
Webinar
Μάθημα
Ορθοπαιδικής ΙΙ
Παγωμένος Ώμος, Αστάθεια Ώμου,
Ενδείξεις Ολικής Αρθροπλαστικής Ώμου
& Αποκατάσταση
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Μέρος 1

Classification of shoulder pathology an algorithm approach to diagnosis

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Arthroscopy

Frequency of shoulder problems

Shoulder pain

- ☑ Second most frequent acute musculoskeletal problem
- ☑ Third most common site of musculoskeletal pain

Neck and shoulder disorders

- ☑ Account for 18% of sickness leaves in Scandinavia

The how of clinical diagnosis

- **Medical record**

Based on well defined algorithm, can lead to a very accurate estimation of shoulder pathology.

- **Clinical examination**

Additional clinical examination can almost always direct towards a diagnosis that can be confirmed by the radiological investigation.

- **Radiological evaluation**

Including plain radiographs, ultrasound, CT scan and MRI or MRI arthrogram.

Stepwise approach to shoulder pathology

A very accurate diagnosis can be made using this stepwise approach to shoulder pathology

Four step algorithm

Four questions for glenohumeral problems

Four "red flags" that must be respected

Algorithmic approach for arriving to the diagnosis of shoulder problem

Step 1: Trauma

Step 2: Exclude referred pain

Step 3: Painful structures around the glenohumeral joint

Step 4: Glenohumeral pathology

Step 1: Trauma

- Mechanism of injury
- The patient can localize the site of pain
- Clinical examination can reveal deformity, abnormal motion or complete loss of motion due to pain
- X-rays will reveal fractures to the shoulder bones or injury to the acromioclavicular joint
- If the pain persists after a traumatic incident and no injury is evident on the x-rays a soft tissue injury must be suspected, usually a rotator cuff tendon tear

Step 2: Exclude referred pain

Suspect structures around the shoulder if:

- ☑ The pain **is vague**
- ☑ The pain is sharp and radiating along the limb with **numbness** of the fingers
- ☑ The patient is unable to localize it
- ☑ The shoulder has **painless full ROM**

Step 2: Exclude referred pain

Remember

Pain from the shoulder worsen when the patient moves the shoulder actively or passively

Step 2: Exclude referred pain

Common causes of referred pain are

Cervical spine pathology:

Sharp, shooting or radiating along the limb pain with numbness of the hand

Abdominal trauma or pathology (spleen trauma and cholecystitis):

Dull, vague or deep pain that cannot be localized may be caused by irritation of the diaphragm

Myocardial ischemia

Agonizing pain that comes with shortness of breath , restlessness and fear of impending death

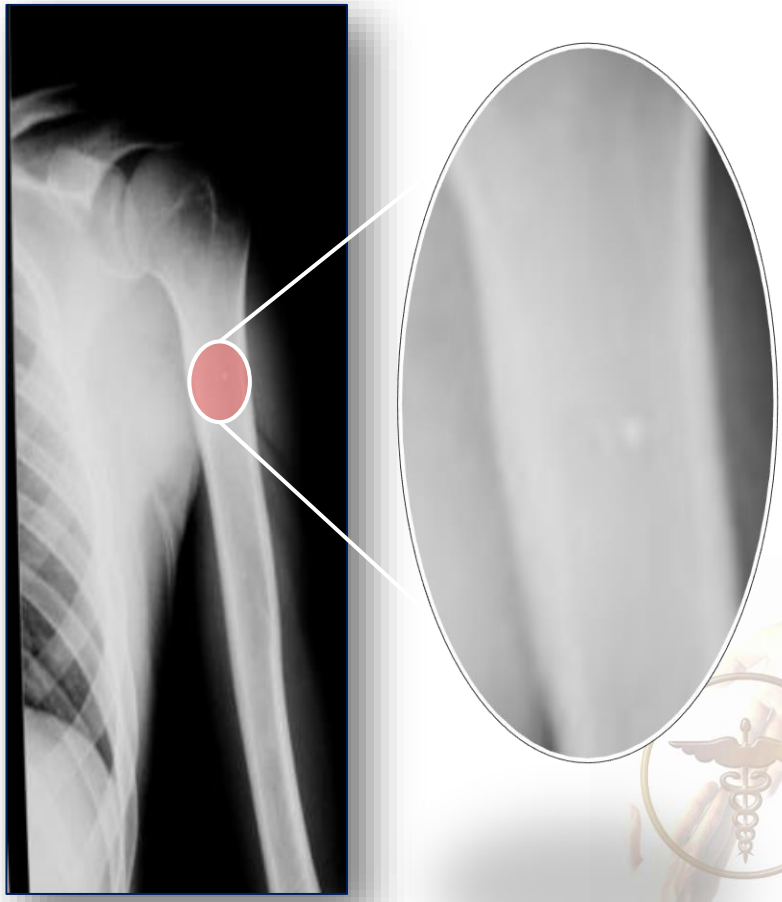
Tumor

Sharp, poorly localized continuous pain ,the patient has lost significant weight and he is obviously suffering

Step 2: Exclude referred pain

Metastatic disease - Lung cancer

Osteoid osteoma



Step 2: Exclude referred pain

Pancoast tumor

Step 3: Painful structures around the glenohumeral joint

Acromioclavicular joint (AC)

The tendon of the long head of the biceps

Scapula muscles

Step 3: Painful structures around the glenohumeral joint

Acromioclavicular joint (AC)

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Scapula muscles

The patient can usually localize problems of the biceps tendon and the AC joint

Step 3: Painful structures around the glenohumeral joint

Acromioclavicular joint (AC)

The tendon of the long head of the biceps

Scapula muscles

The patient can usually localize problems of the biceps tendon and the AC joint

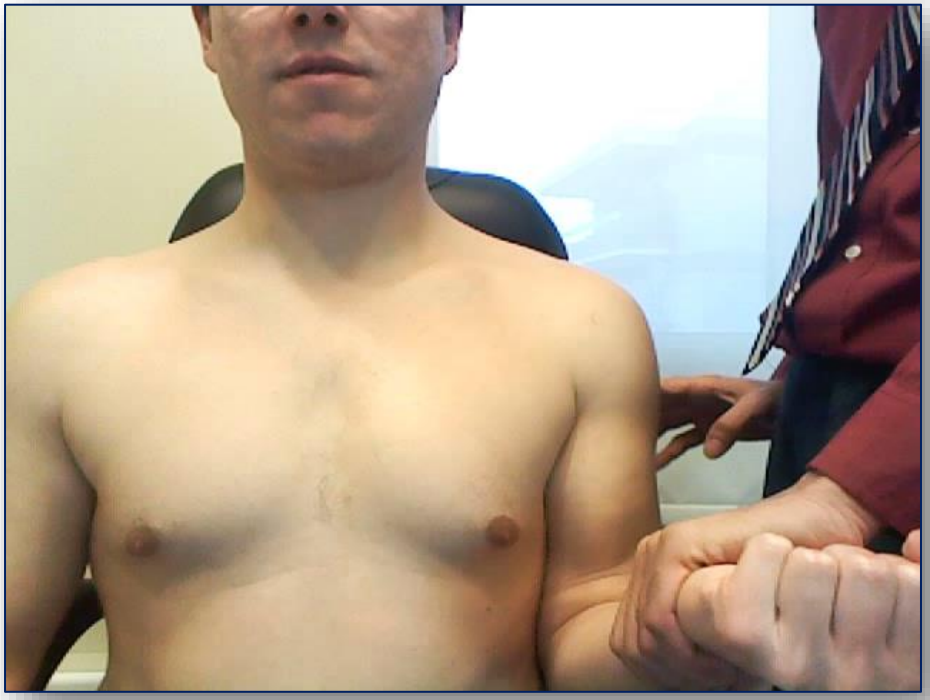
Pain and dysfunction originating from the scapular muscles can be more difficult to localize but search for trigger points of scapula muscles and look for loss of the normal scapulothoracic rhythm

