



# The Exeter Diamond

beyond the Stanmore Triangle



Tim Bunker MD MCh FRCS  
Exeter



Mark Anthony..”I come to bury Bankart  
Not to praise him....BUT”



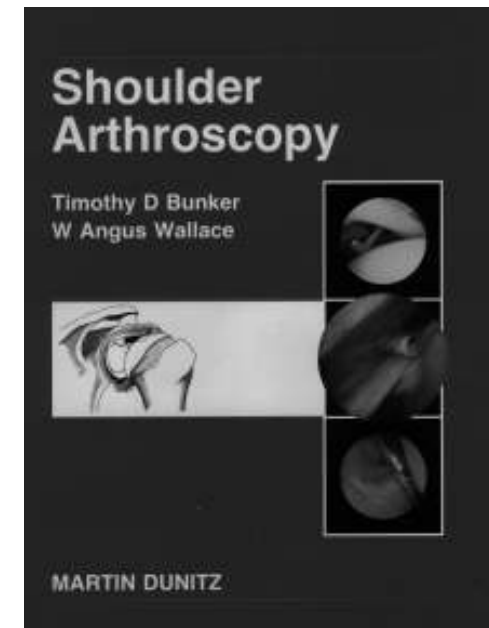
# Shoulder arthroscopy

- 1982 first shoulder scope in UK / Europe?



# Shoulder arthroscopy

- 1983 cadaver studies
- 1984 n=50
- 1985 presented BOA Plymouth
- 1986 publication Annals
- 1986 start textbook
- 1987 Porritt Fellowship





# Lanny Johnson, Lansing

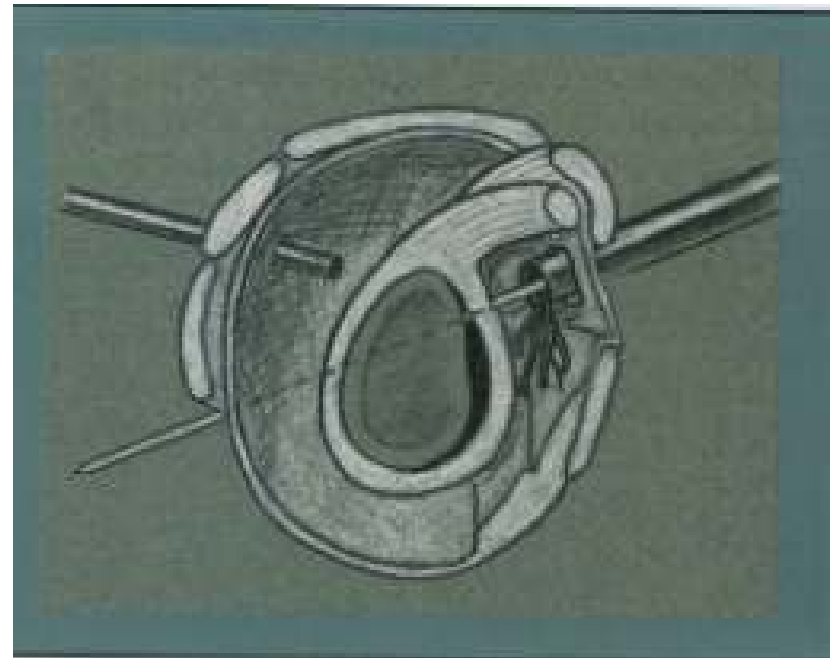
- Dr Lanny Johnson(1982-6)
- Dr Paisch
- Staple repair
- 20% recurrence rate





# Craig Morgan, Baltimore

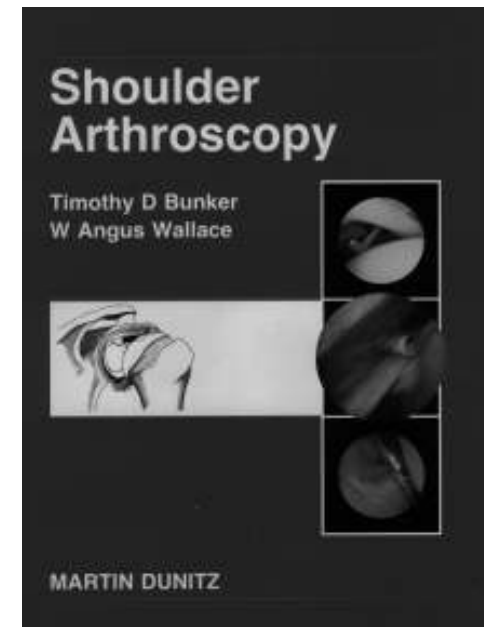
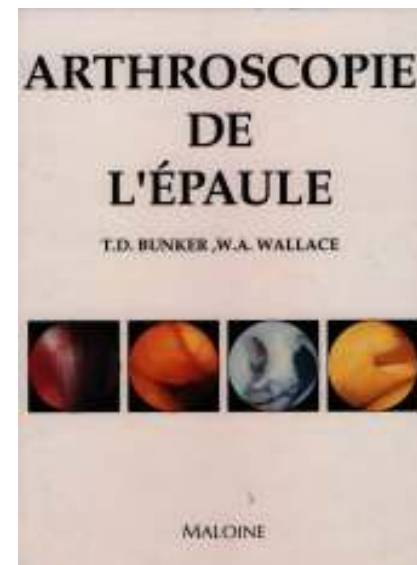
- **Sutures** more tolerant
- **Caspari technique (1988)**
- But knot at back
- Tenodesis effect
- (Poor results)
- 50% failure (Walch)





# Shoulder arthroscopy

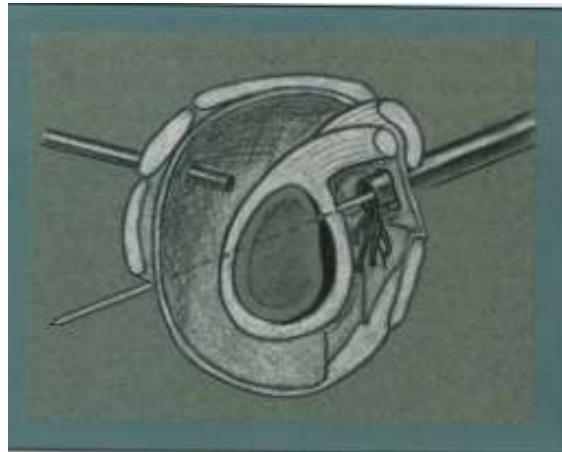
- 1989 first @Bankart UK (Clive W-Smith)
- 1990-1 first series @Bankart, n=12
- 1991 English edition
- 1992 French edition
- 1993 German edition





# @ Bankart

- 4/12 @ Bankart redislocated
- For in a little town like Exeter failure is not acceptable







# A peculiar practice

- Many difficult cases
- Loosey goosey shoulders
- Posterior positional
- Few TUBS





