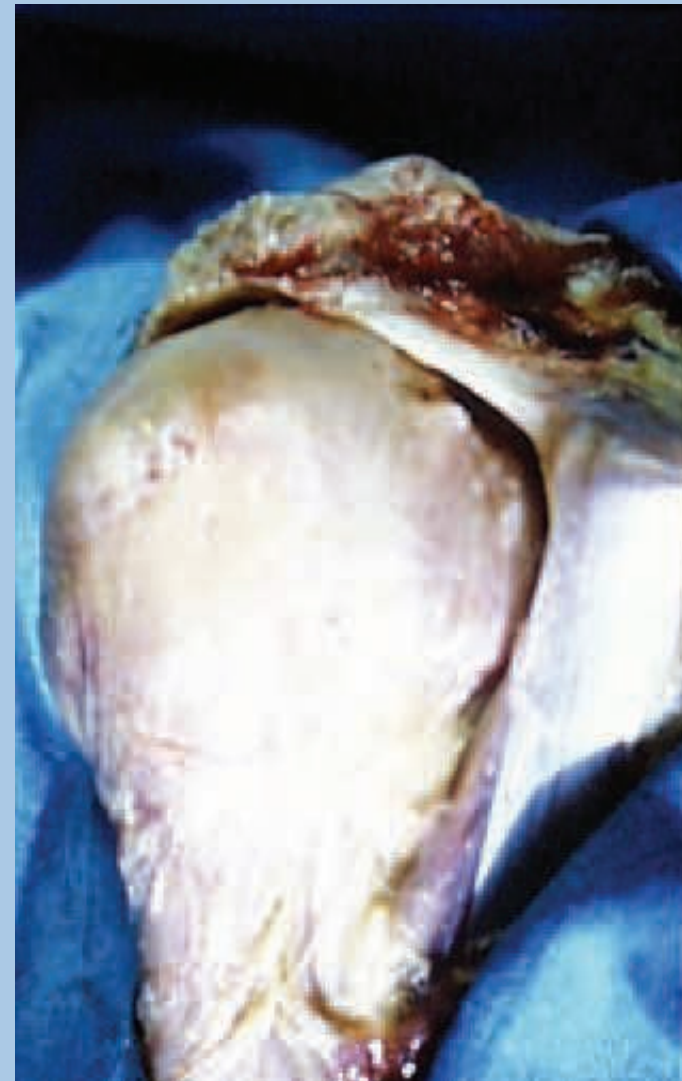
Arterioles



Tenocytes

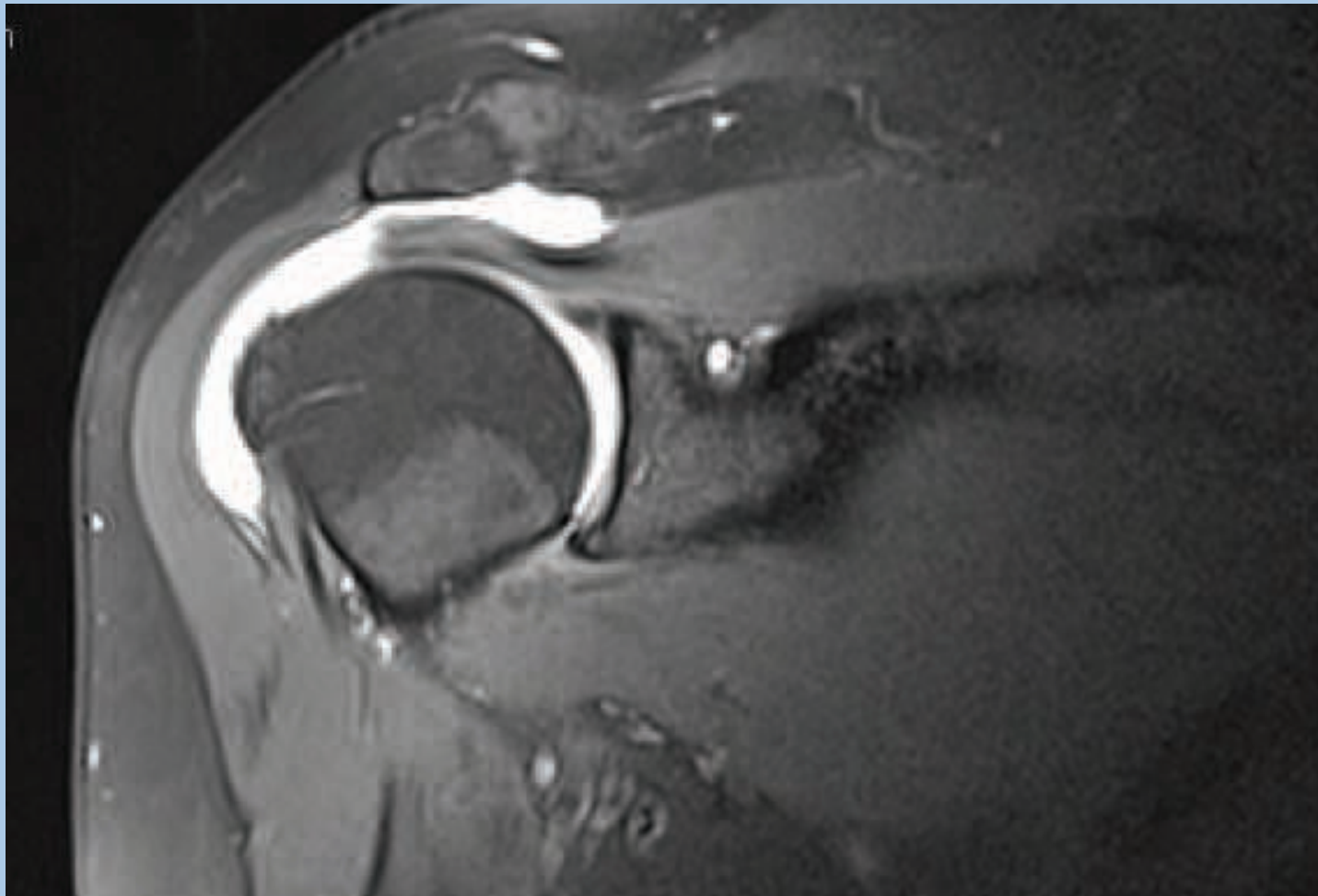


Chondrocytes



OVER 70 YEARS...

- **30% of the patients have RCTs**



SHOULDER PROBLEMS IN ATHLETES

**Are they frequent in the young athlete,
are they painful....**

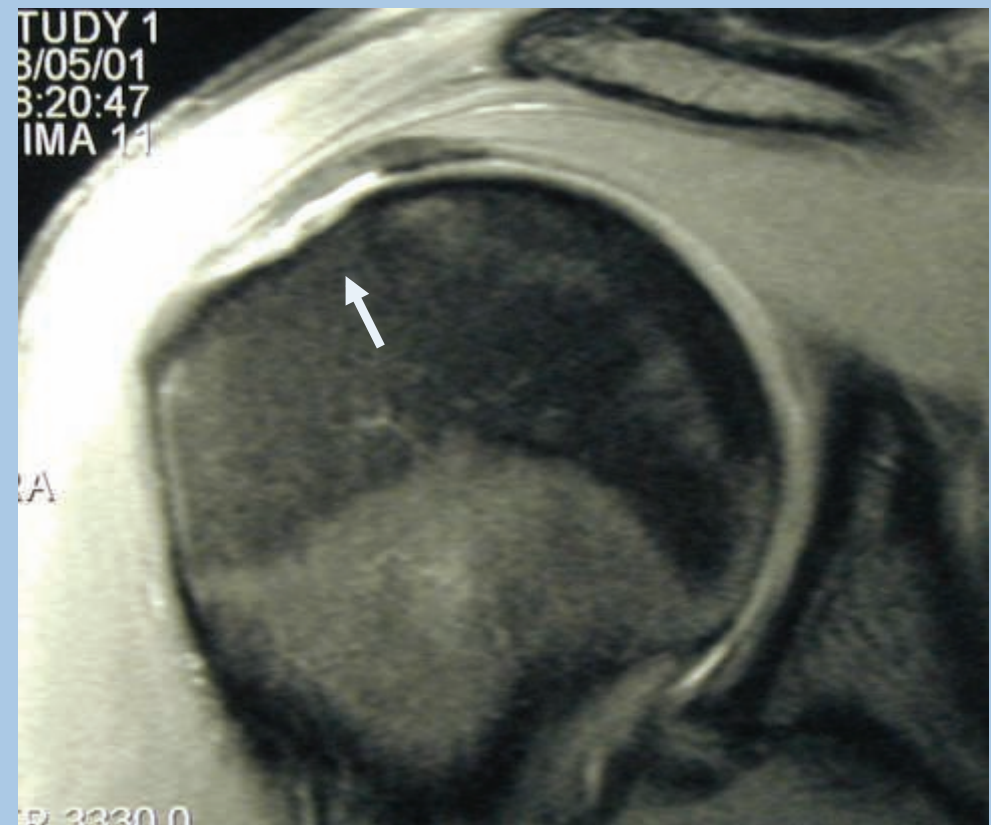


SUPRASPINATUS 83%

Tendinopathy

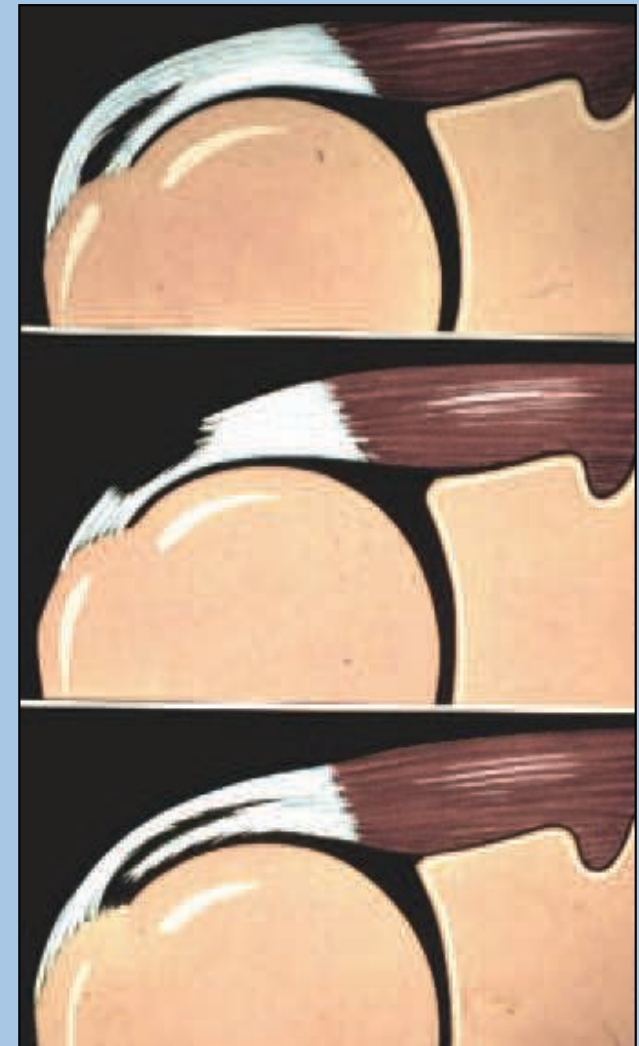


Partial articular tear



PARTIAL TEARS SSP

- Intratendinous 10%
- Superficial 5%
- Articular 85%



RARELY TRANSMURAL LESION



THROWING SHOULDER PAIN

pain (n=11)

- 3-tendon RC abnorm. n=10

no pain (n=19)

- 3-tendon RC abnorm. n= 1

- SSP abnorm. n=14

p = 0.003

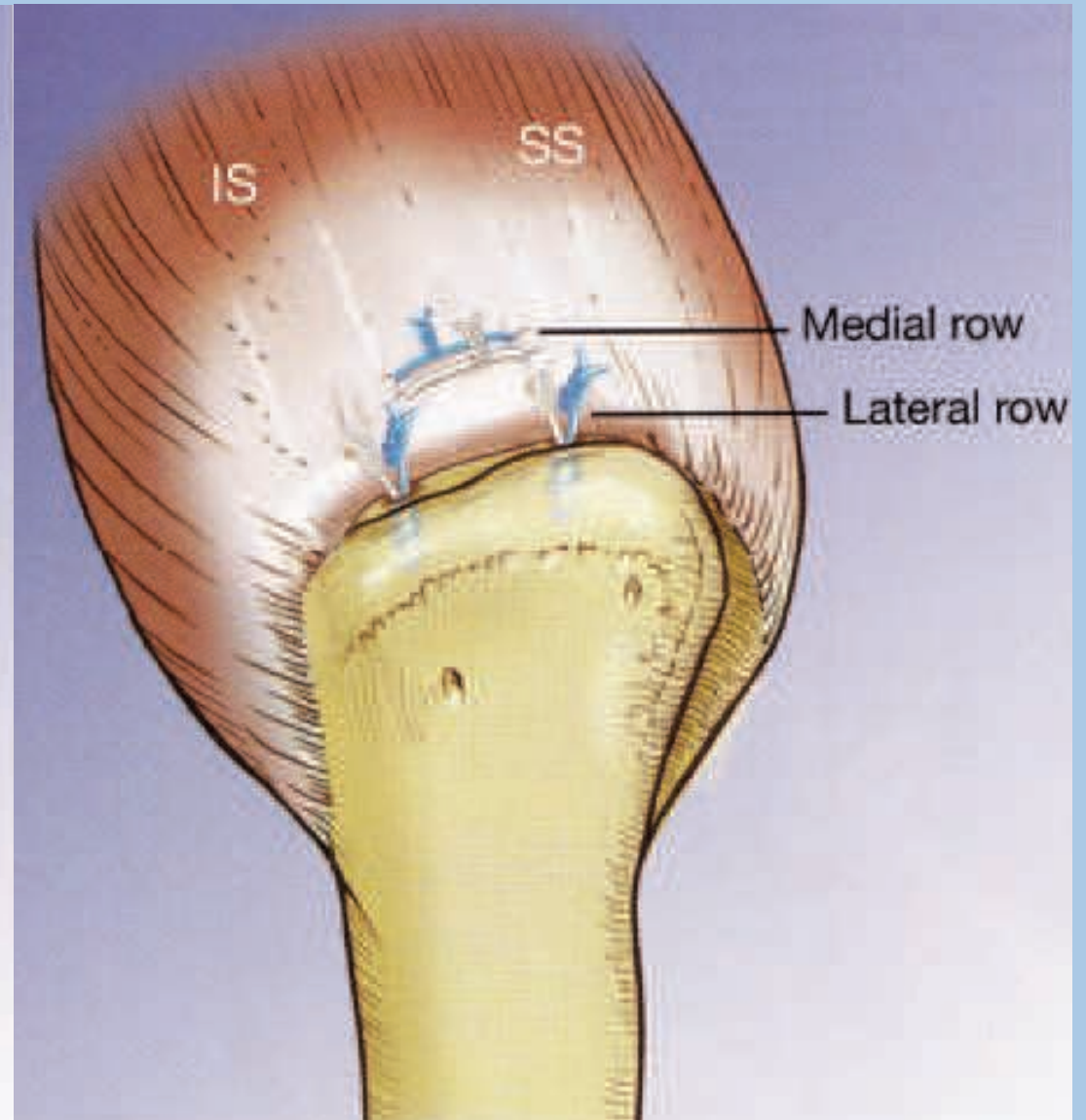
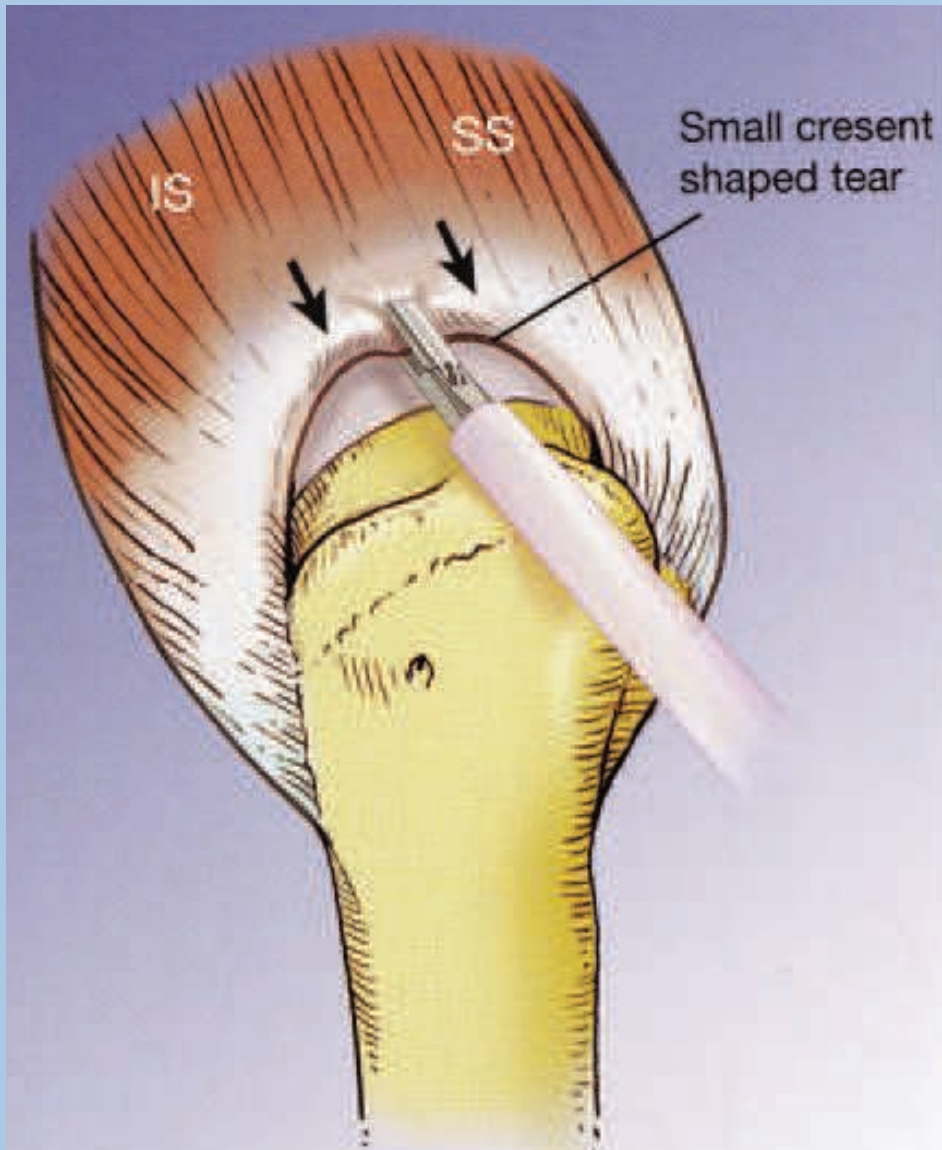
→ PASTA-Lesion is poor predictor of pain

NEVER OPERATE IMMEDIATELY...

First always conservative treatment:

- Rest , NSAID
- Physical therapy : stretching, strengthening
- Modification of the "late cocking phase"
- (avoid forceful external rotation AND hyperextension)
- **CAVE traumatic transmural rotator cuff tears (esp. SSC) !!!**

ARTHROSCOPIC ROTATOR PRINCIPLES



TAKE HOME MESSAGES



Transmural RCTs

→ rarely, if traumatic consider surgery (esp. SSC)

Tendinopathy/partial tendon tears

→ frequently

→ conservative, rarely arthroscopy

PASTA-Lesion is poor predictor of pain

THROWING SHOULDER PAIN

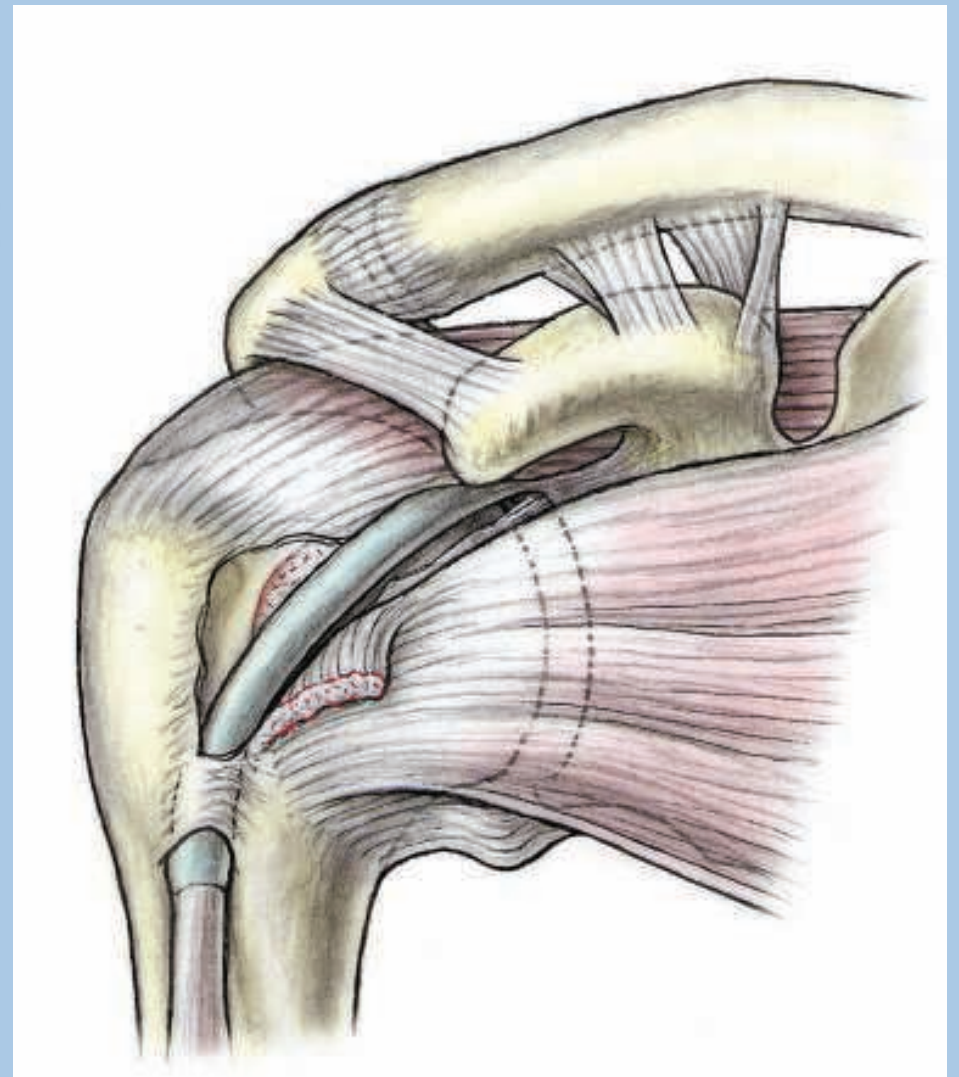
Pain is not derived from rotator cuff...