Step 3: Painful structures around the glenohumeral joint

Acromioclavicular joint (AC)

Step 3: Painful structures around the glenohumeral joint

Biceps tendinitis



Step 3: Painful structures around the glenohumeral joint

Winging Scapula

Medial winging

Inferior border of scapula migrates medially

Deficit in serratus anteriorInjury to the long thoracic nerve (C5,6,7)

Lateral winging

inferior pole of the scapula migrateç laterally

Injury to (CN XI - spinal accesory nerve) + ventral ramus C2,3,4.

Step 4. Glenohumeral pathology

Types of glenohumeral pathology:

- ☑ Pain and loss of power of the arm
- ☑ Pain and stiffness
- ☑ Instability
- ☑ Pain and joint incongruity

Each one has different characteristics and often affects different age groups.
In some cases mixed pathologies, such as pain and instability, may exist.

Questions for glenohumeral problems

Question 1: What is the main complain?

Question 2 : What is the age of the patient?

Question 3: What is the activity type and level of the patient?

Question 4: How long has this problem persisted for?

Question 1. What is the main complaint?

Pain and/or loss of power

indicates problem of the rotator cuff tendons:

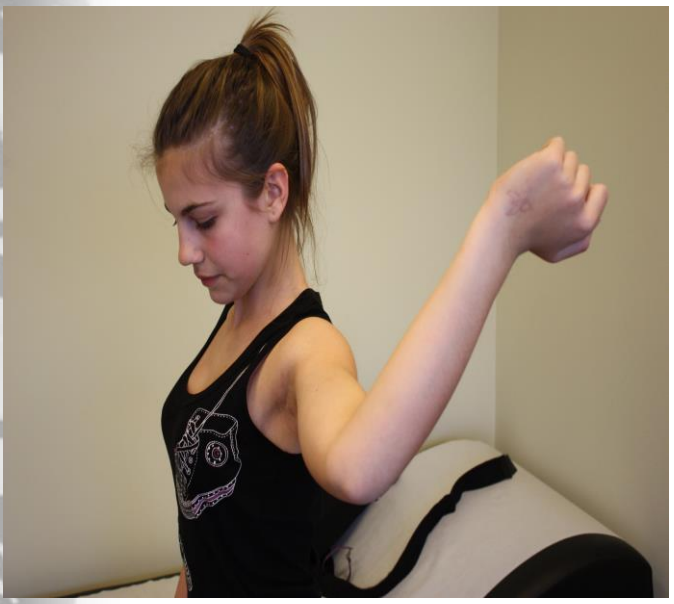
Tendinitis, tear or calcifying tendinitis

Pain from the intra-articular portion of the long head of the biceps tendon can either coexist or mimic pain caused by the cuff tendons

Question 1. What is the main complaint?

Instability can be traumatic or resulting from joint laxity

Clinical examination of other joints (knee, elbow)



Question 1. What is the main complaint?

Loss of range of motion, usually painful, may indicate either frozen shoulder or osteoarthritis.

Coarse crepitus and a plain x-ray will differentiate them

Question 2. What is the age of the patient?

Adolescent and young adults:

The most common problem is instability.

In overhead athletes: partial tears of supraspinatus, SLAP II lesions

Middle aged :

The most common problem is rotator cuff pathology (tears calcifying tendinitis)

Older patients:

The most common problems is osteoarthritis and massive cuff tears

Question 3. What is the activity type and level of the patient?

Middle aged marathon swimmers vs. Middle aged office workers

Young throwers with pain have a range of problems
often termed as “internal impingement”
(partial joint side tears of the supraspinatus or infraspinatus
combined with SLAP II lesions

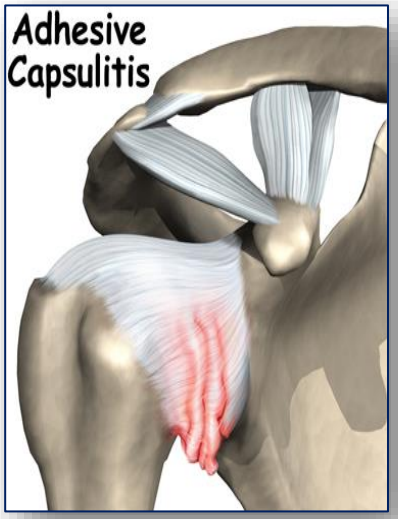
Question 4. How long has this problem persisted for?

Acute problems without history of trauma are often benign in nature and usually indicate overuse injuries such as tendinitis

Question 4. How long has this problem persisted for?

Acute onset of severe pain in middle aged sedentary patient without trauma – absorptive phase of calcifying tendinitis

Question 4. How long has this problem persisted for?



Chronic shoulder pain that leads to loss of range of motion and power is indicative of adhesive capsulitis or osteoarthritis

Case scenarios

Instability without pain usually in young patients following a shoulder dislocation

Acute pain in young active patients usually indicates tendinitis, unless they participate in overhead sports and complain of pain during throwing. In the later case problems of the superior labrum or articular side tears of the supraspinatus tendon can be anticipated.

Prolonged pain in middle aged overhead workers or pain that persists after an injury to the shoulder indicates a rotator cuff tendon tear.

Acute pain in middle aged women, without a history of trauma and a fairly inactive life style is often caused by calcifying tendintis.

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Case scenarios

Pain and loss of range of movement in middle aged patients with a history of mild shoulder problems is indicative of frozen shoulder

Pain with loss of active range of motion and complete range of passive motion in middle aged patients indicates rotator cuff tear

Pain and loss of range of movement in an elderly patient with history of shoulder problems may be caused by osteoarthritis or rotator cuff arthropathy

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Red flags

1. Pain and loss of movement that is disproportional to the clinical and radiographic findings

- ☑ If the patient has lost significant weight and is suffering, primary or a metastatic bone tumor should be excluded
- ☑ Dull non specific pain that may worsen at night and that is usually relieved by aspirin or other anti-inflammatory drugs may indicate the existence of an osteoid osteoma of the scapula or of the proximal humerus

Red flags

2. Pain and loss of range of motion accompanied by local signs of infection (redness, heat and swelling) together with fever may indicate the presence of an infection

- ☑ This could be the result of a previous local injection

Red flags

3. An inflammatory condition with shoulder pain usually indicates arthritis of rheumatoid origin

Red flags

4. In some cases a mixture of glenohumeral pathologies may exist

- A traumatic dislocation that causes instability could be accompanied by a rotator cuff tear that causes pain, especially in a middle aged patient.