# Open Bankart Repair

1990-2009

- Approach





# Open Bankart Repair

1990-2009

- Weapons
- cephalic

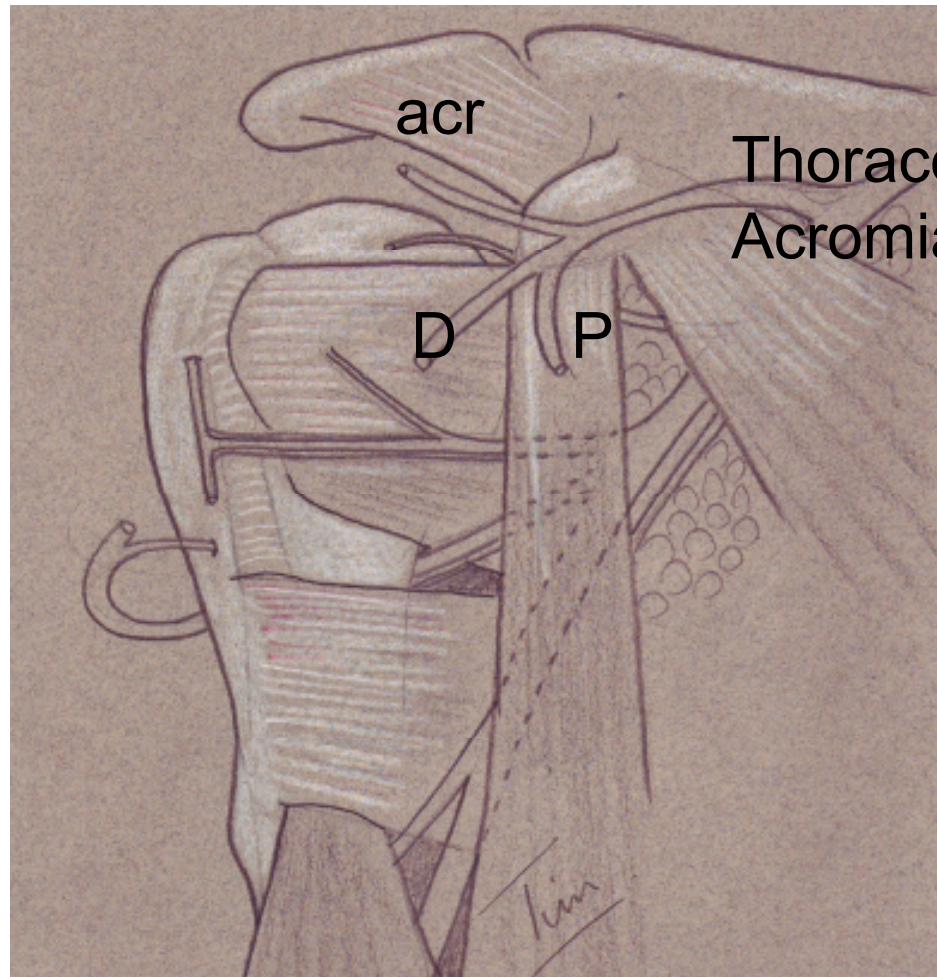




# Open Bankart Repair

1990-2009

- vessels



Thoraco  
Acromial trunk

acr

D

P

kim

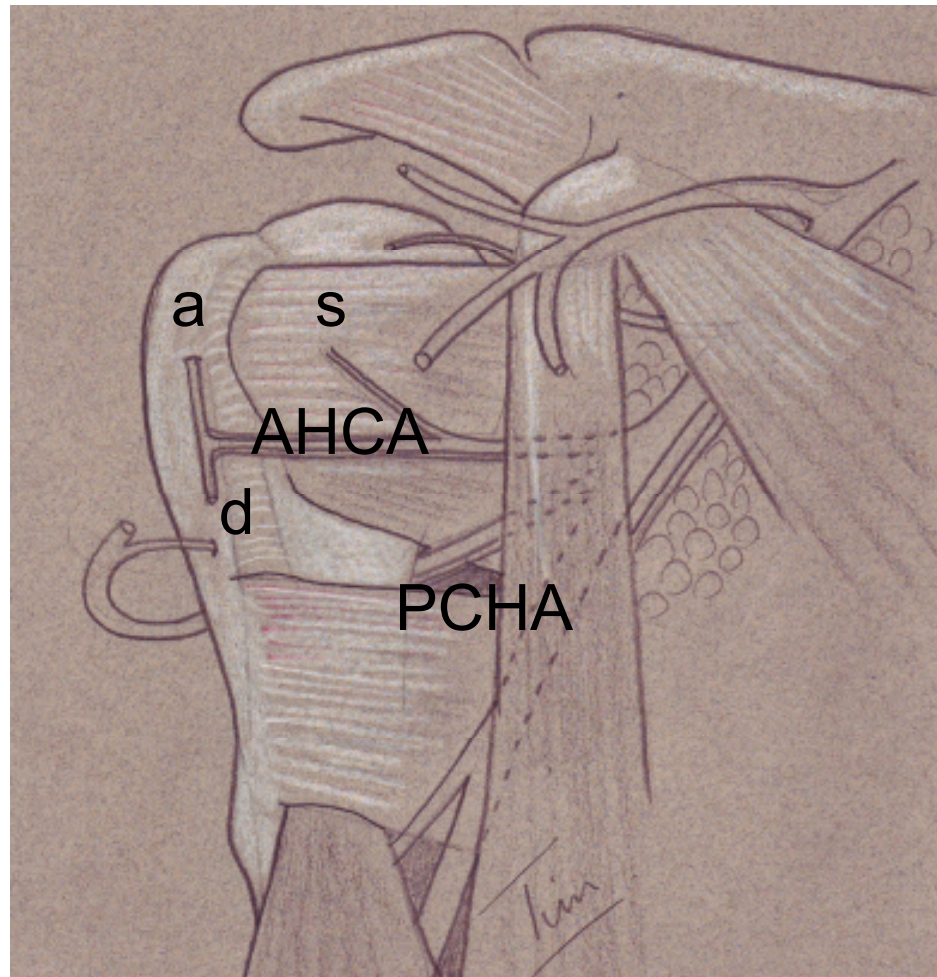




# Open Bankart Repair

1990-2009

- vessels

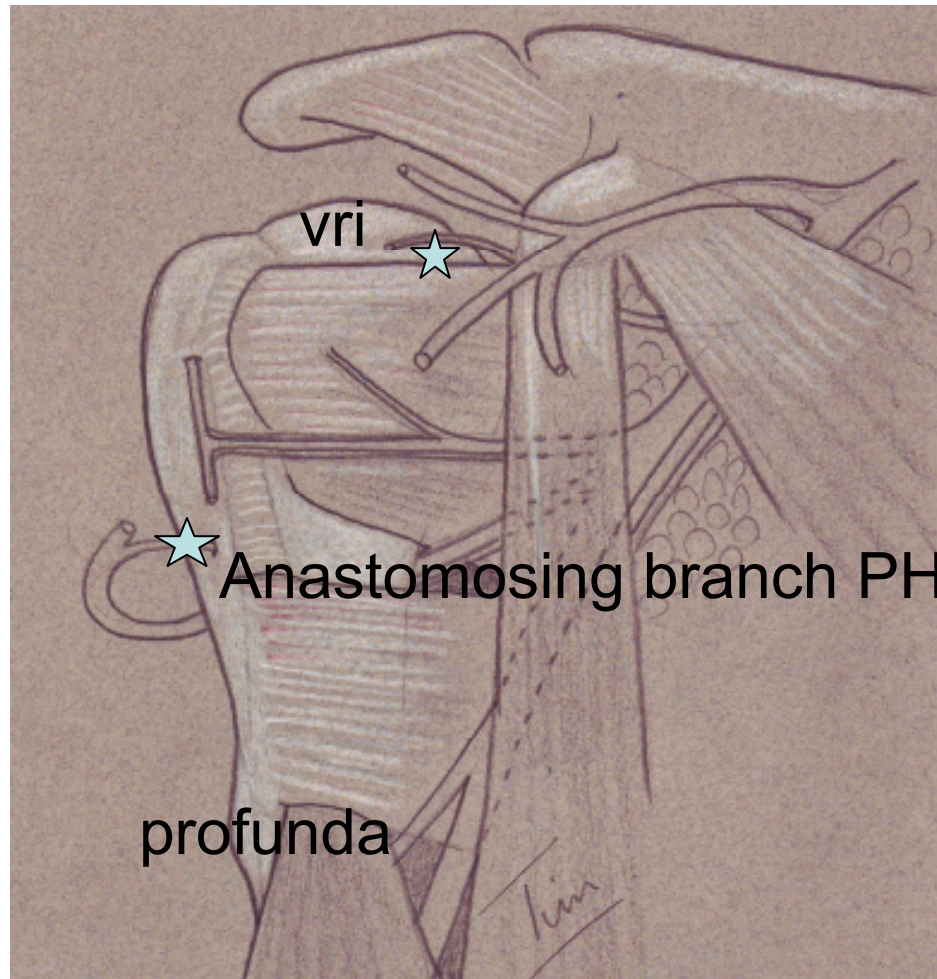




# Open Bankart Repair

1990-2009

- vessels



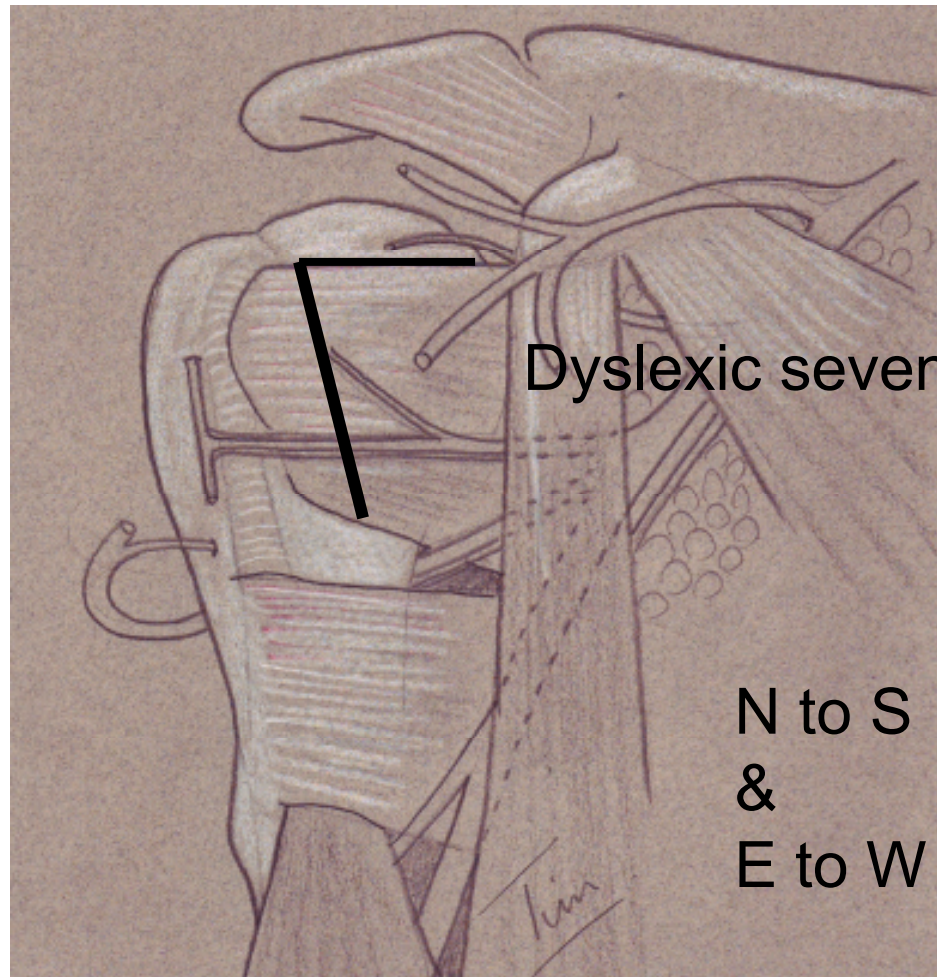




# Open Bankart Repair

1990-2009

- capsulotomy

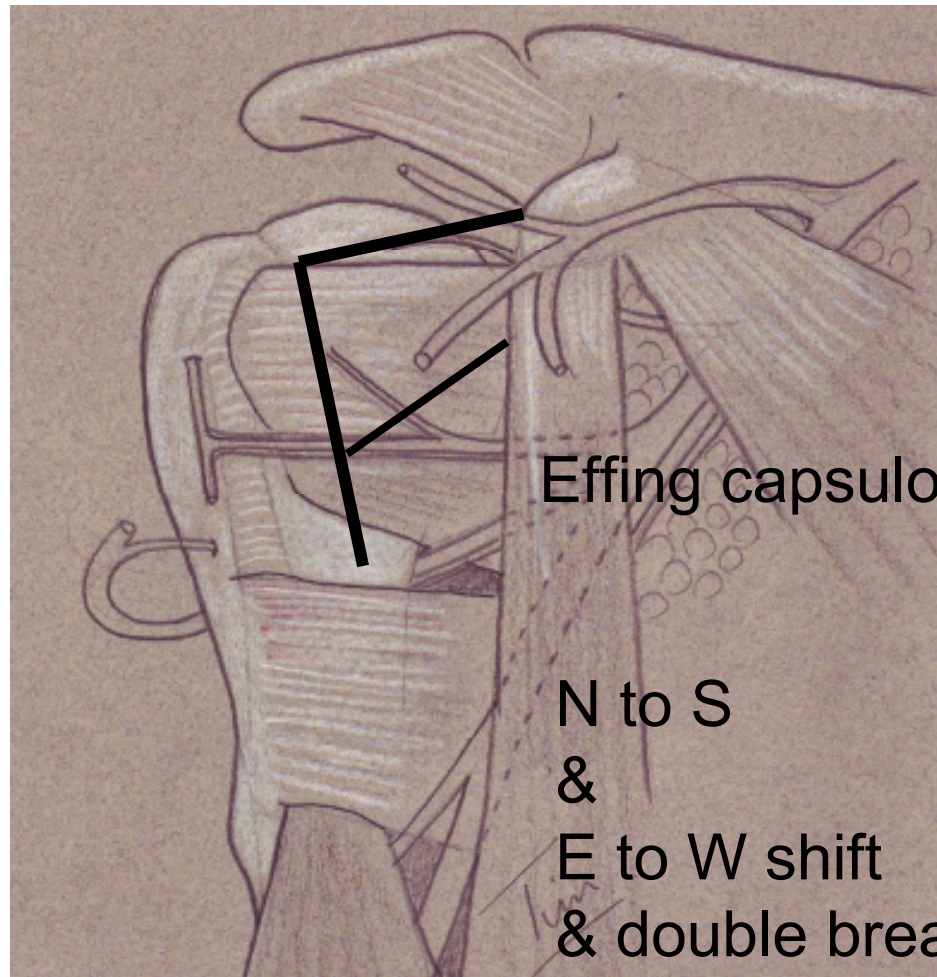




# Open Bankart Repair

1990-2009

- capsulotomy



Effing capsulotomy

N to S

&

E to W shift

& double breast

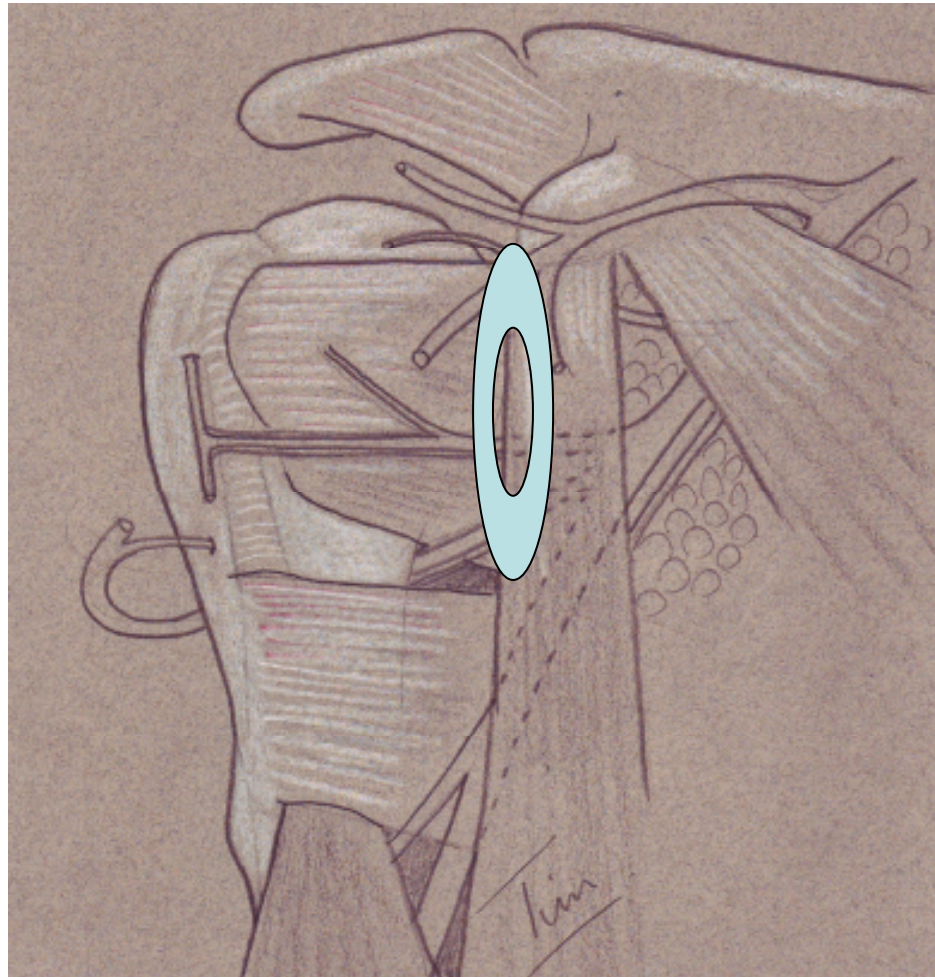




# Open Bankart Repair

1990-2009

- pathology

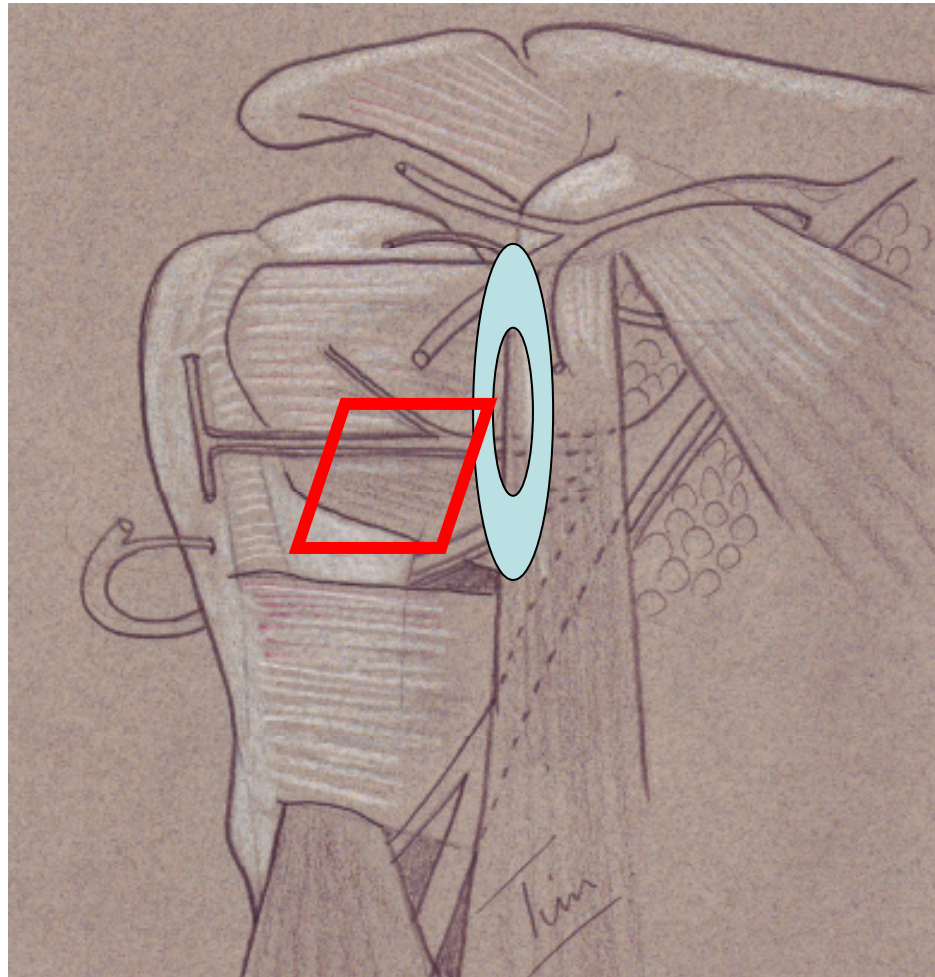




# Open Bankart Repair

1990-2009

- pathology



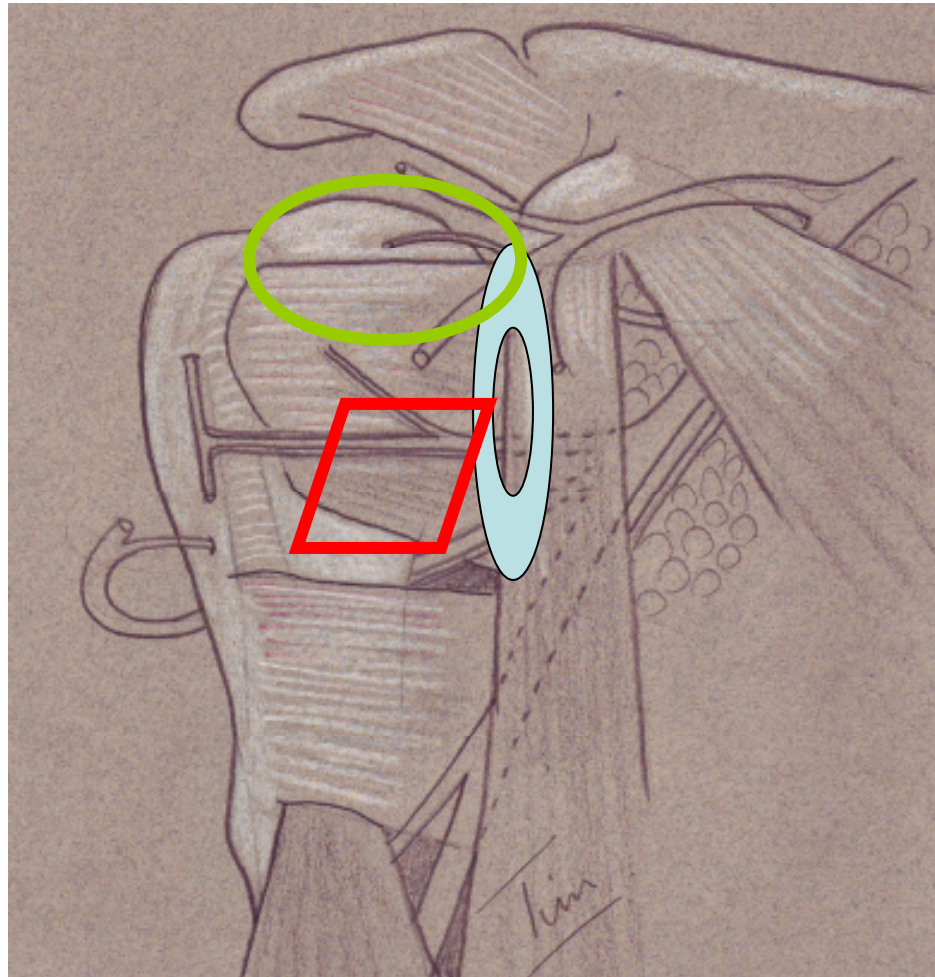




# Open Bankart Repair

1990-2009

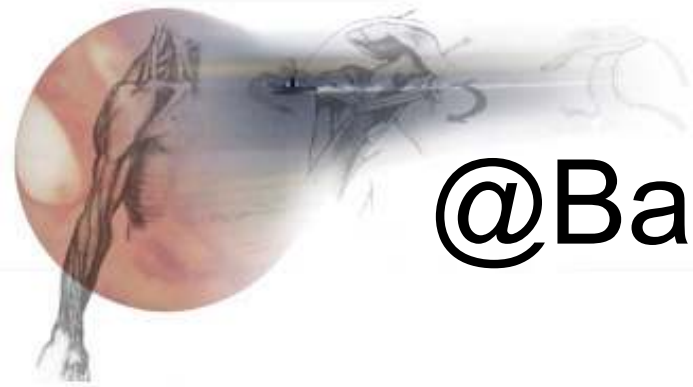
- pathology





# @Bankart 1999-2010

- **Third hand**
- Portal placement
- Preparation
- Anchors
- Suture management
- Suture placement
- Knots
- Shift
- Rotator interval closure
- Problems specific to arthroscopy
- Recurrence rate



## @Bankart 2005-7

- 2 year period n=233
- >2 year follow up
- Anchors and pinch tuck
- 62 completed Fup
- Half @, half open
- 9 recurrences/62
- Recurrence associated with bone loss & epilepsy



# Definitions

- Instability =
- Excessive translation that causes symptoms in the conscious patient

– Boileau 2009



# Definitions

- Laxity does not equal instability
- **CORRECT**
- Some lax patients do not dislocate
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- **FOR**
- Some people who smoke do not get cancer
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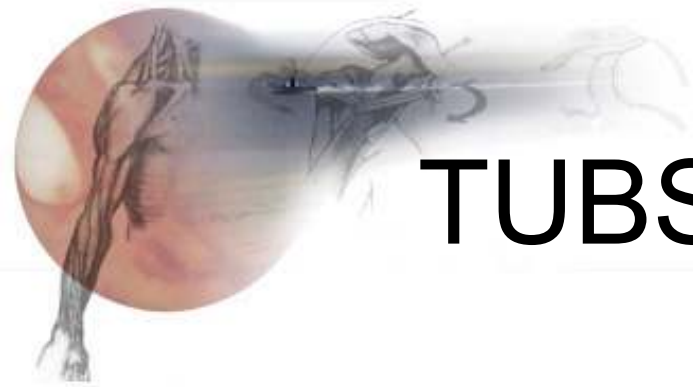
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- Stiff shoulders can not dislocate
- In order to dislocate must be lax
- Laxity is mandatory in dislocation



# Definitions

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  - Boileau 2009



# TUBS and AMBRI

- Matsen
- Traumatic Unilateral Bankart Surgery
- Atraumatic MDI Bilateral Rehab
- Inferior capsular shift
- Service but disservice

# There is a spectrum of dislocation



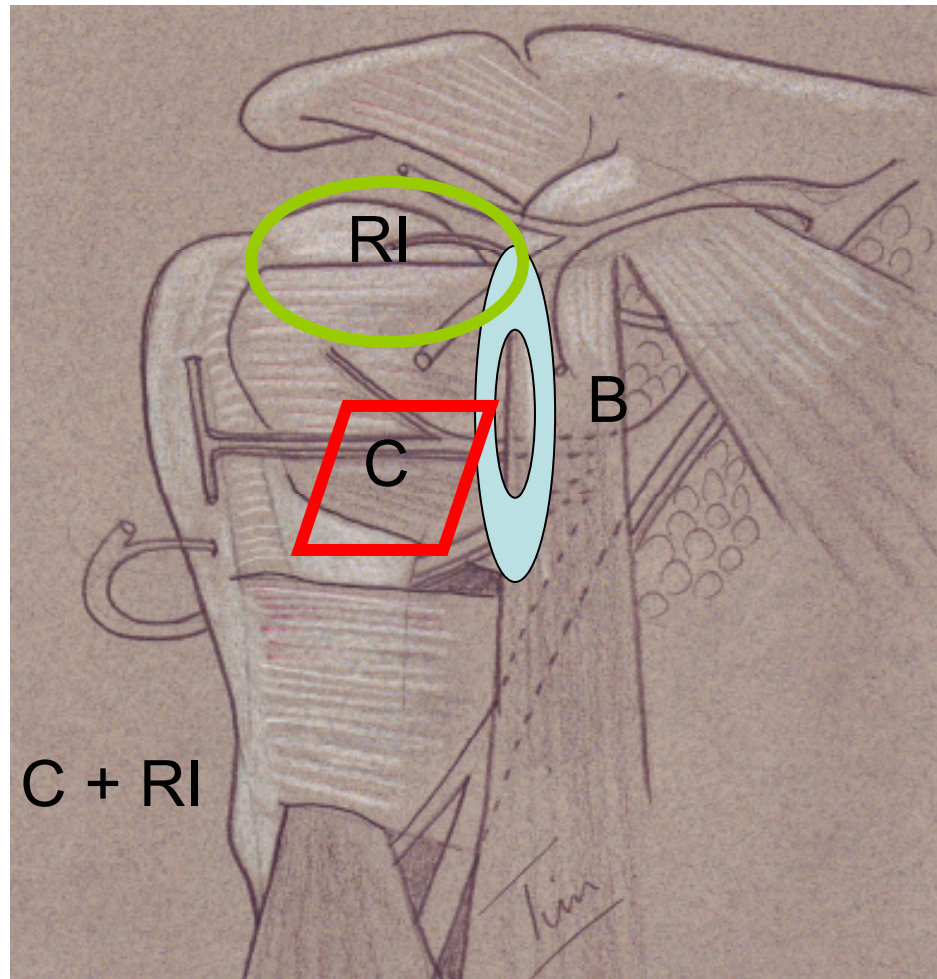
Most patients will have elements of laxity and avulsion



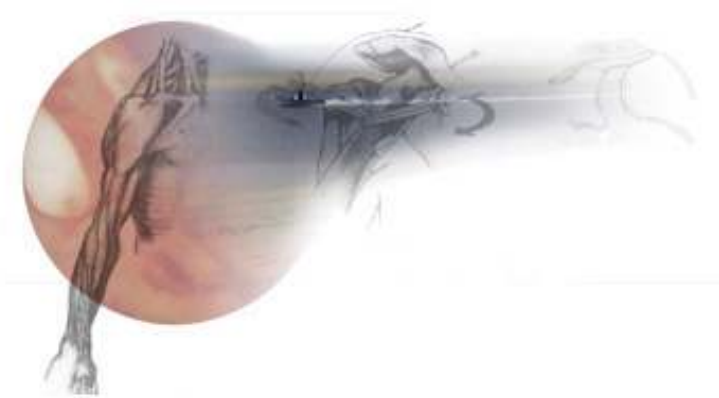
# Open Bankart Repair

1990-2009

- pathology



Repair = B + C + RI



Polar I  
structural

Non structural  
Polar II

Polar III

STANMORE TRIANGLE

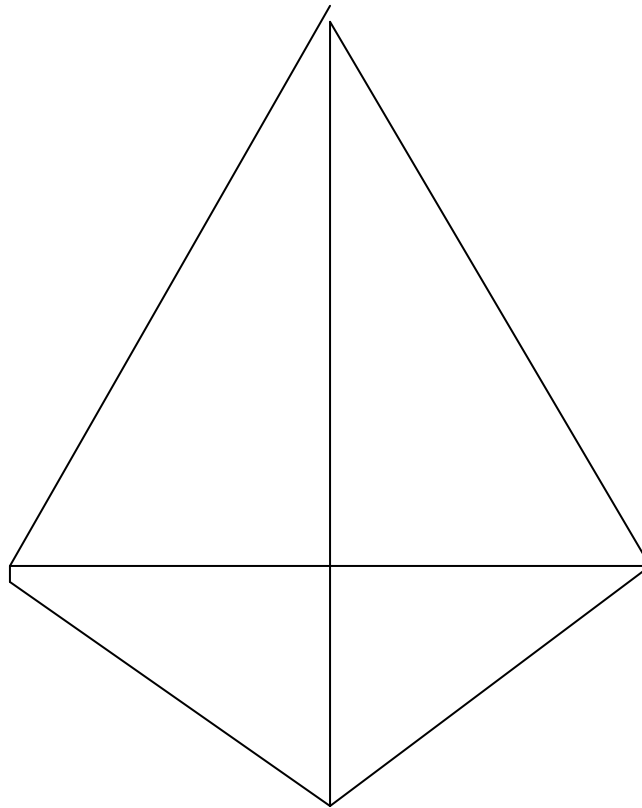


# Stanmore triangle

- No mention of
- Anterior or posterior or inferior
- No place for posterior positional
- Overemphasis of muscle induced



# Exeter diamond







# Exeter diamond

structural

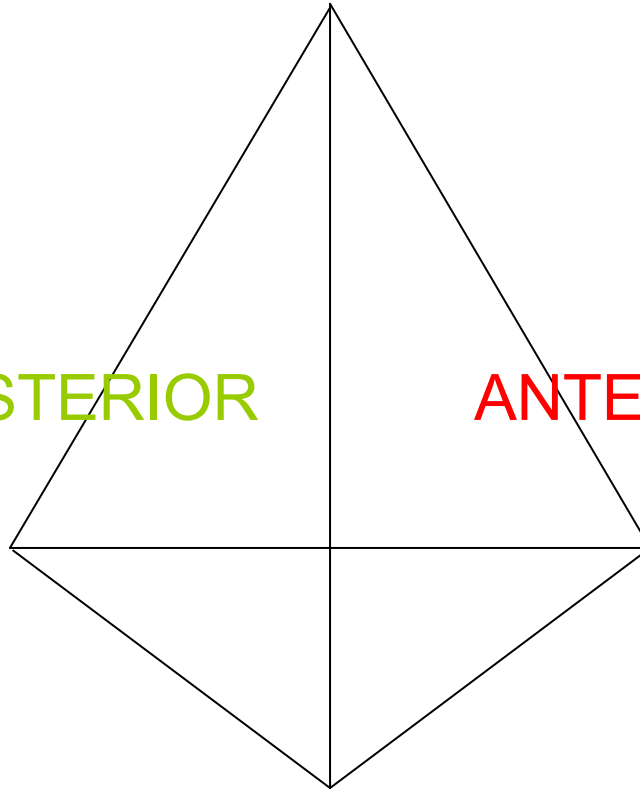
POSTERIOR

ANTERIOR

Non-structural

Non-structural

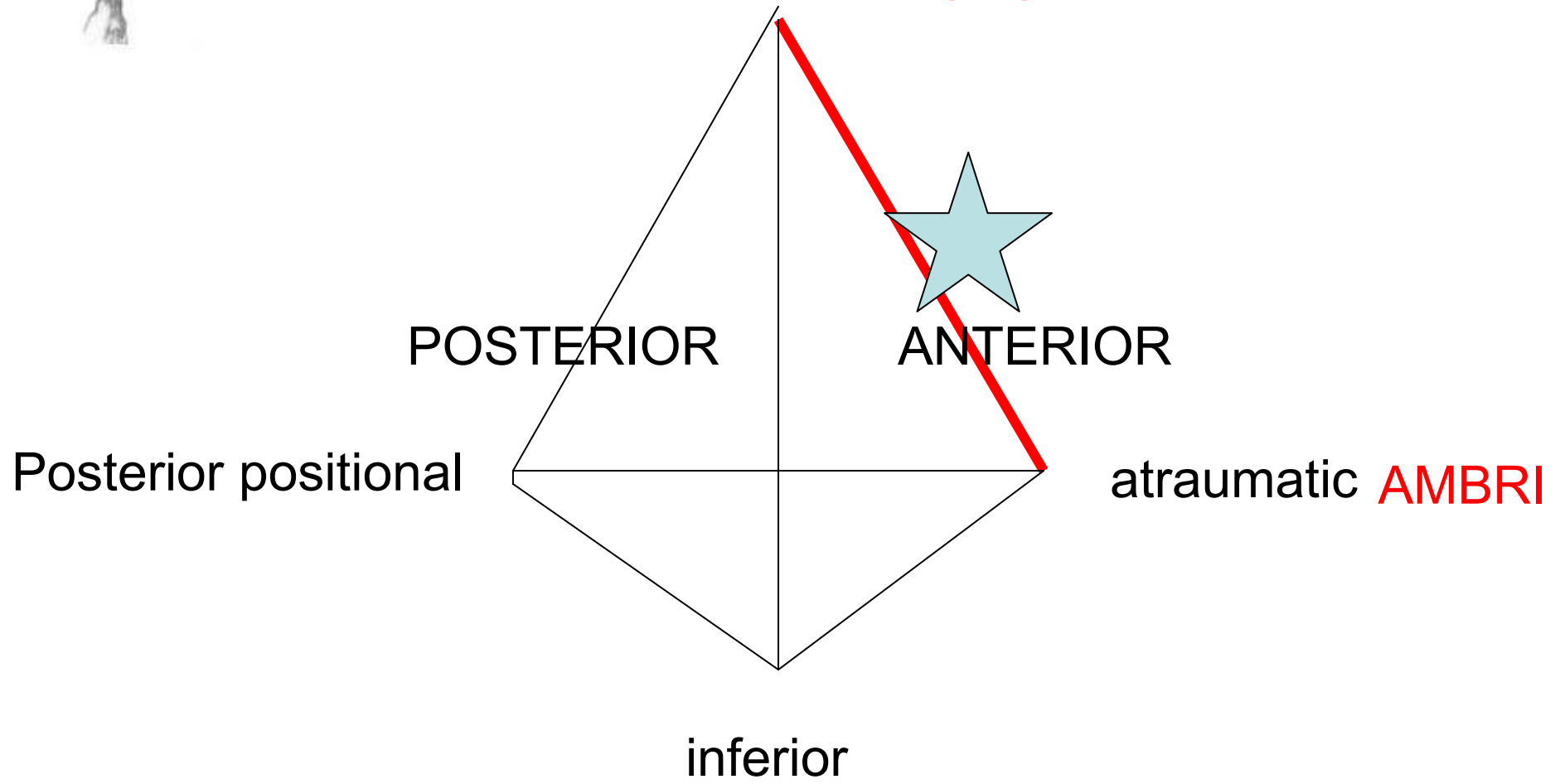
INFERIOR





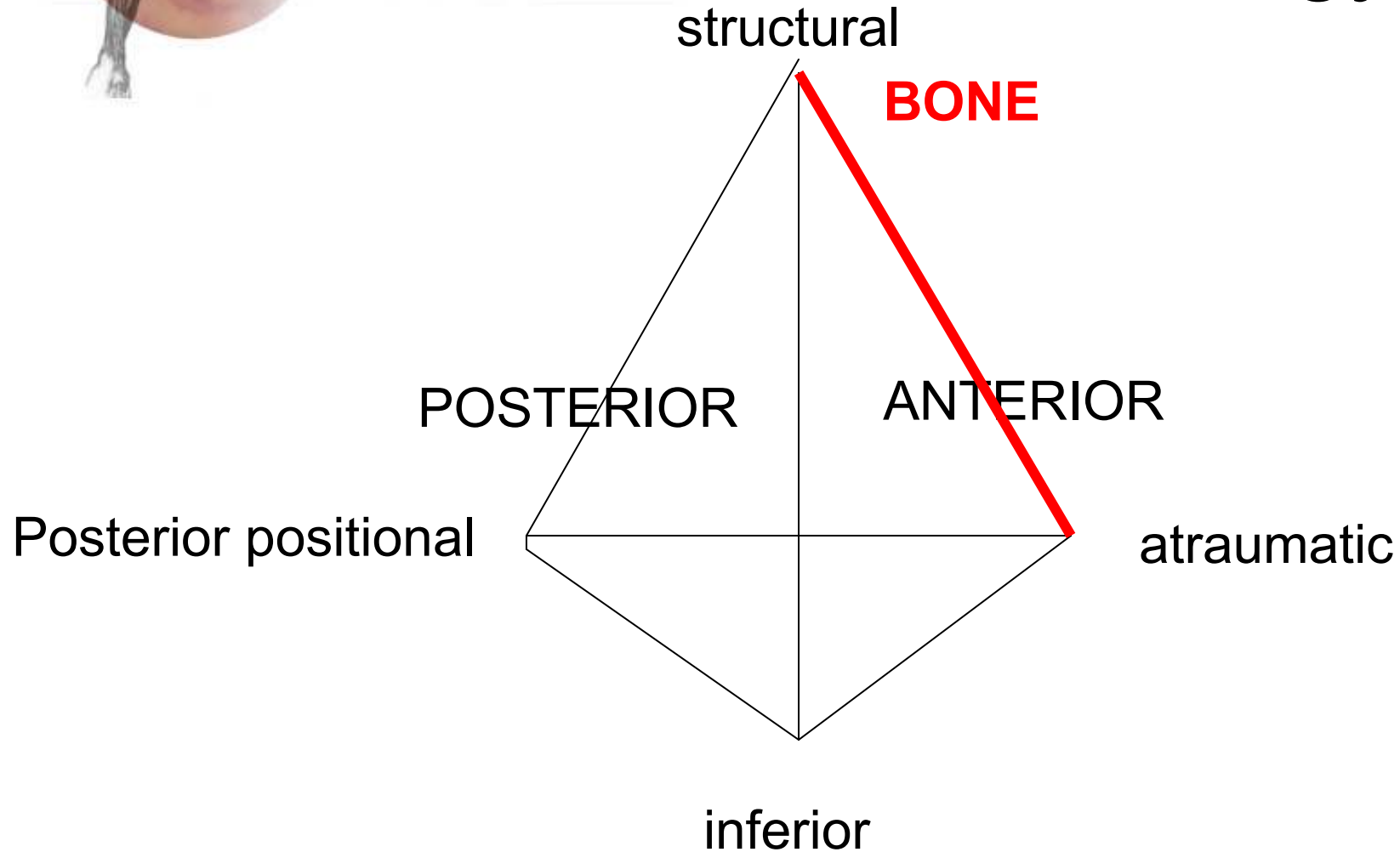
# Exeter diamond

structural **TUBS**





# Exeter diamond Pathology

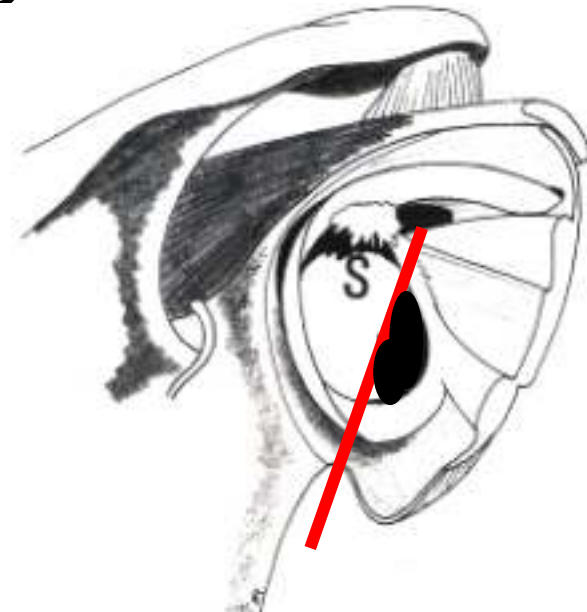




# Jo DeBeer

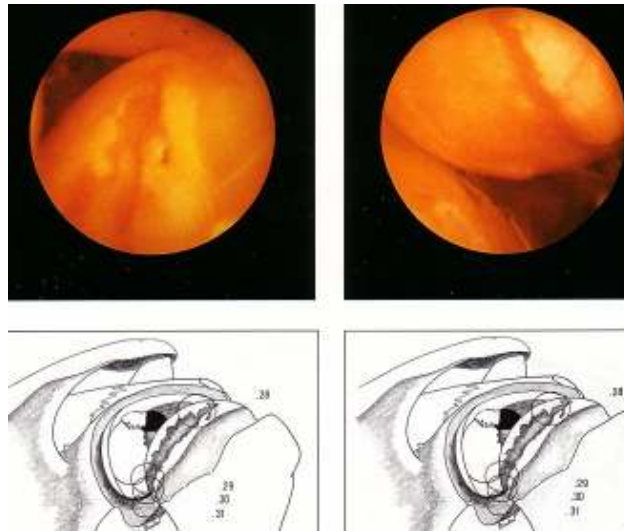
## Antwerp 2004

- Bankart tear is rare
- Most dislocations take sliver of bone
- Some take a lot of bone
- “inverted pear glenoid”