...but where does the pain come from....

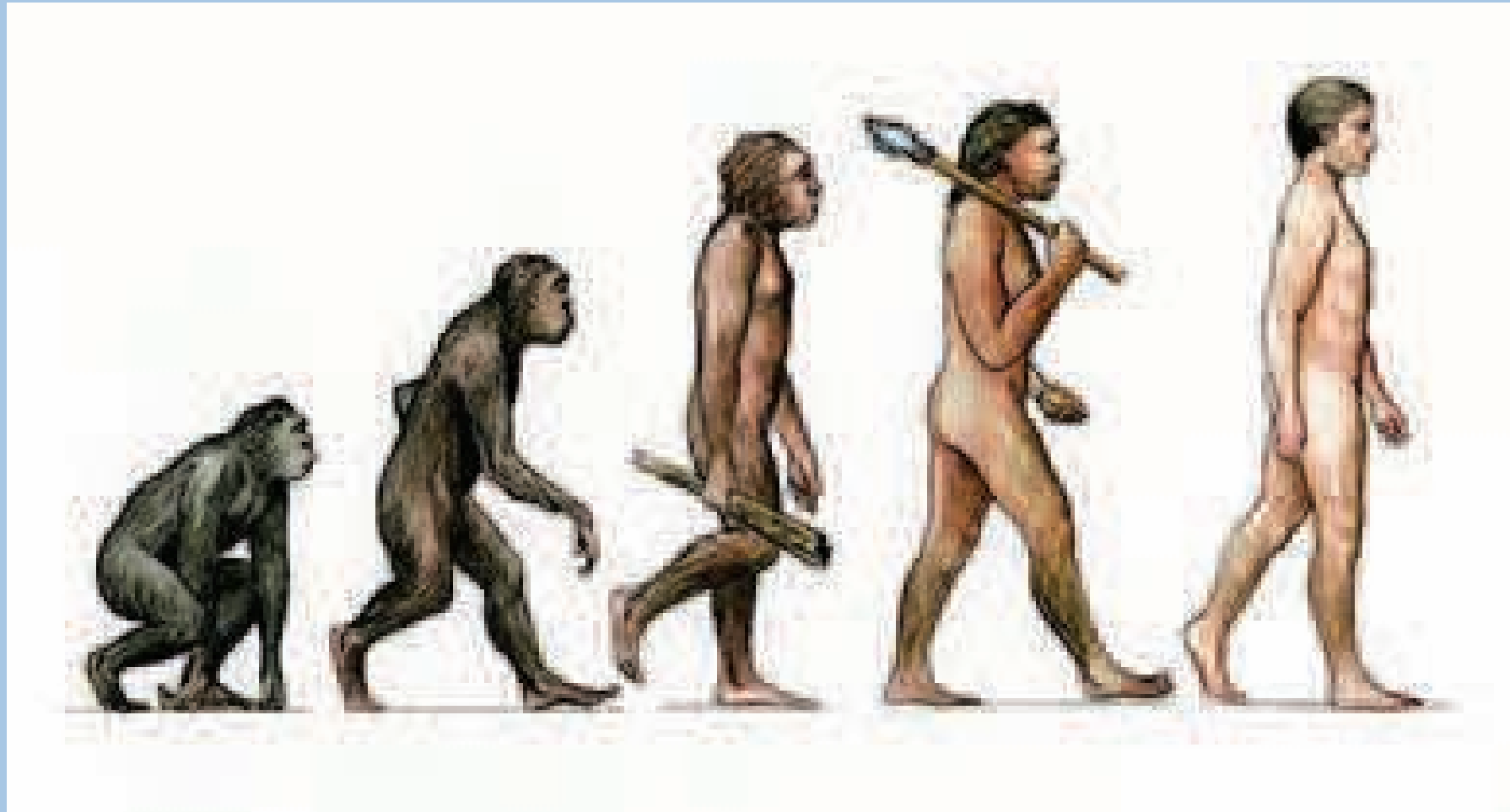


LHB = A MAJOR CAUSE OF PAIN

- Tenosynovitis
- Hypertrophy & Entrapment (Hourglass Biceps)
- Proximal desinsertion (SLAP)
- Delamination
- Pre-rupture
- Subluxation
- Dislocation

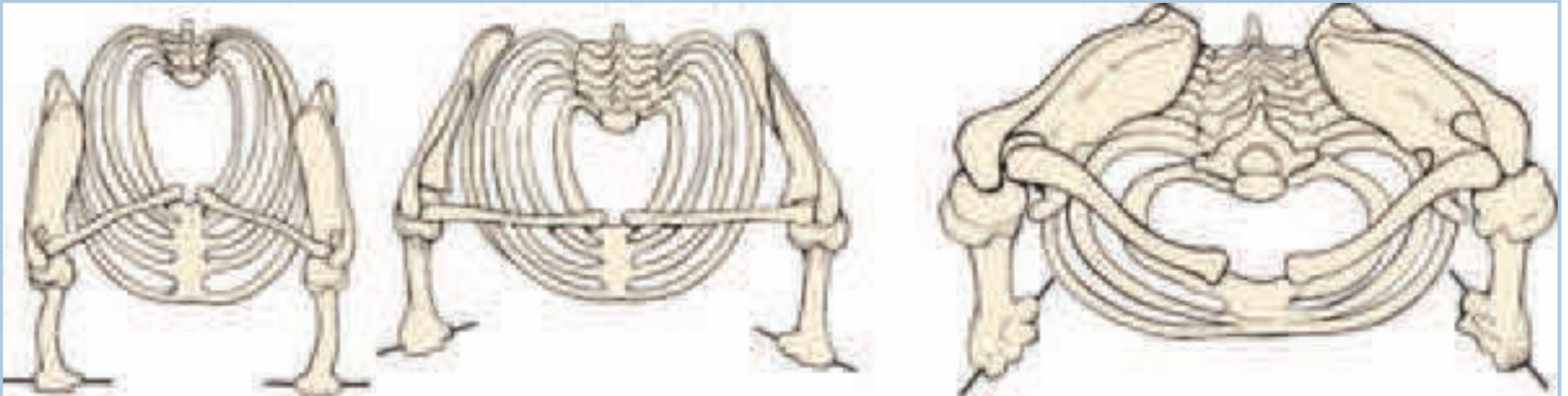


CHALLENGE OF THE BICEPS...



.... is the challenge of human evolution!

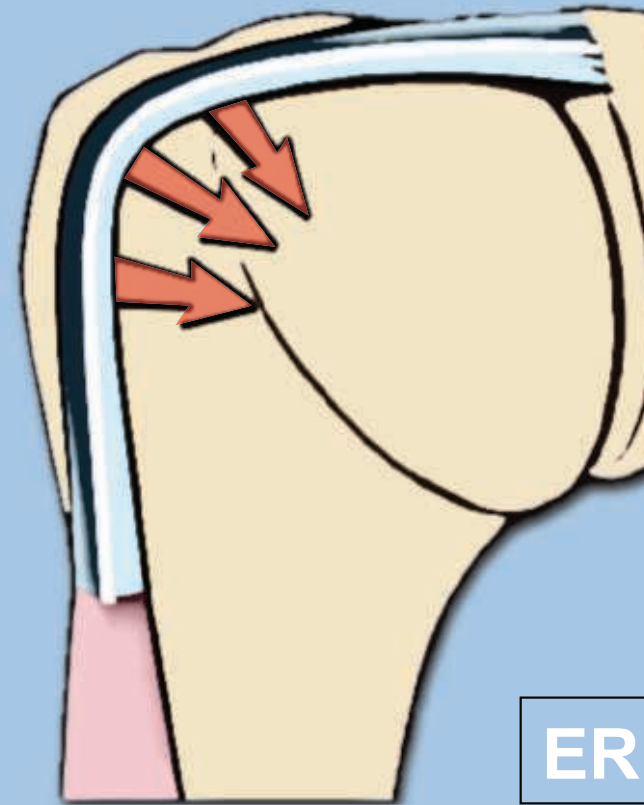
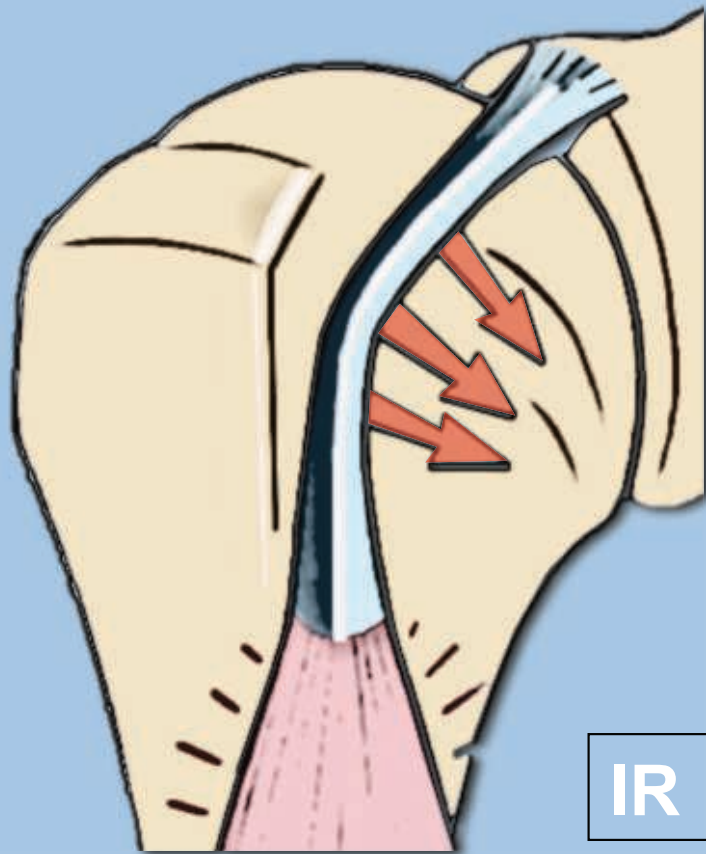
CHALLENGE IN THE HORIZONTAL PLAN



CHALLENGE IN THE HORIZONTAL PLAN

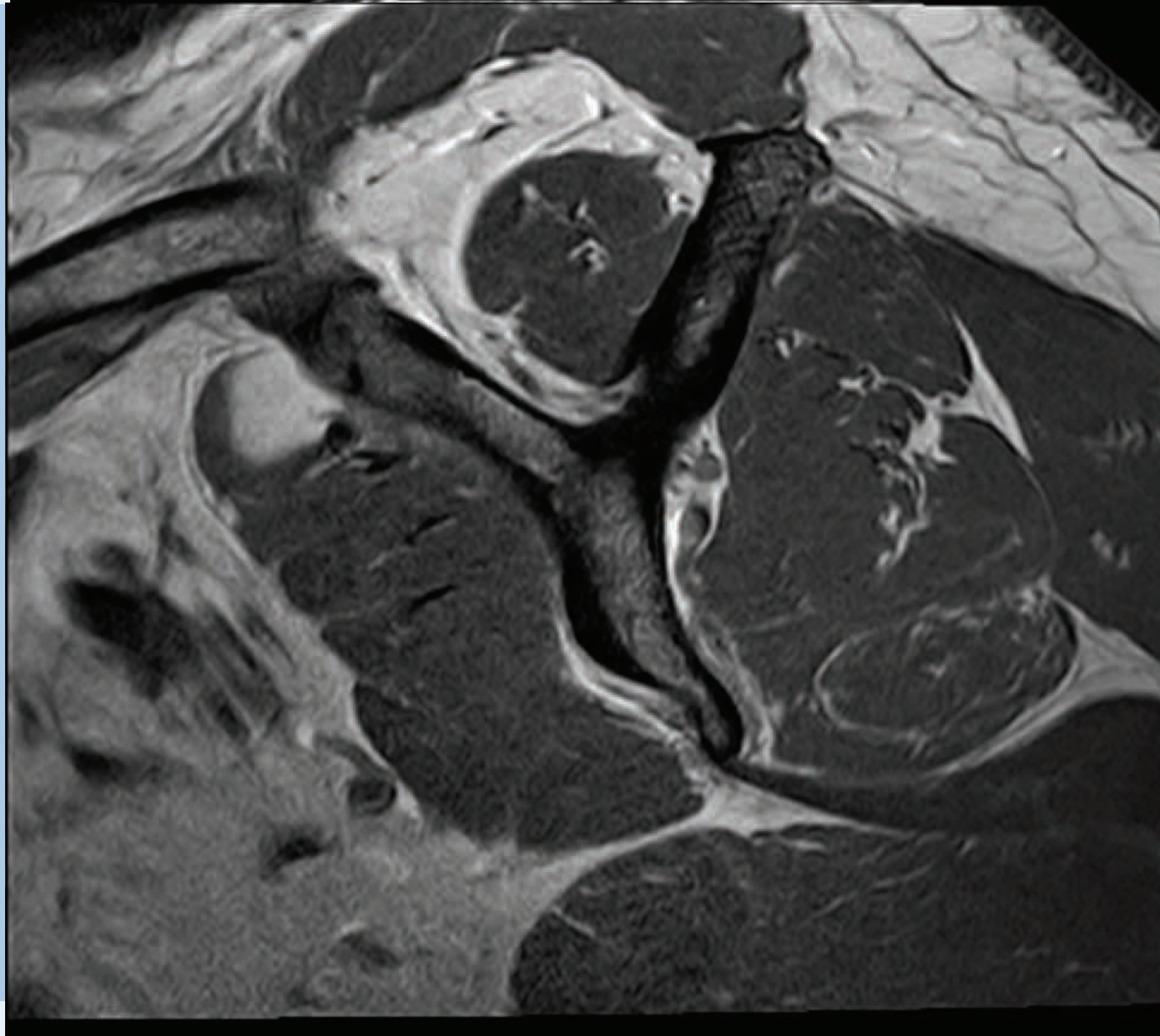


CHALLENGE IN THE HORIZONTAL PLAN

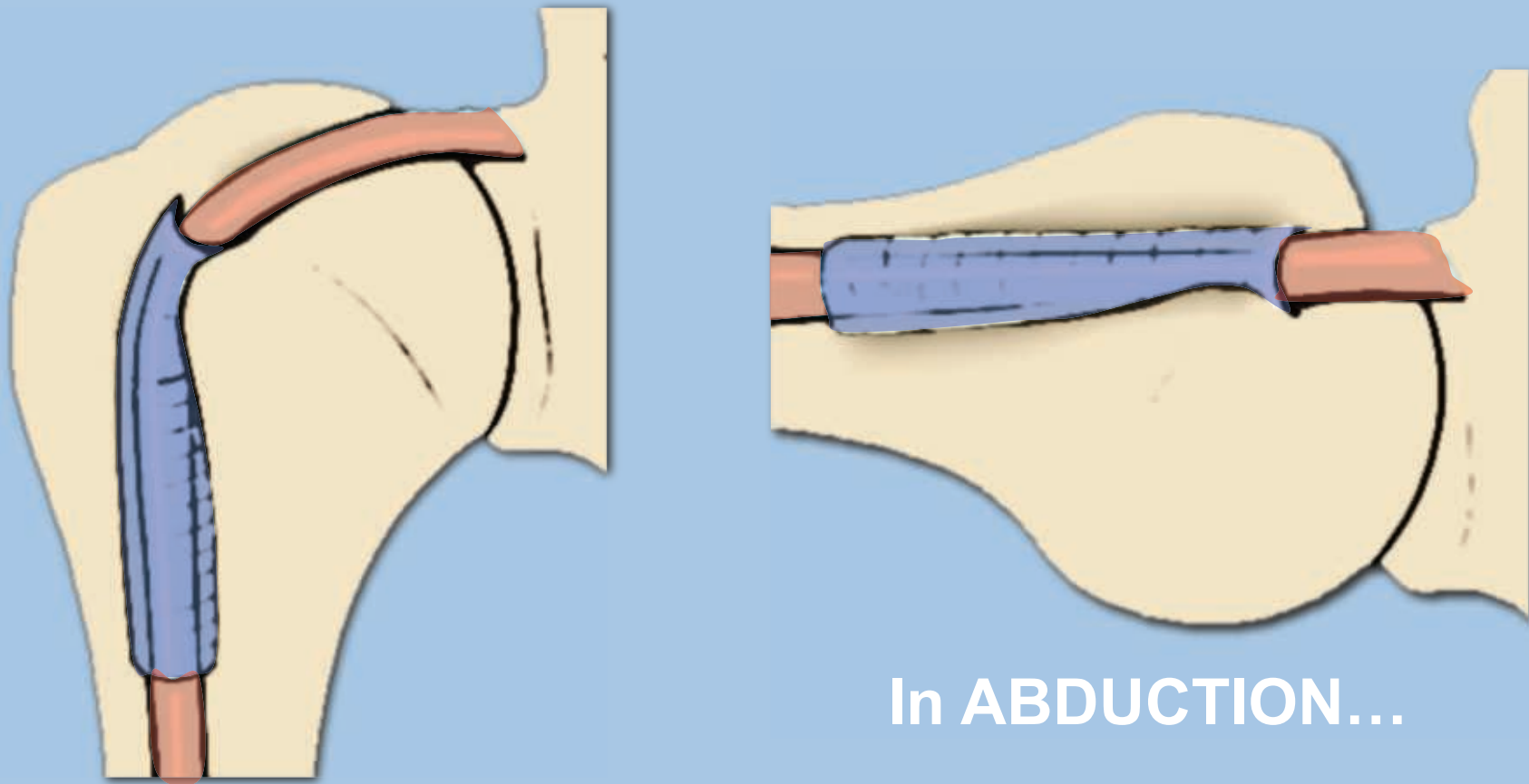


→ Tendency for subluxation or dislocation!

FINDINGS ON MRI



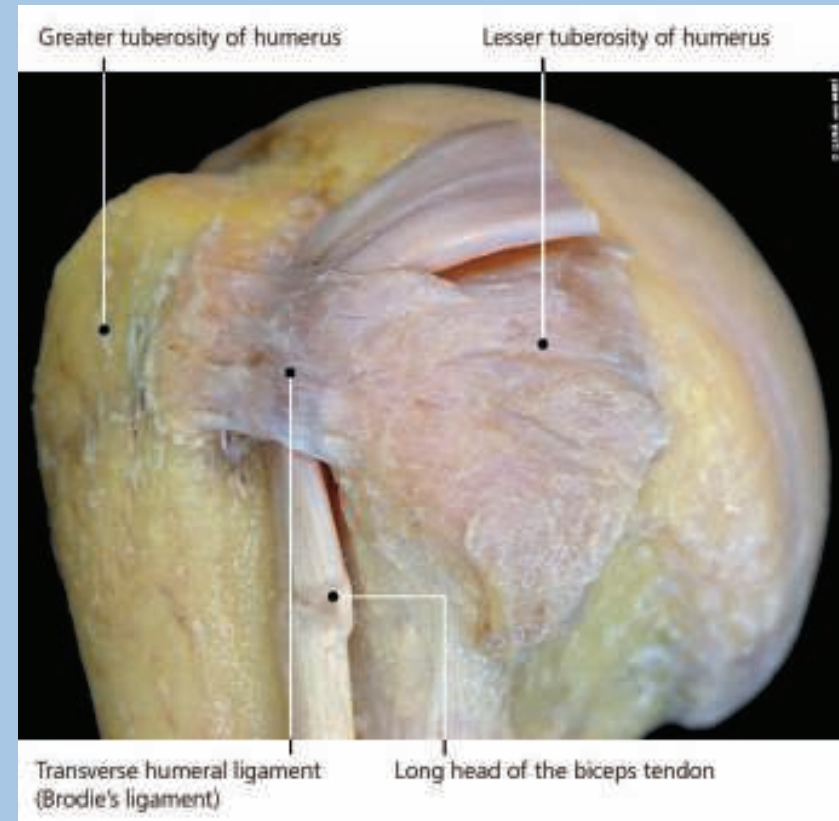
CHALLENGE IN THE VERTICAL PLANE



In ABDUCTION...