Shoulder pain and psychological disorders

Sometimes non specific shoulder problems that persist and cannot be correlated to a physical cause exist

Psychological causes : What is the patient unconsciously trying to succeed

Cases under litigation

Malingering

An anatomic organic lesion should be ruled out

Conclusion - Take home message

A very accurate diagnosis can be made using this stepwise approach to shoulder pathology

Conclusion - Take home message

A very accurate diagnosis can be made using this stepwise approach to shoulder pathology

Four step algorithm	Four questions concerning glenohumeral pathology
Step 1: Trauma	Question 1: What is the main complain?
Step 2: Exclude referred pain	Question 2 : What is the age of the patient?
Step 3: Structures around the glenohumeral joint	Question 3: What is the activity type and level of the patient?
Step 4: Glenohumeral pathology	Question 4: How long has this problem persisted for?

Four "red flags" that must be respected
Red flag 1: Bone tumors, benign or malignant
Red flag 2: Infection
Red flag 3: Rheumatoid disorders
Red flag 4: Mixed shoulder pathologies

Μέρος 2

The shoulder joint . A magic joint

Arthroscopy
www.shoulder.gr

hygeia hospital

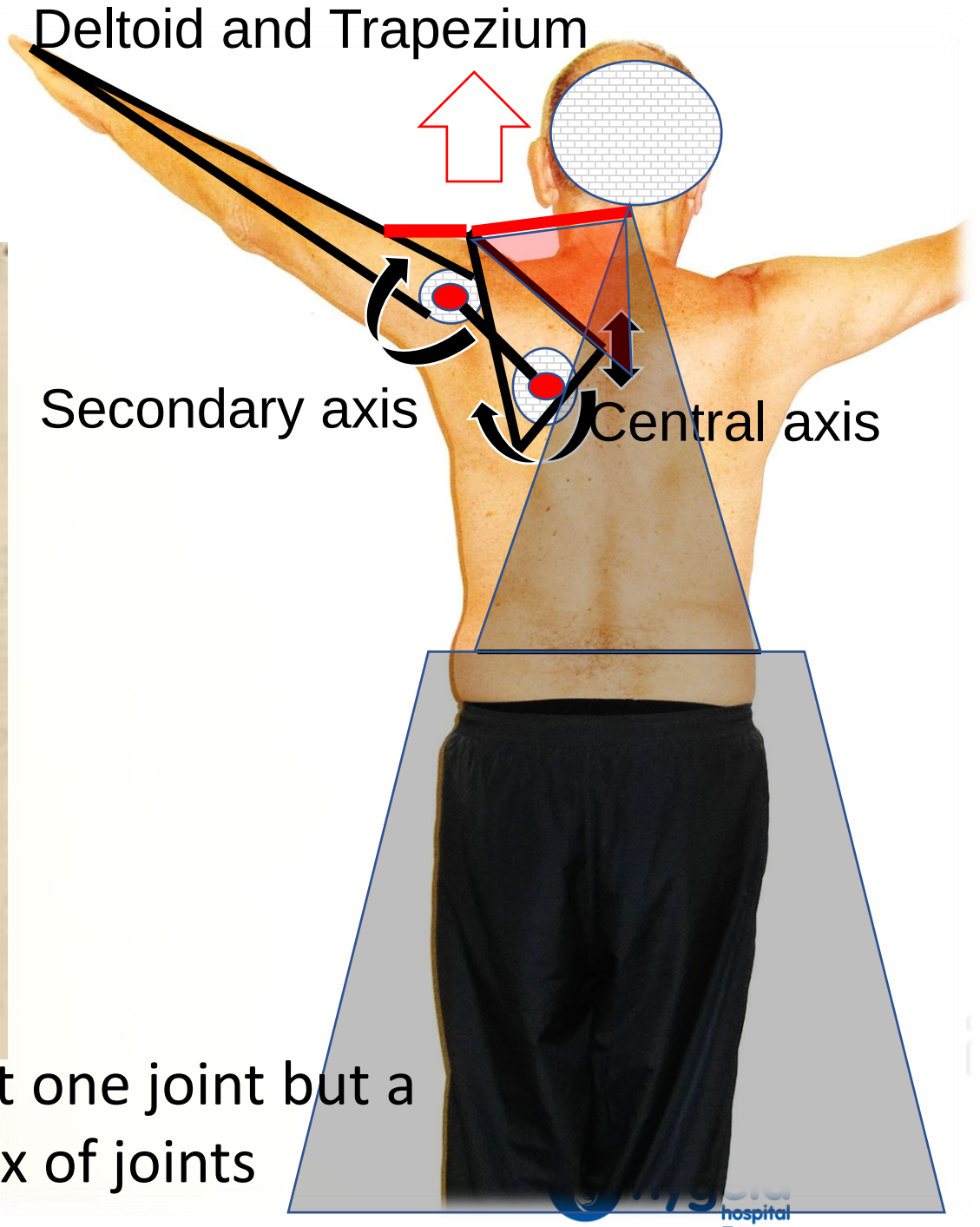
The Shoulder

The joint that Sacrifices

stability for mobility

The shoulder joint

A joint in the air!!! Where everything is under dynamic control

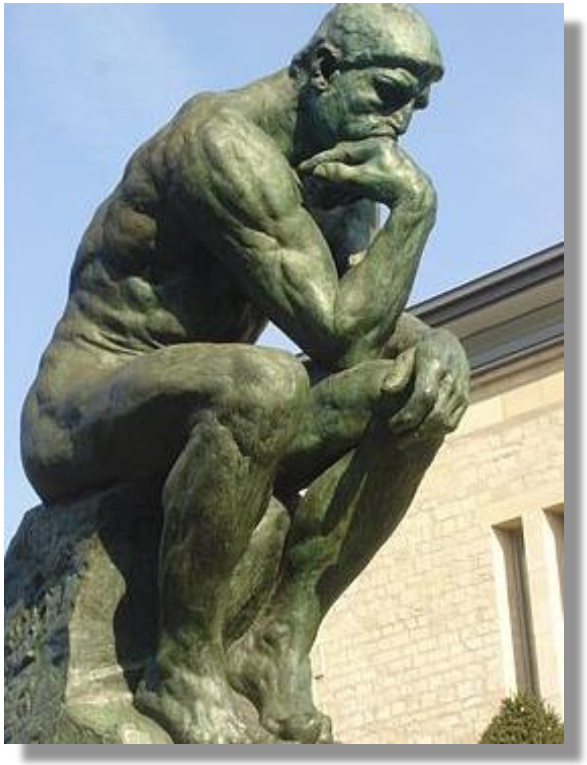


Not just one joint but a complex of joints

Shoulder pathology

- Pain and loss of strength – Rotator Cuff pathology
- Excessive motion – instability , dislocation
- Loss of motion –Stiffness , adhesive capsulitis
- Joint incongruence – Arthritis

Such a compex joint- many causes of pain



- Subacromial Impingement
- Rotator Cuff Tears
- Biceps Tendinosis - Instability - Tear
- Calcific Tendinitis
- Frozen Shoulder
- SLAP lesions
- Synovitis, Arthritis of the glenohumeral Joint
- AC arthritis, tear of the intraarticular meniscus
- Suprascapular Nerve Entrapment
- Atraumatic Shoulder Instability - Internal Impingement
- Shoulder arthrtis

Shoulder arthroscopy

Shoulder arthroplasty

www.shoulder.gr

Shoulder Arthroscopy first
Where we stand were are we going?