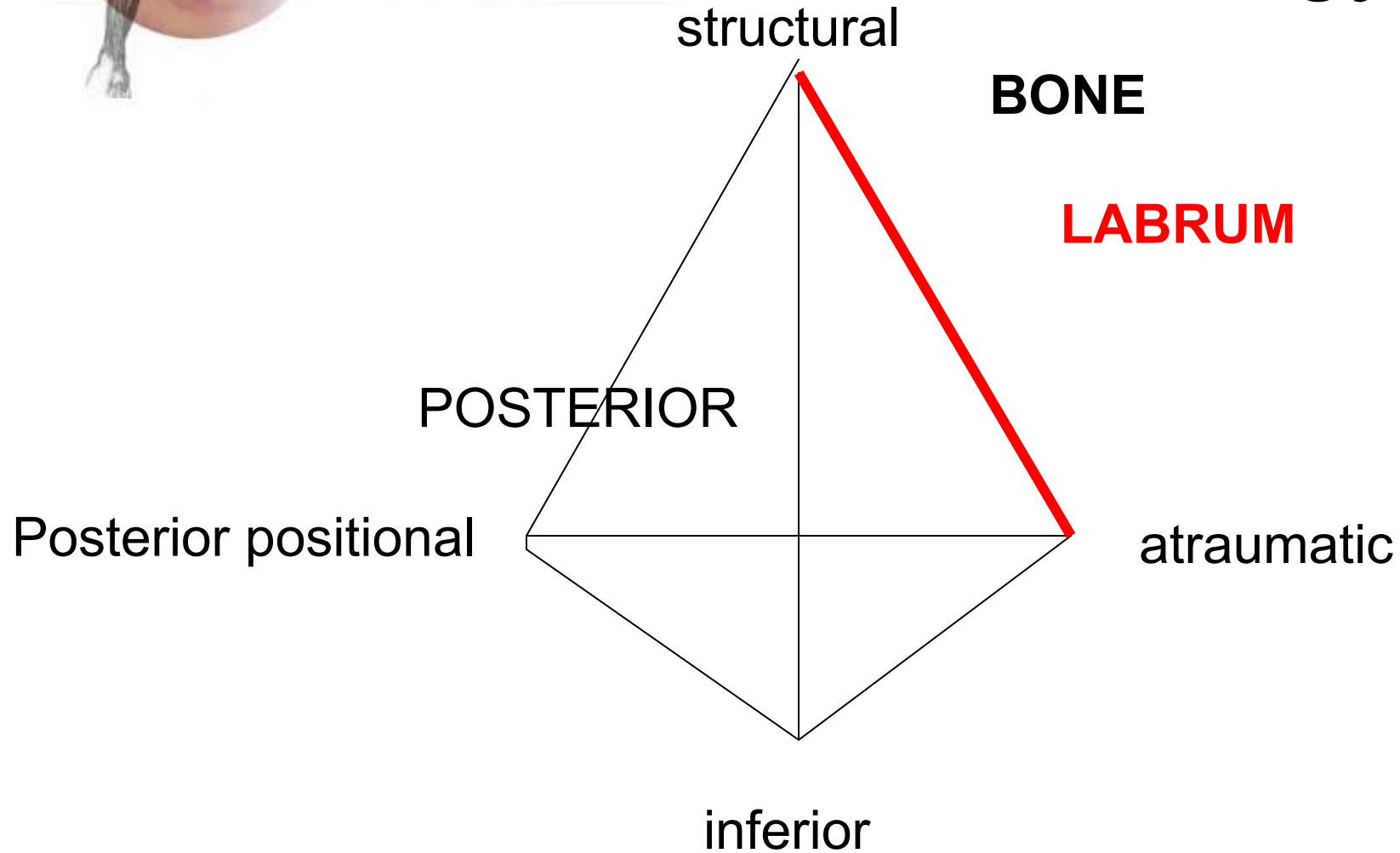


# Hill Sachs lesions



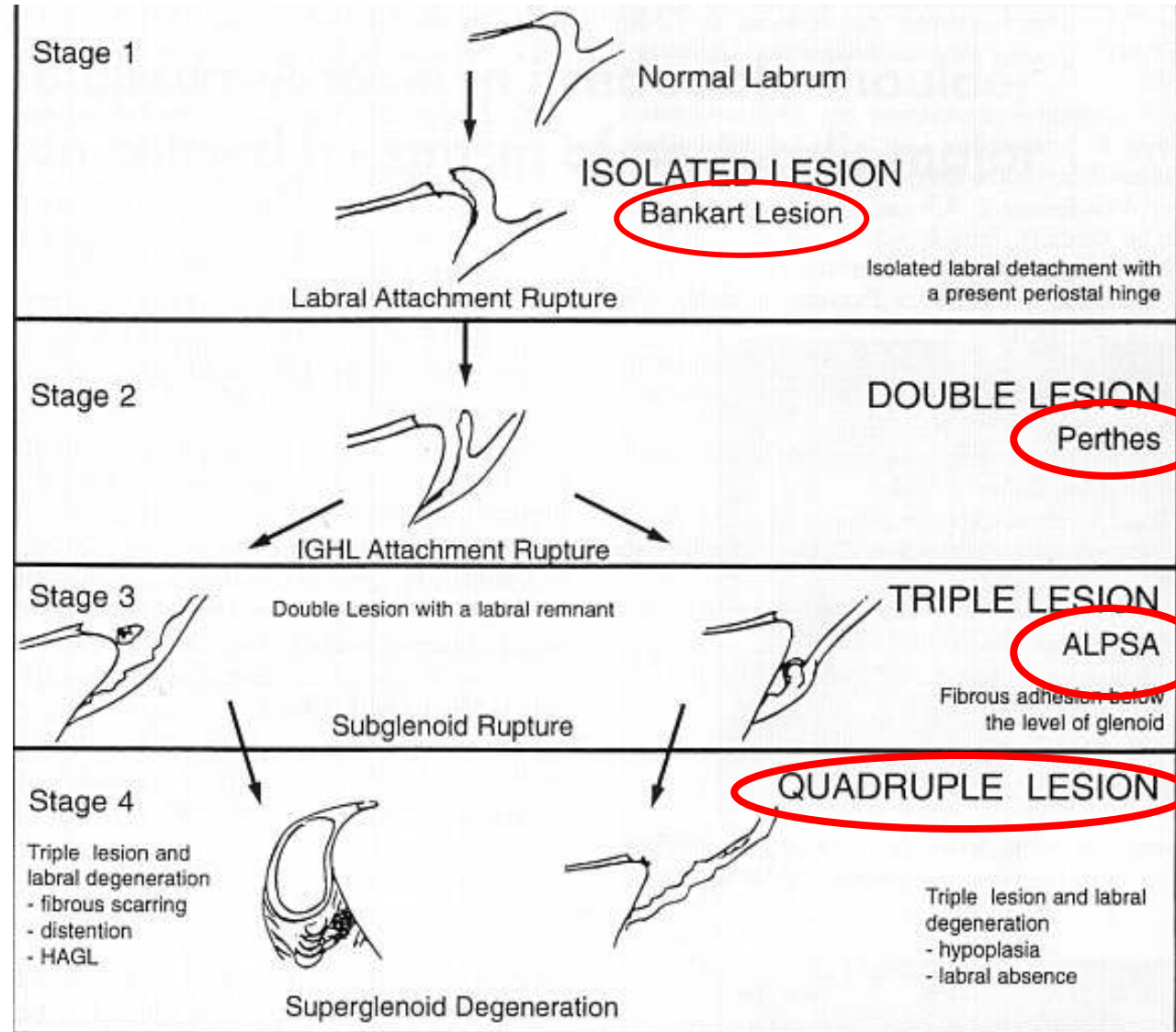


# Exeter diamond Pathology



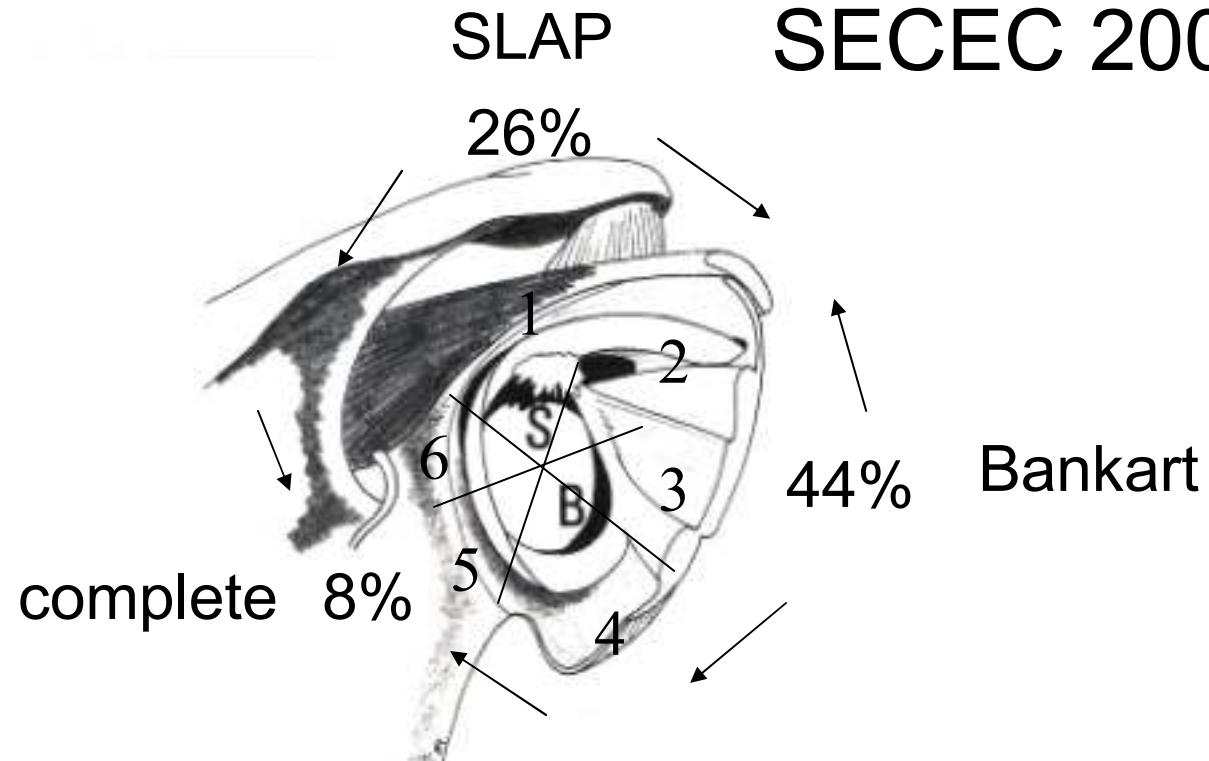


# Bankart variations Habermeyer





Walch, Lafosse  
SECEC 2002



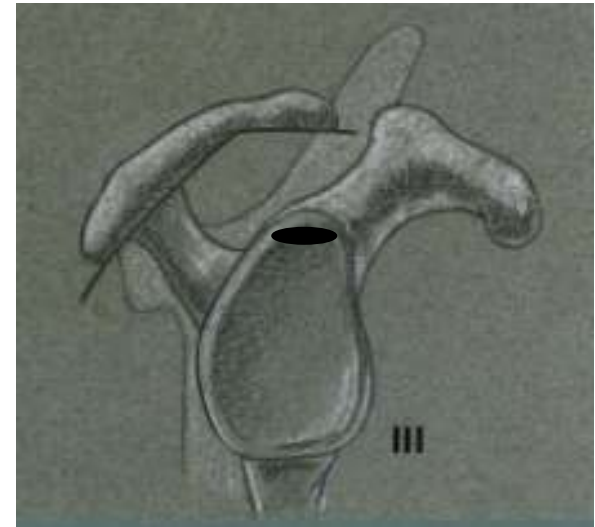
243 shoulder videos analysed  
8% complete circle avulsed





# SLAP tears

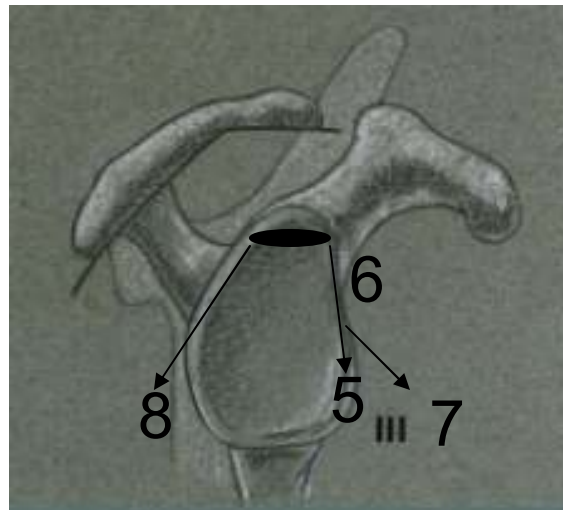
- 1 fibrillation
- 2 avulsion of anchor
- 3 bucket handle
- 4 complex into LHB





# SLAP tears

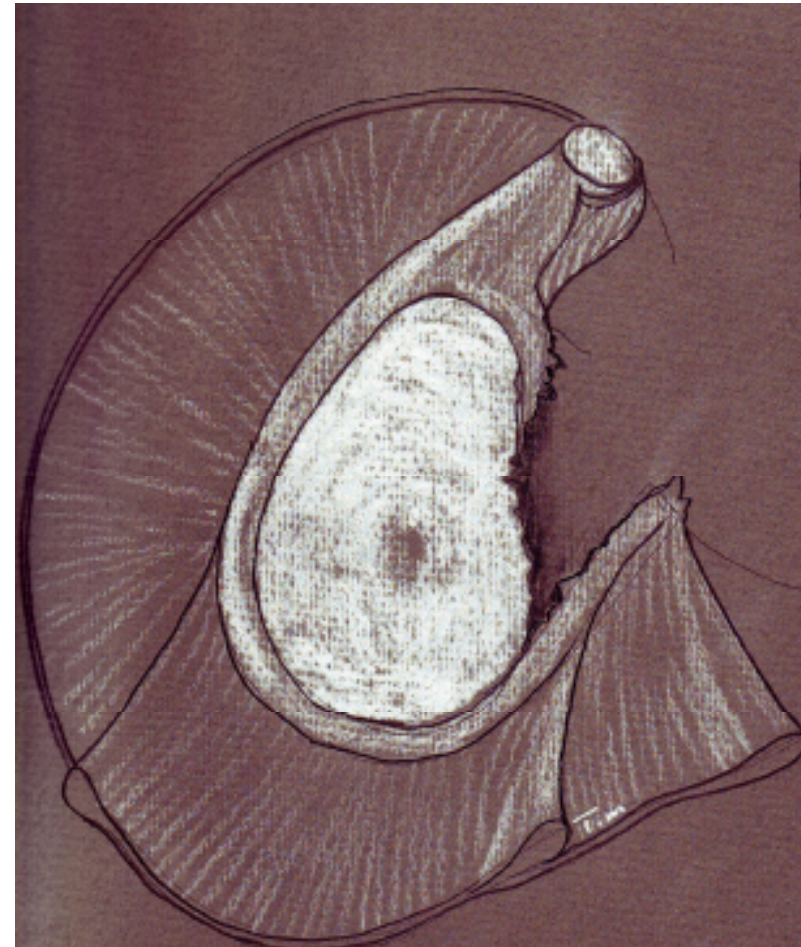
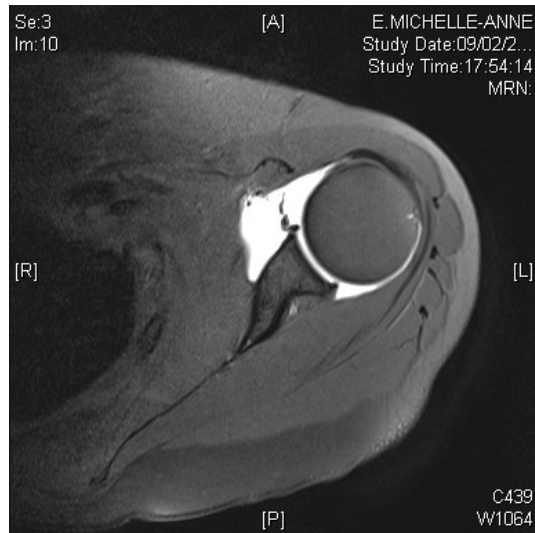
- 5 Type 2 SLAP extending into Bankart tear
- 6 Type 2 + unstable flap tear
- 7 Type 2 SLAP extending between MGHL & IGHL
- 8 Type 2 SLAP extending to posterior labrum





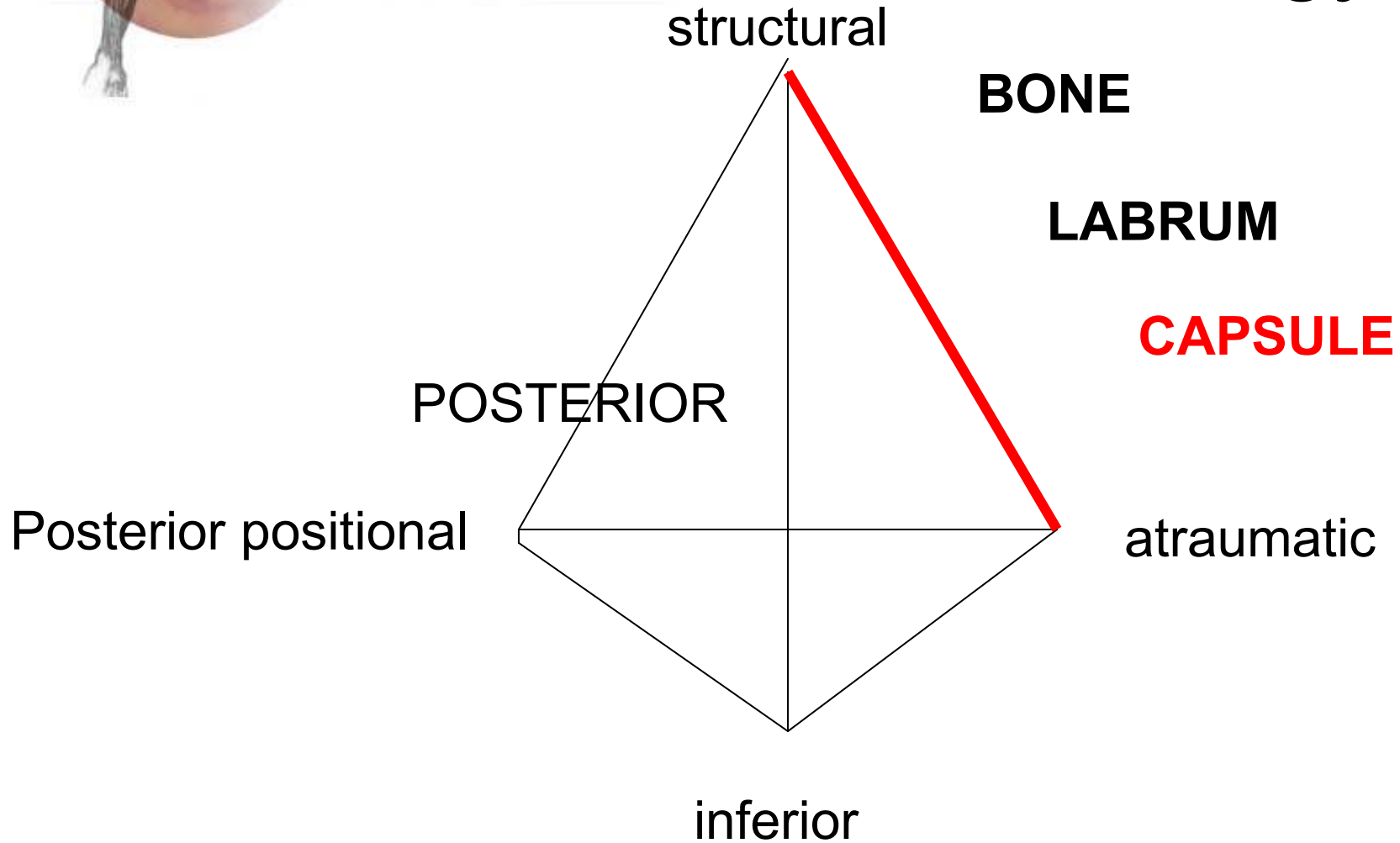
# Hertel radial tear

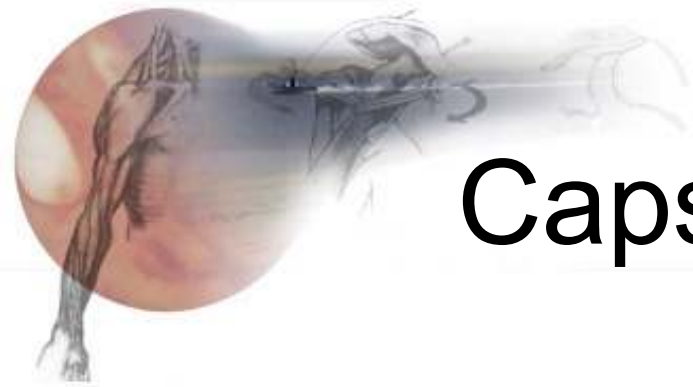
- Detachment 94%
- Medialisation 76%
- Radial tear 34%
- Segmental gap 42%