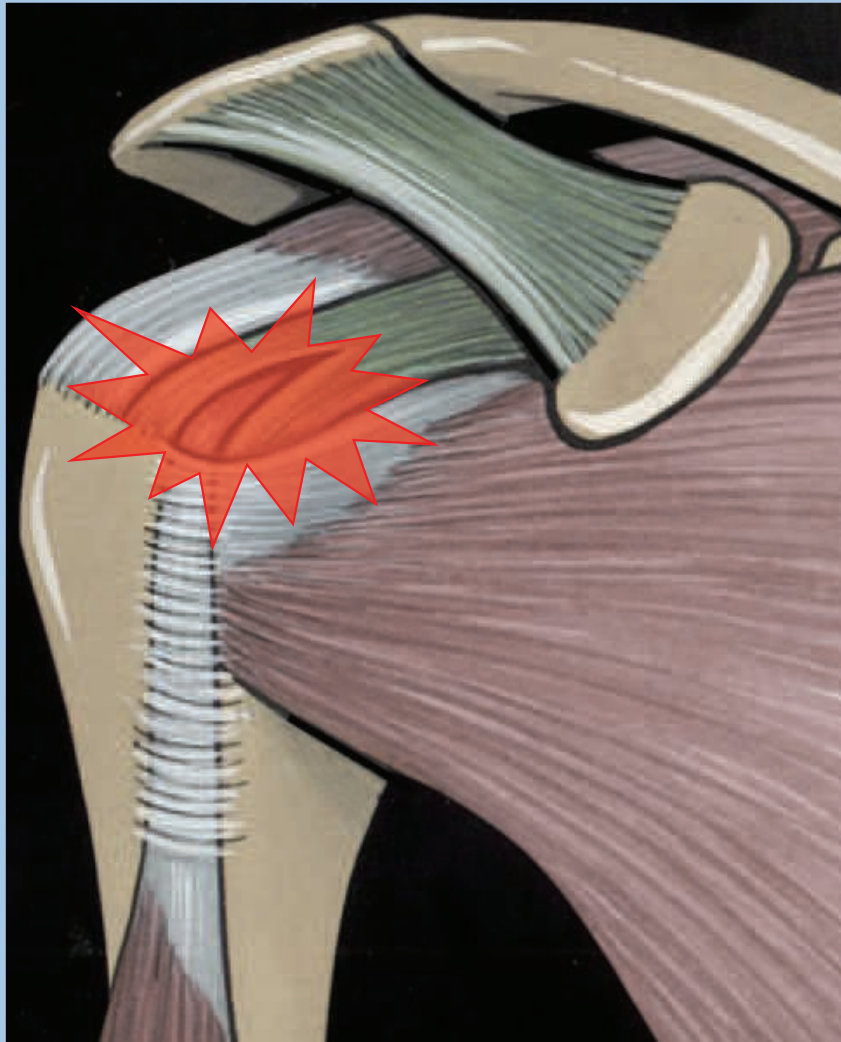
...LHB has to glide through the groove

THE INTRAARTICULAR PORTION OF THE LHB



= a cause of pain and locking of the shoulder

CHALLENGE IN THE VERTICAL PLANE



THE HOURGLASS BICEPS



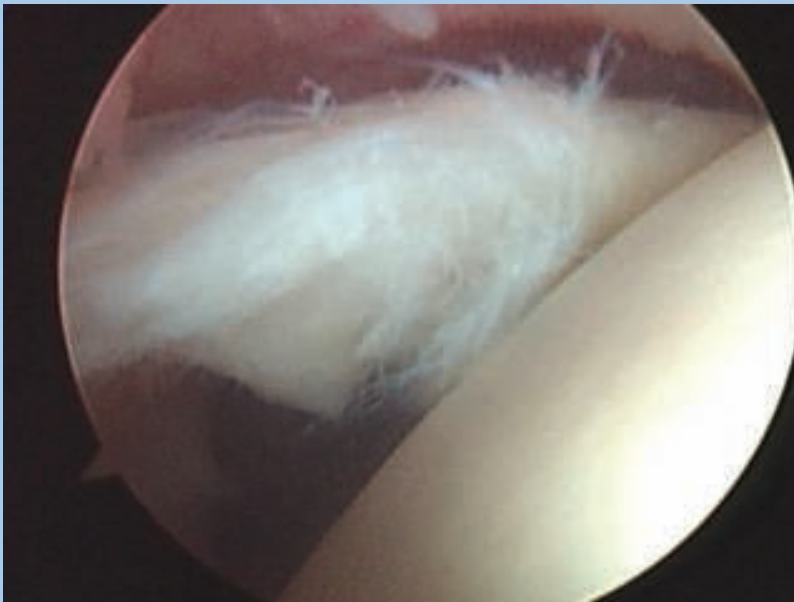
LONG BICEPS TENDON



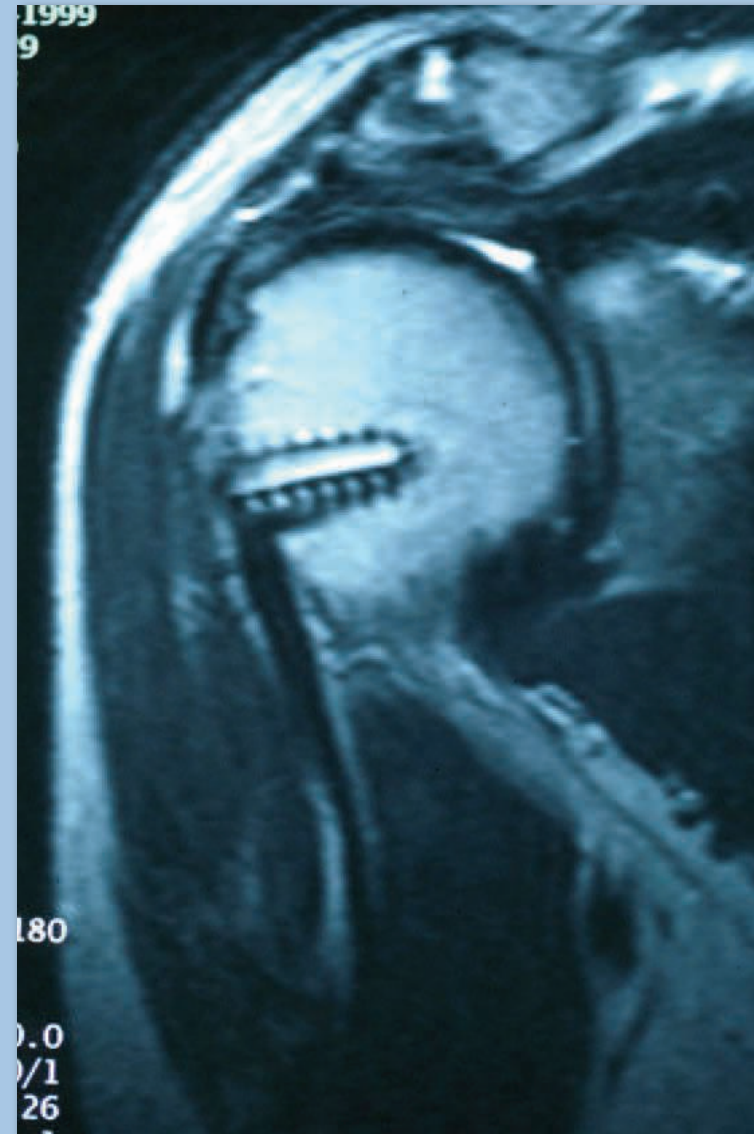
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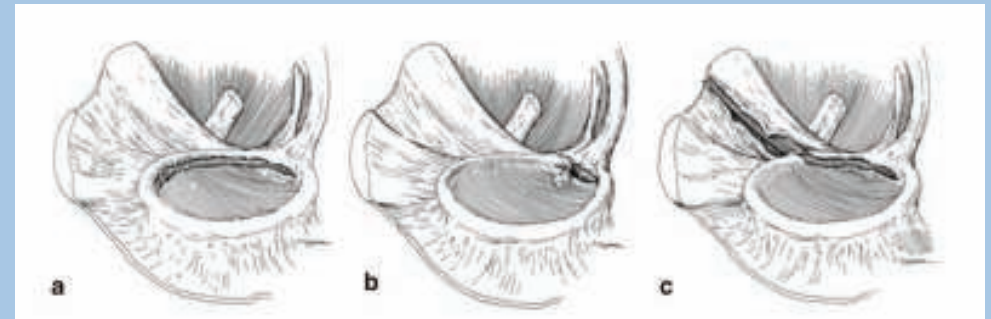
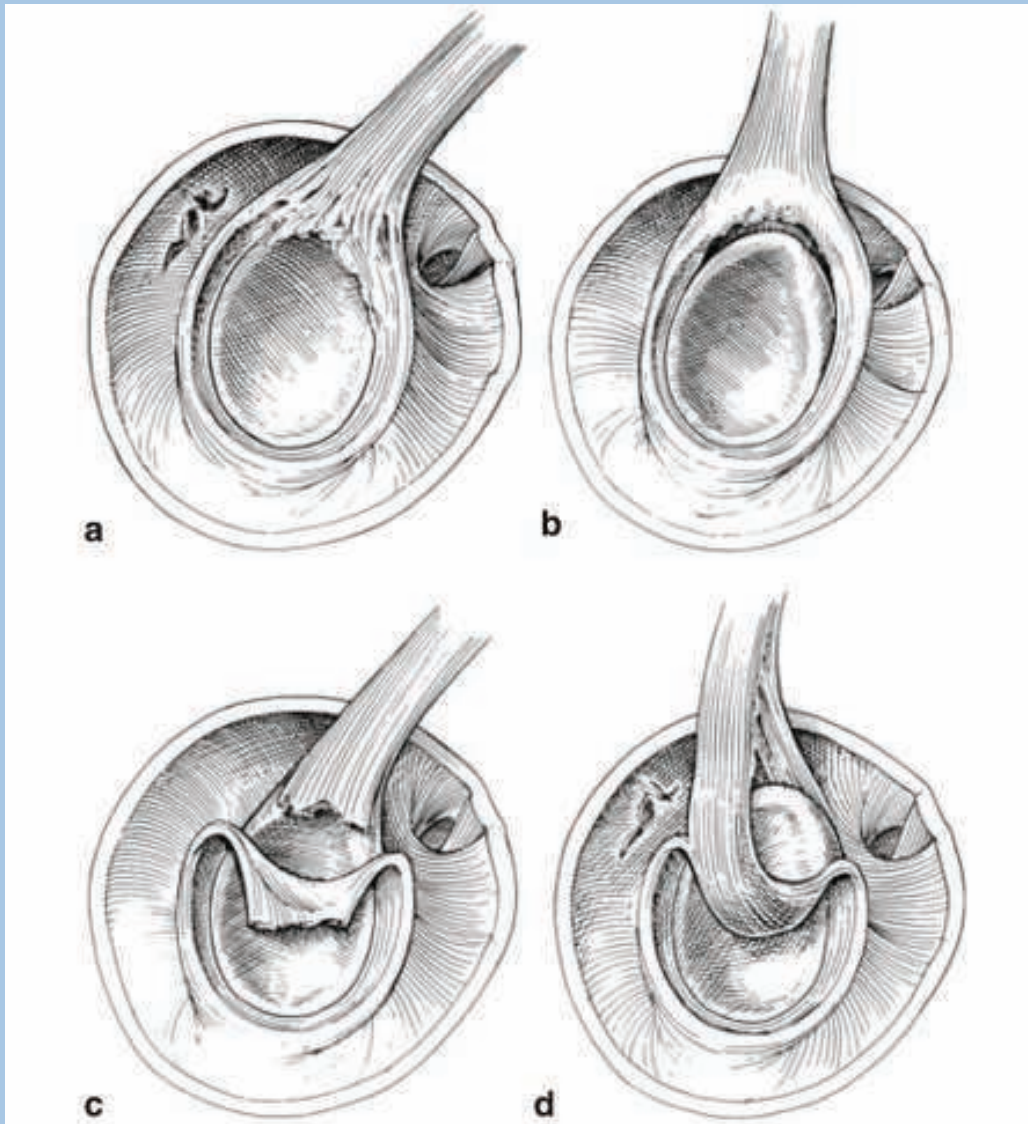
- almost no shoulder function!!!
- "appendix of the shoulder"



ARTHROSCOPIC BICEPS TENODESIS



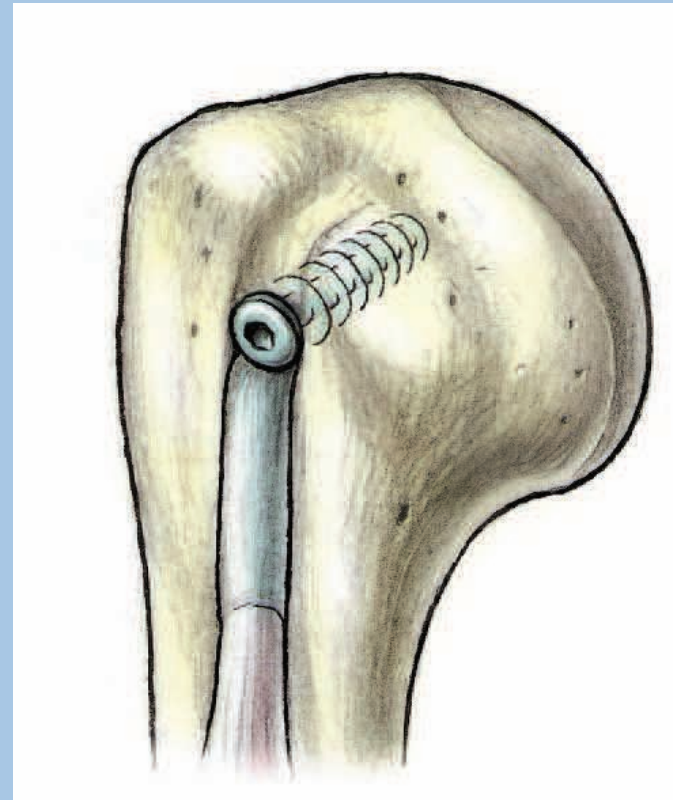
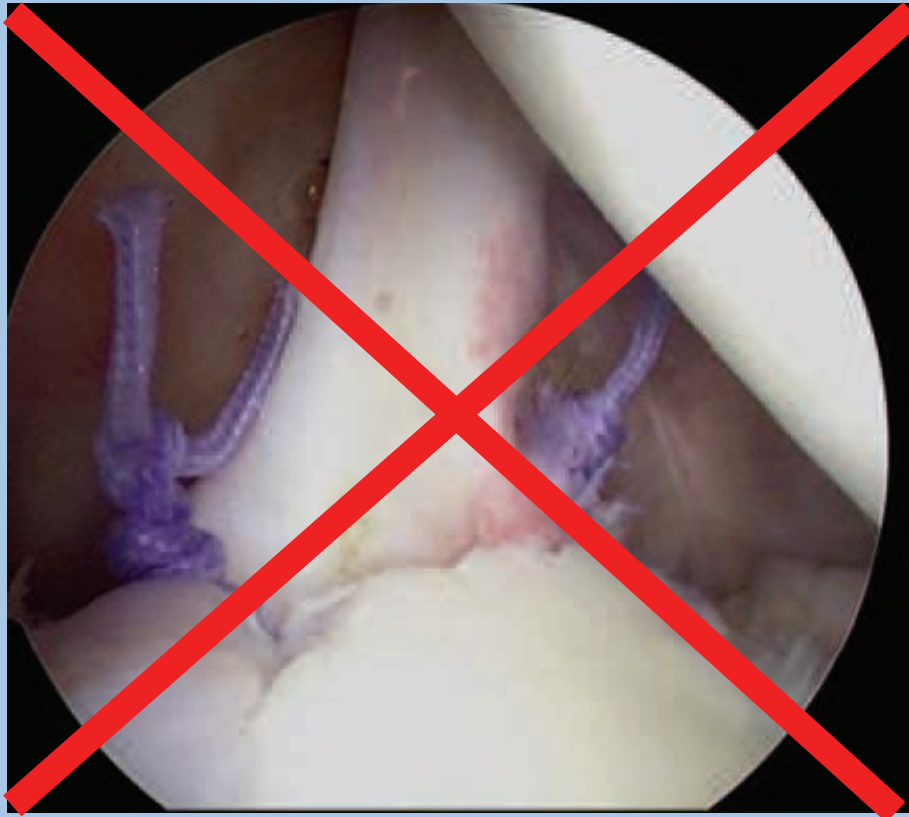
LESION OF THE PROXIMAL INSERTION (SLAP)



Snyder; Arthroscopy, 1990, 6:274-9

Maffet; AJSM, 1995, 23:93-8

REPAIR OF SLAP II LESIONS



→ Only 40% were satisfied with SLAP-repair
vs. 93% in tenodesis group

TAKE HOME MESSAGES



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LHB is a frequent source of shoulder pain !!!

Almost no shoulder function;

"appendix of the shoulder"

Results after SLAP II surgeries are more consistent with tenodesis than repair

SHOULDER PROBLEMS IN ATHLETES

Acute versus chronic injuries:

- Rotator cuff lesions
- Biceps pathologies and Superior Labral Anterior Posterior (SLAP) Lesions
- Extra- or intraarticular anatomical conflicts
- Glenohumeral shoulder instabilities
- Acromioclavicular instability

UNDERSTAND MOVEMENTS



Courtesy to Dr. Lajtai

EXTRAARTICULAR SUBACROMIAL CONFLICT

pain

- Onset by increase of overhead activity
- Night
- Dominant arm



EXTRAARTICULAR SUBACROMIAL CONFLICT

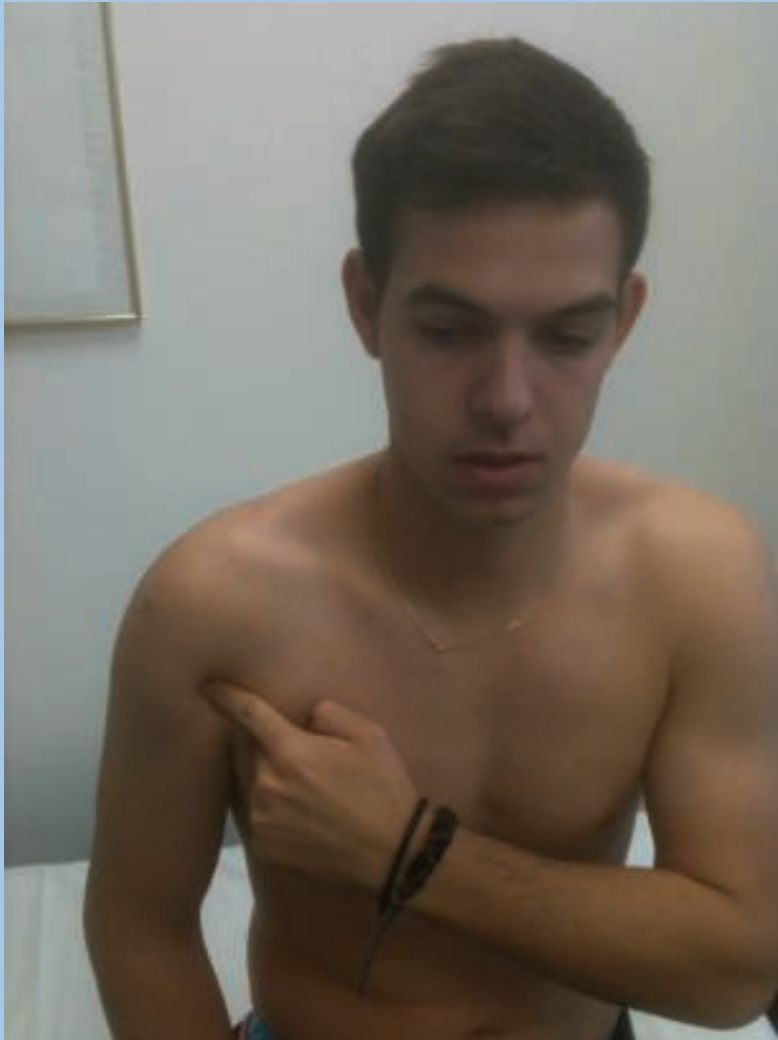


CONSIDER SKAPULAR DYSKINESIA

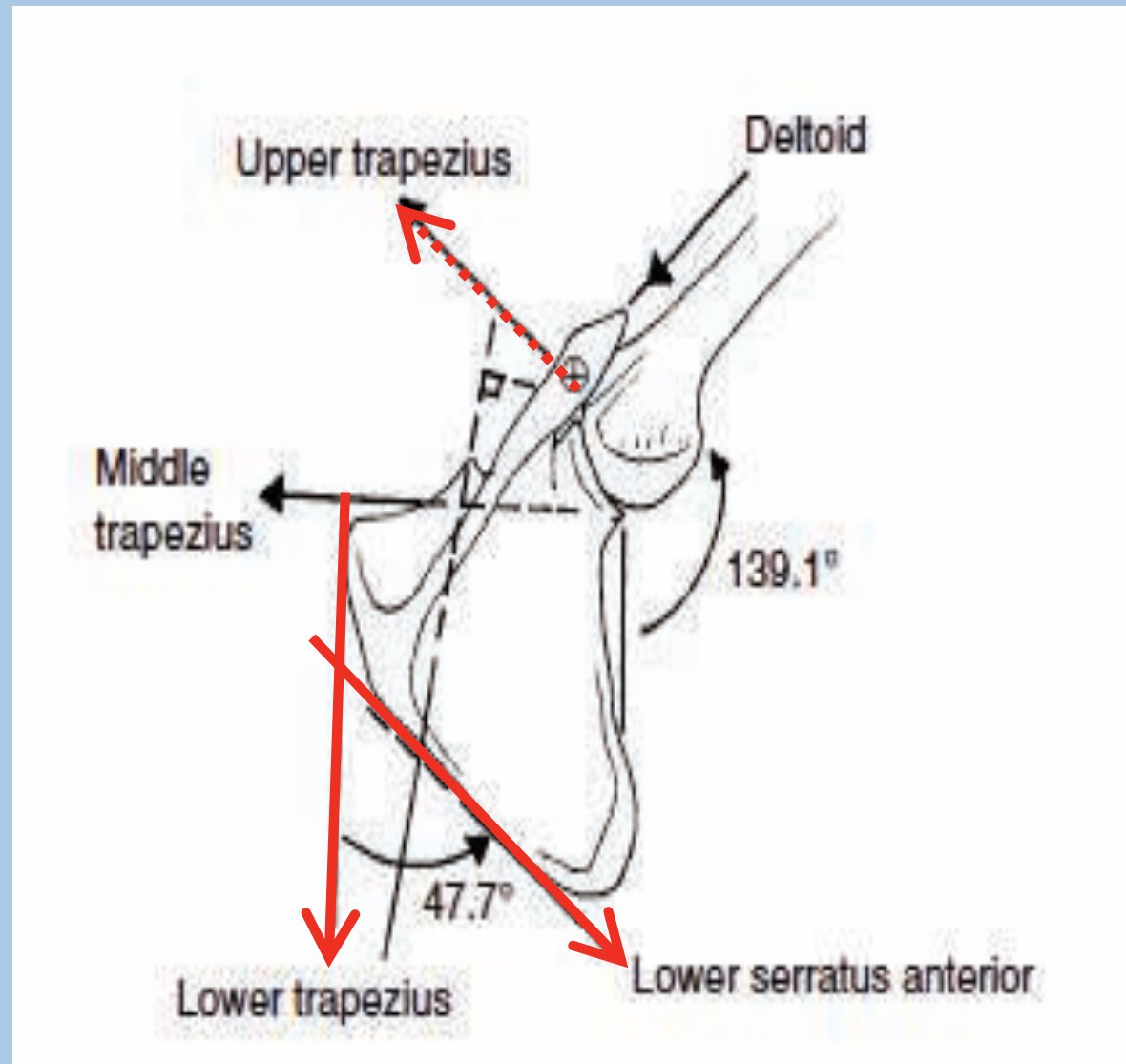


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FORCE COUPLES FOR SCAPULAR ROTATION