History

- 1931 First Cadaver Shoulder Arthroscopy Burman
- 1974 First Shoulder Arthroscopy in vivo Johnson LL
- 1982 First Arthroscopic repair of Shoulder Instability Johnson LL

Diagnostic arthroscopy

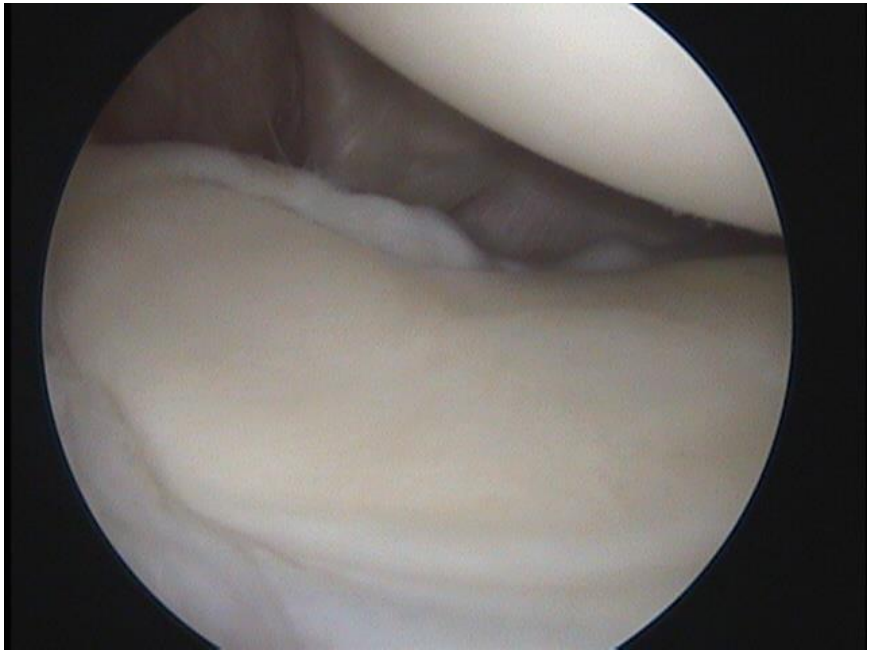
The way everything began back in the 80ies !!

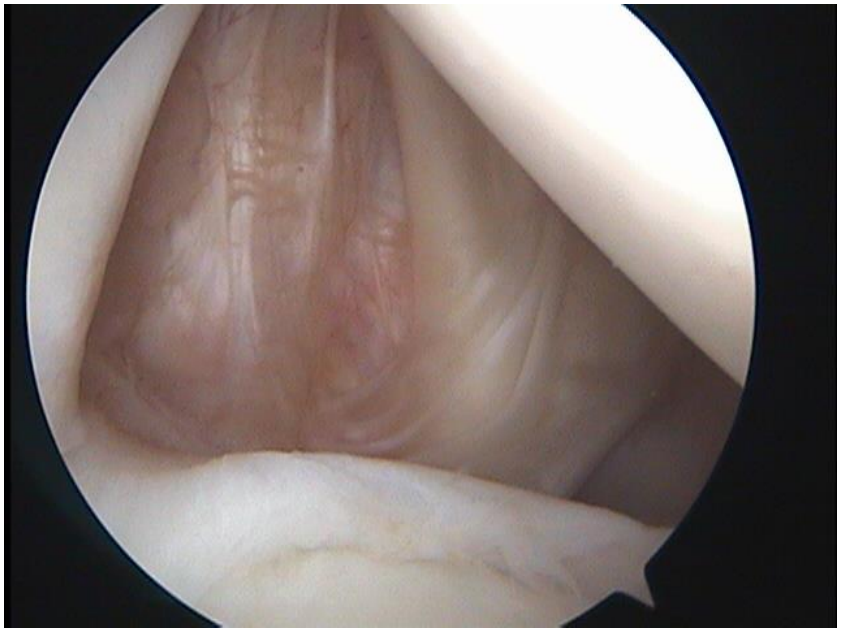
Arthroscopy in its infancy

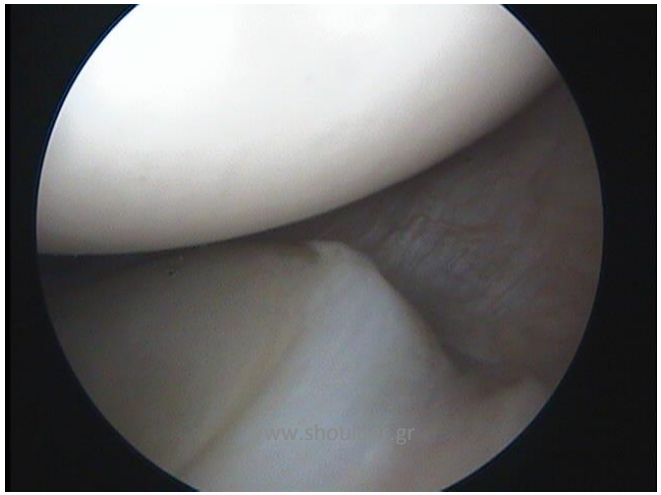
Diagnostic Arthroscopy

- Distinguish Normal Anatomy
- Anatomic Variants
  - Variation of GHLs
  - Sublaral Hole
  - Cord-like middle GHL
  - Buford Complex
  - Rotator Crescent Sign (cuff “ridg
- SLAP lesions
- Bursal side RC tears
- Internal Impingement