# Exeter diamond Pathology



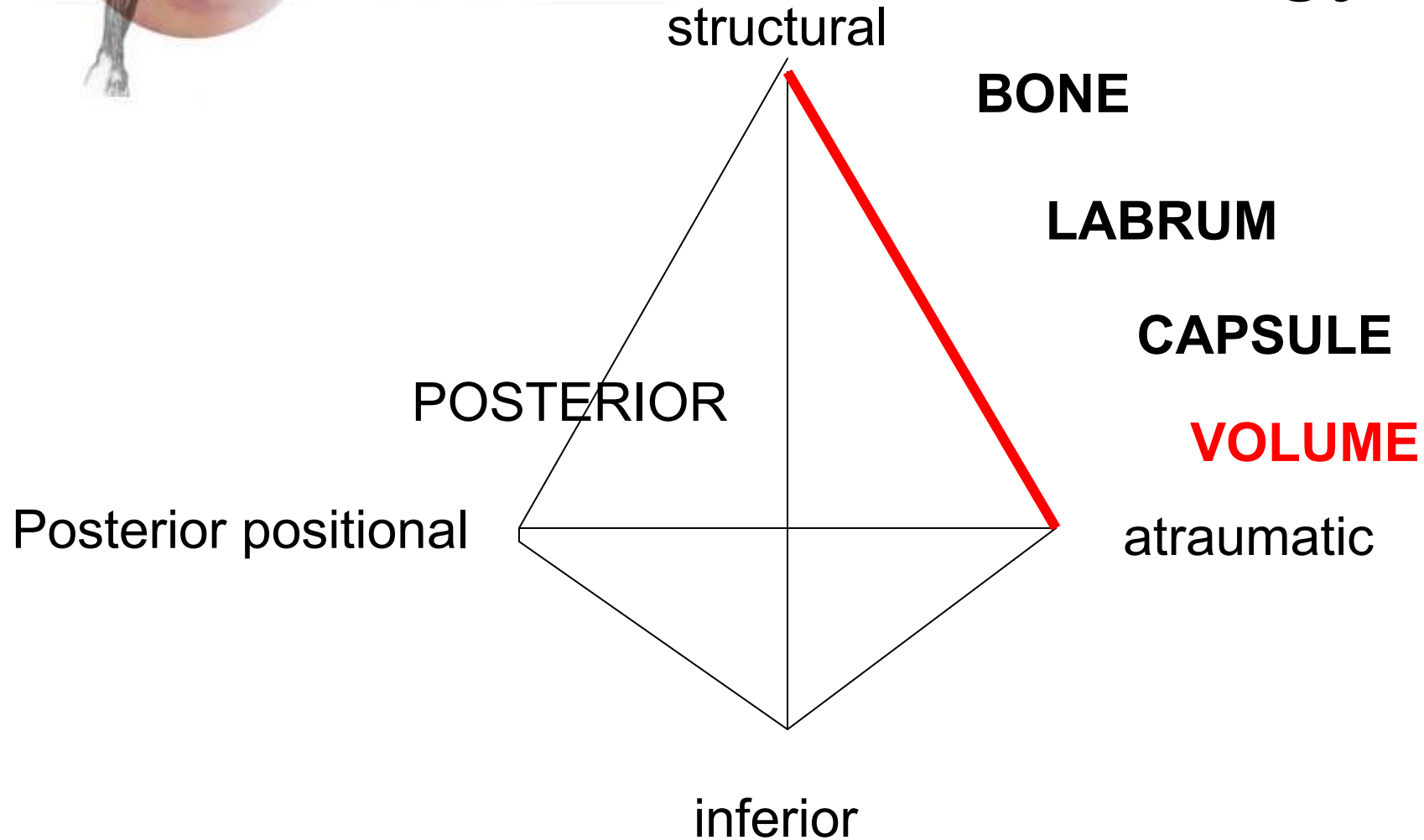


# Capsular lesions

- Wide rotator interval
- Dysplastic MGHL
- Capsular tears
- Radial lesions



# Exeter diamond Pathology







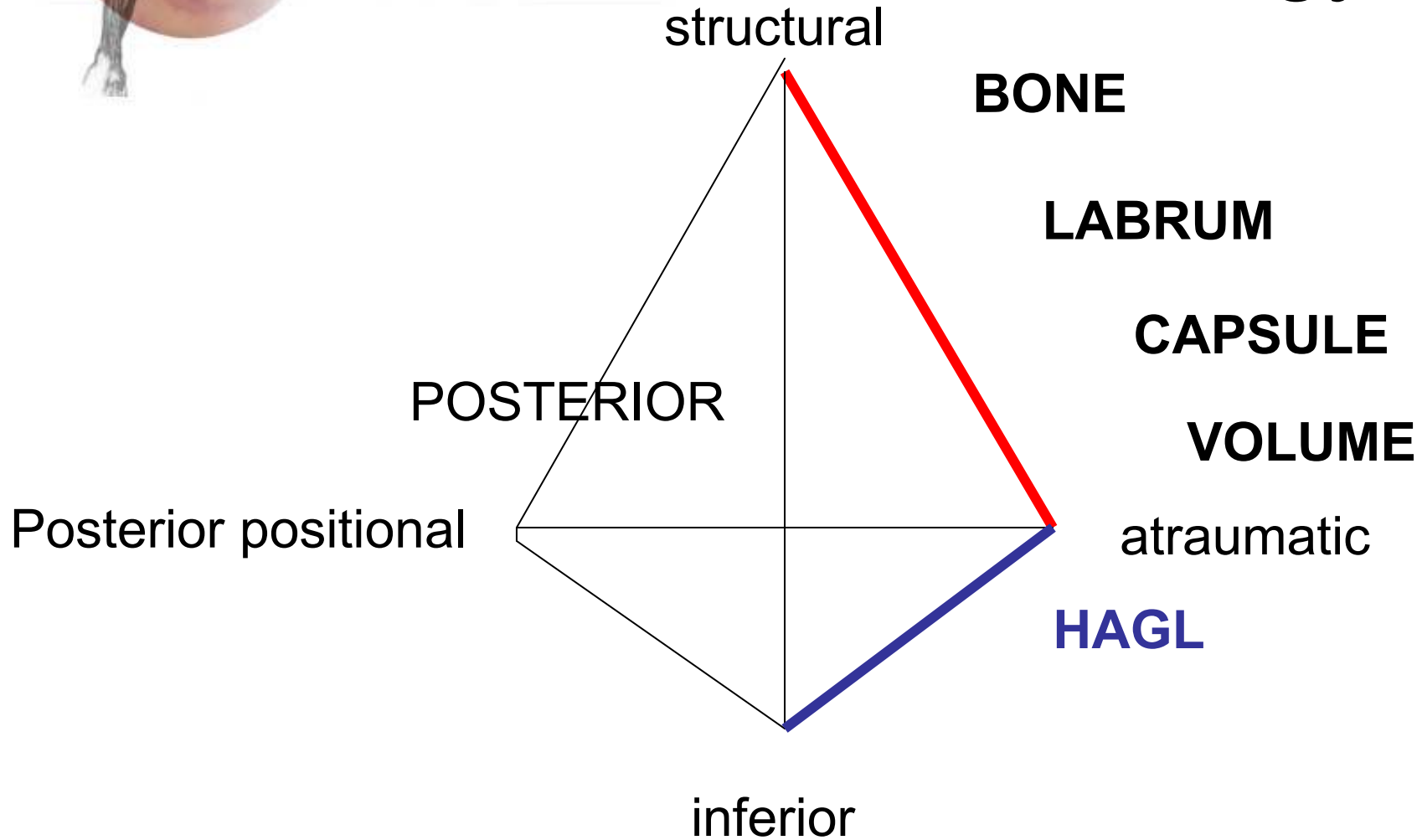
# Loosey Goosey shoulders

- Congenital laxity
- Capsular stretch
- Capsular tears
- +ve drive thru sign



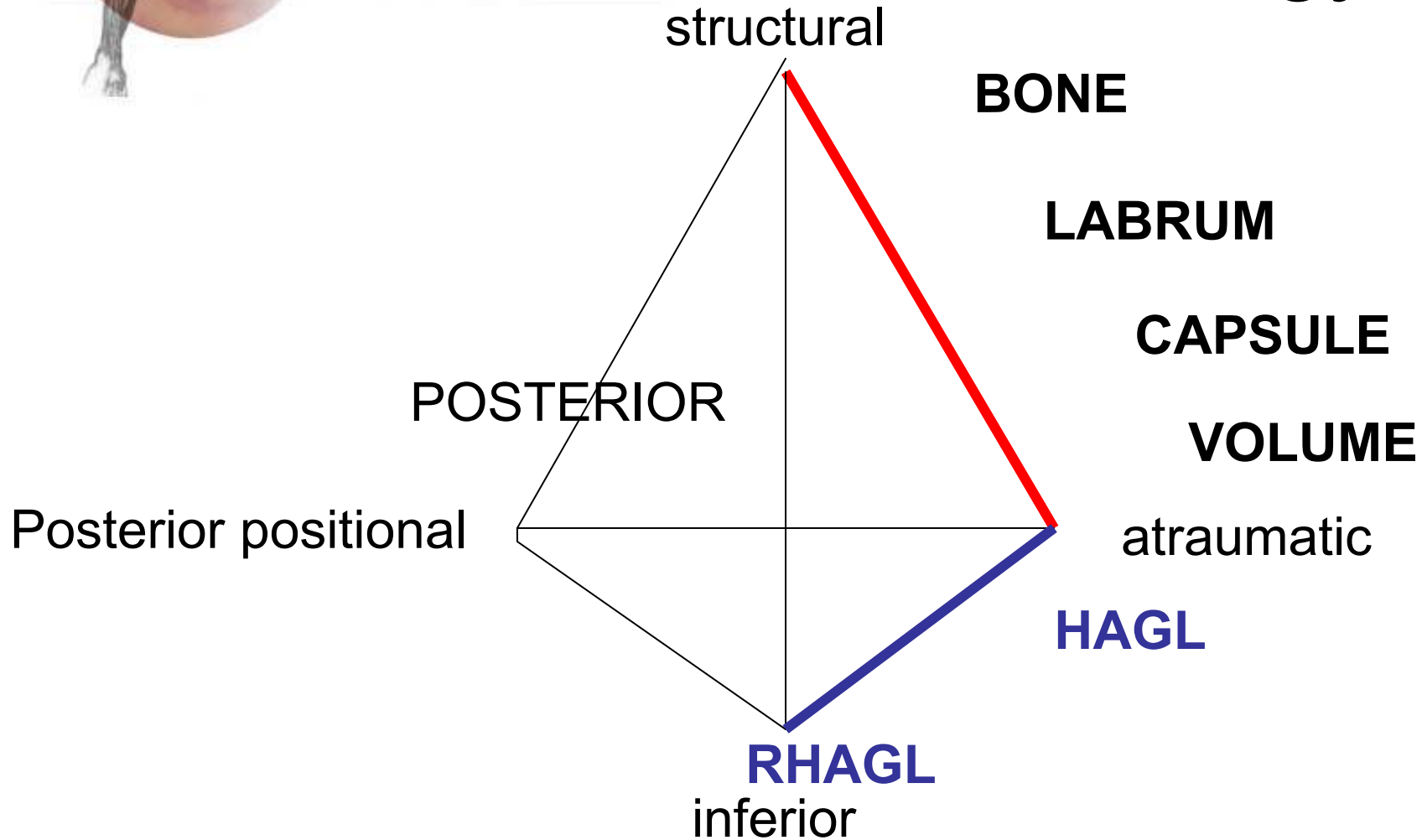


# Exeter diamond Pathology



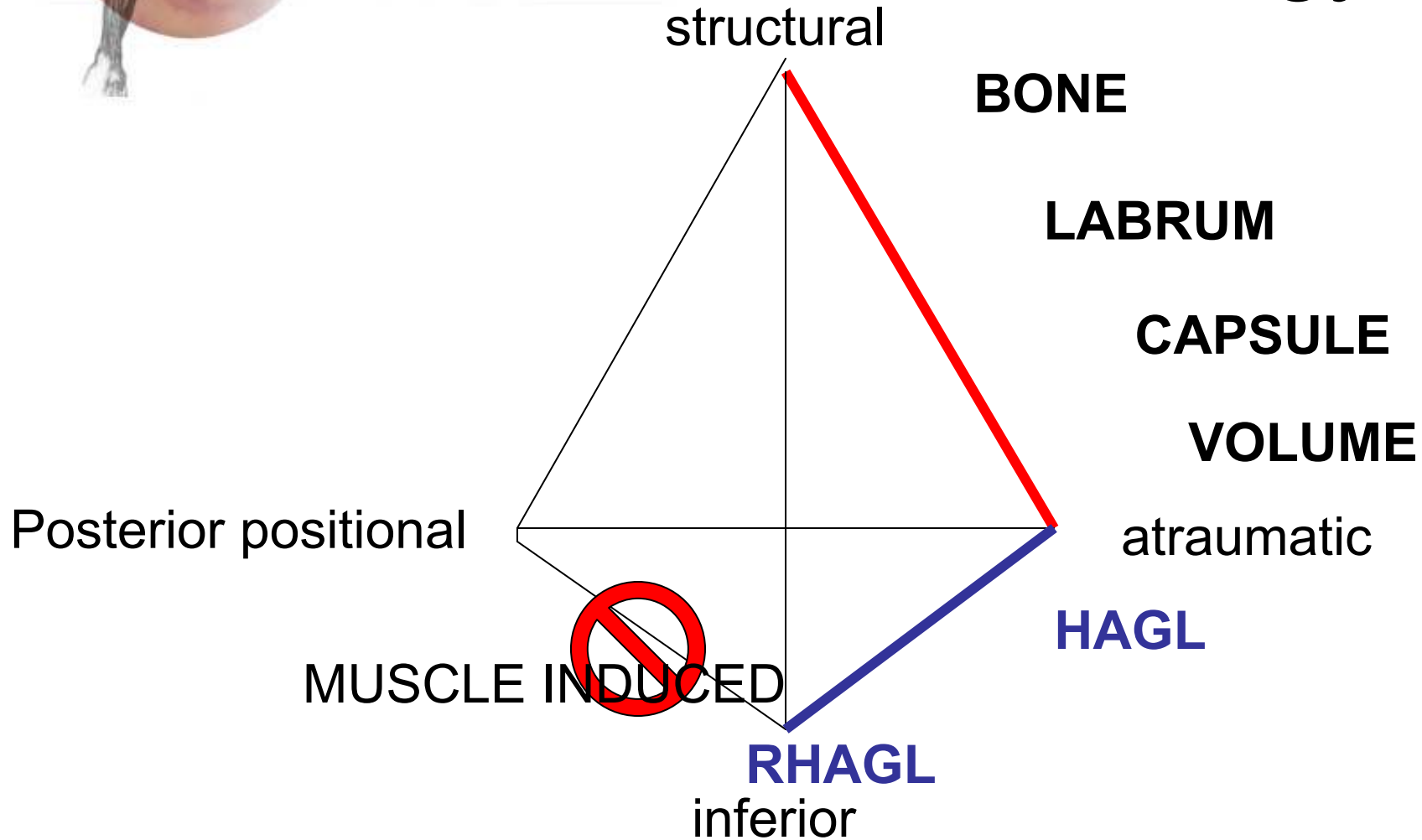


# Exeter diamond Pathology





# Exeter diamond Pathology





# Muscle patterning

- Stanmore
- N=1096 over 20 years
- Patterning in 45%
- And 100% of inferior dislocation
- (excessive ? Peculiar practice)



# Muscle patterning Polar III

- Ordinary physio success 24%
- Specialist physio success 61%
- Takes 2 years of physio
- 25% of successes relapse within 2 years
- Success = notes review





# Muscle patterning Polar III

- Results of physio
- 10 X worse if have had surgery
- Do not operate on them
- Maybe got surgery because 10X as bad

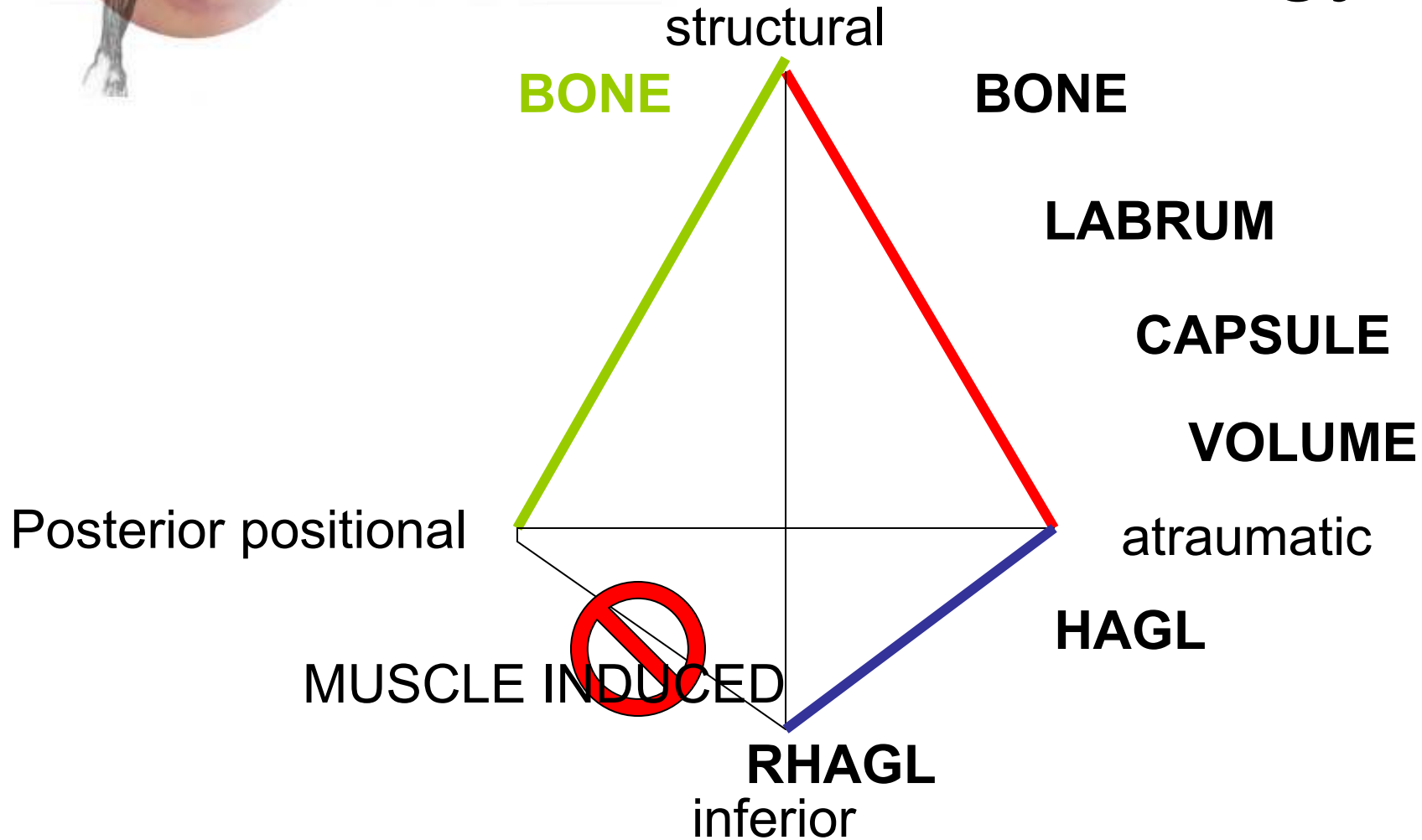


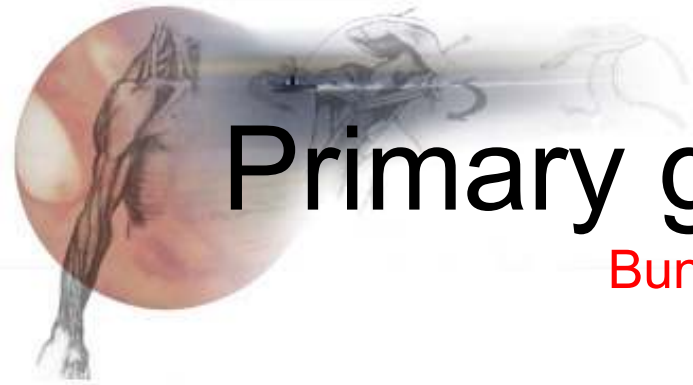
# Muscle patterning Polar III

- Jaggi; 3 subgroups
- Central E6
- Positional not MP
- Protective not MP



# Exeter diamond Pathology



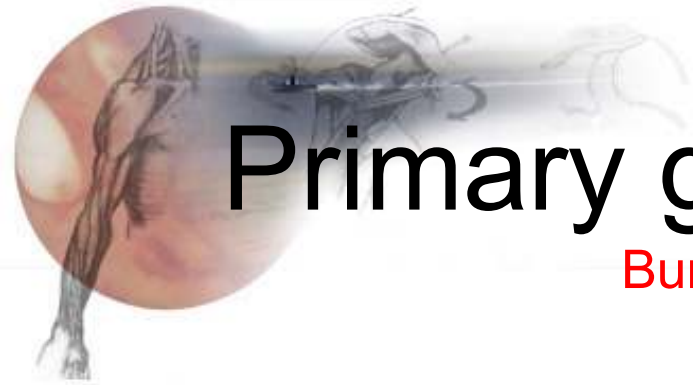


# Primary glenoid dysplasia

Bunker et al JSES 2001

- 12 cases
- Bilateral retroverted flat glenoid
- Clavicular bossing
- Bimodal presentation
- 12-24                      clicking, instability, pain
- 48-69                      secondary OA



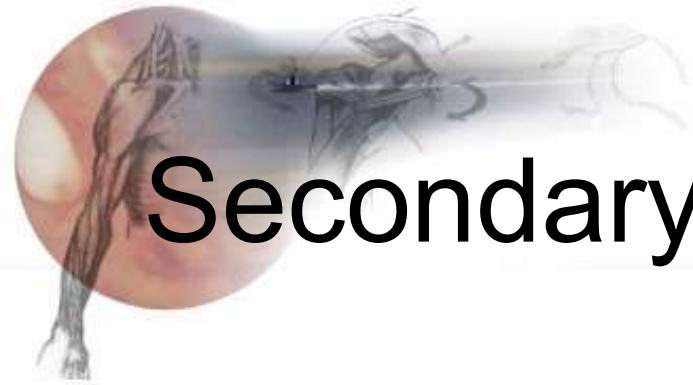


# Primary glenoid dysplasia

Bunker et al SAE 2009

- Father and son
- Gene disorder
- Autosomal dominant inheritance





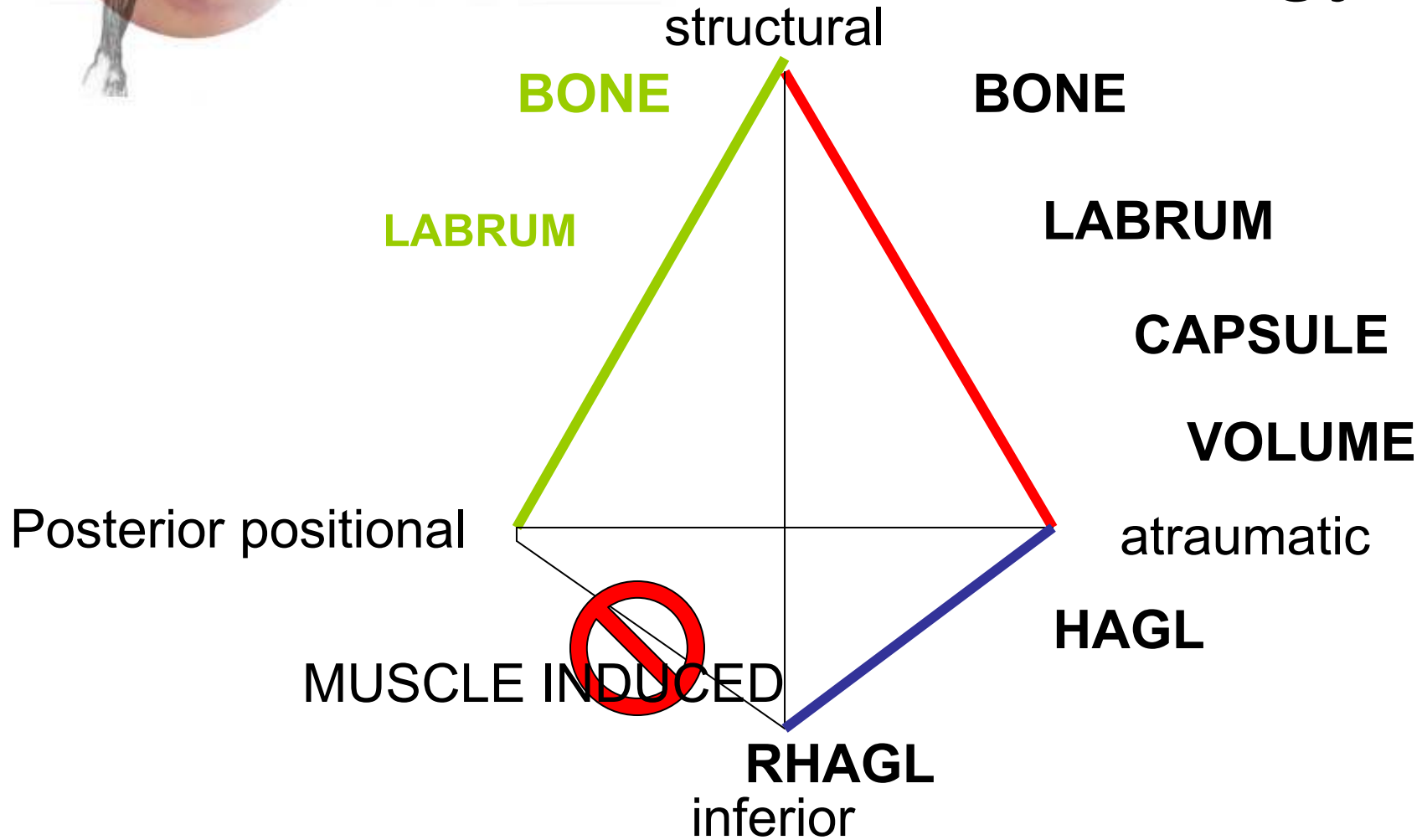
# Secondary glenoid dysplasia

- OBPP                      25 children
- 7 normal glenoids
- 18 abnormal
  - 5 flattened
  - 7 biconcave
  - 6 dislocated with pseudoglenoid
- Changes reversible with QUAD procedure