SCAPULAR DYSKINESIS

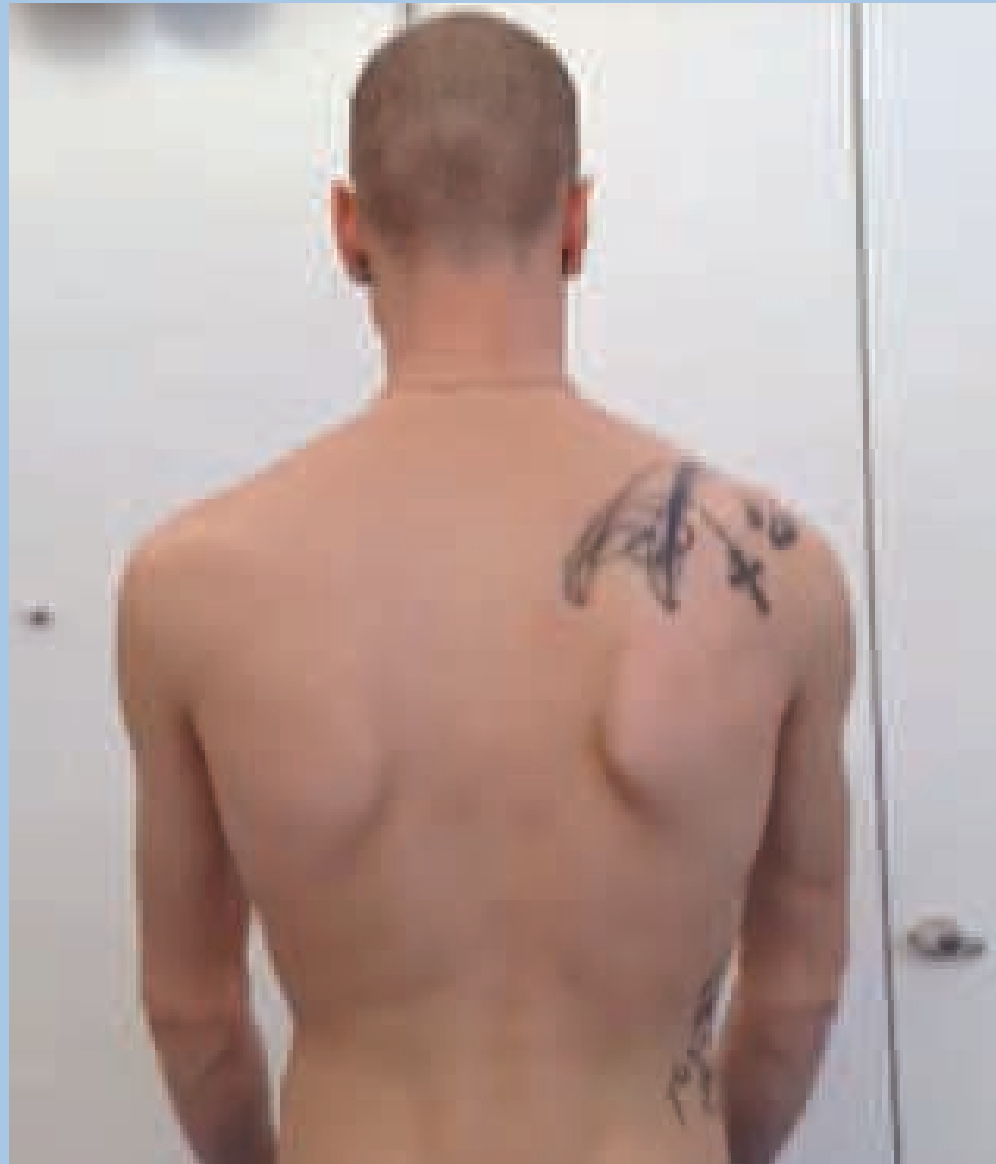
Scapular dyskinesis:

- “dys” – alteration of, “kinesis” – movement

Classification:

- Typ I: medial border prominence
- Typ II: inferior angle prominence and/or early scapular elevation on arm elevation
- Typ III: superior scapular prominence or rapid downward rotation during arm lowering

SCAPULAR DYSKINESIA: CLINICAL PRESENTATION



SCAPULAR DYSKINESIA

Type I: Medial border prominent

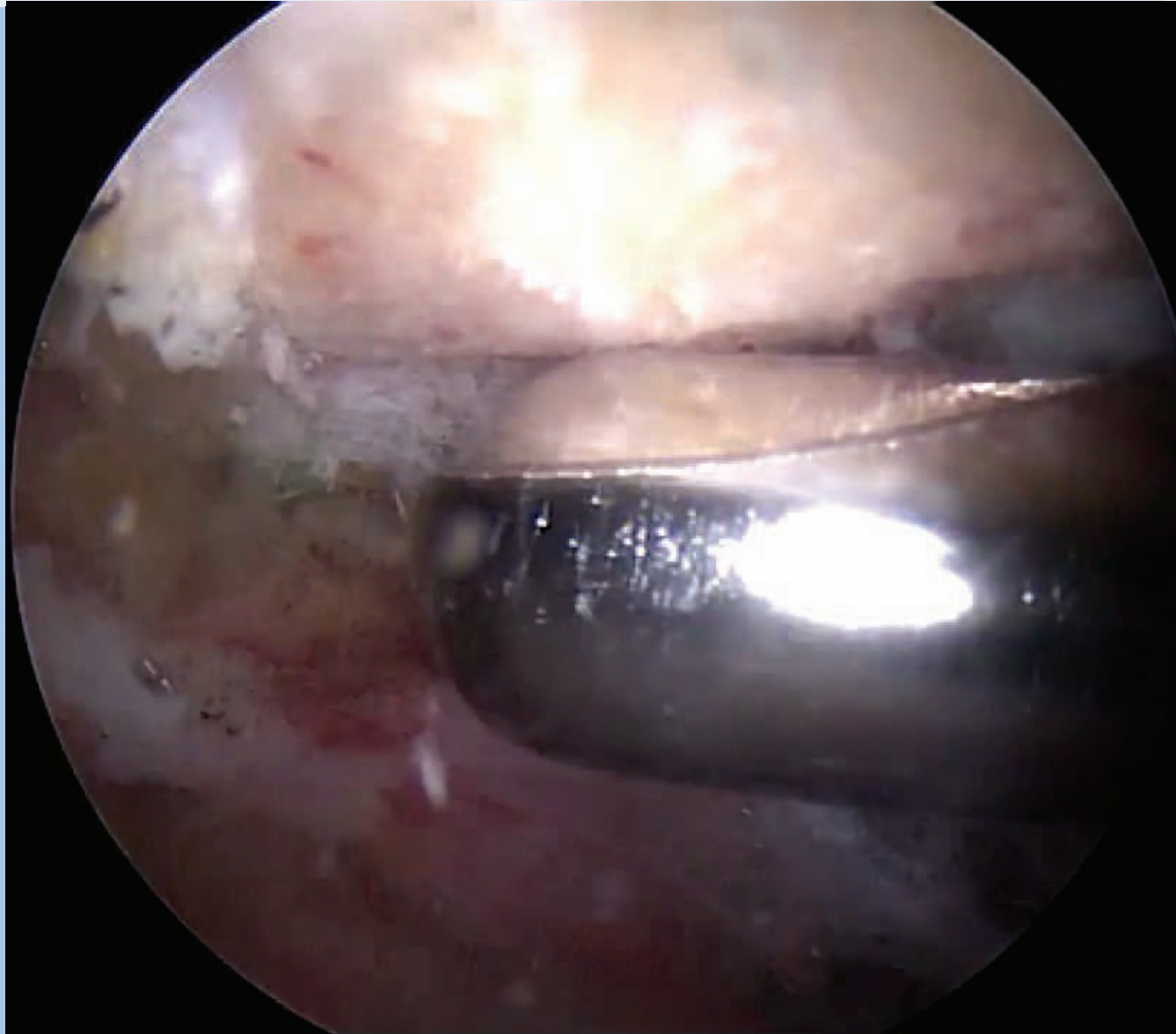


Courtesy to Bettina Bertschy

EXTRAARTICULAR SUBACROMIAL CONFLICT

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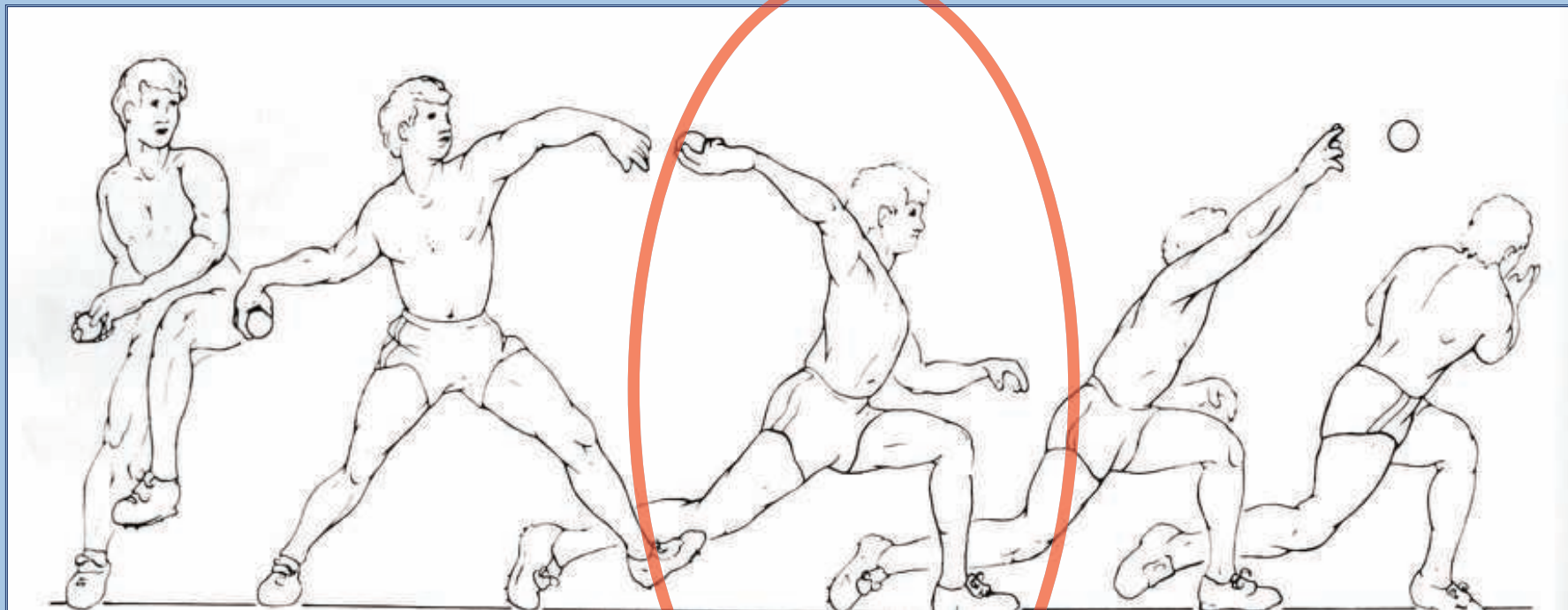


EXTRAARTICULAR SUBACROMIAL CONFLICT

- Decoadaptation
→ (San Antonio-program)
- Increase strength of external rotators
→ **ISP → increase clearance**
- Strengthening of scapular retractors
- Occasionally subacromial infiltration

INTRAARTICULAR POSTERO-SUPERIOR CONFLICT

- Pain in ABD and maximum ER



Wind up

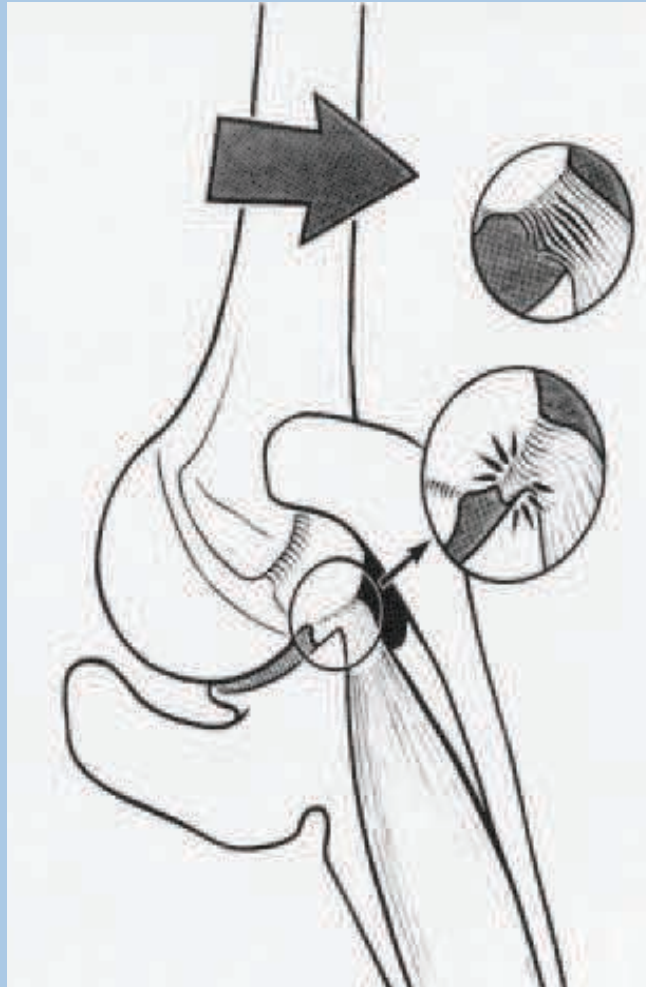
Early
cocking

Late
cocking

Acceleration

Follow
through

INTRAARTICULAR POSTERO-SUPERIOR CONFLICT



CLINICAL SIGNS

Posterior Pain:

- in ABER position / late cocking
- no instability
- no AS conflict
- GH injection relieves pain



CLINICAL SIGNS

Throwing Non Throwing

• ER (°)	100	92	p=0.003
• IR (°)	65	70	p=0.01



THE THROWING SHOULDER

“shoulder at risk”: GIRD und SICK

SICK Scapula Syndrome

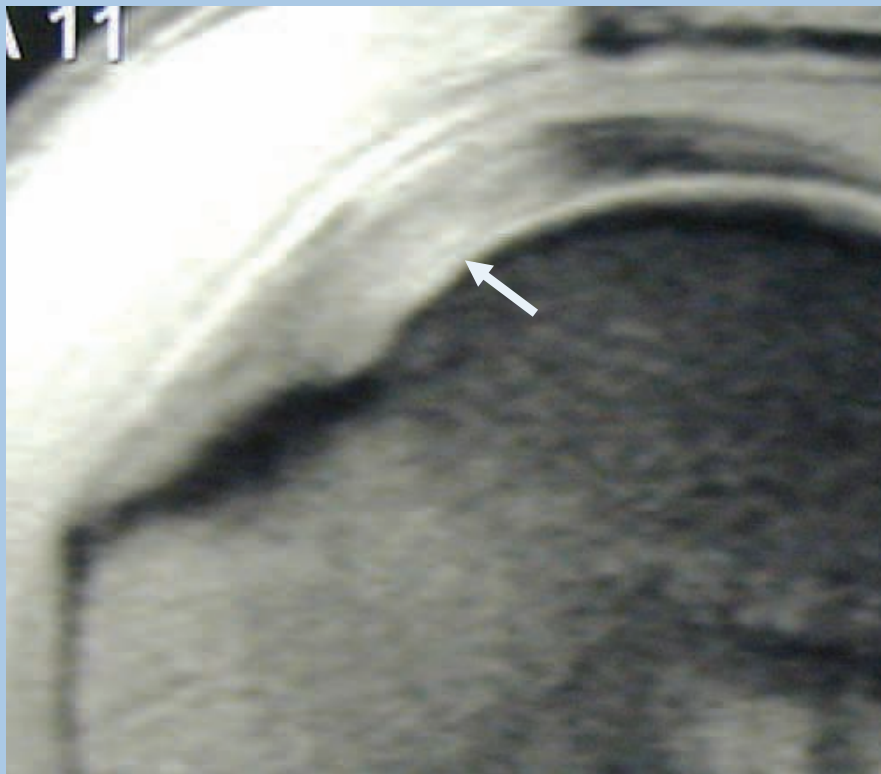
Scapular malposition, Inferior medial border prominence, Coracoid pain, and dysKinesis of scapular movement

- 1. Infa → dropped scapula
- 2. Lateral translaton
- 3. Abduction (ER)

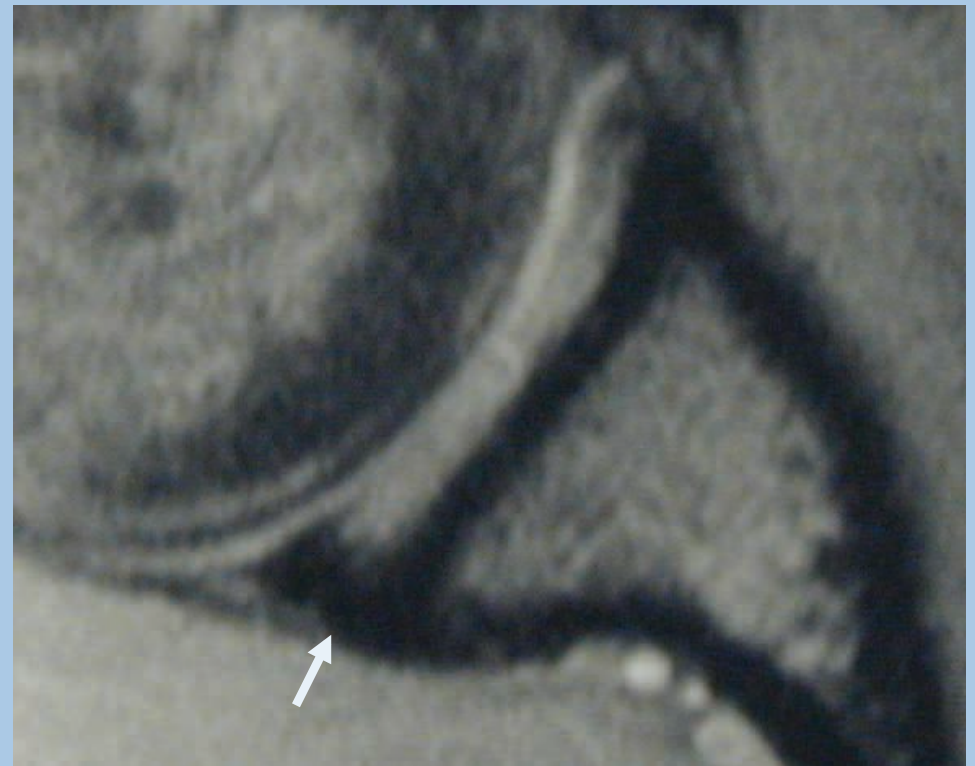


MR FINDINGS

Posterior partial SSP tear



Fraying of posterior labrum



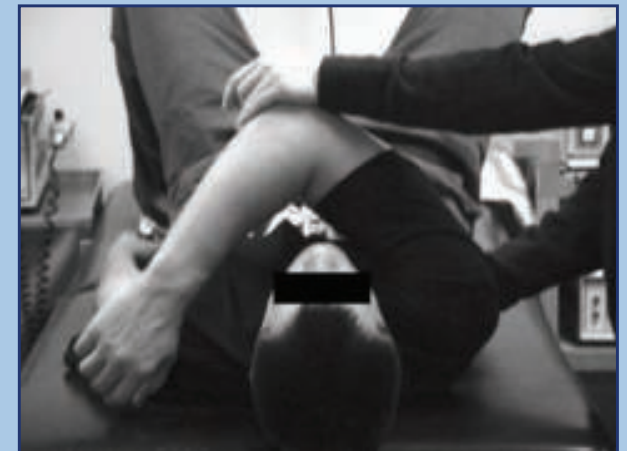
ARTHROSCOPIC FINDINGS



TREATMENT OPTIONS

- Rest and rehabilitation
- GH injection
- Stretching PI capsule / strengthening of scapular stabilizers
- Restore ROM