The first magic views of a living shoulder

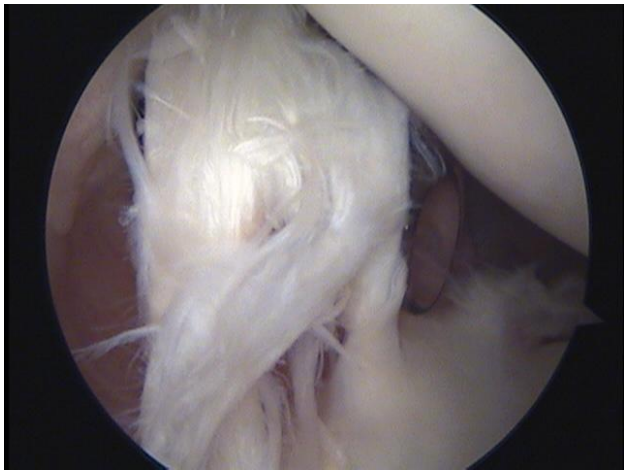


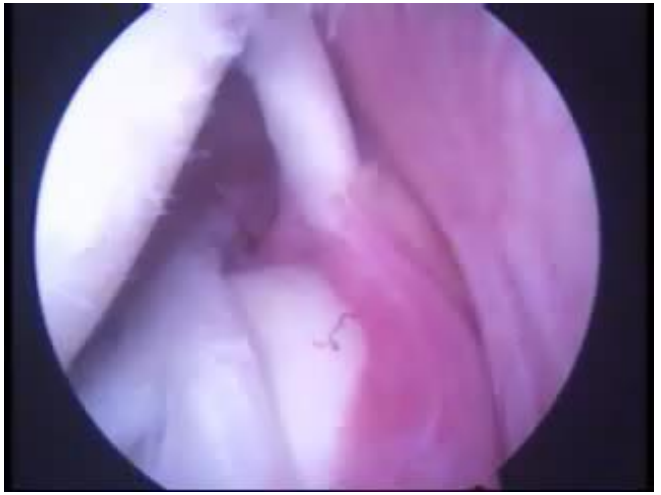




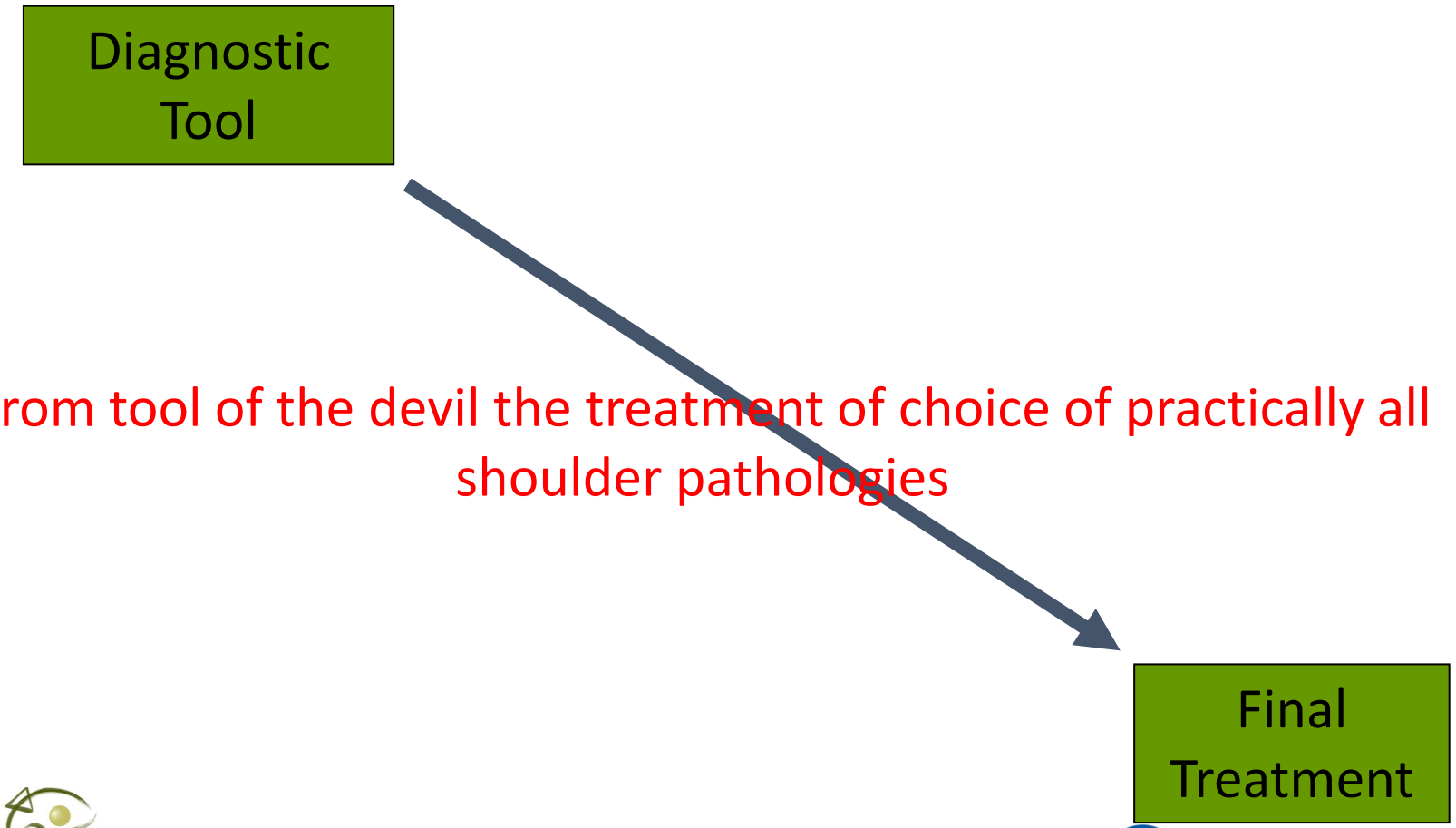
And It's pathology –An amazing Diagnostic Tool