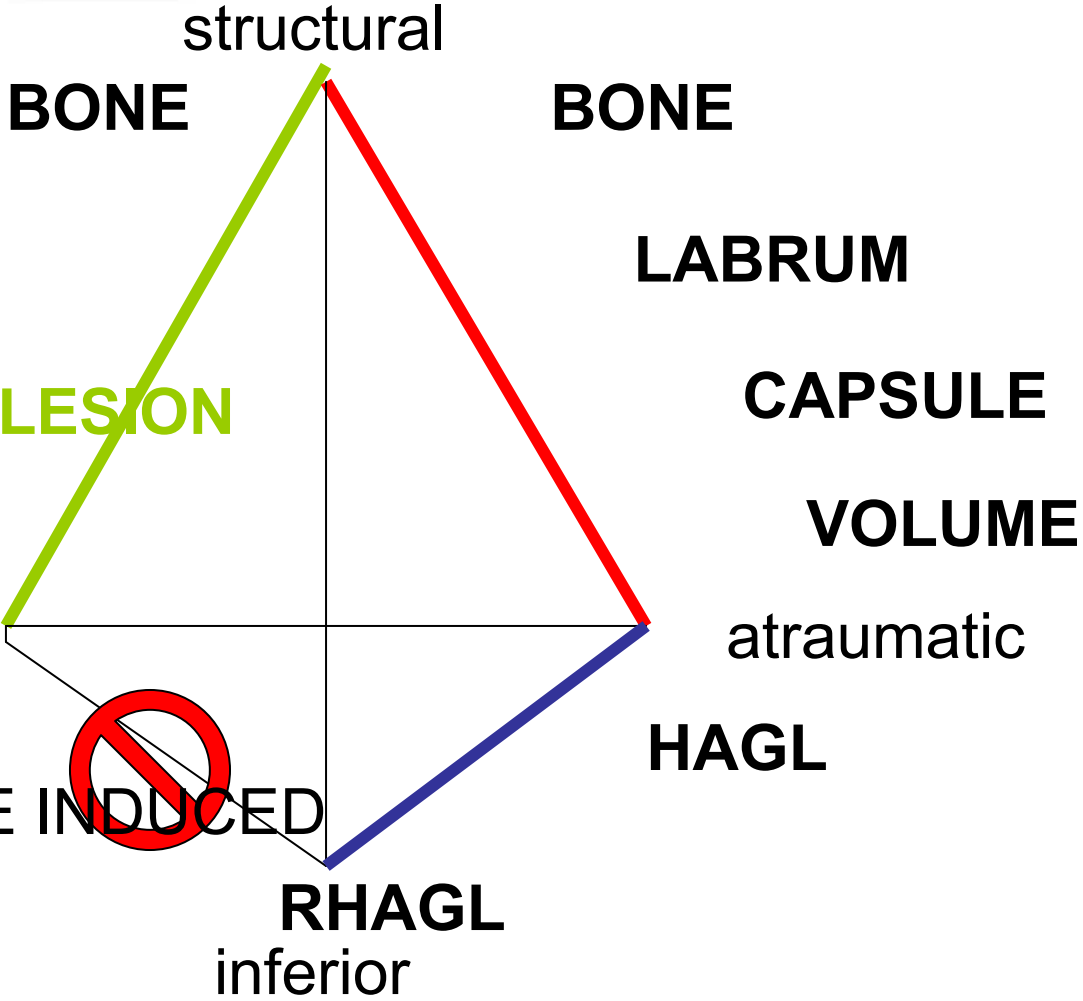
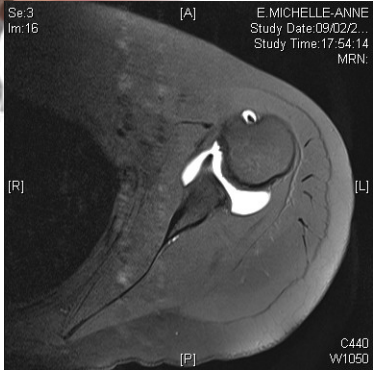


# Exeter diamond Pathology





# Exeter diamond Pathology





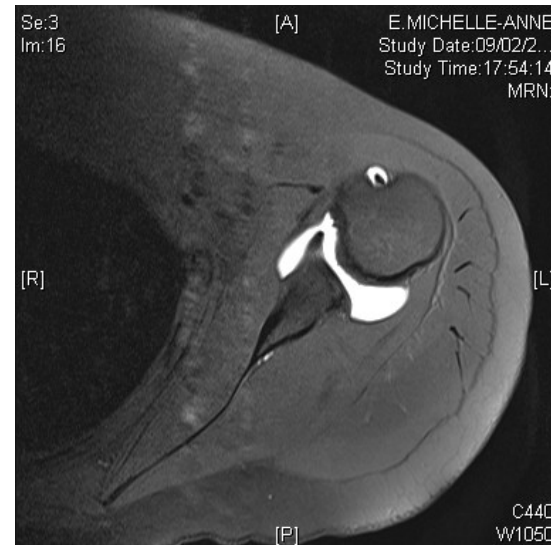
# Postero-inferior dysplasia

- Edelson Clin Orthop 1995
- N=1150 dried scapulae
- Postero-inferior hypoplasia
- 19% Negev desert Bedouin
- 21% USA Caucasians
- 35% Mexican Indians



# Postero-inferior dysplasia

- **Edelson**
- 300 CT and MRI
- Convex post-inf glenoid 18%
- Lazy J shaped





# Postero-inferior dysplasia

- Edelson
- 12 scans of post dislocators
- 9/12 had Lazy J appearance



# Postero-inferior dysplasia

- Innui et al Clin Orthop 2002
- MRI 20 patients, 45 normals
- Dislocators 60% convex at lowest plane
- Normals 78% concave





# Postero-inferior dysplasia

- Kim et al      Arthroscopy 2004
- Kim et al      JBJS 2003
- 1 recurrence in 15 cases



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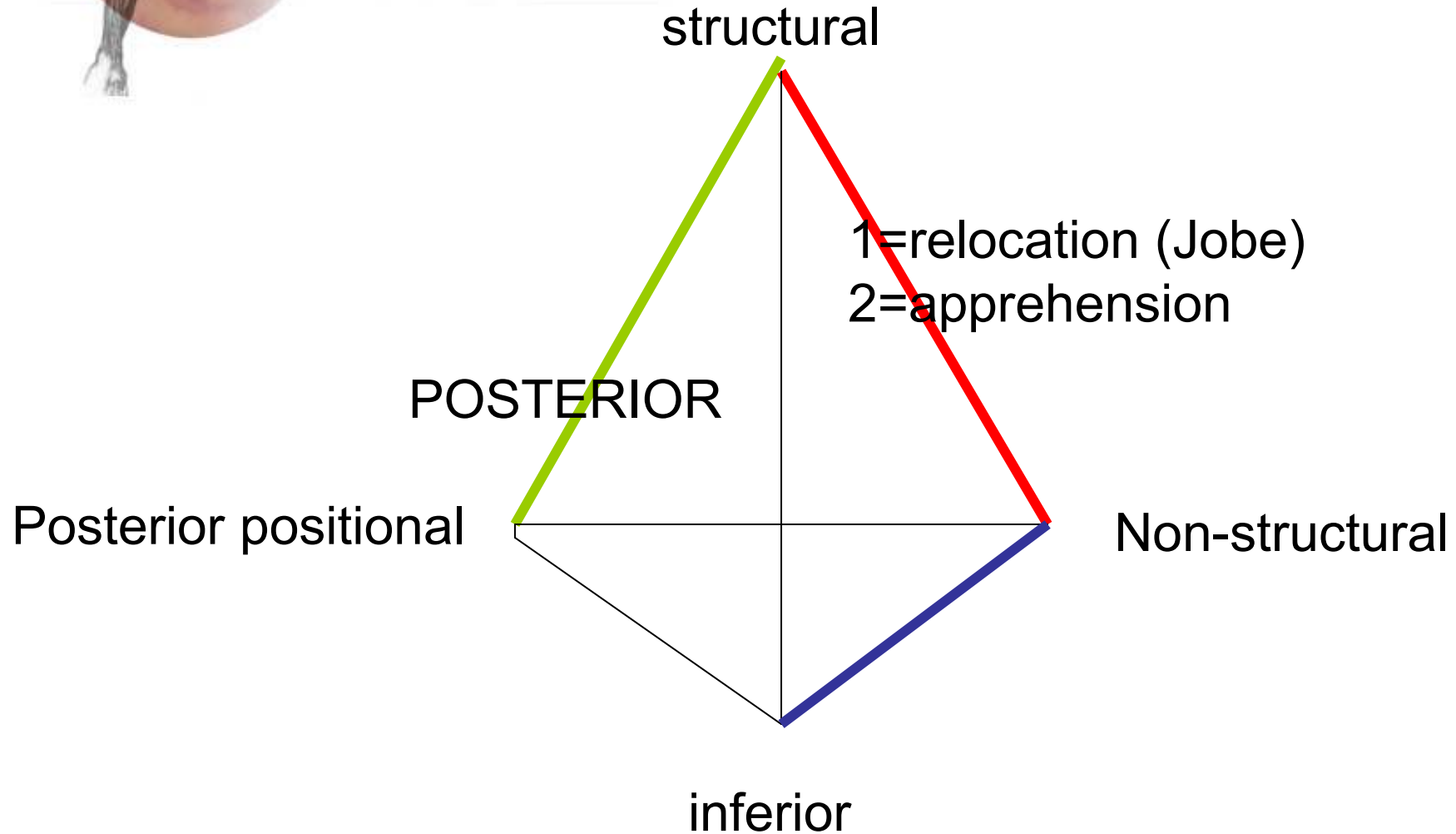
## 4 levels of evidence

- 1 relocation
- 2 provocation
- 3 translation
- 4 excess ROM





# Exeter diamond exam







# Reproduction

- (Apprehension)
- Crank
- Relocation



Figure 1.20 – The apprehension test. The patient is brought to the position of apprehension and shows evidence of strain from, anxiety and concern.

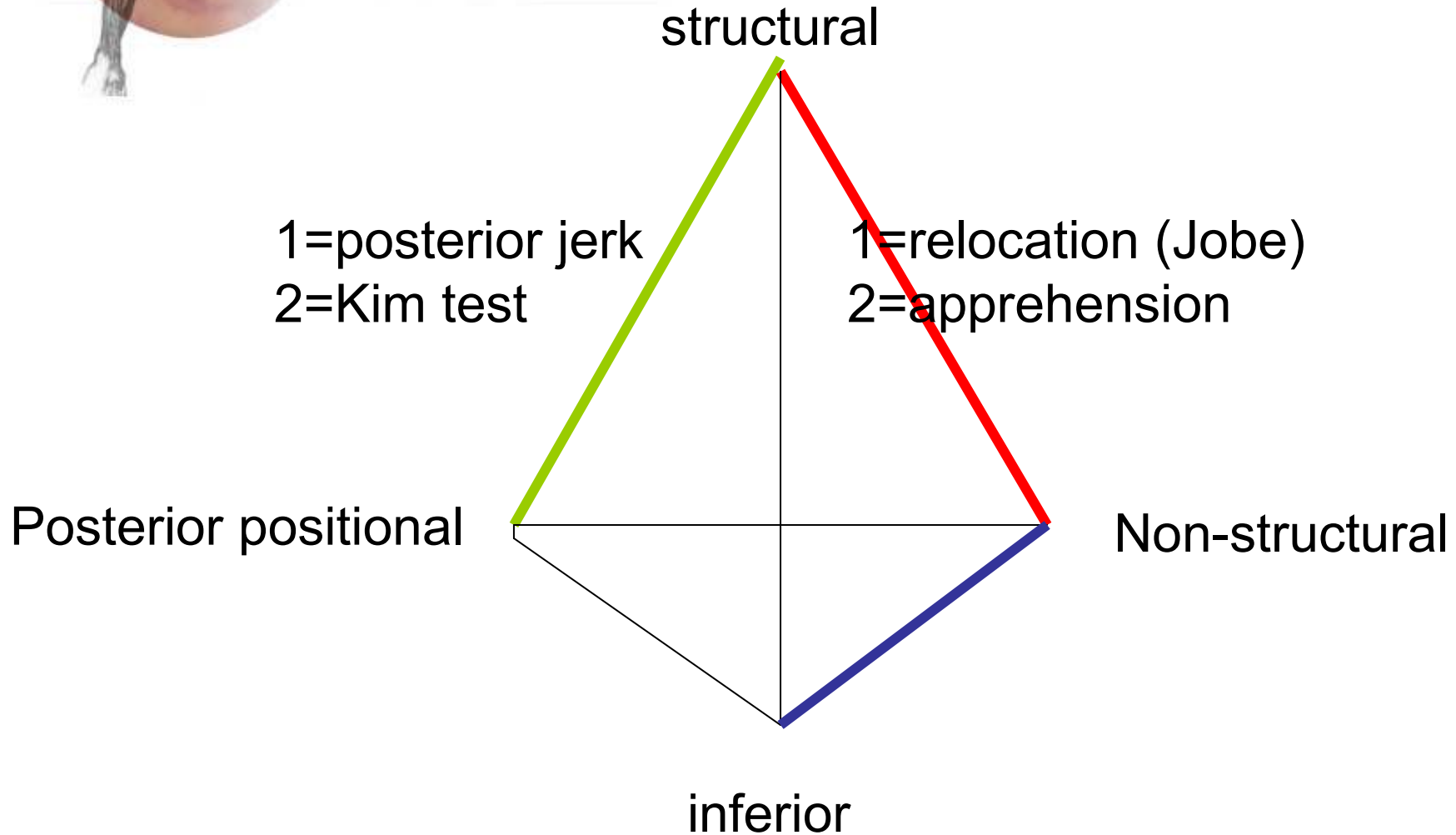


Figure 1.21 – The crank test. With the patient in the position of apprehension the arm is extended, guided, and over more internal rotation. The patient becomes agitated.





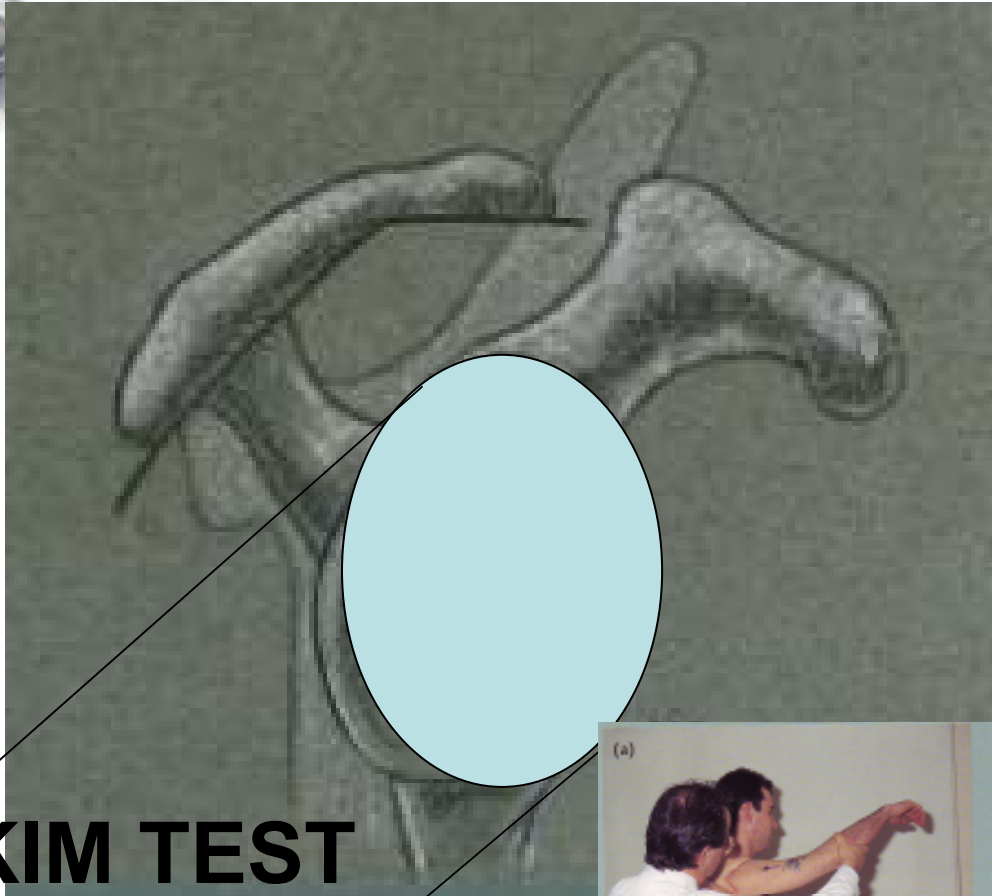
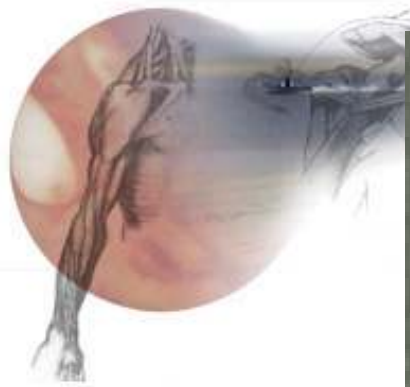
# Exeter diamond exam





# Reproduction

- Posterior jerk



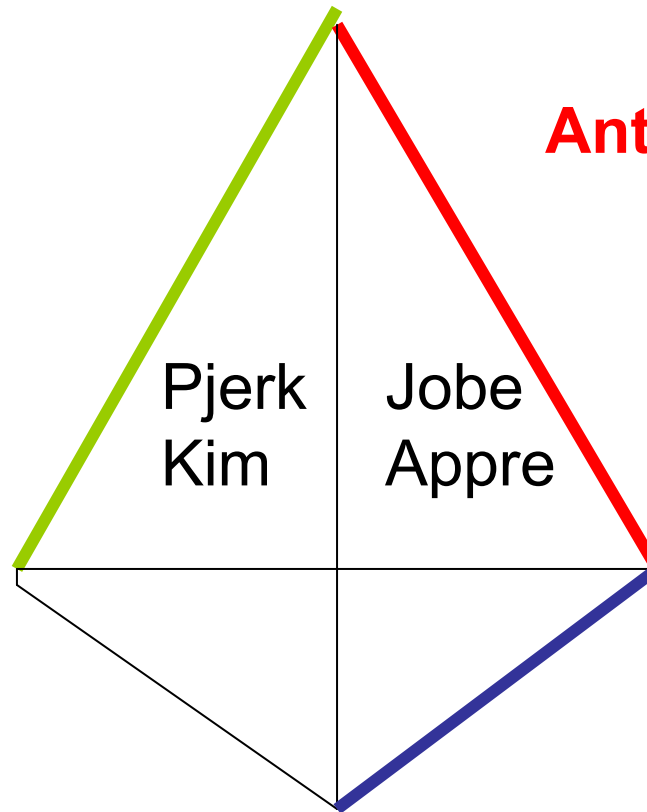
**KIM TEST**  
**Posterior**  
**positional**





# Exeter diamond exam

level 3; translation

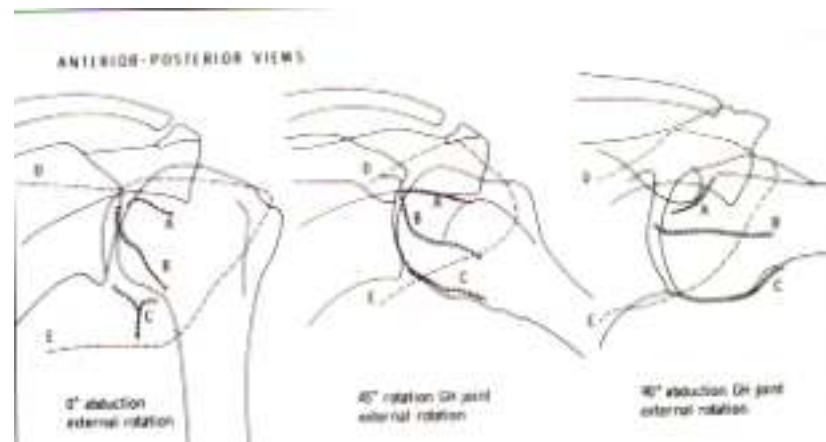


**Anterior drawer**



## Level 3; translation

- Often done incorrectly!!!
- Depends on **unpacking** capsule
- As with Leadbetter or Flynn in hip