→ Modification late cocking phase



SURGICAL TREATMENT



→ PS glenoid bone resection: 80% success
with 18/26 return to sport

TAKE HOME MESSAGES



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**Always do conservative treatment before
searching for surgical solution**

Look for dyskinesia, GIRD, SICK

**If necessary, arthroscopic techniques are
surgery of choice.....**

TAKE HOME MESSAGES



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**... but operations
should be evaluated
thoroughly!**

SHOULDER PROBLEMS IN ATHLETES

Acute versus chronic injuries:

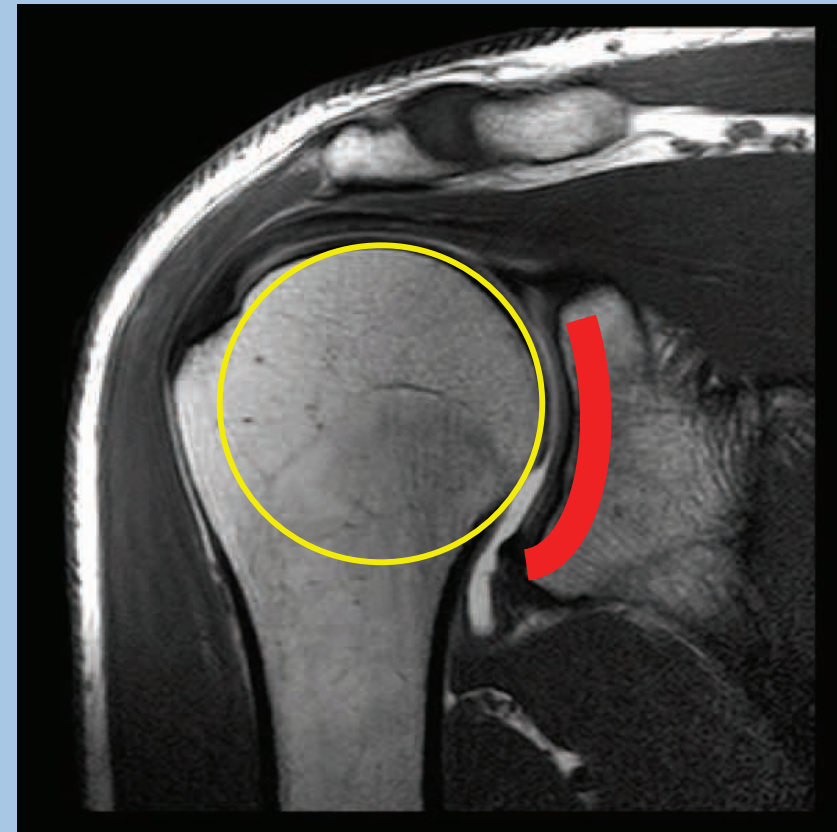
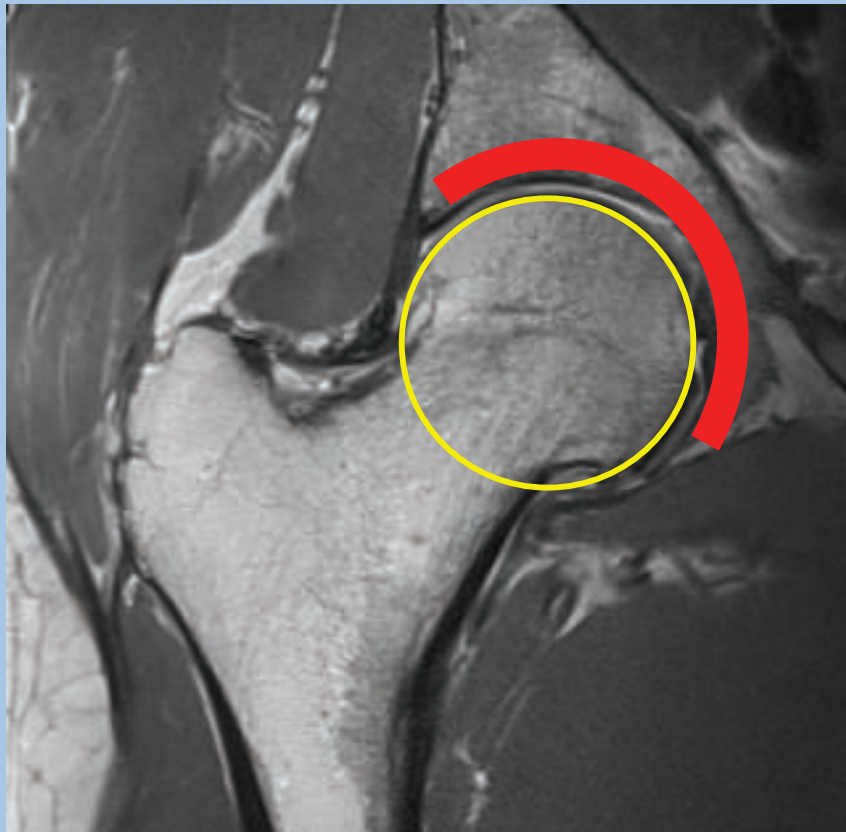
- Rotator cuff lesions
- Biceps pathologies and Superior Labral Anterior Posterior (SLAP) Lesions
- Extra- or intraarticular anatomical conflicts
- Glenohumeral shoulder instabilities
- Acromioclavicular instability

BONY STABILITY

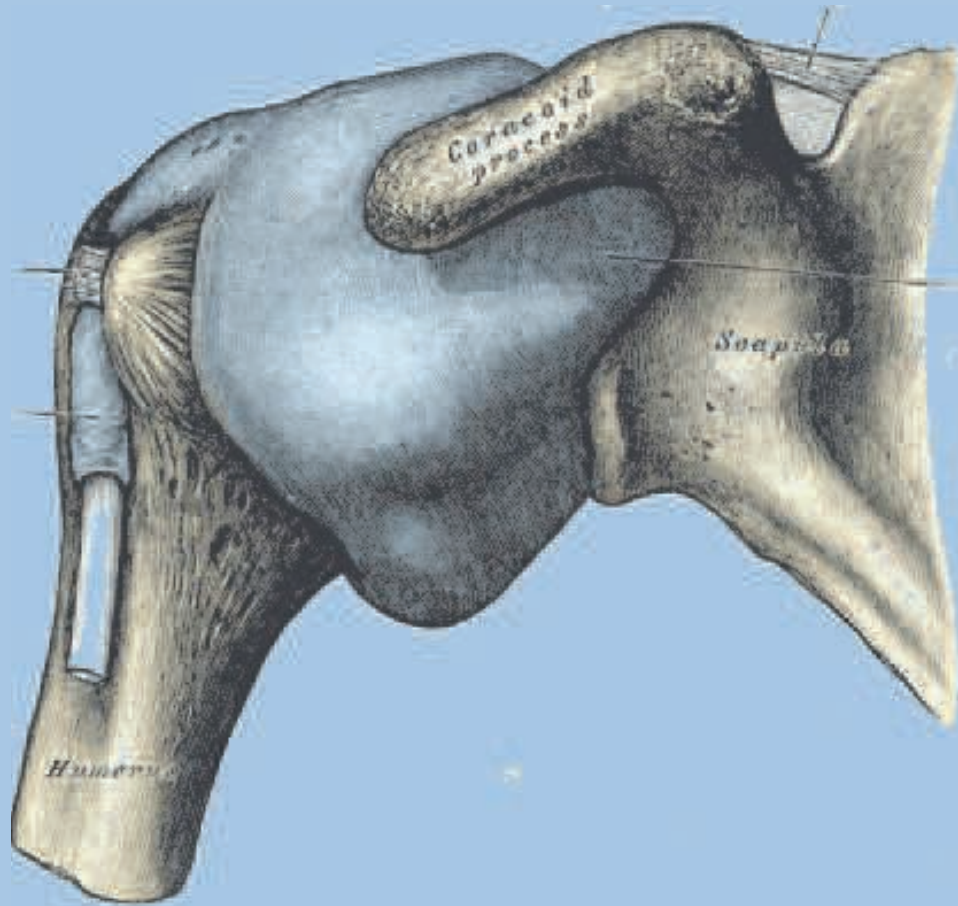


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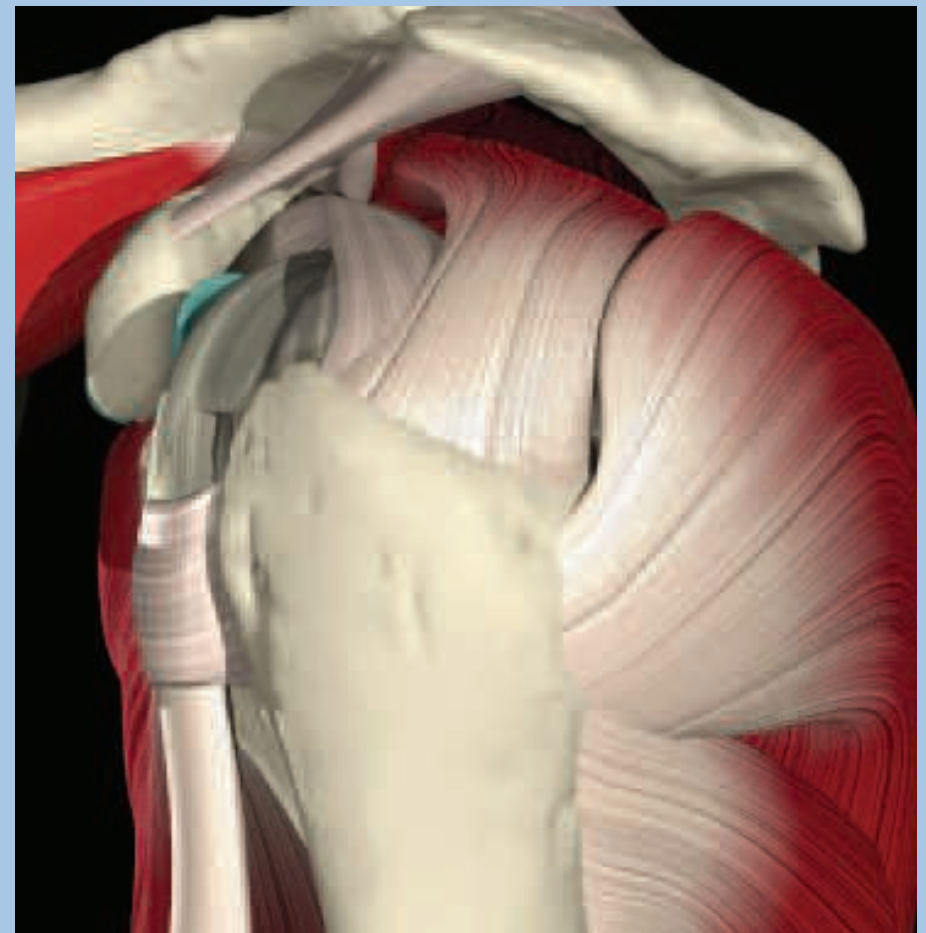
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SOFT TISSUE STABILIZERS



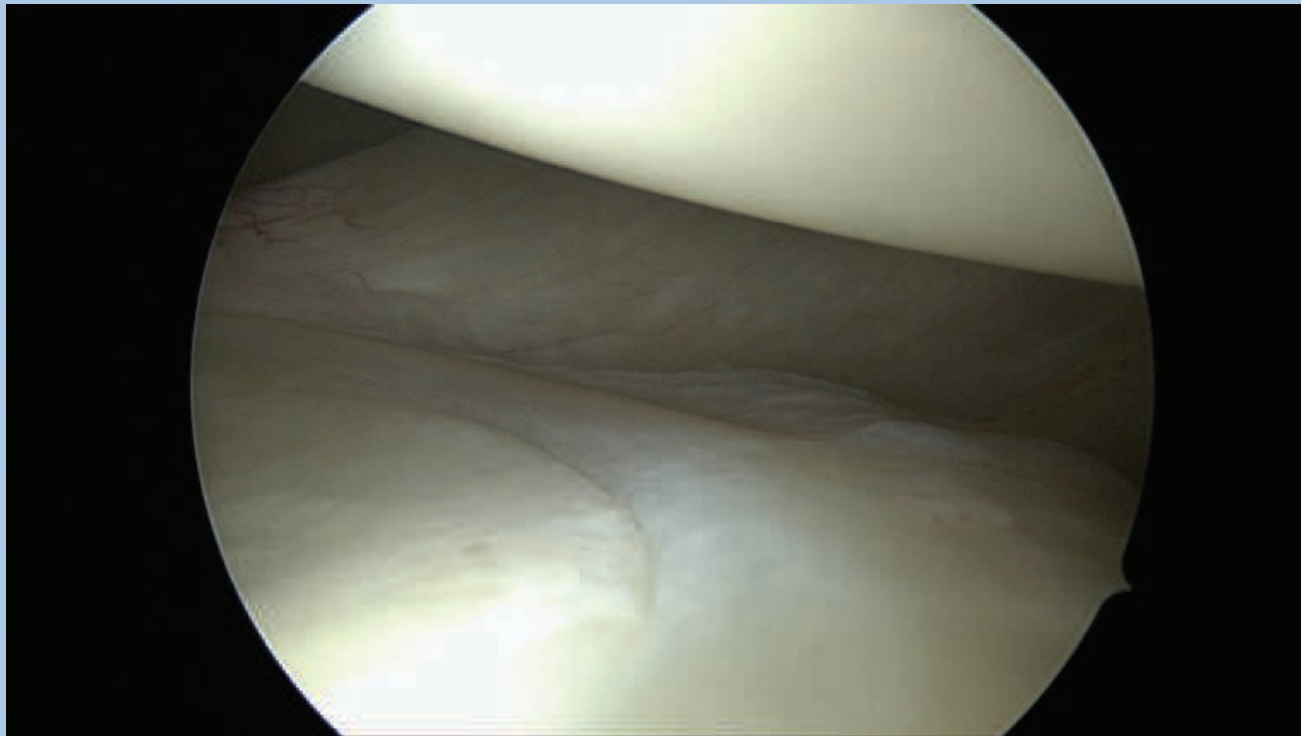
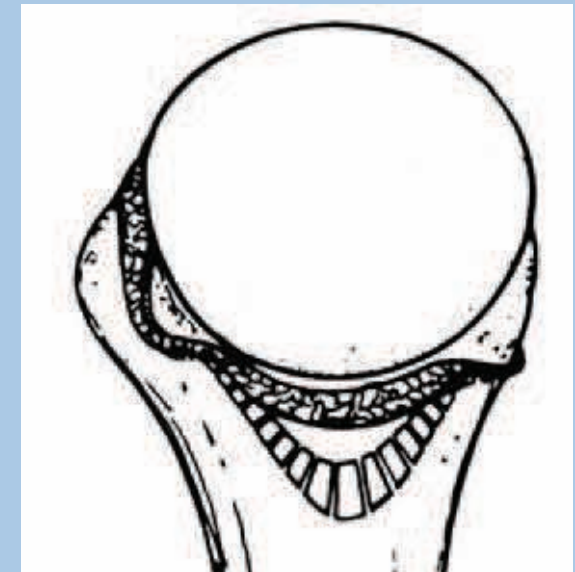
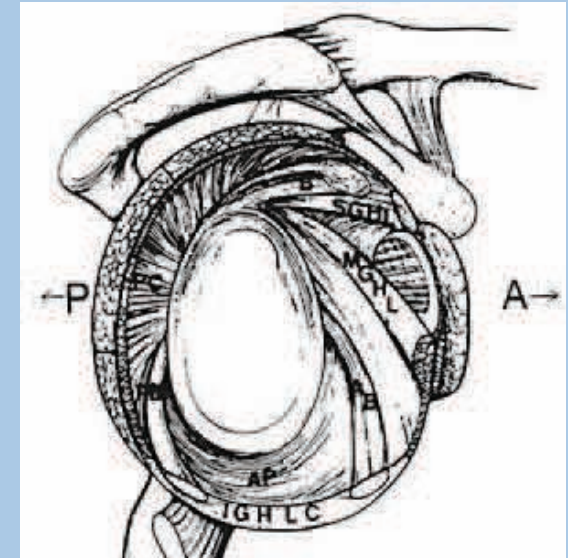
- **static:**
 - Capsulolabral complex



- **dynamic:**
 - Rotator cuff muscles

INFERIOR GLENOHUMERAL LIGAMENT

- always present
- consists of:
 - anterior band
 - axillary recess
 - posterior band



CLINICAL PRESENTATIONS

- **Acute dislocation**
- **Chronic instability**
- **Unstable painful shoulders (= UPS)**

CLASSIFICATION

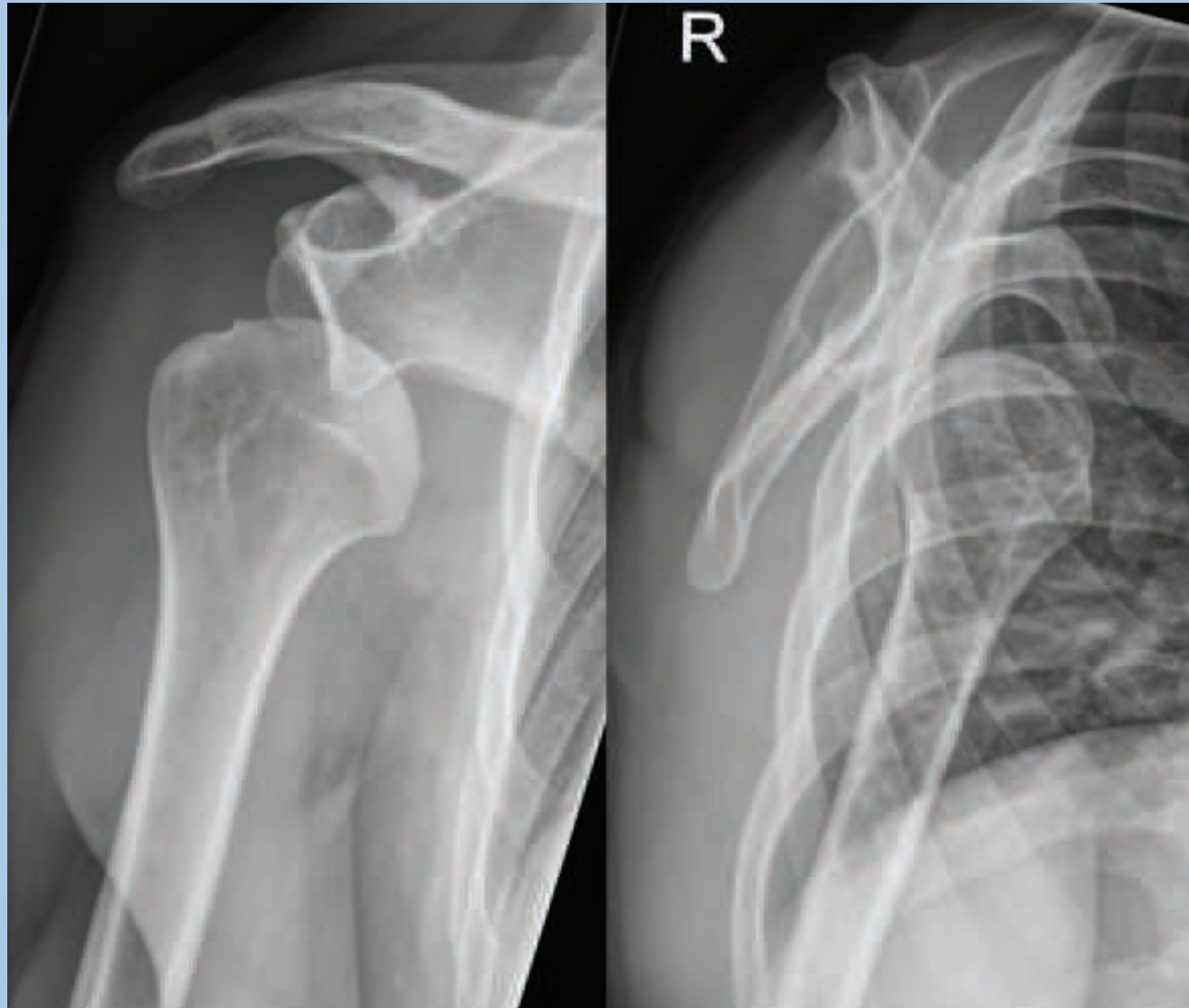
% of patients

1 Chronic, Locked	*
2 Unidirectional Instability without Hyperlaxity	60
3 Unidirectional Instability with Hyperlaxity	30
4 Multidirectional Instability without Hyperlaxity	*
5 Multidirectional Instability with Hyperlaxity	5
6 Voluntary (Habitual) Instability	*