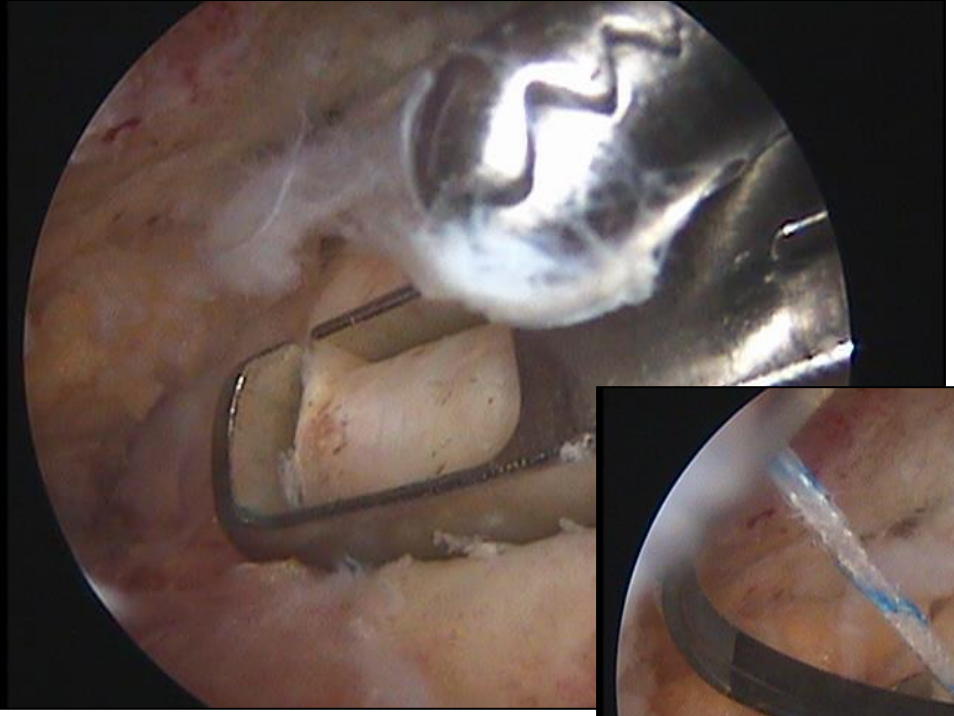
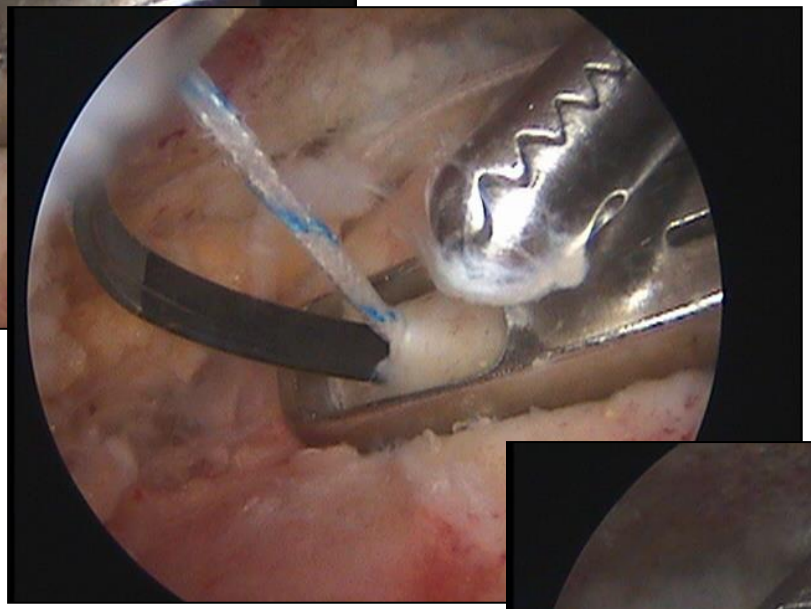
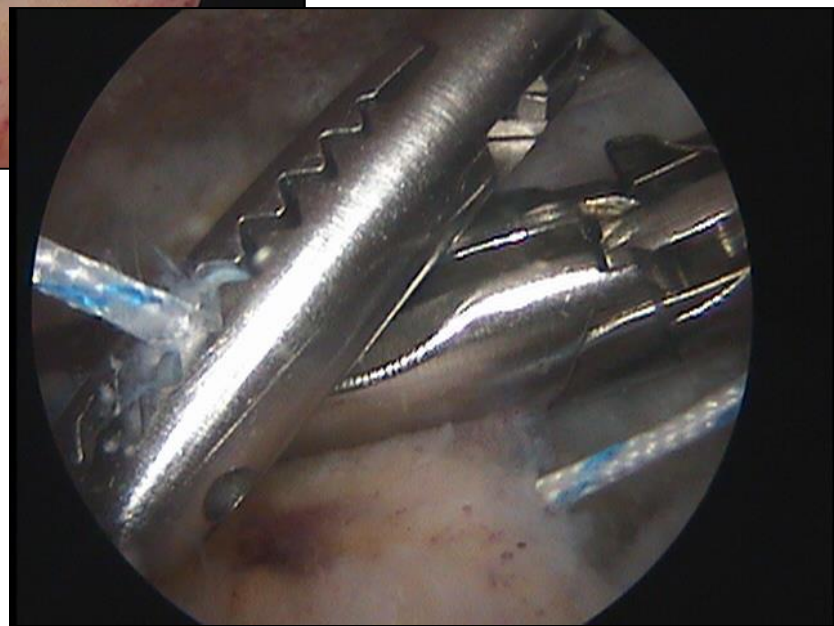
- SLAP Lesions





Shoulder Arthroscopy
the evolution of the technique



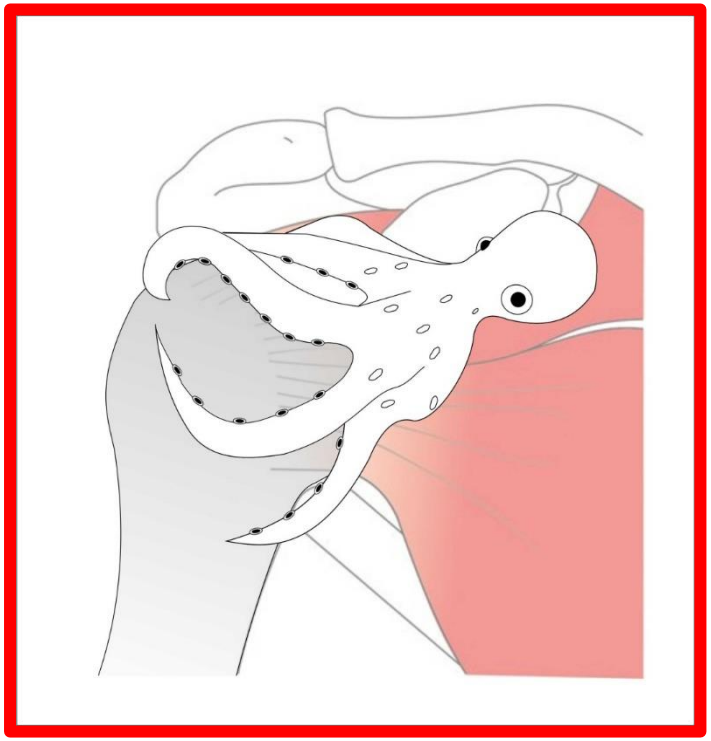




The revolution of Rotator cuff repair

Now we could learn how to mobilize and repair it
Act early try to avoid irreversible bad tissue quality.

And learn about the Rotator Cuff functional anatomy

- RC is a functional-anatomic unit rather than four unrelated tendons
- injury to one component may have an influence on the others



and how to restore the function of the shoulder.

- **Repair the cuff: restore the force cuples**
- Increase the functional capacity of the remaining intact cuff (physiotherapy , inspace ballon ,allograft reconstruction of the superior capsule
- Lower the functional demands of the patient (persuation)
- Tendon transfers
- Reverse shoulder arthroplasty

Repair the cuff what to do

- Balanced force couples
- Stability of the edges
- Strong fixation
- Repair without tension