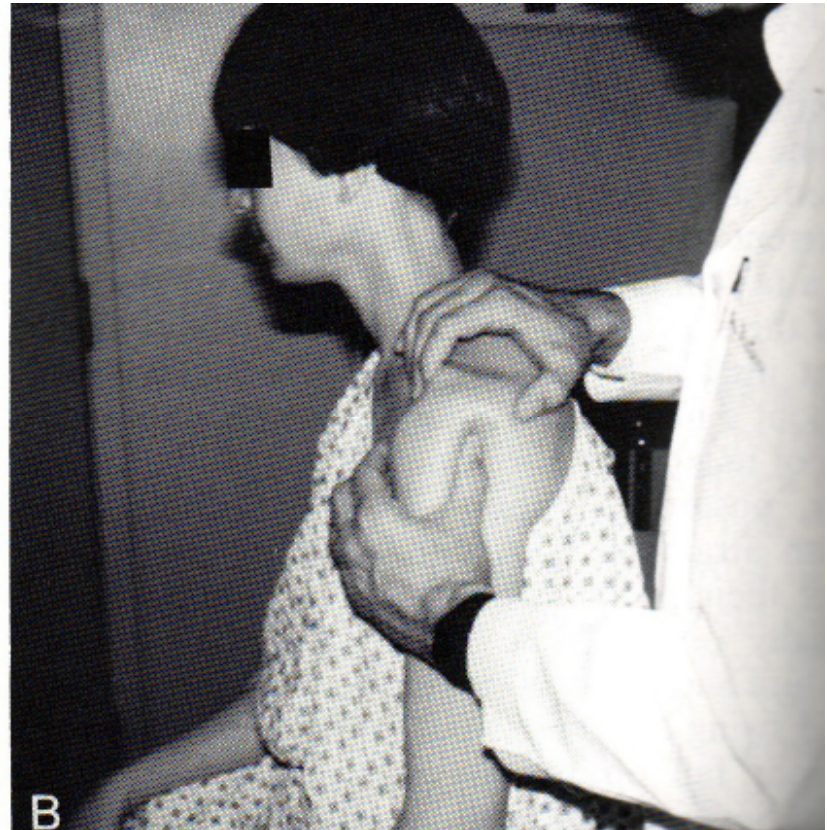






# Drawer tests

- Rockwood & Matsen

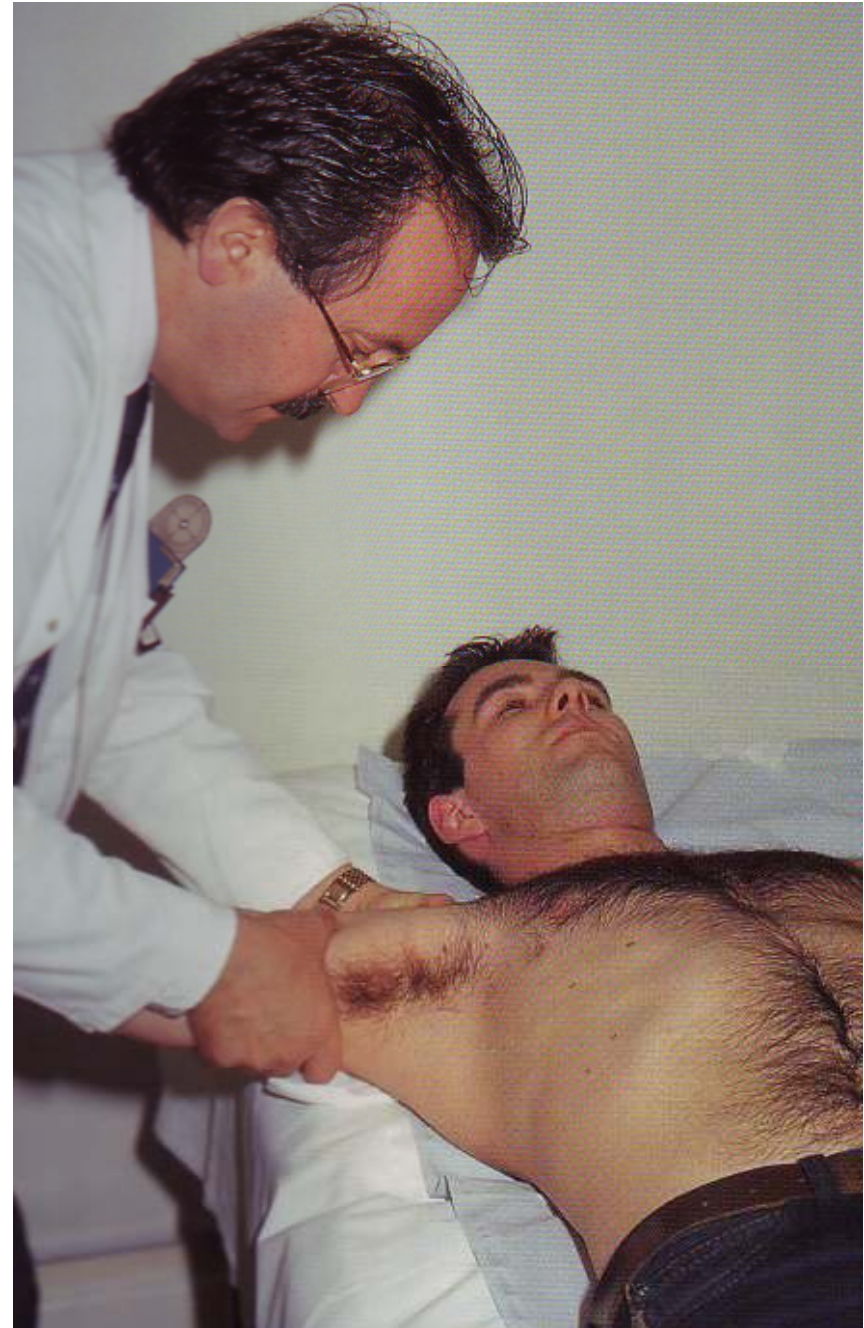






# Drawer tests

- Ganz & Gerber





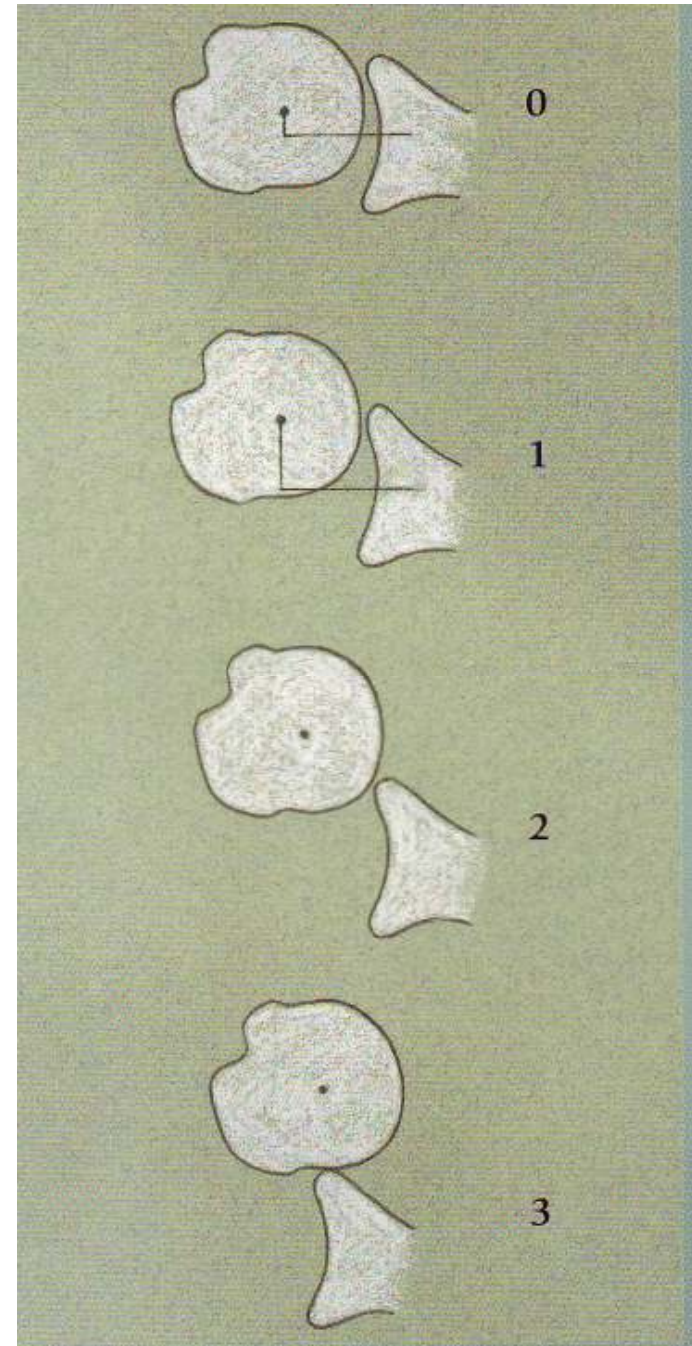
# Unpacked drawer test

- unpacked drawer test



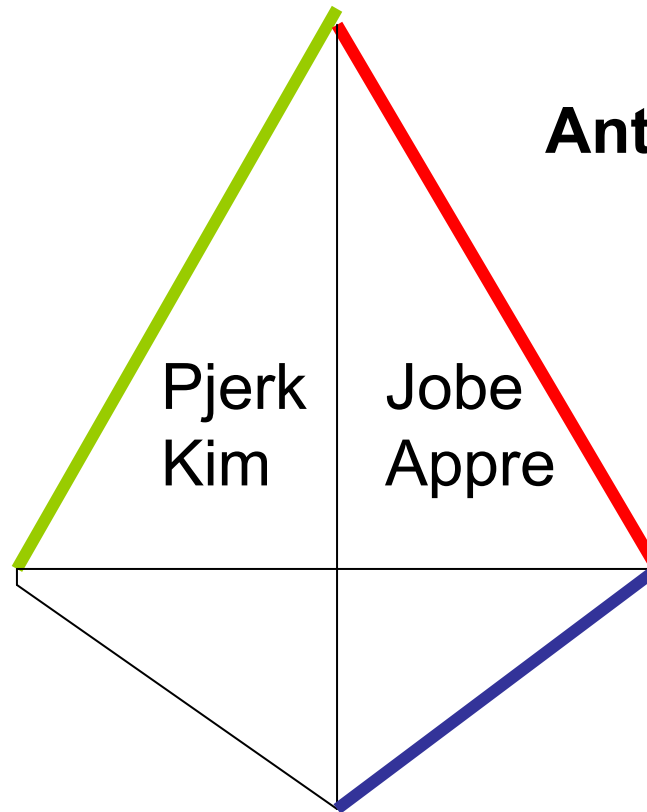
# Grade

- Normal G0
- Hmmmm G1
- Wow G2
- Oops G3





# Exeter diamond exam



**Anterior drawer**

**UADT**

**EEEEEEperlaxity**



Definition of laxity  
must first define normality  
and the verb “to be normal”



I am normal  
you are strange  
they are peculiar



## Normality      Laxity

- Elevation       $170^{\circ}$        $>180^{\circ}$
- Ext Rotation       $70^{\circ}$        $>85^{\circ}$
- Int rotation      T7      T3-4



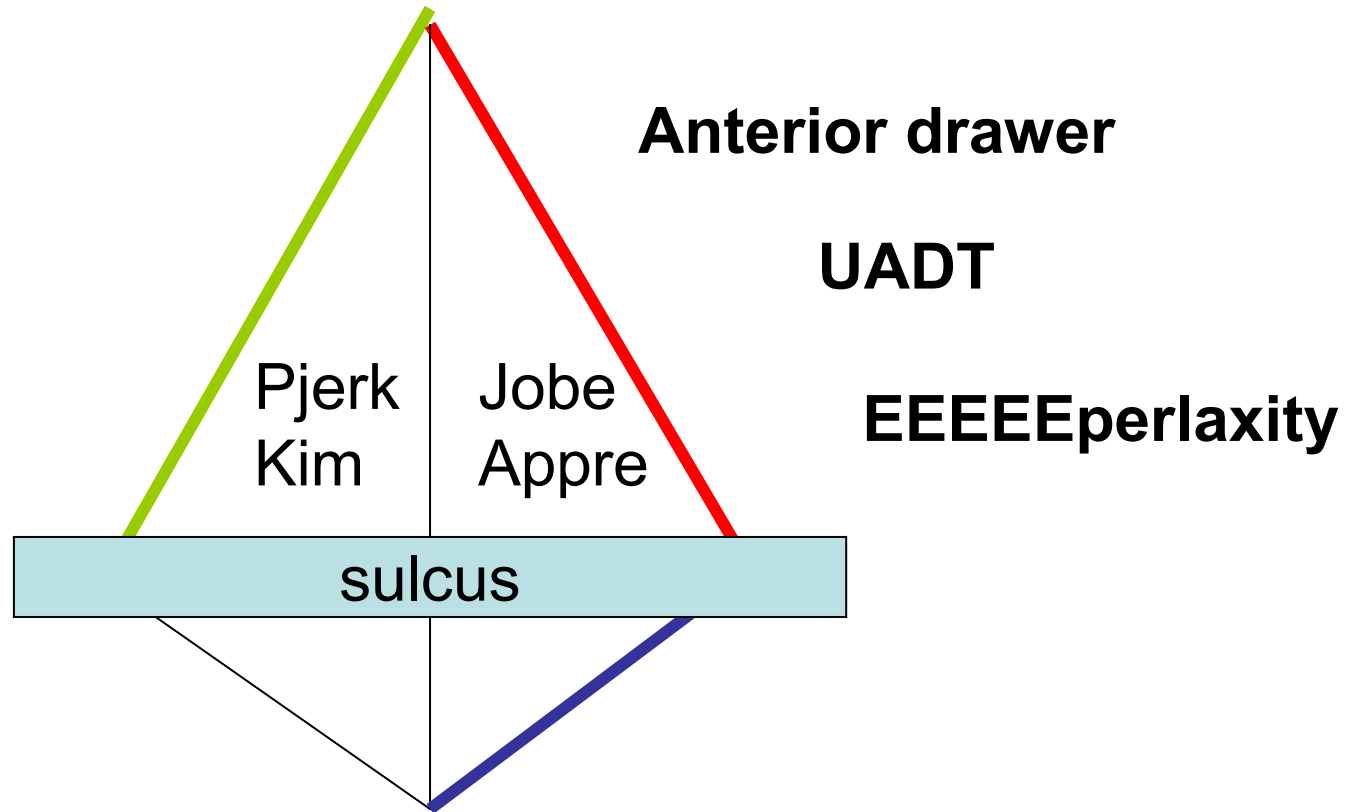


# Eeeeeeeperlaxity

- French
- “Zis patient iz eeeeeperlax”
- 90° plus external rotation



# Exeter diamond exam

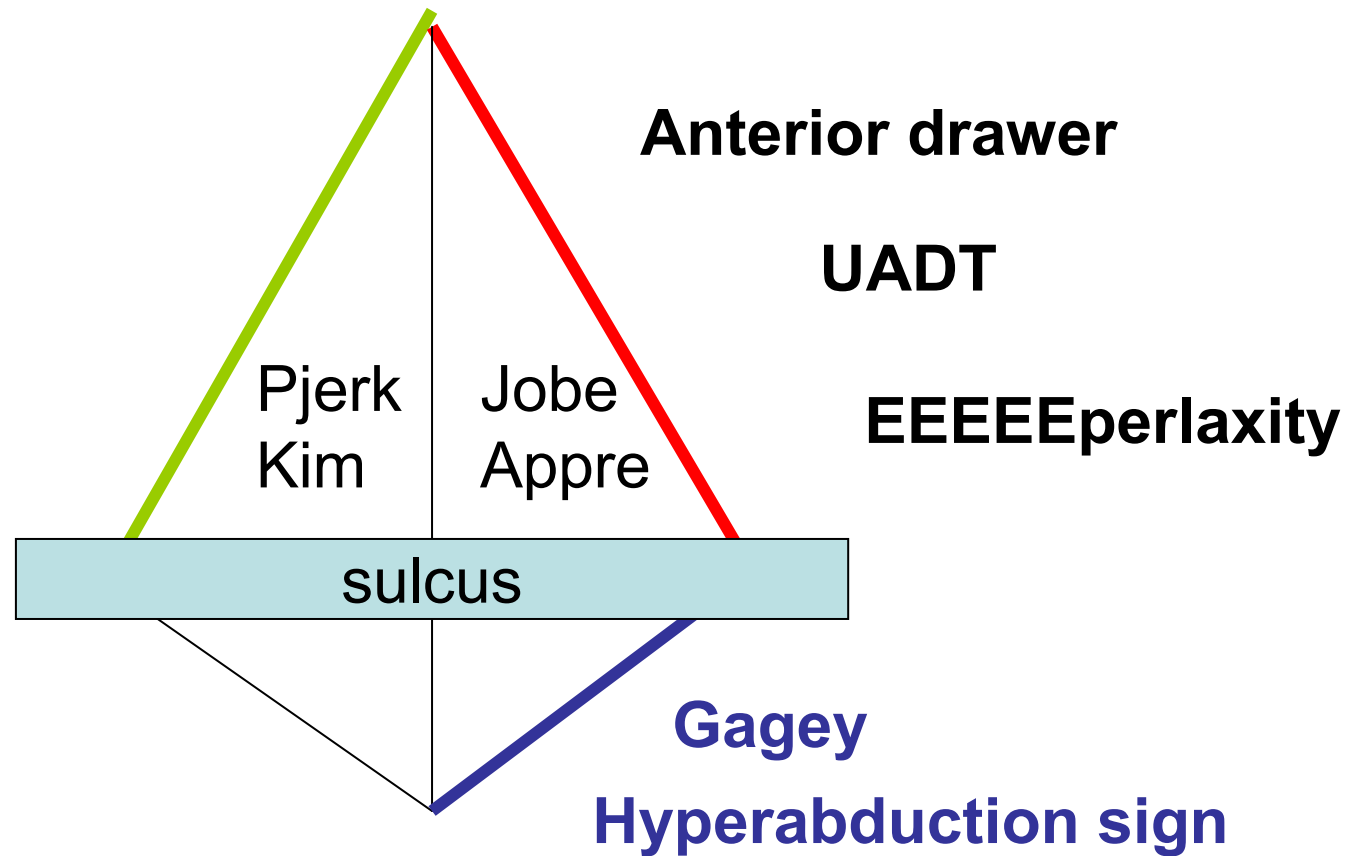




**Sulcus sign**



# Exeter diamond exam





# Gagey Sign

- Inferior capsule lax
- $>110^\circ$  abduction

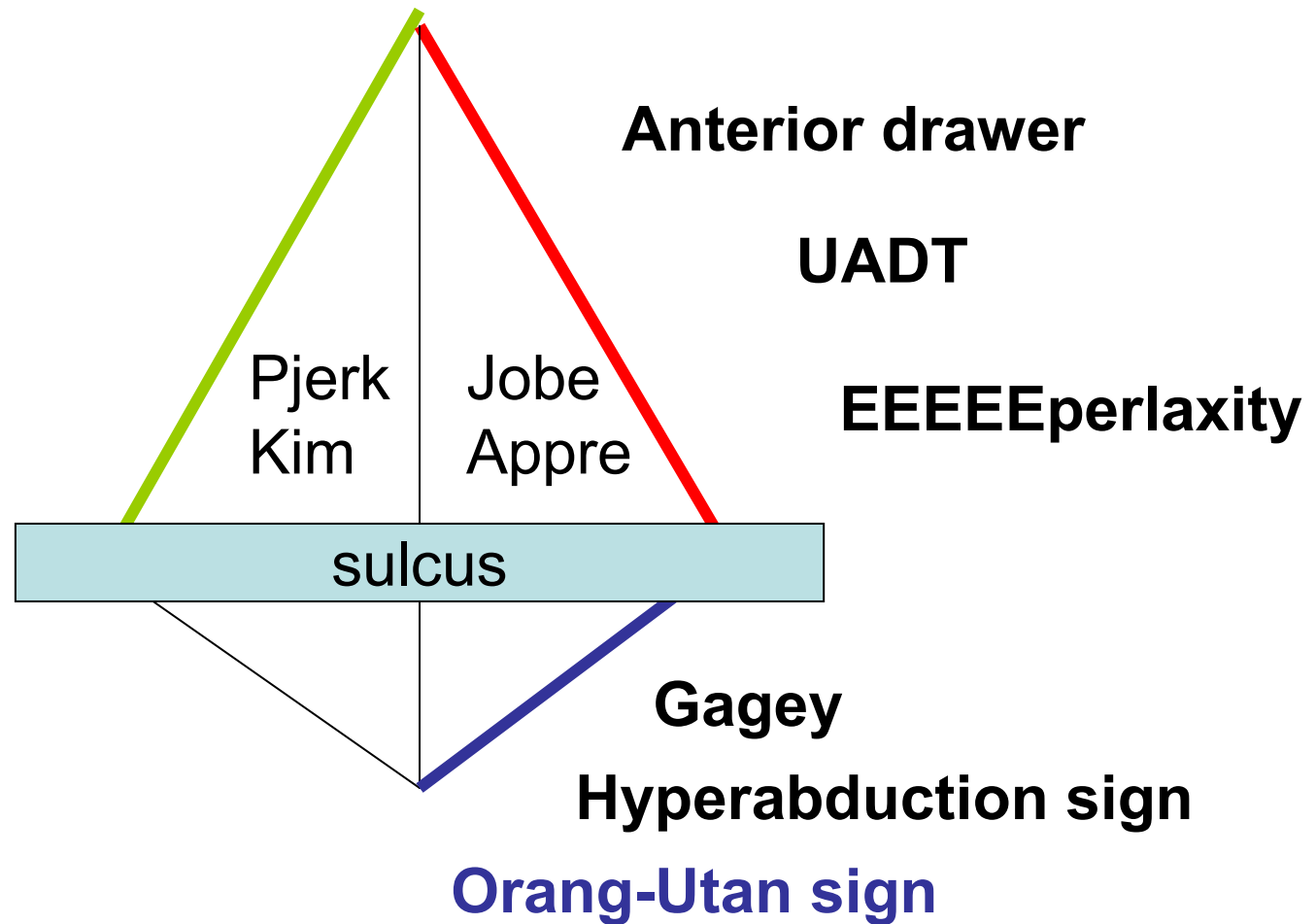


# Hyperabduction sign

- Symptomatic side Gagey
- 20° more than
- Asymptomatic side Gagey



# Exeter diamond exam







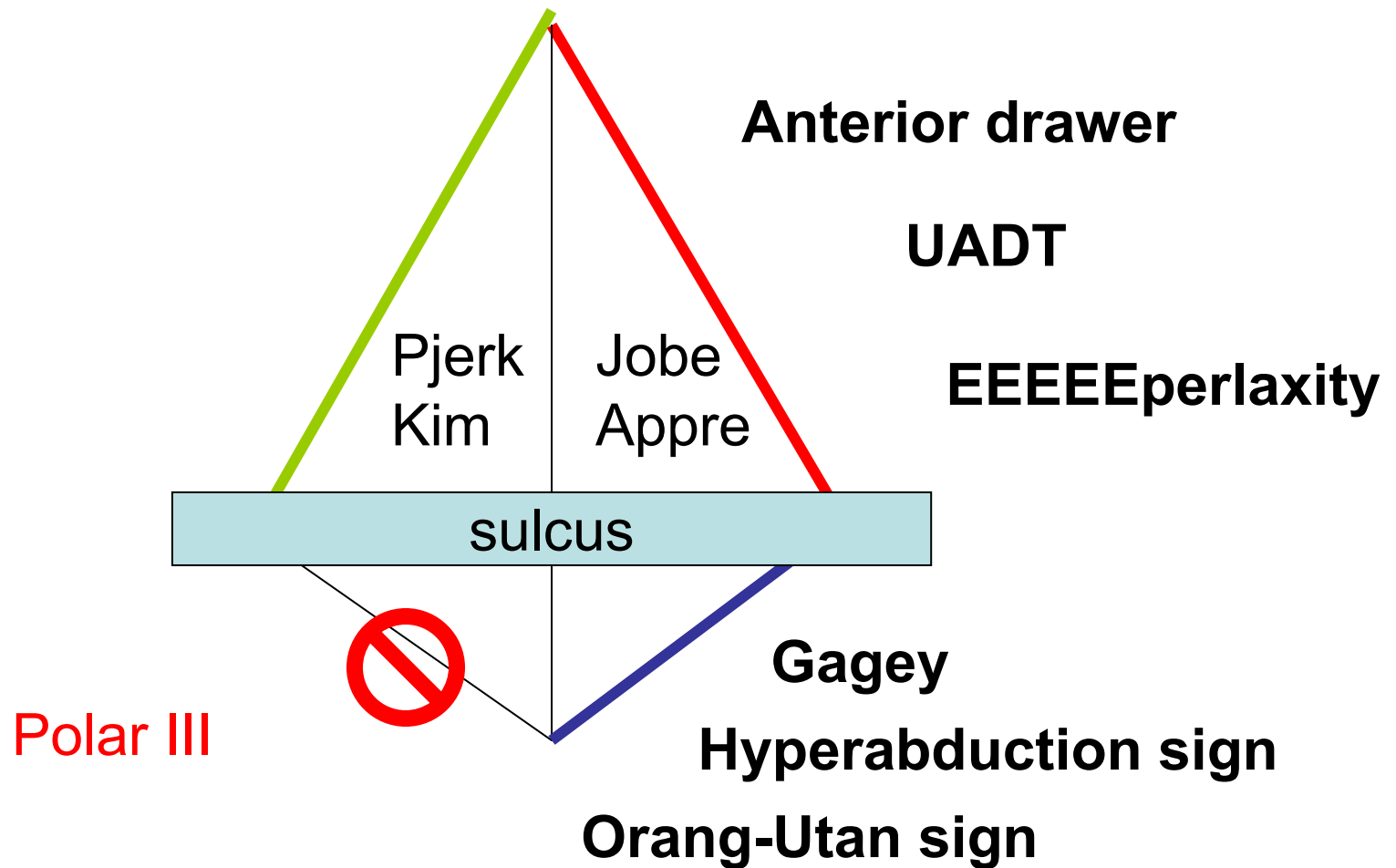
# Orang Utan Sign

- (Bunker & Schranz, The Shoulder 1998; Isis)