ACUTE DISLOCATION



ACUTE DISLOCATION



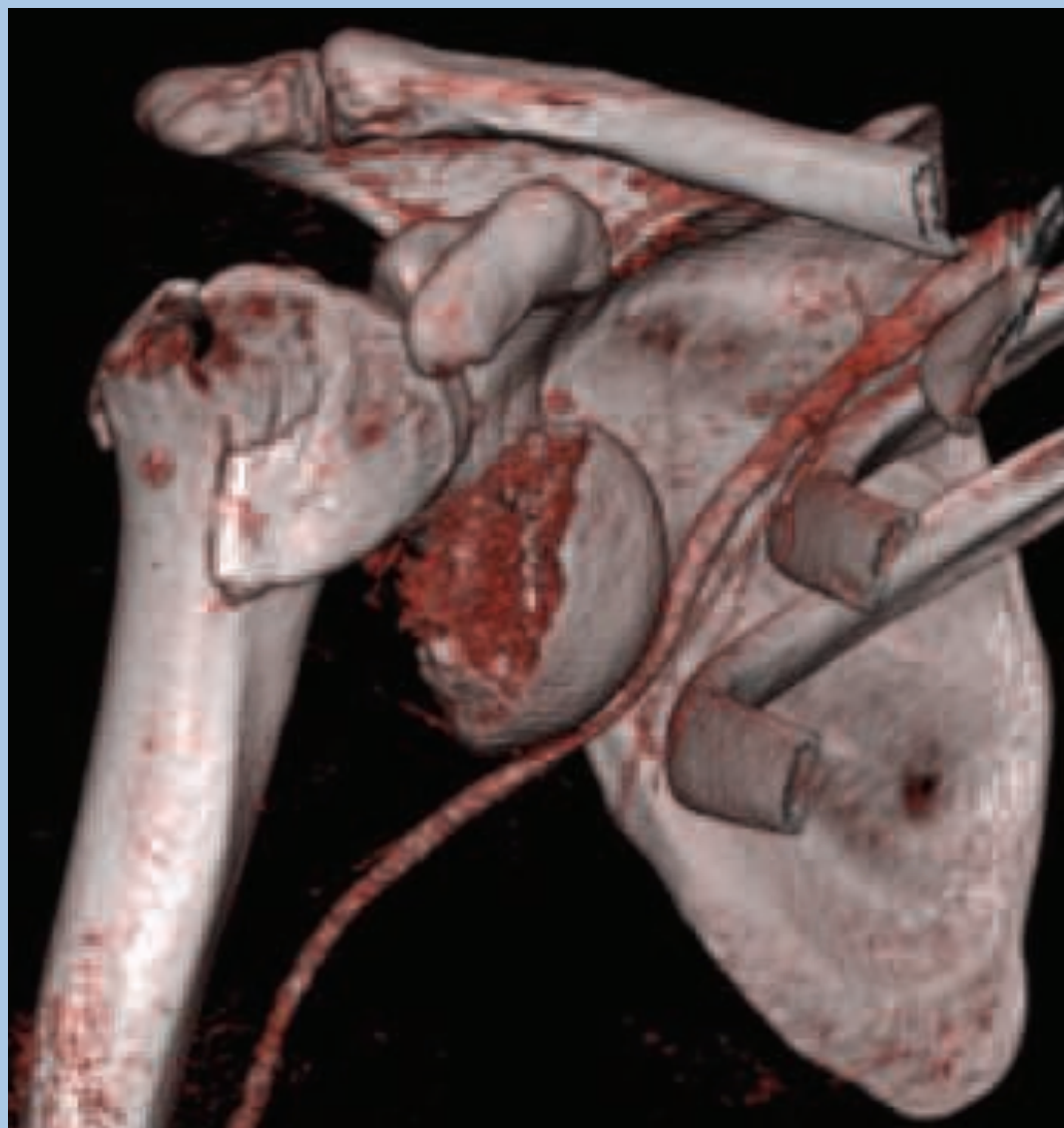
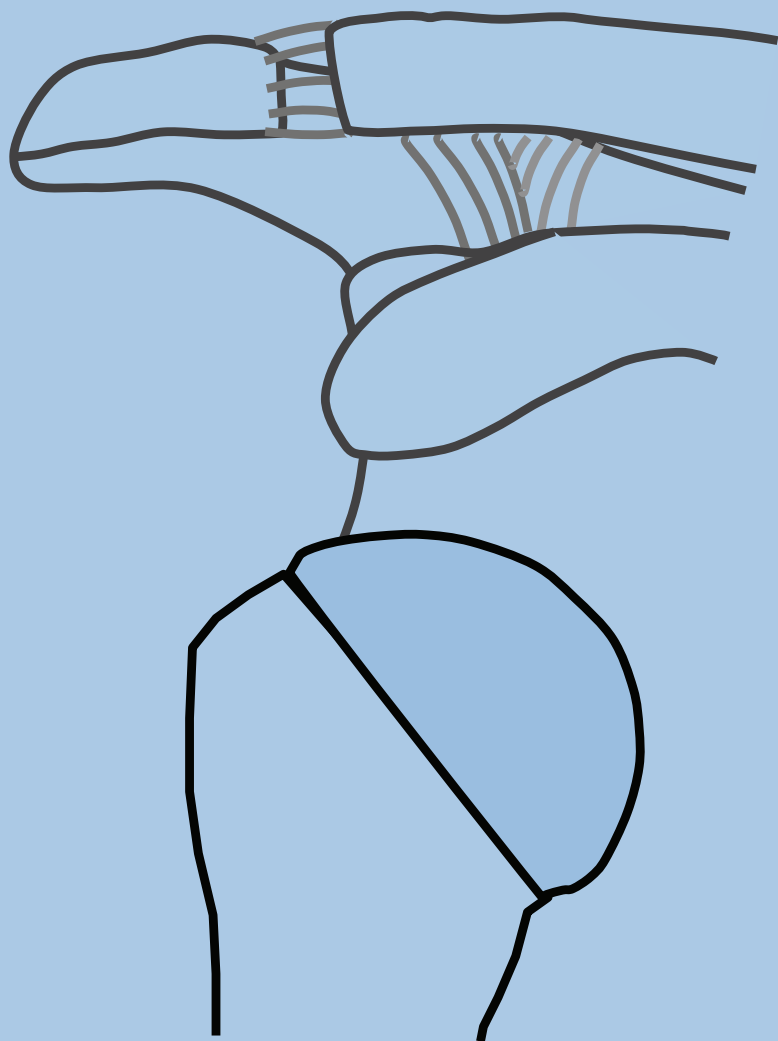
ACUTE DISLOCATION: TREATMENT

- Radiographic examination
- Neurovascular control
- Reduction in sedation/relaxation



IATROGENIC DISPLACEMENT OF FRACTURE-DISLOCATIONS OF THE SHOULDER

A REPORT OF SEVEN CASES



Hersche and Gerber; JBJS (Br) 1994

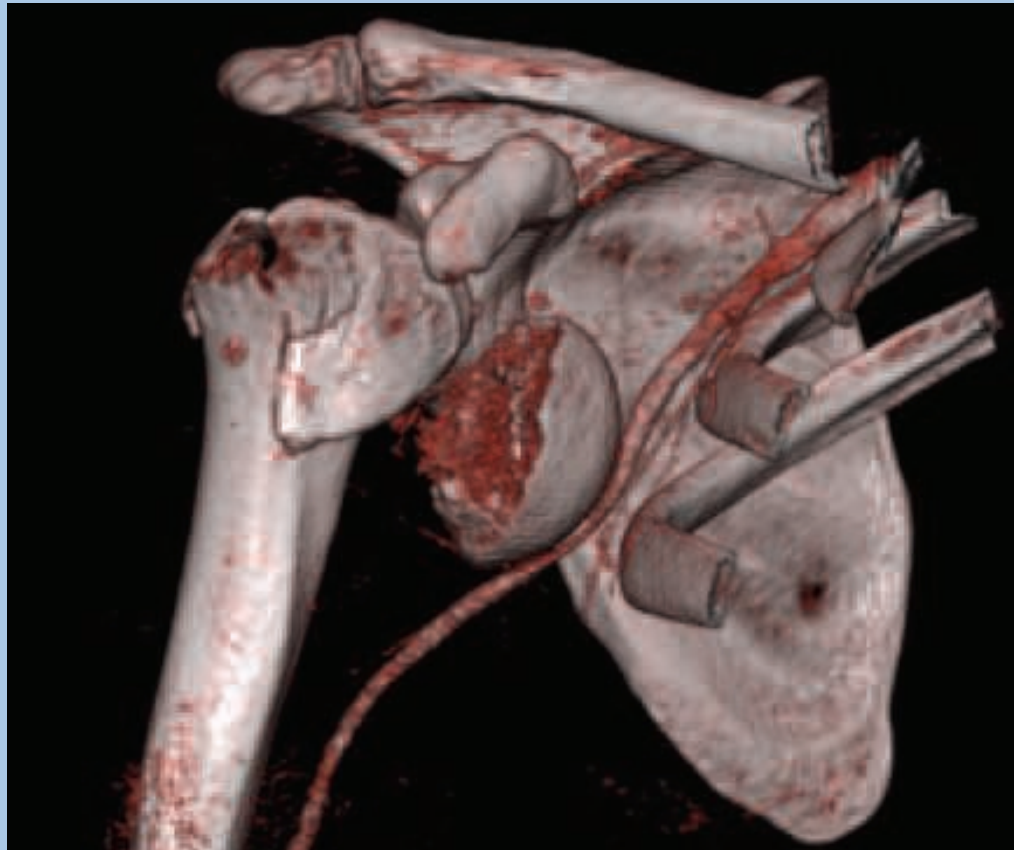
NEUROVASCULAR LESIONS



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- Up to 62% neurophysiologically documented nerve damage
- Axillary nerve most frequently involved



NEUROVASCULAR EXAMINATION



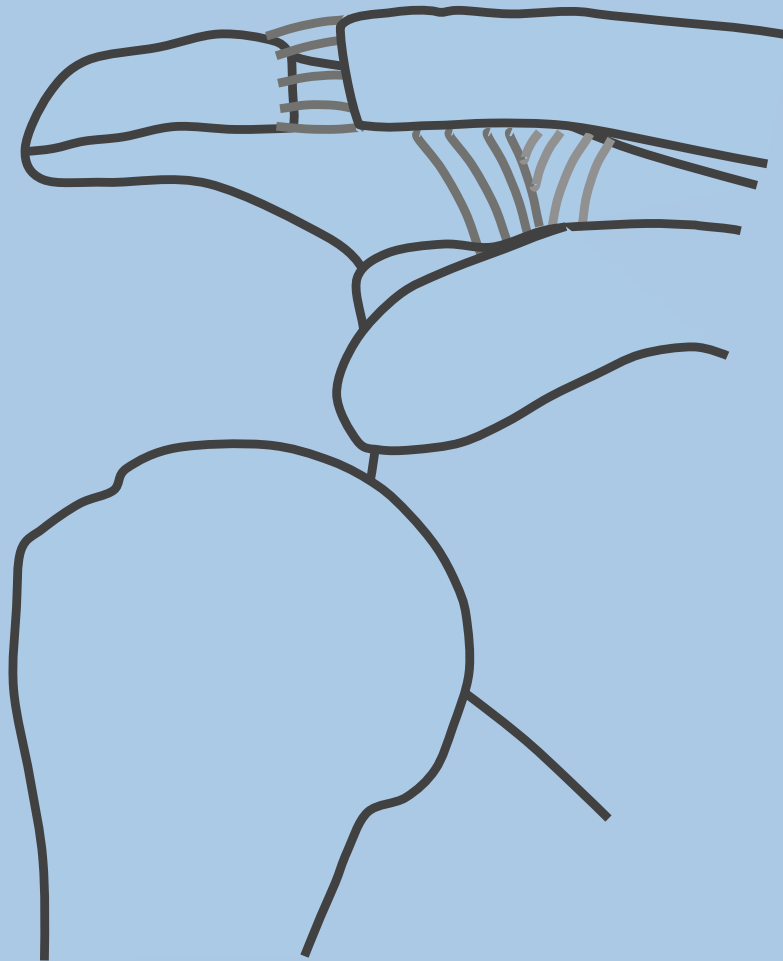
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- Up to 62% neurophysiologically documented nerve damage
- Axillary nerve most frequently involved



REPOSITION AND CONTROL



- Neurovaskular
- Rx Control
- Test: Supraspinatus
- Test: Subscapularis
 - *CAVE > 40 yrs*
- → **Arthro**-MRI in doubt of RCT

WHAT IS THE NEXT STEP?



- **Can we prevent recurrent dislocation?**

IMMOBILISATION

- IR is not better than functional treatment in a sling for two to four weeks
- Physiotherapy passive and aktive assisted, then active

Malicky DM, JSES: 1996

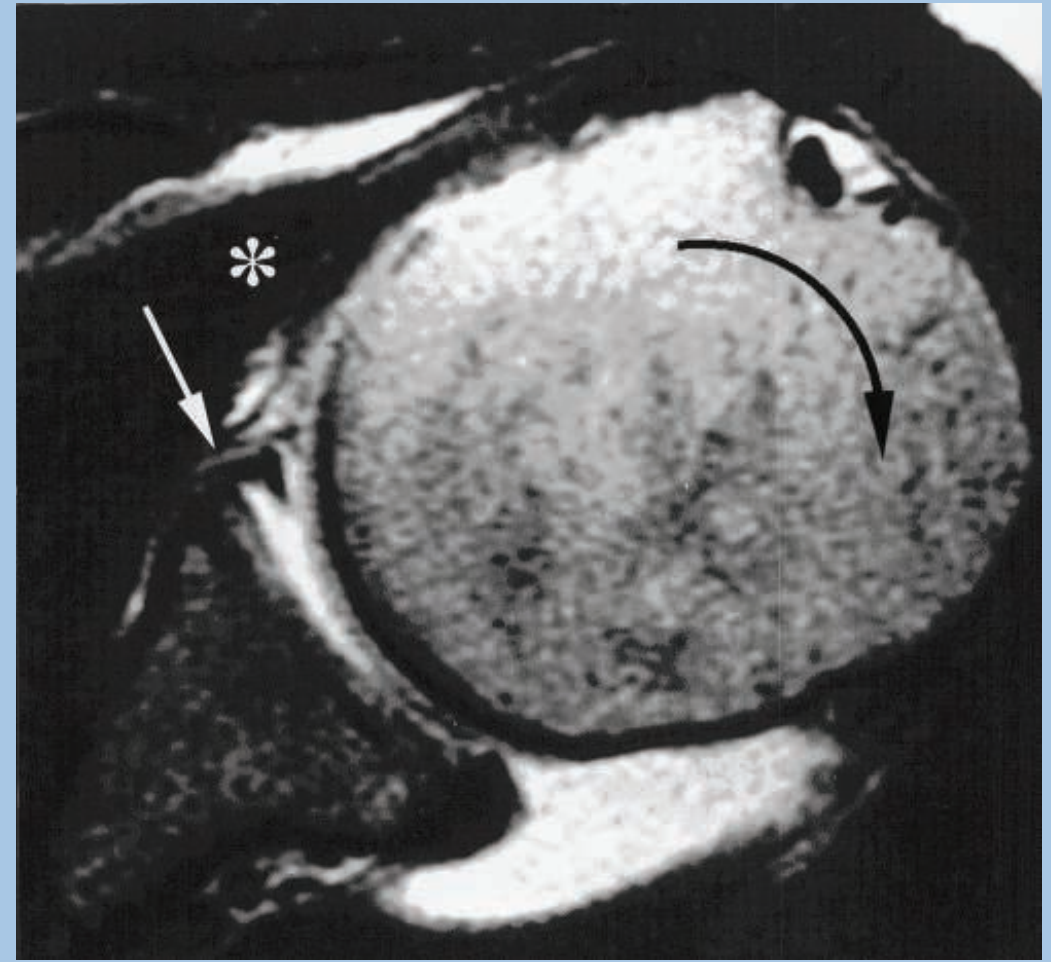
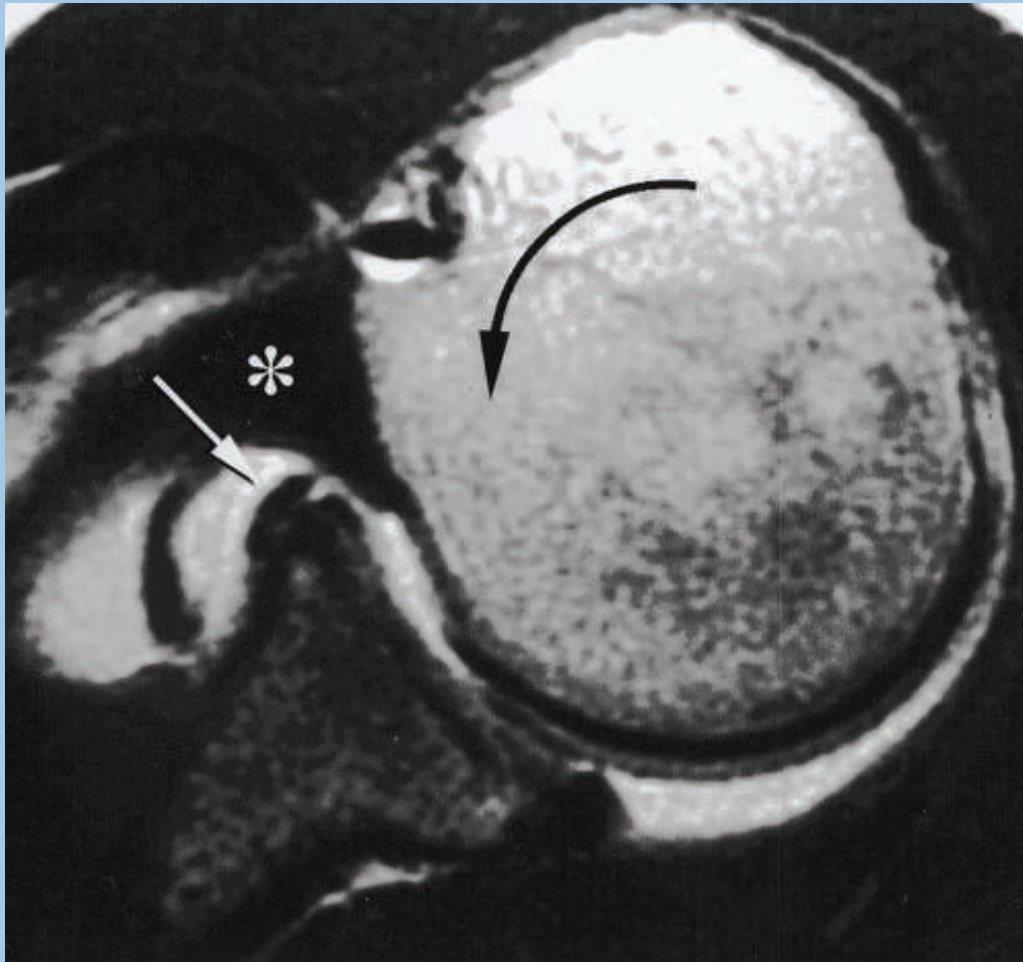
Hoveluis L, J Orthop Sci: 1999

IMMOBILISATION IN ER

Significant reduction of redislocation rate!



WHY SHOULD ER BE SUPERIOR TO IR?



IMMOBILISATION IN ER

In 10° external rotation for 3 weeks

TABLE III Recurrence Rate Stratified by Age

Age	Internal Rotation Group	External Rotation Group	P Values*
≤20 years	13/19 (68%)	11/27 (41%)	0.064
21-30 years	12/23 (52%)	7/29 (24%)	0.037
31-40 years	2/8 (25%)	1/6 (17%)	0.71
≥41 years	4/24 (17%)	3/23 (13%)	0.73
Total	31/74 (42%)	22/85 (26%)	0.033

IMMOBILISATION IN ER

Newer studies couldn't demonstrate any difference between IR and NR

- *But brace was not worn 23/24h per day!!!*
- *Neither strictly in 10° ER*

CHRONIC INSTABILITY



CHRONIC INSTABILITY: CLINICAL PRESENTATION

History

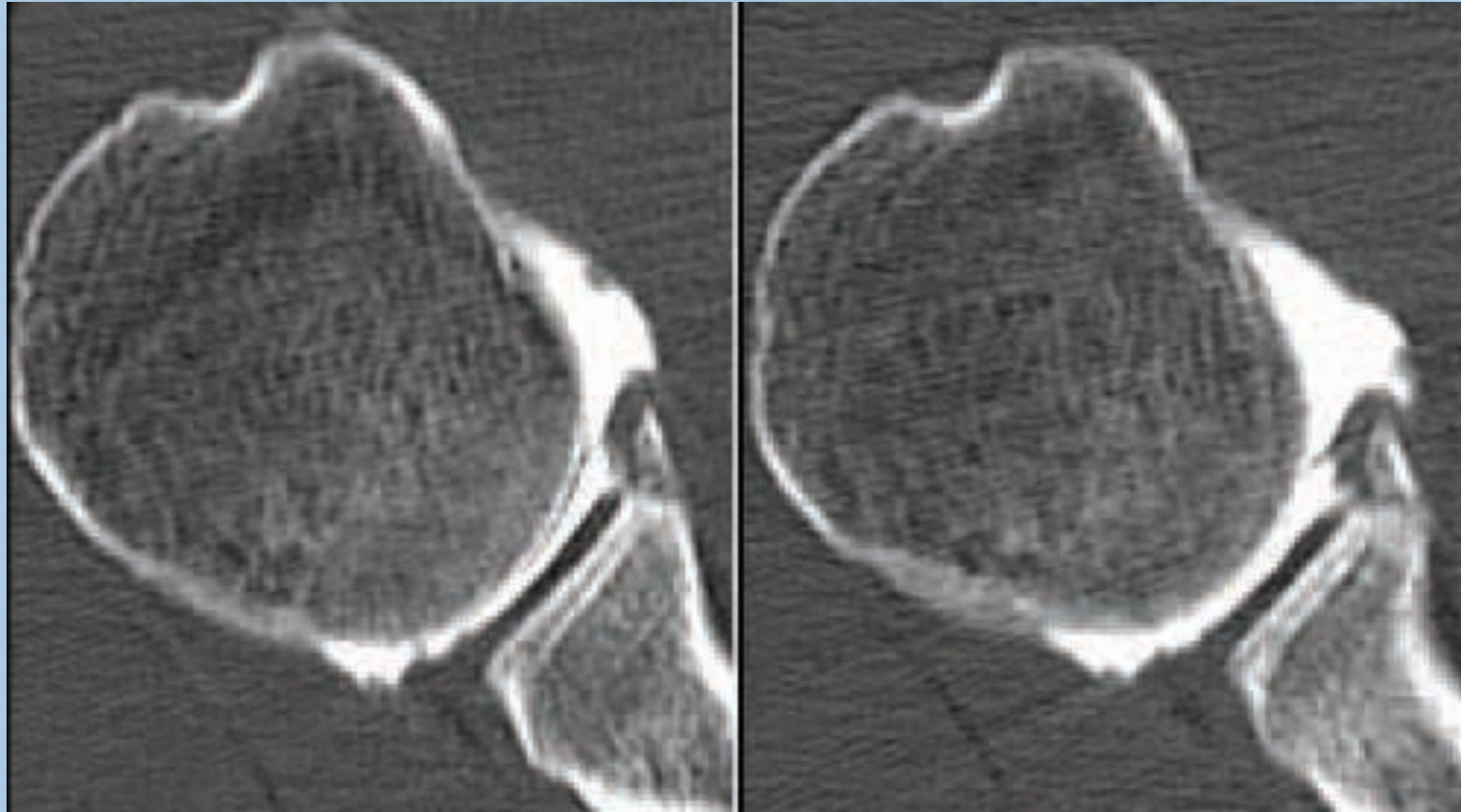
- Which position provokes symptoms?
- Number of previous dislocations and subluxations
- Reduction maneuver
- Pain or Instability?