ANY TYPE OF RECONSTRUCTION MUST

AVOID TENSION

OVER-LOAD OF THE REPAIR

When to suspect that the cuff is not repairable

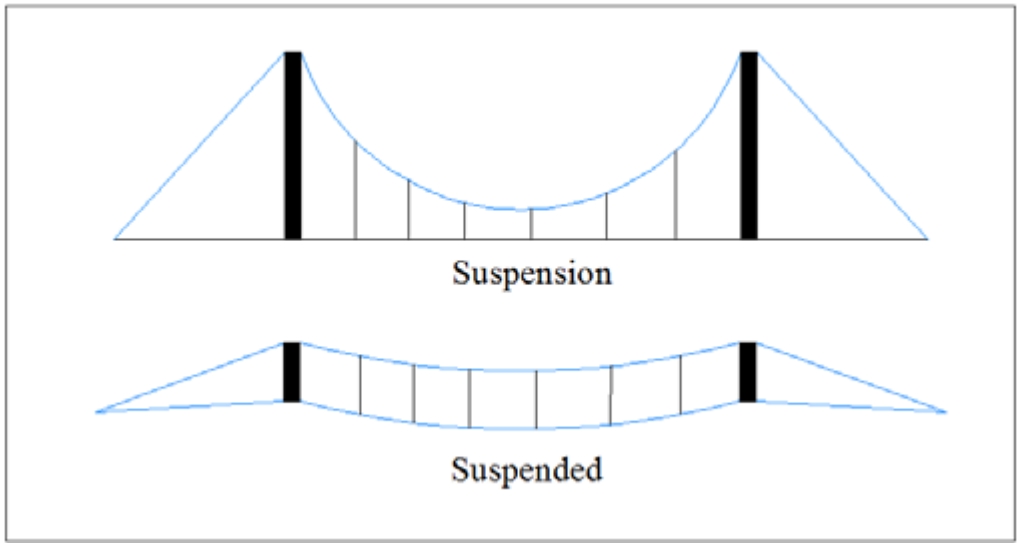
Consider and anticipate problems

- Age of the patient
- Chronicity of tear (duration of symptoms)
- Fatty infiltration more than stage 3-4(more fat than muscle) according to Goutallier
- Patte tendon retraction stage 3(tendons to the glenoid)
- Acromiohumeral distance <2mm
- Rot cuff arthropathy

How to perform a repair

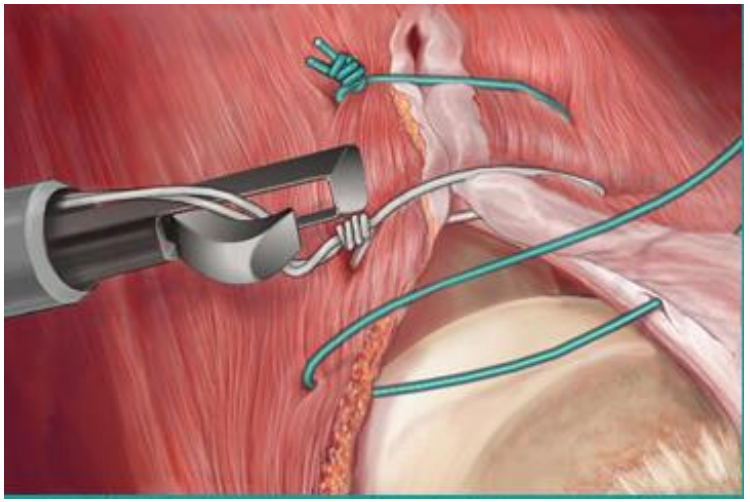
- Recognize the tendons
- Release the tendons completelly
- Fix the tendons