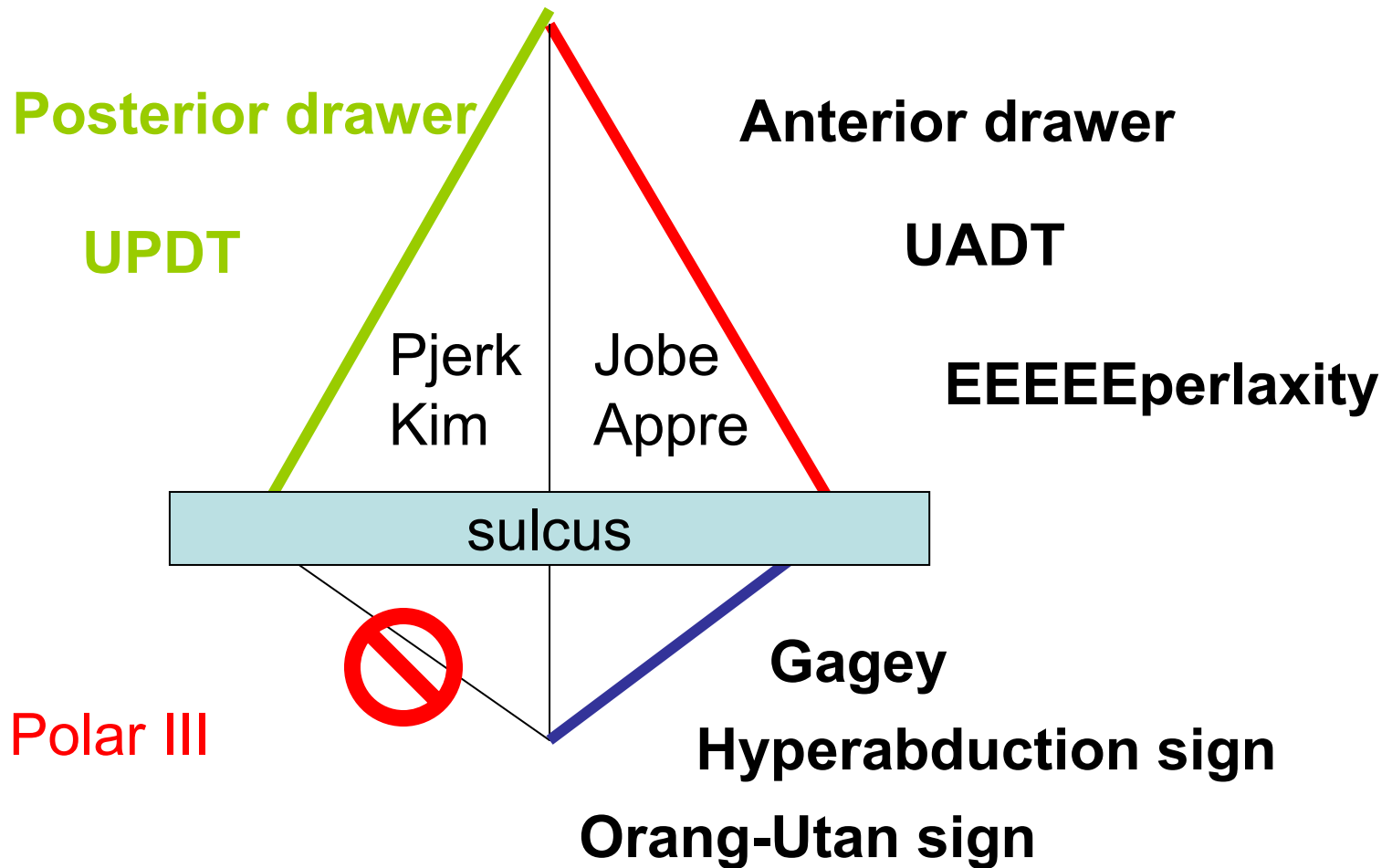


# Exeter diamond exam





# Exeter diamond exam

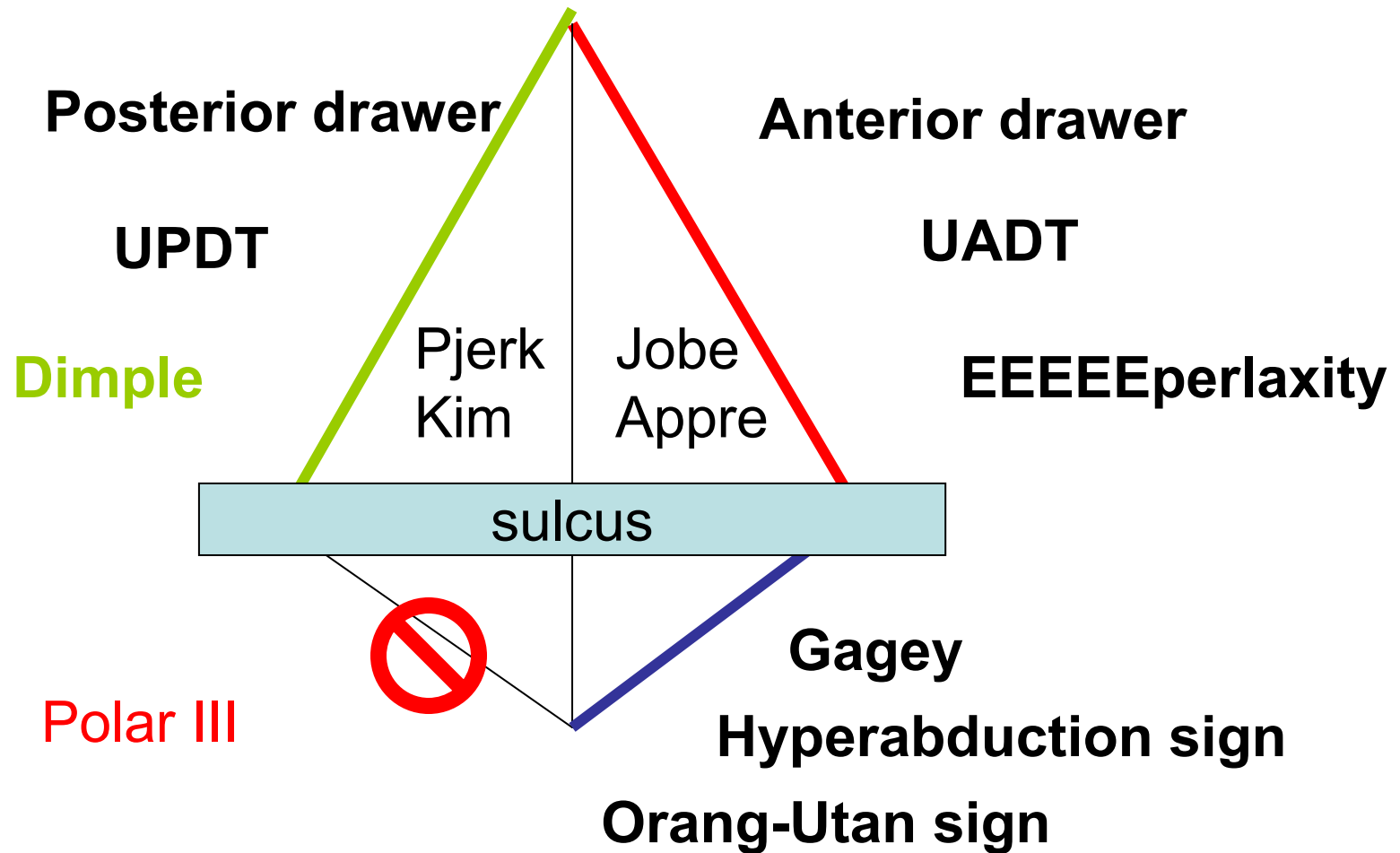




# Unlocked Posterior drawer



# Exeter diamond exam

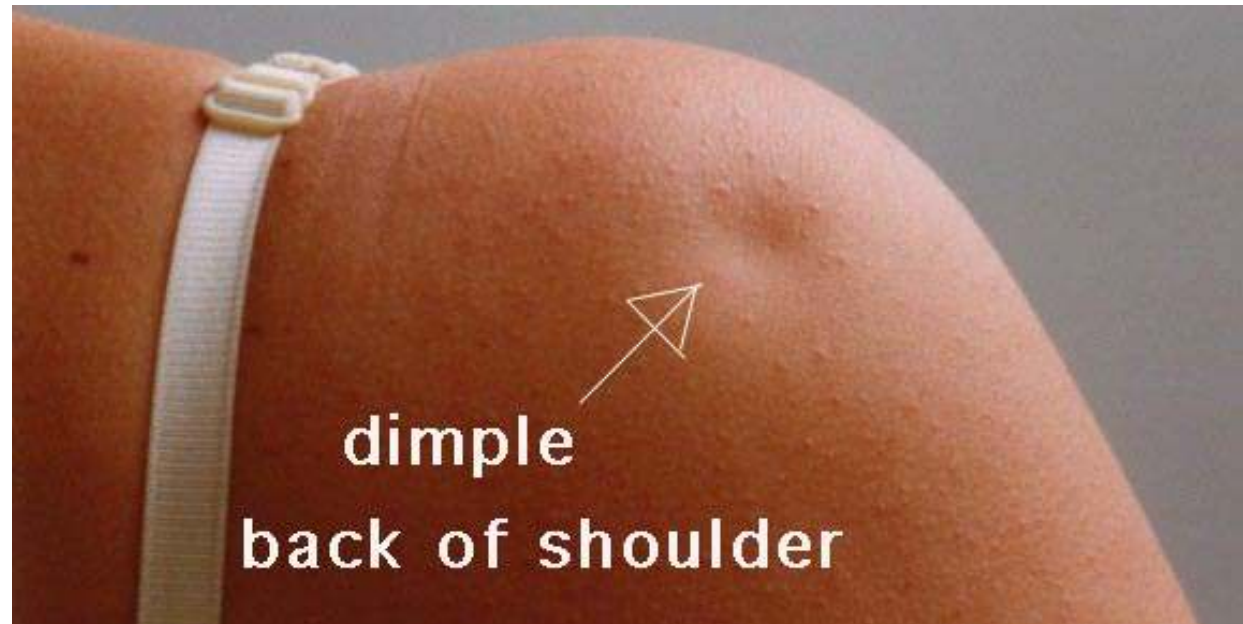




# Look, Posterior Dimple

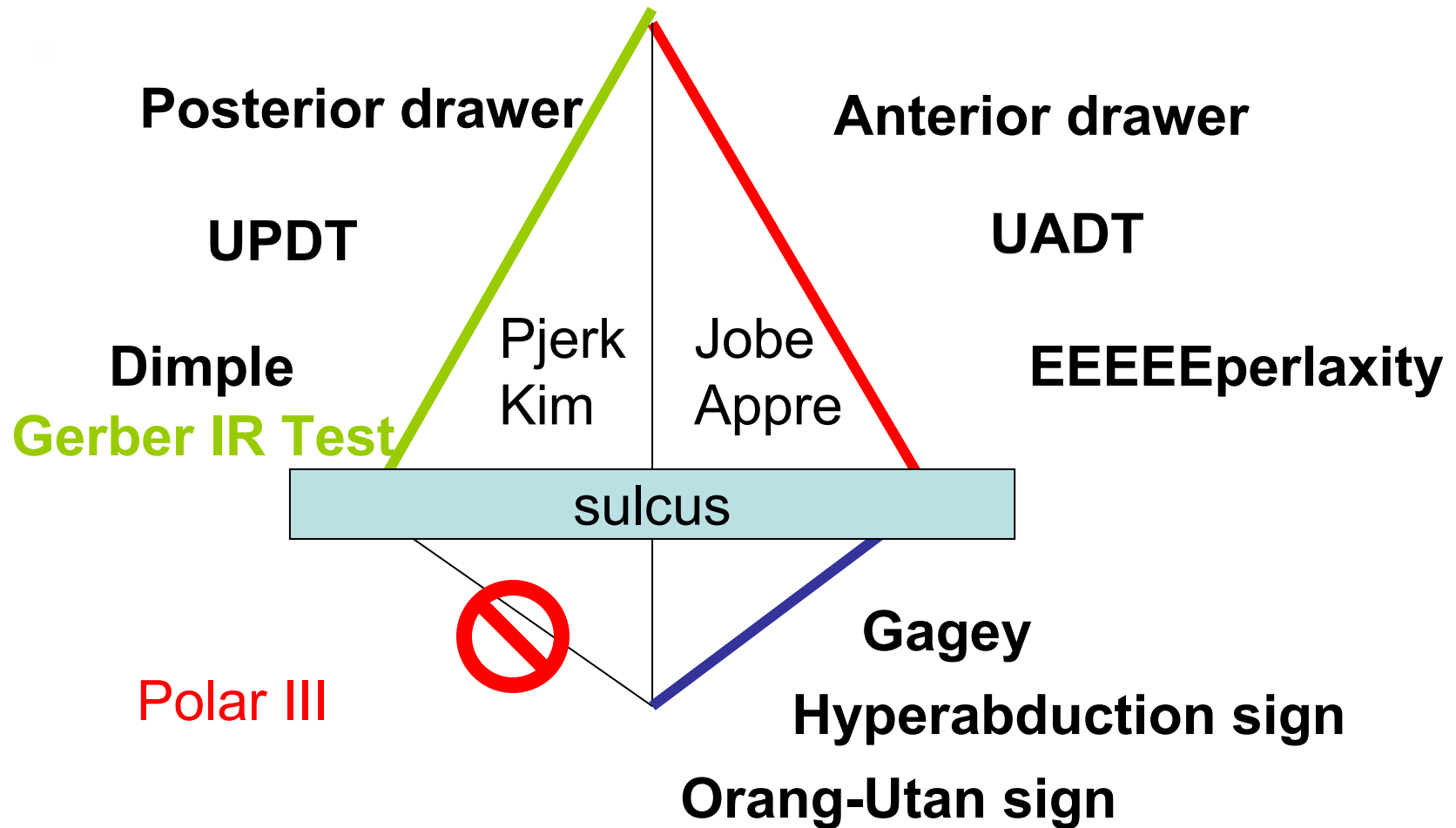
Bunker, Campbell, Ramesh, Van Raebroex  
Journal Shoulder Elbow Surgery 2006;15(5):591-594

- Dimples
- Posterior jerk





# Exeter diamond exam







# Beighton Score

- Wrist flexion 2
- Little finger extension 2
- Elbow recurvatum 2
- Knee recurvatum 2
- Palms on floor 1
- **Total 9**

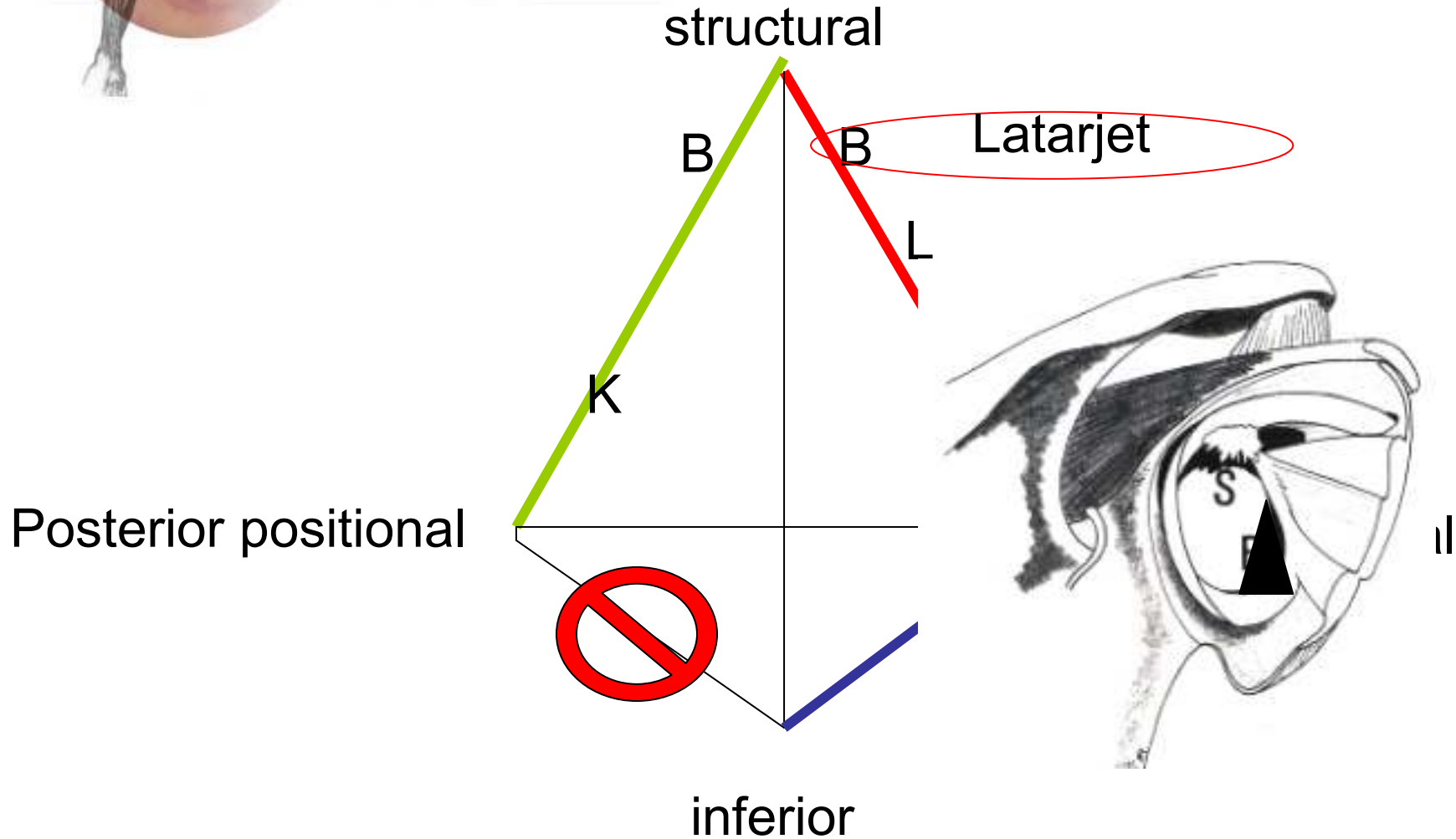


# Understanding

- **Understanding**
- Pathology is variable (bone/labrum/capsule/volume)
- Assessment (relocation/provocation/laxity/range)
- Allows us to consider treatment
- **ONE SIZE DOES NOT FIT ALL**

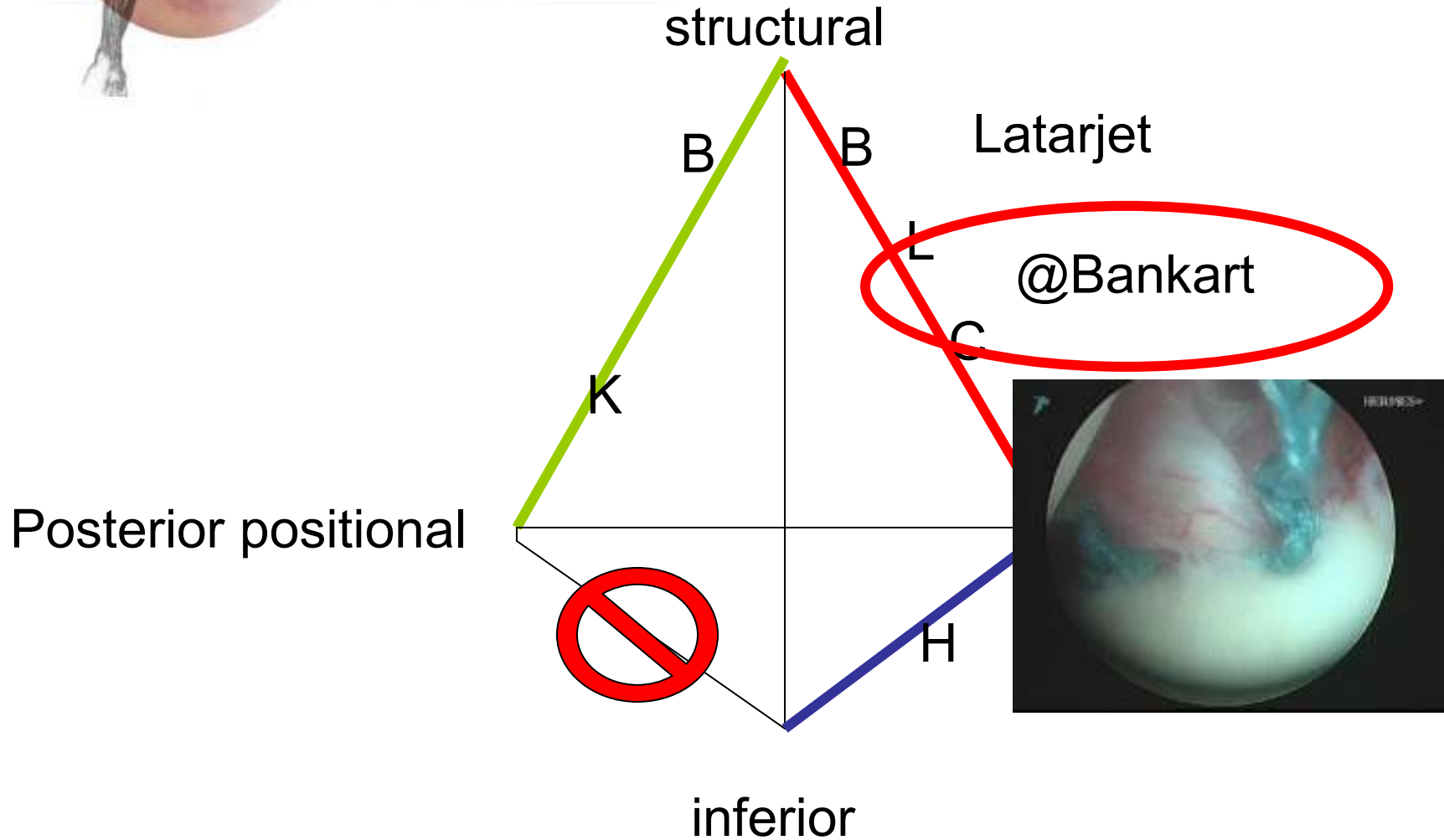


# Exeter diamond treatment





# Exeter diamond treatment





## @ Bankart

- Not without problems
- Technical problems
- Recurrence rate
- Pain
- Stiffness
- squeaking





- **Third hand**
- Portal placement
- Preparation
- Anchors
- Suture management
- Suture placement
- Knots
- Shift
- Rotator interval closure
- Problems specific to arthroscopy
- Recurrence rate



# Recurrence Metanalysis

Tingart, Bathis, Bouillon, Tiling Unfallchirurg 2001; 104: 894-901

- Arthroscopic vs open Bankart
- Metanalysis of 172 publications
- 12 prospective studies
- Open 0-8%
- Arthroscopic 8/12 studies <10%
- “Arthroscopic repair has not been shown to be equal or superior to the open technique”

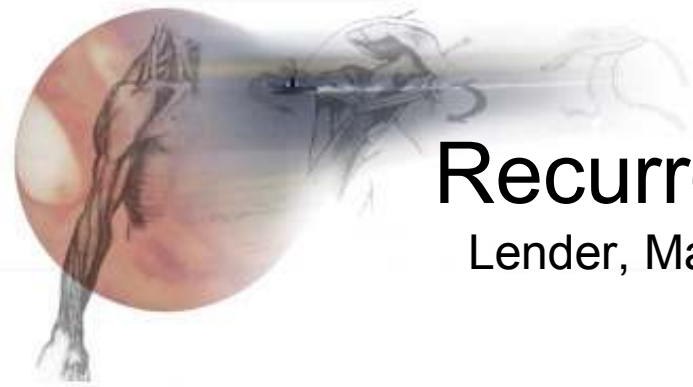


# Recurrence Metanalysis

Mahtadi, Hollinshead, Harper et al. Arthroscopy 2005

- Reviewed 979 articles
- 18 worthy of analysis
- Open vs closed
- Open repair has more favourable outcome





# Recurrence Metanalysis

Lender, Matsen Clin J Sports Med 2007

- 18 articles
- @ not as effective as open Bankart
- In preventing instability
- Or in return to work

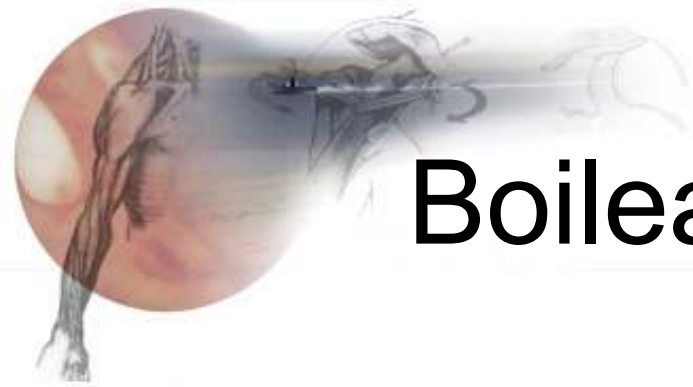


# Recurrence Metanalysis

Hobby, Boileau et al

- Metanalysis of 62 studies
- 3044 dislocation repairs
- Failure of @Bankart higher than open
- But if you look at modern papers
- They are more equal





# Boileau ISIS score

- Age under 20 2
- Sport level competition 2
- Type sport collision 1
- Hyperlaxity exam 1
- Hill Sachs AP film 2
- Glenoid loss Bernageau view 2



# ISIS score break points

• <b>ISIS</b>	<b>recurrence rate</b>	<b>p value</b>
• <b>&lt;=3</b>	4.8%	<0.001
• <b>&lt;=6</b>	9.9%	<0.001
• <b>&gt;6</b>	<b>70%</b>	<b>&lt;0.001</b>