CHRONIC INSTABILITY: RADIOGRAPHIC EXAMINATION

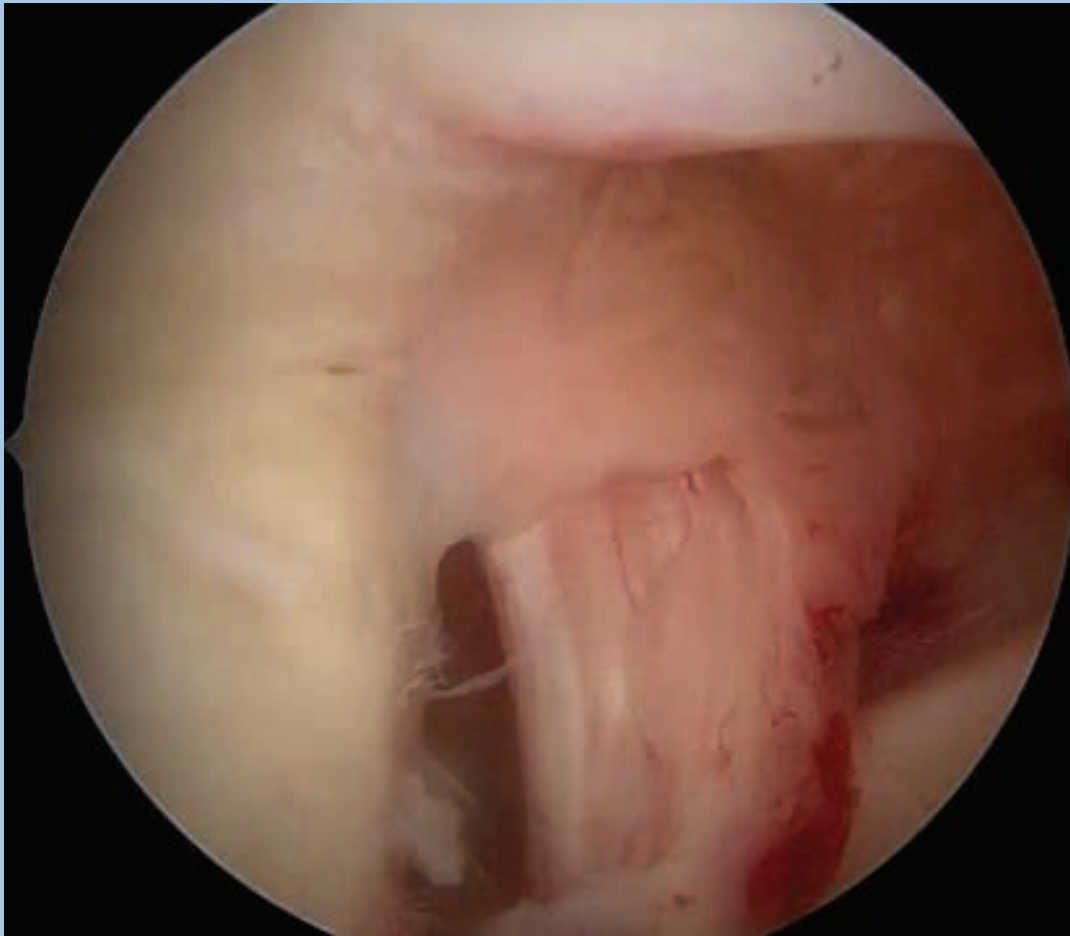
Arthro-CT superior to Arthro-MRI

WHY?

ARTHRO - CT: BONEY DEFECT



FINDINGS AT ARTHROSCOPY



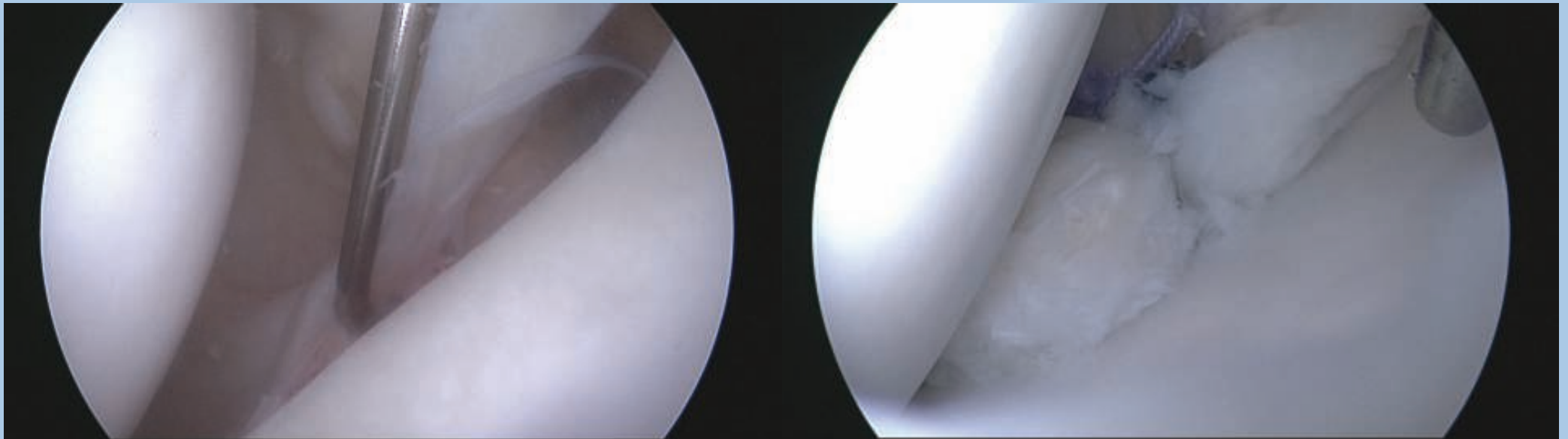
FINDINGS AT ARTHROSCOPY



ARTHROSCOPIC BANKART-REPAIR

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TREATMENT OF CHRONIC INSTABILITY

OPEN

- Detachment of the subscapularis muscle
→ Insufficiency
- Loss of ER

ARTHROSCOPIC

- Standard therapy
- No harm for SSC
- Recurrence rate comparable
15% (3-67%)

Hobby J, JBJS Br: 2007

Rhee YG, AJSM: 2006

Tjumakaris FP, CORR: 2006

Bottoni CR, AJSM: 2006

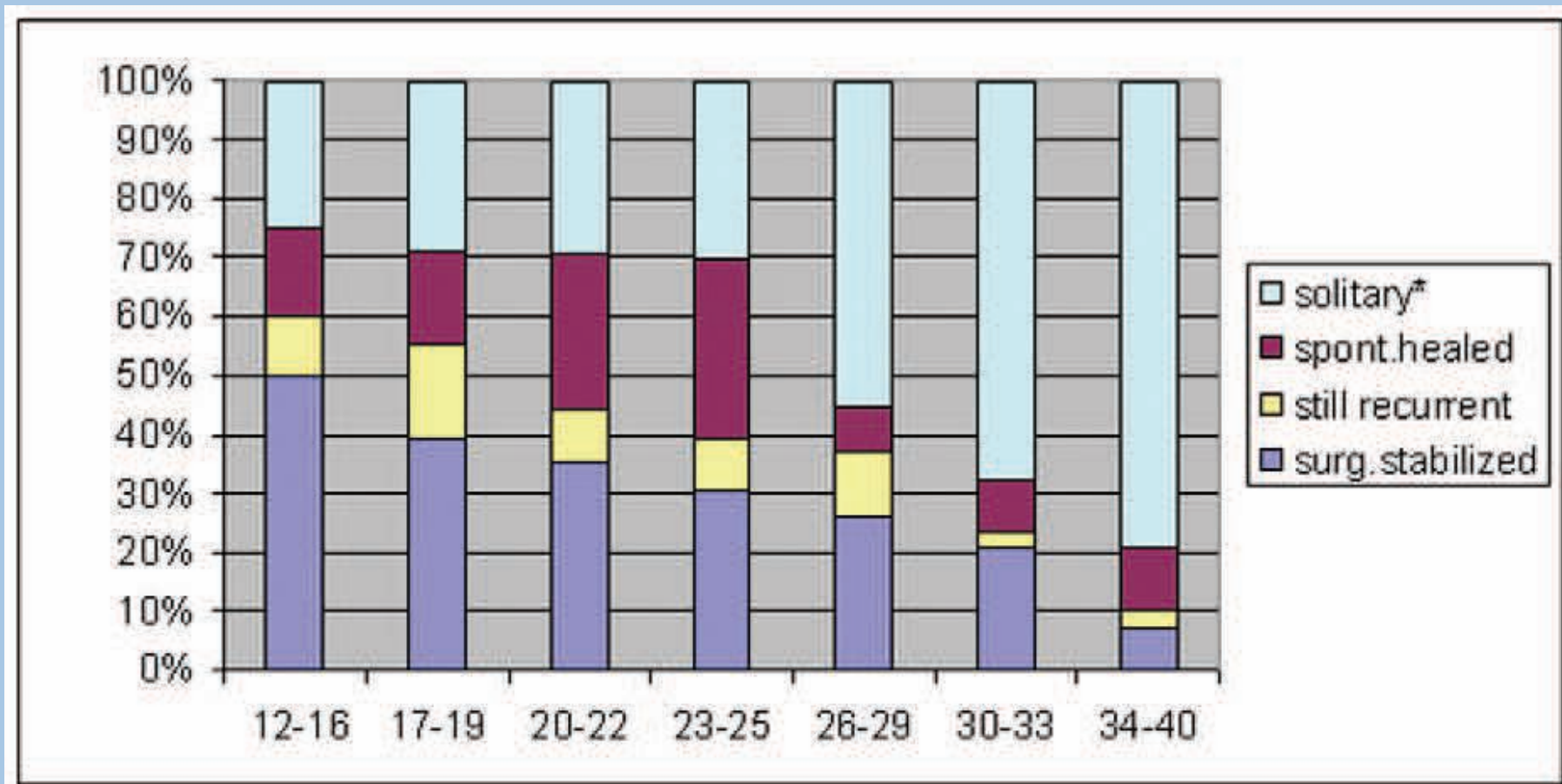
RECURRENCE RATE AFTER BANKART-REPAIR

Which are the Pejorative Prognostic Factors...?

Who are the High Risk Patients...?

RISK FACTOR FOR RECURRENCE

Age at dislocation < 20 years



RISK FACTOR FOR RECURRENCE

Contact or Forced-Overhead Sports



Lafosse L, RCO: 2000

Pagnani M, AJSM: 1996



Roberts S, JSES: 1999

Torchia M, Arthroscopy: 1997

RISK FACTOR FOR RECURRENCE

Level of Sport Practice [Competition]



	Recurrence
Competition	50%
Recreational or no sports	15%



Lafosse L, RCO: 2000

Roberts S, JSES: 1999

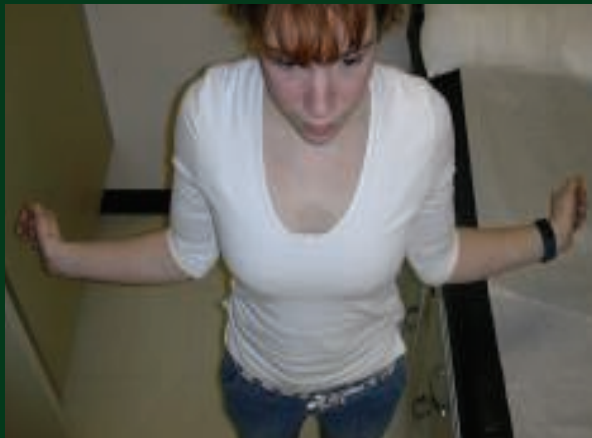
Balg F, JSES: 2007

RISK FACTOR FOR RECURRENCE

Hyperlaxity (ant. or inf.)

Anterior Shoulder hyperlaxity:

External rotation at the side $> 85^\circ$



Kempf JF, RCO: 2000

Coudane S, RCO: 2000

Inferior Shoulder hyperlaxity :

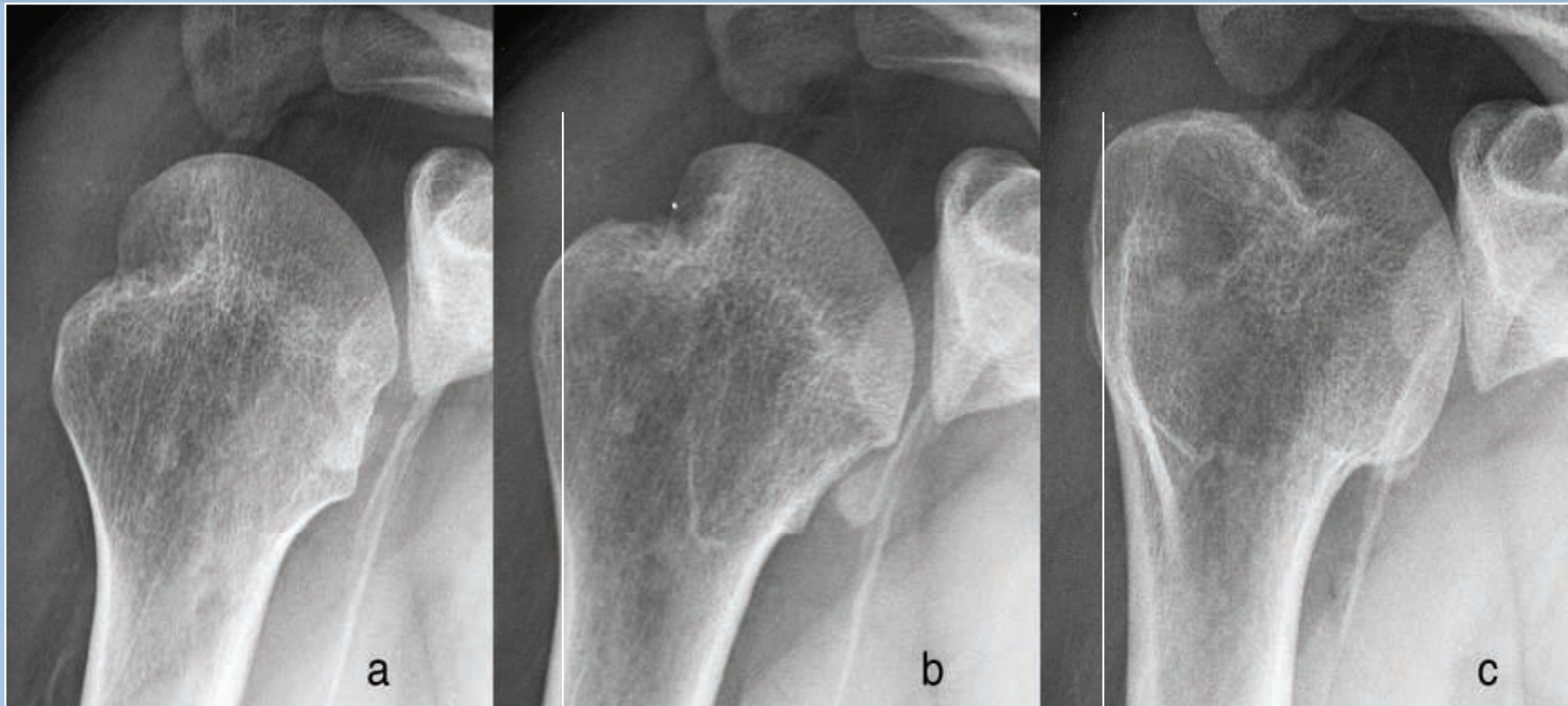
Side to side difference in hyperabduction $> 20^\circ$ (Gagey Test)



Torchia M, Arthroscopy: 1997

RISK FACTOR FOR RECURRENCE

Hill-Sachs Lesion

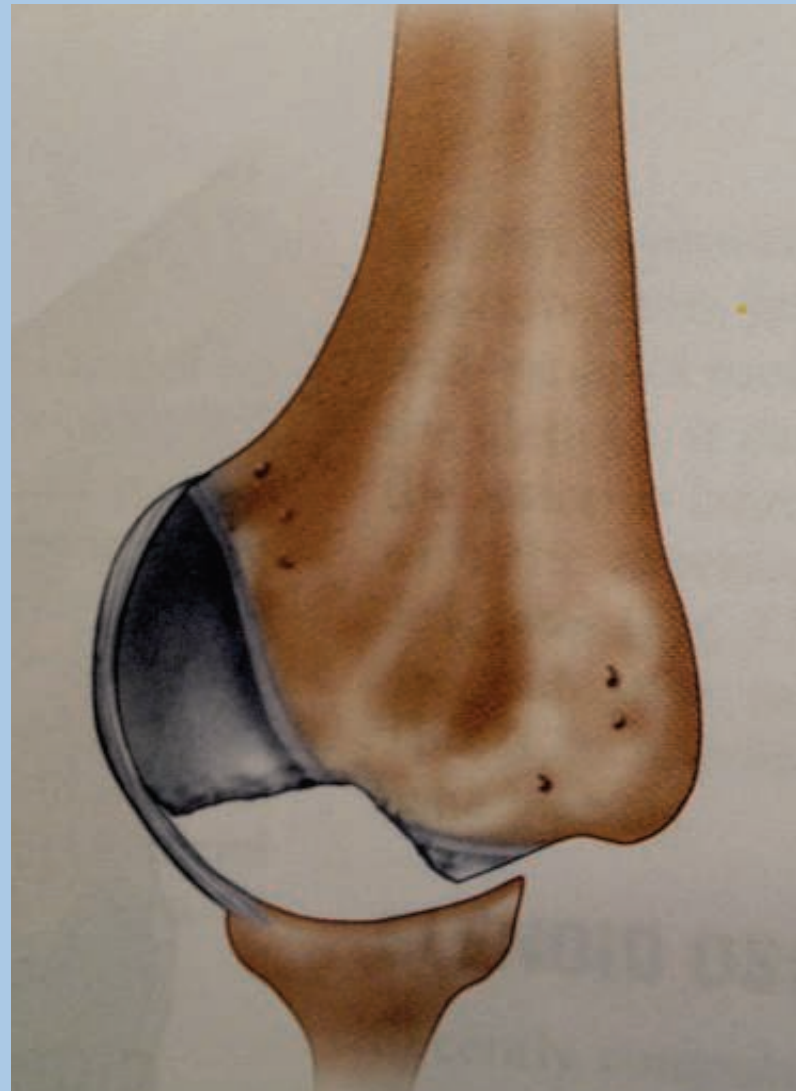


Internal rotation

Neutral rotation

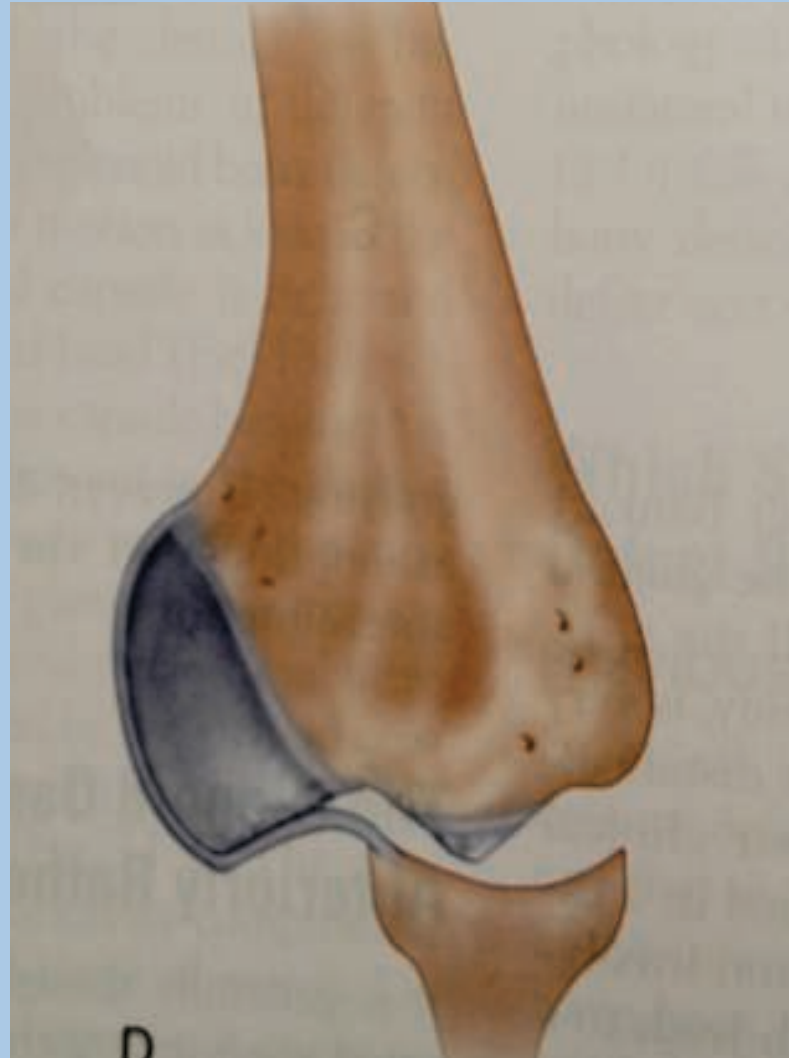
External rotation

ENGAGING HILL SACHS LESION

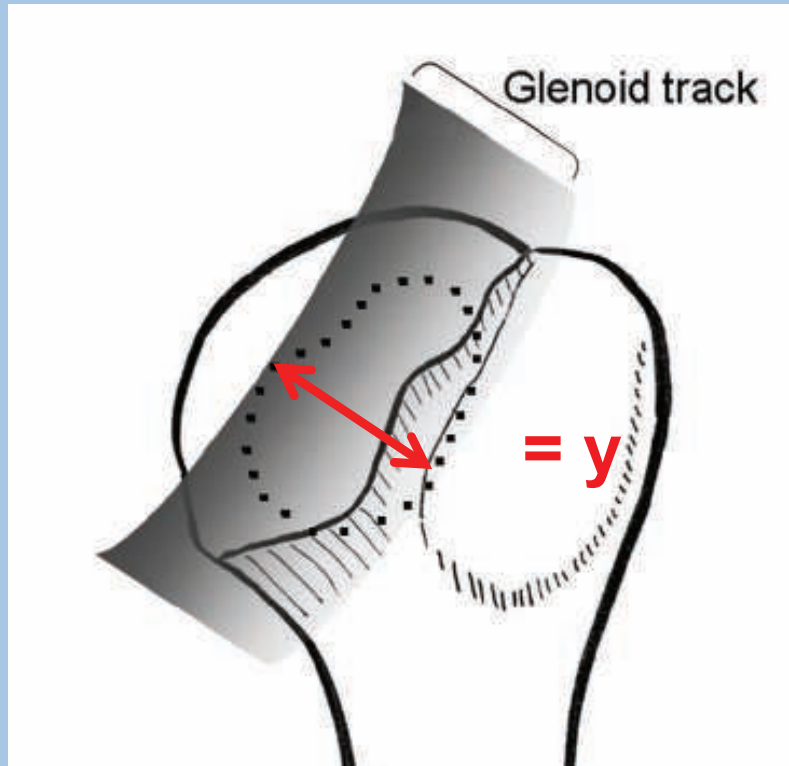


Provencher MZ, Romeo AA: Shoulder Instability

ENGAGING HILL SACHS LESION



GLENOID TRACK



- Medial margin of the glenoid track → 18.4 mm
- $y / w > 84\%$ → risk for engagement