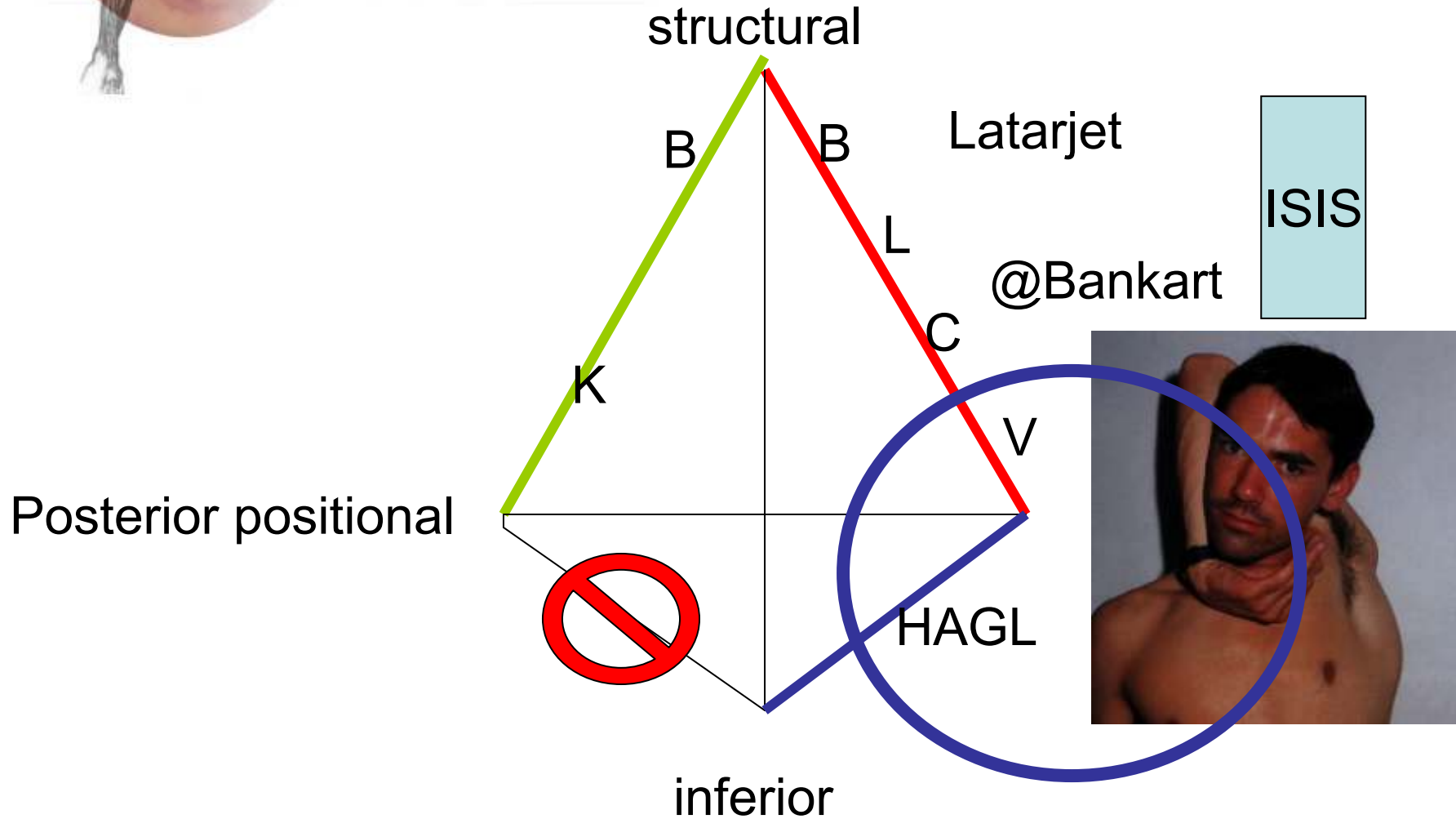
# Val d'Iserre 2009

• Surgeon	@Bankart	Latarjet
• Boileau	45%	55%
• Lafosse	35%	65%

**WHY?**



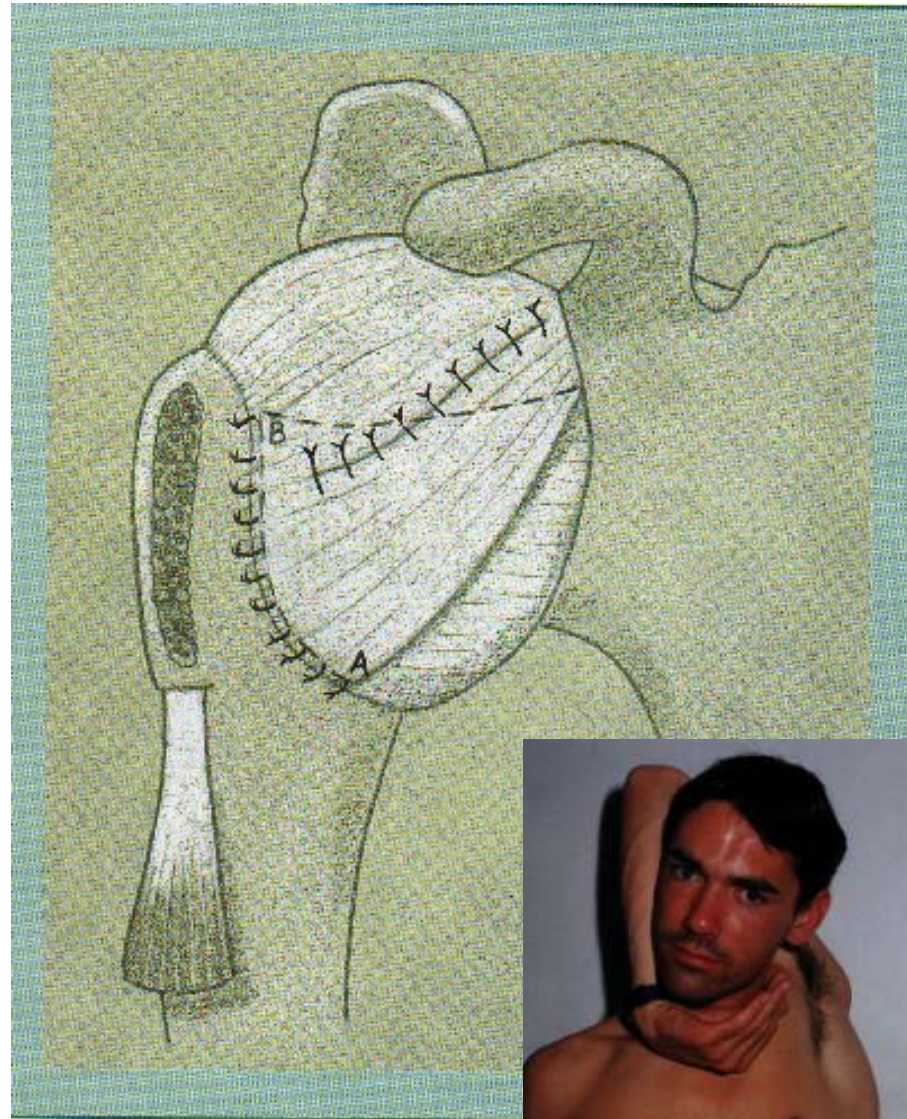
# Exeter diamond treatment





# Treatment

- Capsular laxity
  - Double breast
  - NS shift
  - EW shift
  - RI closure







# Exeter diamond treatment

structural

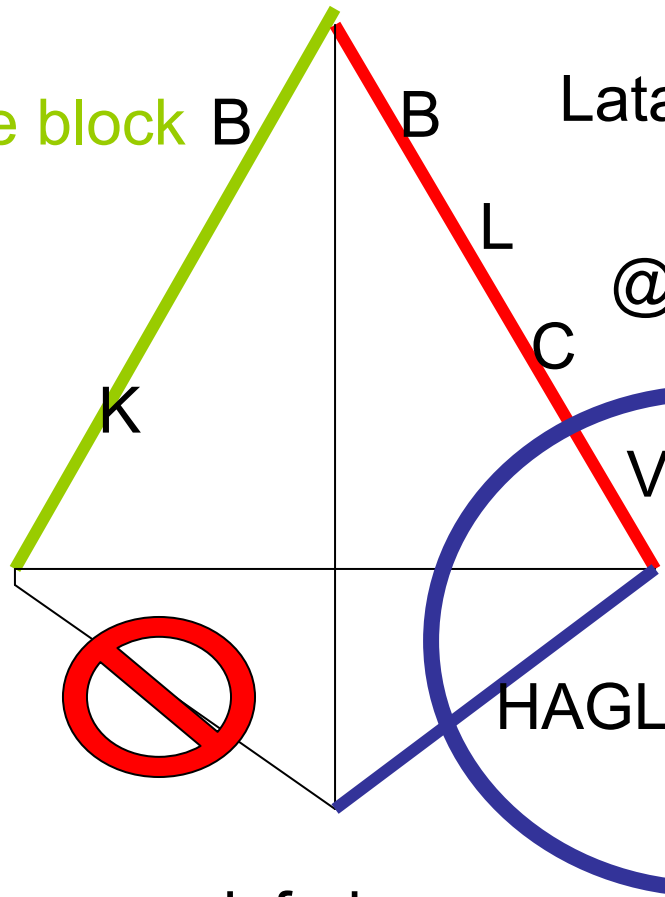
Posterior bone block B

Latarjet



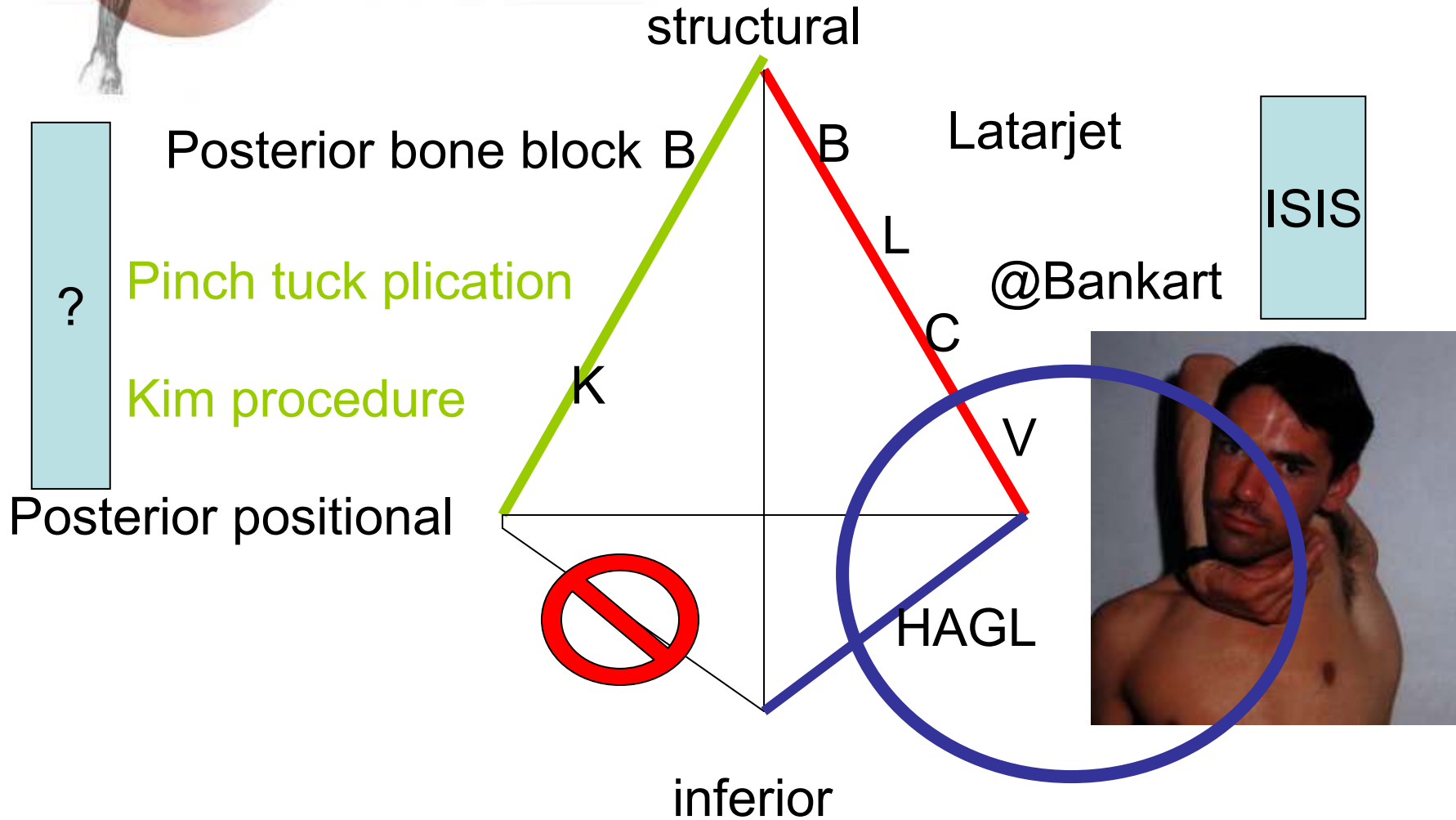
@Bankart

Posterior positional



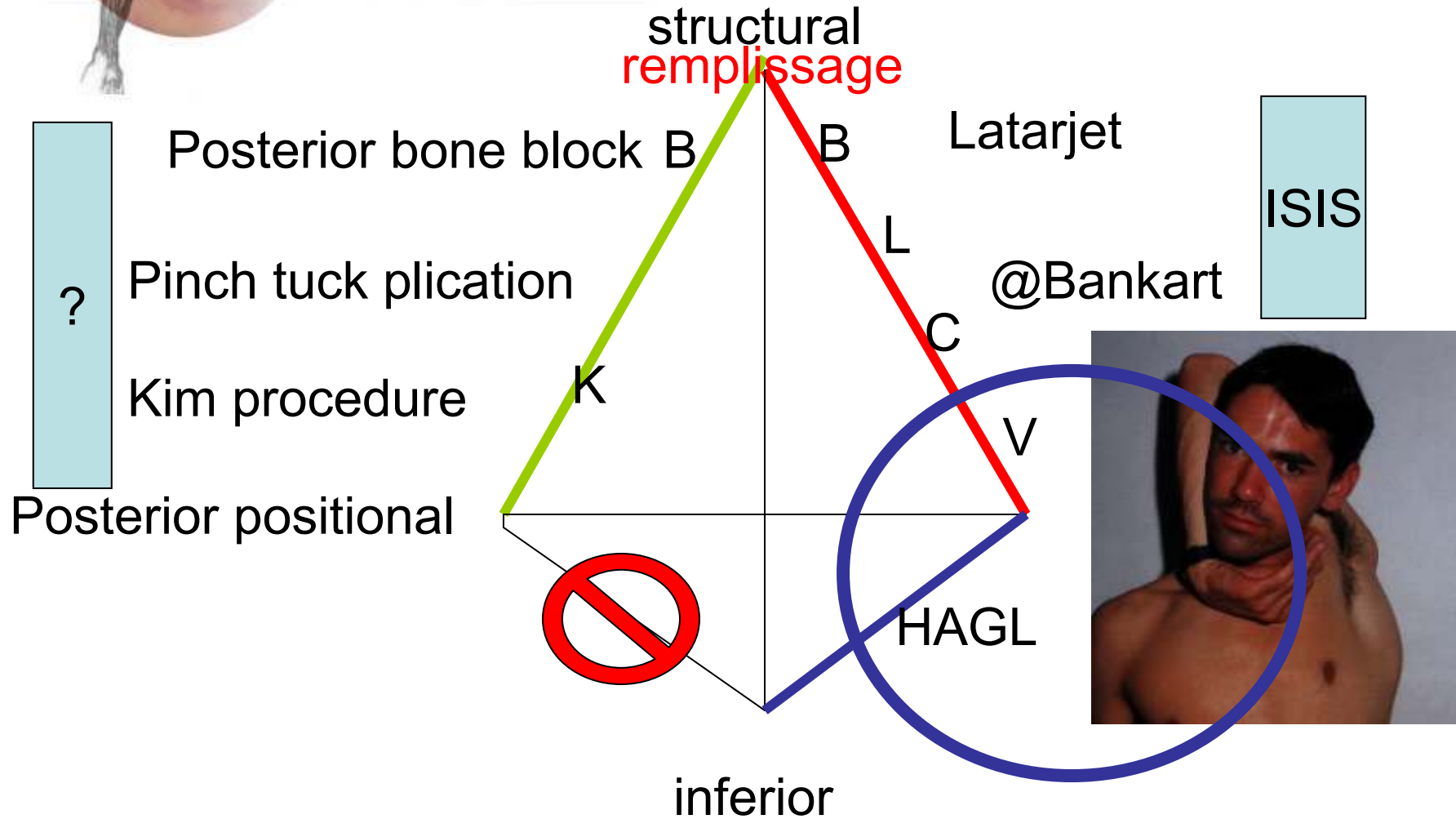


# Exeter diamond treatment





# Exeter diamond treatment





# Polar III



# Polar III E6

Shorthand for  
“don’t touch with a broom handle”  
Barking



QuickTime™ and a  
DV - PAL decompressor  
are needed to see this picture.

# Polar III

Patient demonstrates translation  
**with arm at side**

Induced by muscle pull

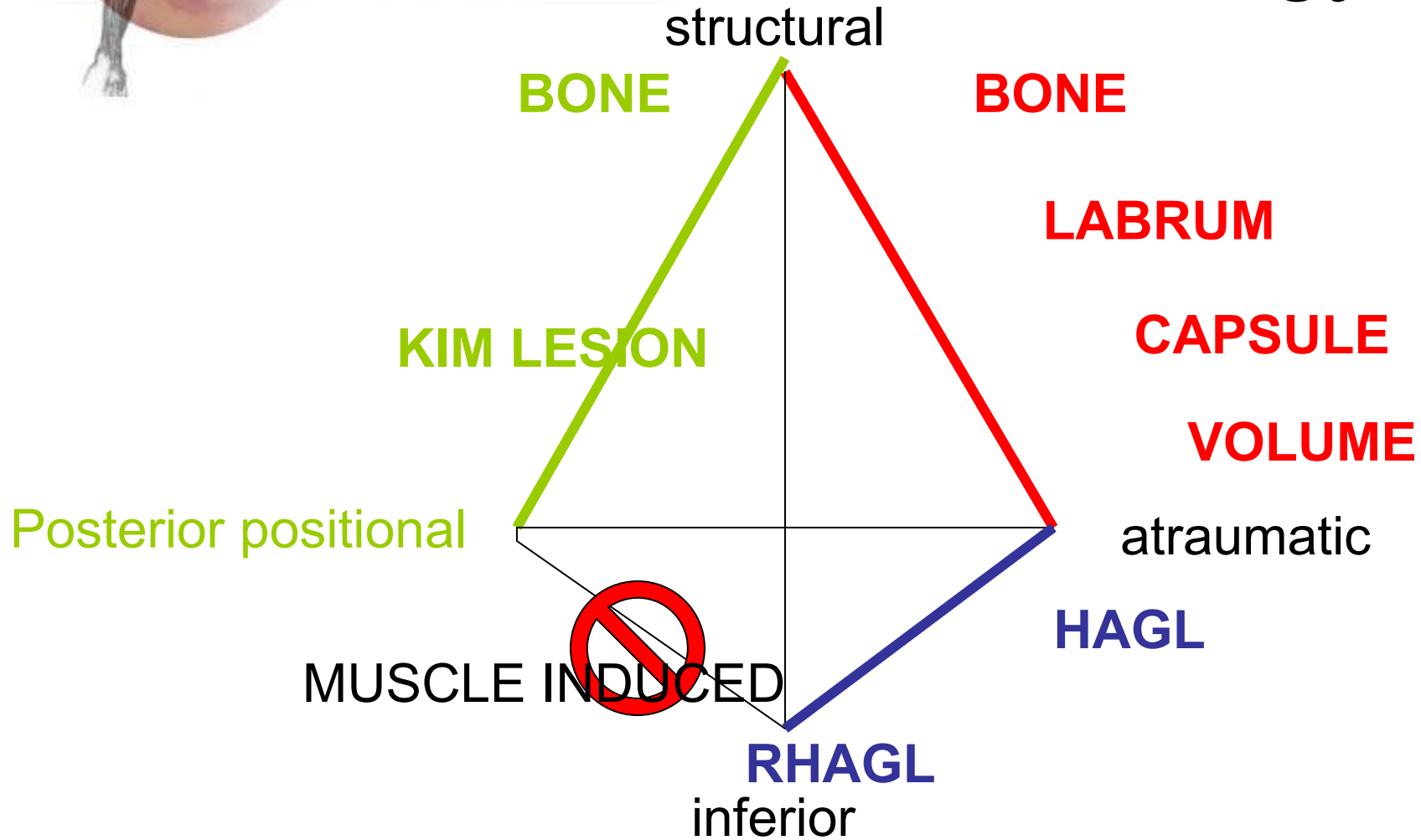


# Muscle patterning

- Codman
- “I am not in sympathy with the view of those authors who hold that the contracted pectoralis and latissimus act as a fulcrum to promote dislocation of the head of the humerus. I think the reverse is true, this action merely acts to prevent dislocation” p269



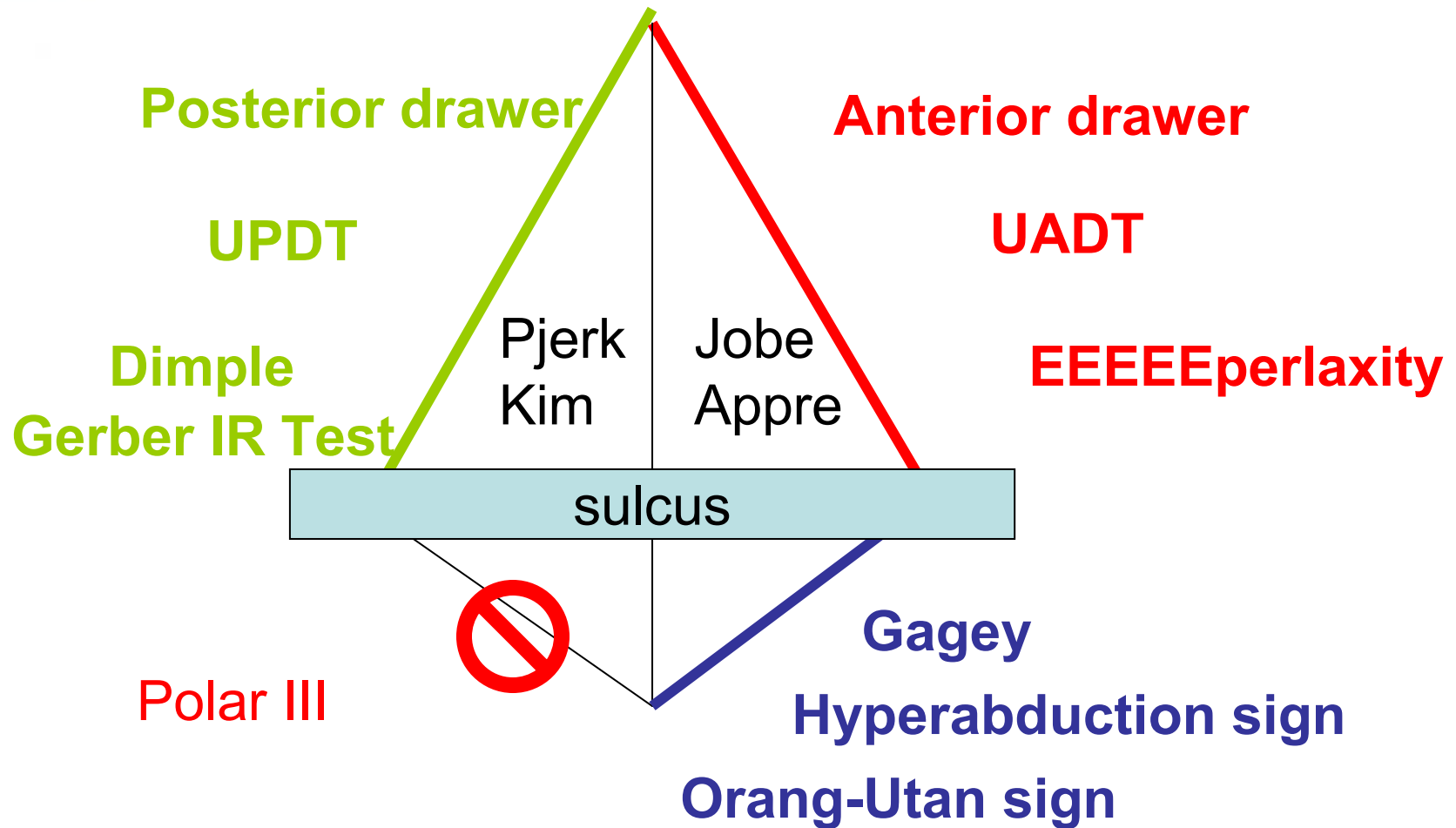
# Exeter diamond Pathology





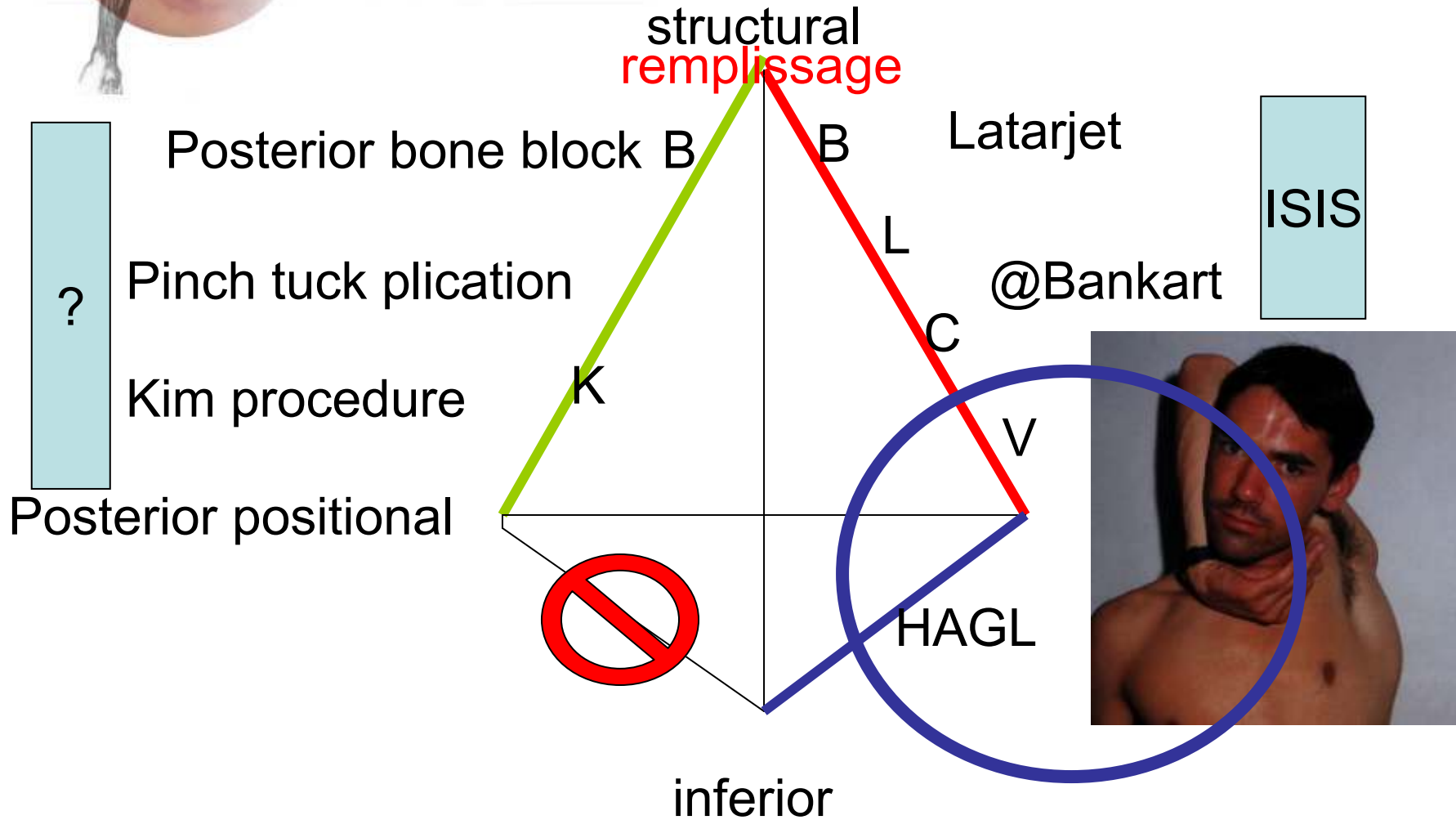


# Exeter diamond exam





# Exeter diamond treatment





Thank you