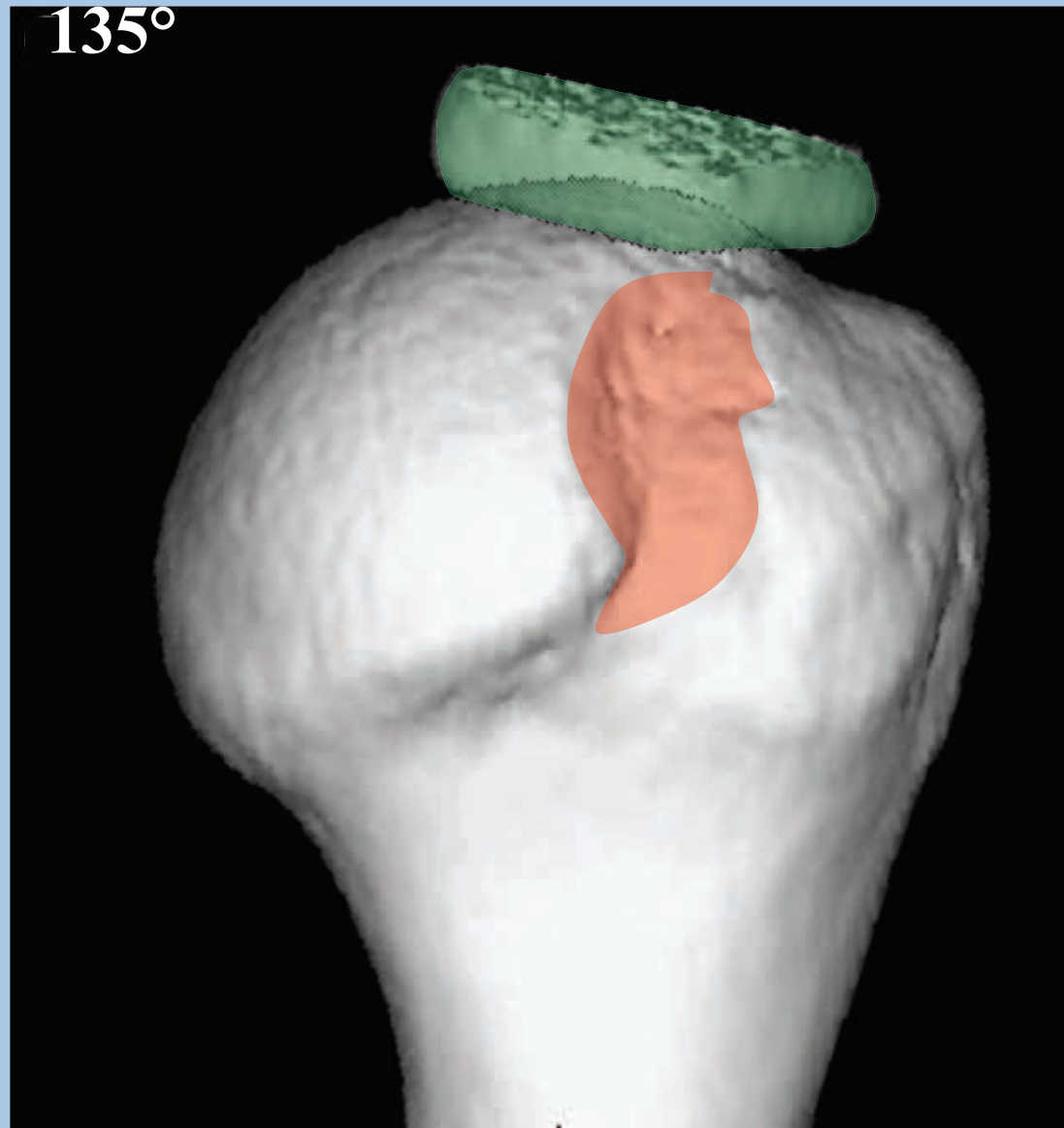
GLENOID TRACK: CONTACT OF GLENOID AND HUMERAL HEAD



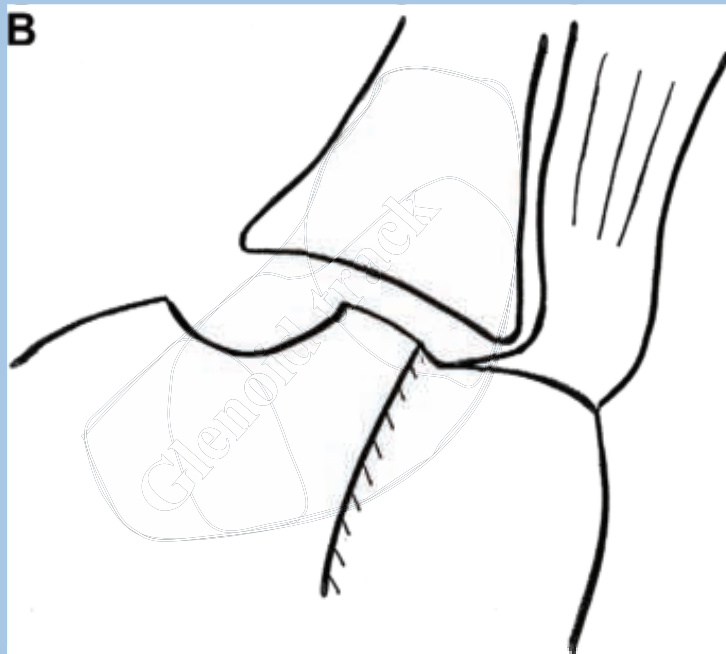
GLENOID TRACK: CONTACT OF GLENOID AND HUMERAL HEAD



GLENOID TRACK: CONTACT OF GLENOID AND HUMERAL HEAD



GLENOID TRACK: CONTACT OF GLENOID AND HUMERAL HEAD



0°, 30°, 60° ABD.

GLENOID TRACK:

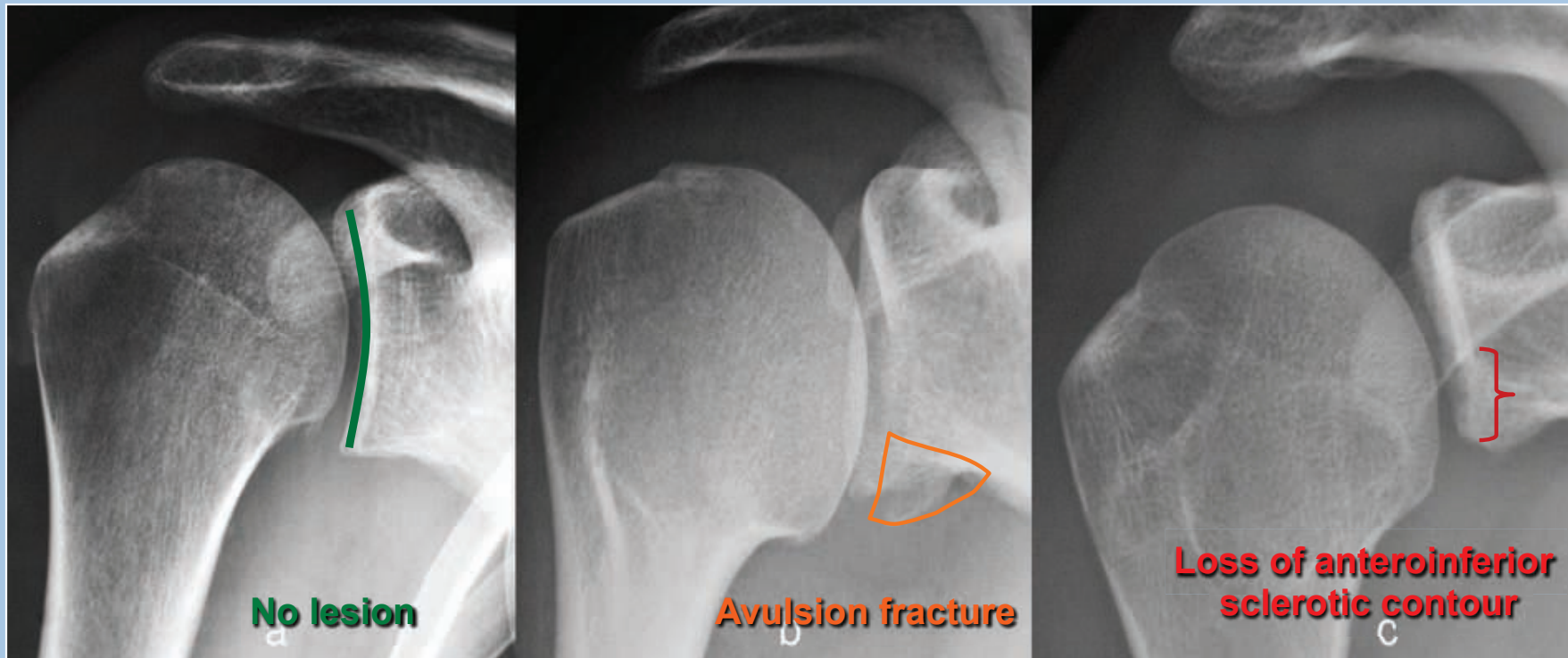
84% of glenoid width (Ø 18.4 mm)

ENGAGING HSL:

→ HSL > GLENOID TRACK

RISK FACTOR FOR RECURRENCE

Glenoid Bone Loss on AP View



GLENOID BONE LOSS

Glenoid critical bony defect



Arthroscopic capsulolabral repair



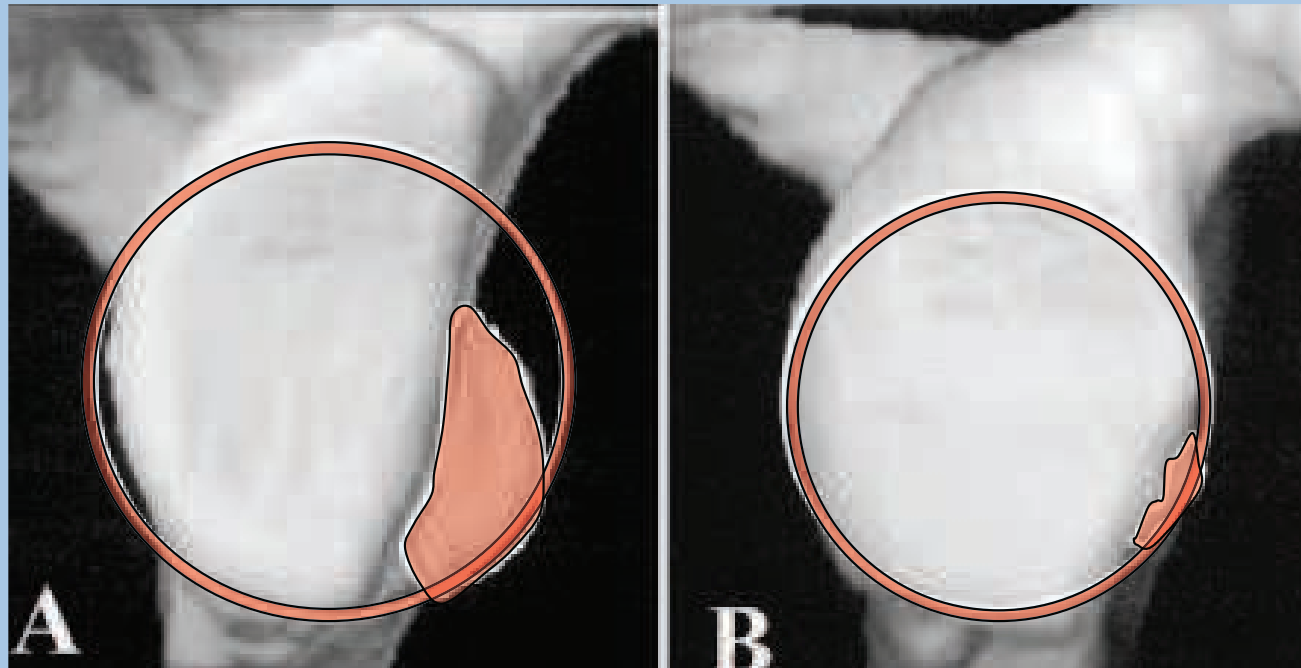
Recurrence rate 56 to 67%

Burkhart; Arthroscopy; 2000

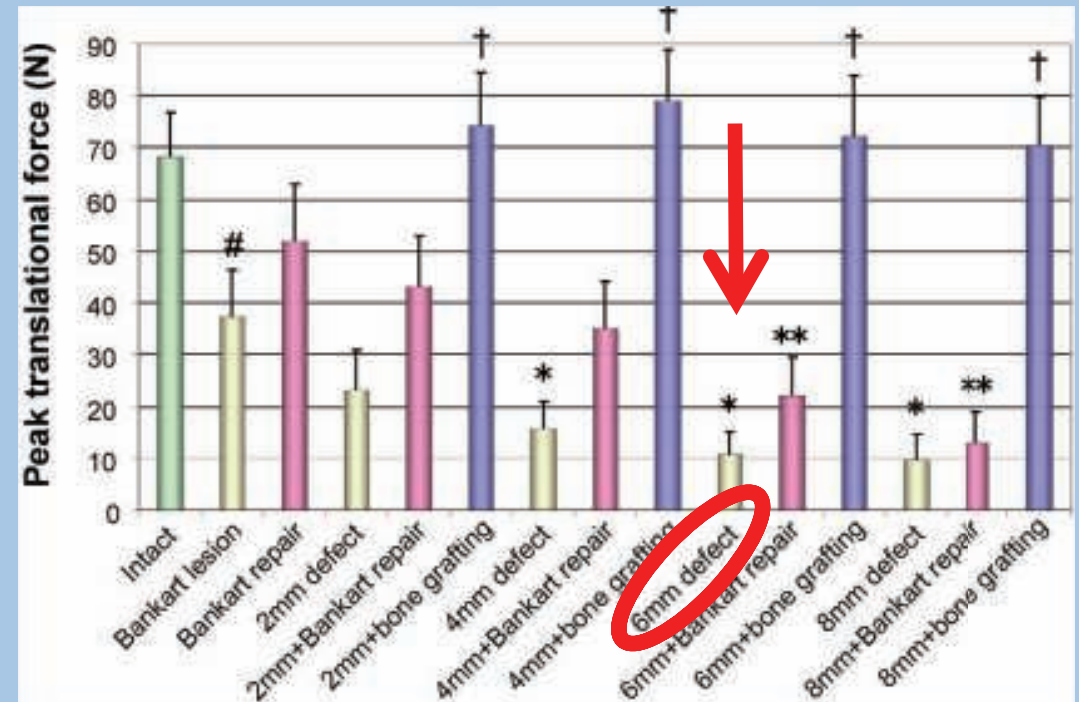
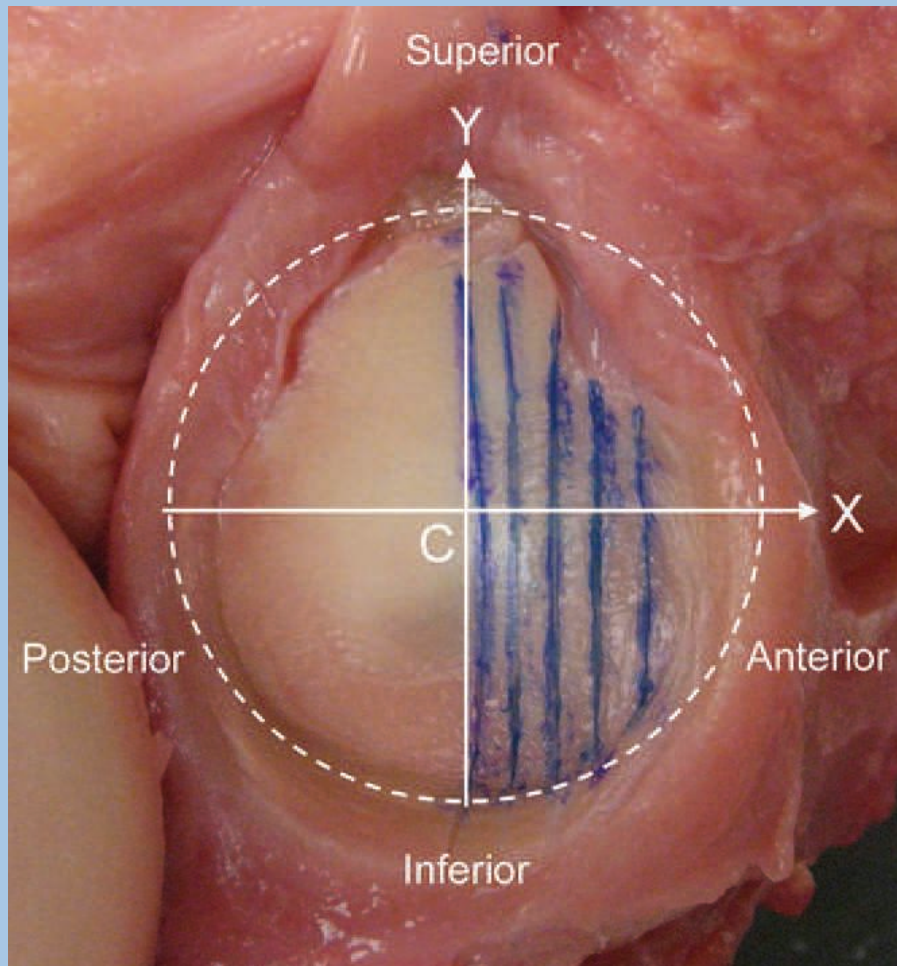
Tauber; JSES; 2004

GLENOID BONE LOSS

What is the critical size of glenoid defect that requires bone grafting?



INFLUENCE OF GLENOID DEFECT: CADAVERIC STUDY



25% of glenoid width;
19% of glenoid length

INSTABILITY SEVERITY INDEX SCORE (ISIS)

			points
Questionnaire	Age (at surgery)	{ Inf or equal to 20 y	= 2
		{ > 20 y	= 0
	intensity of sport activity	{ Competition	= 2
{ Leisure or no sport		= 0	
Type of sport	{ Contact or forced overhead	= 1	
	{ others	= 0	
Ex.	Hyperlaxity	{ Hyperlaxity Ant. ou inf.	= 1
		{ NO hyperlaxity	= 0
AP x-ray	Hill-Sachs lesion	{ Visible in ER	= 2
		{ Non visible in ER	= 0
Glenoid Bone loss	{	Glenoid bone loss	= 2
		No bony lesion	= 0



Total = 10

ISIS CUT OFF VALUES

The ISIS score was applied to the Bankart population

ISIS	Recurrence rate
0 to 3	5%
4 to 6	10%
> 6	70%

$p < 0.001$

(Latarjet / Bristow Recurrence rate < 4%)

PATIENT SELECTION



u^b

b
**UNIVERSITÄT
BERN**

**ISIS Score < 3 = @
Bankart**

ISIS Score > 3 =

WHAT'S THE PROBLEM?

(= formal contraindications for Bankart surgery)



ERROR: ioerror
OFFENDING COMMAND: image

STACK:

-mark-
-savelevel-