Following mechanical principles



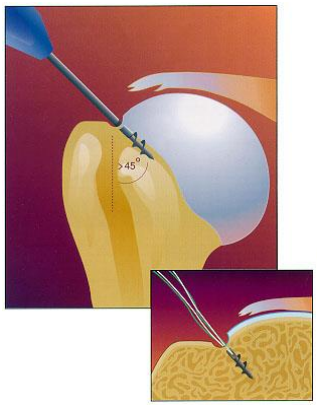
Cuff repair

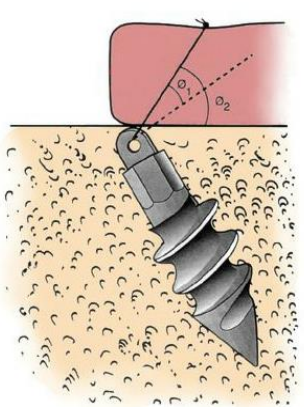
Side to Side Repair

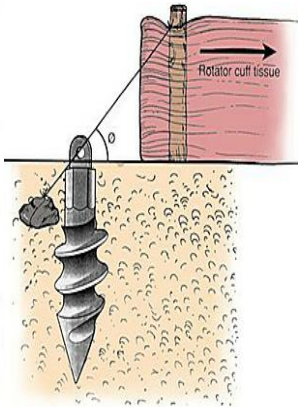


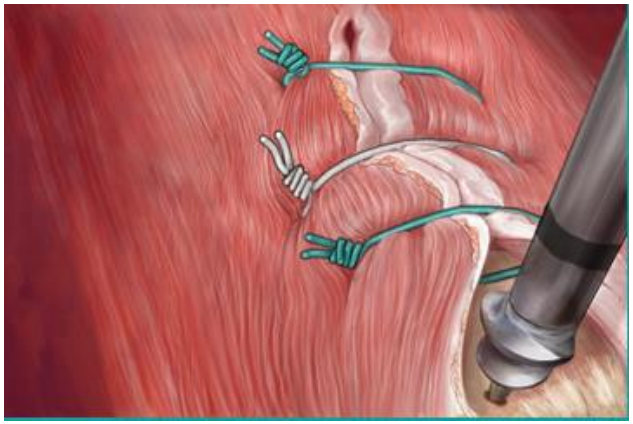
Cuff repair

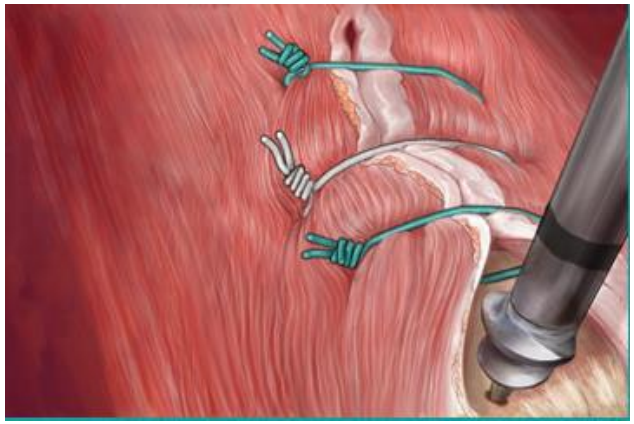
Tendon to bone repair



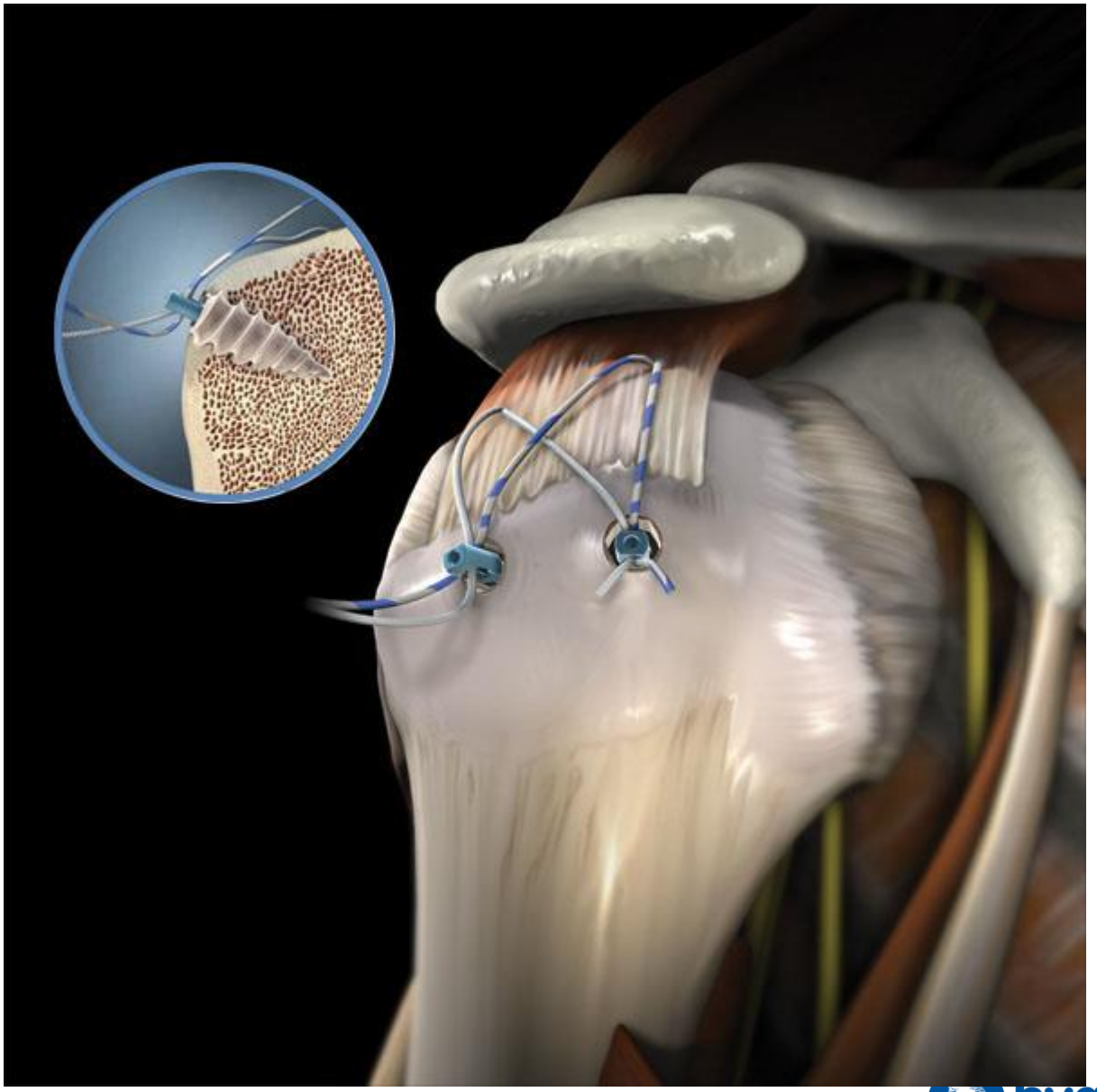








Anchor Repair- suture bridge



Or turn to other options

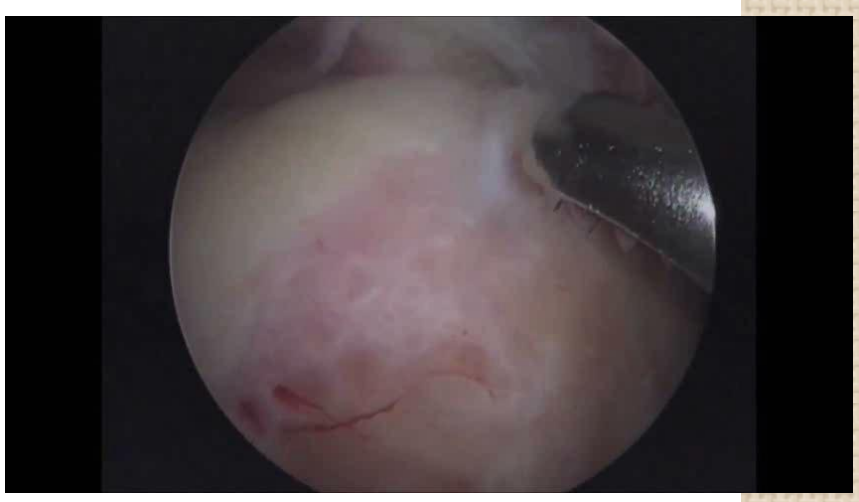
Latissimus Dorsi Transfer

Indications

- Intact Subscpularis
- Intact Deltoid
- No Stiffness

Arthroscopic Preparation

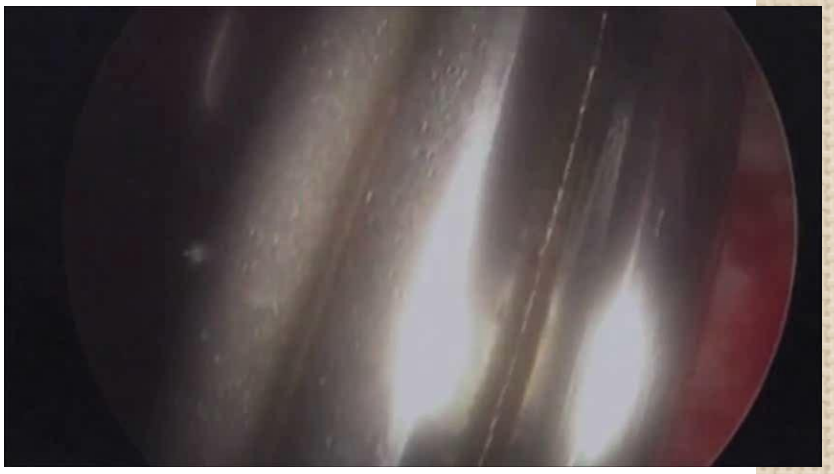
New!!!

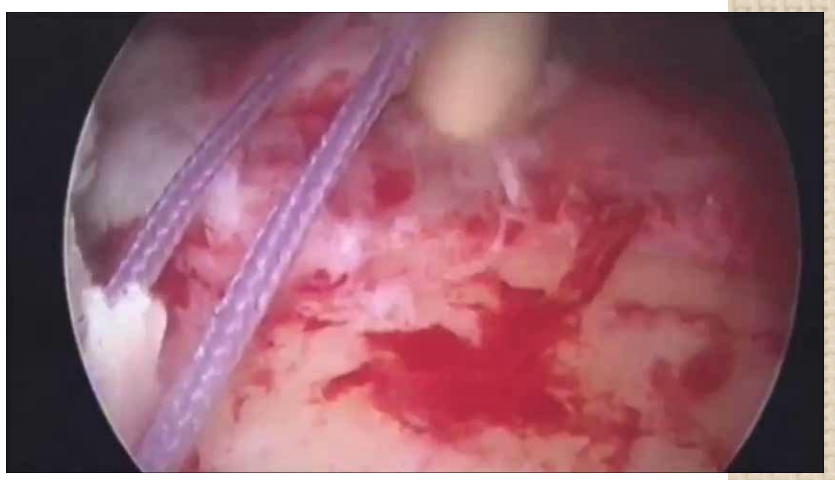


Tendon preparation 3

Graft passage & fixation

New!!!





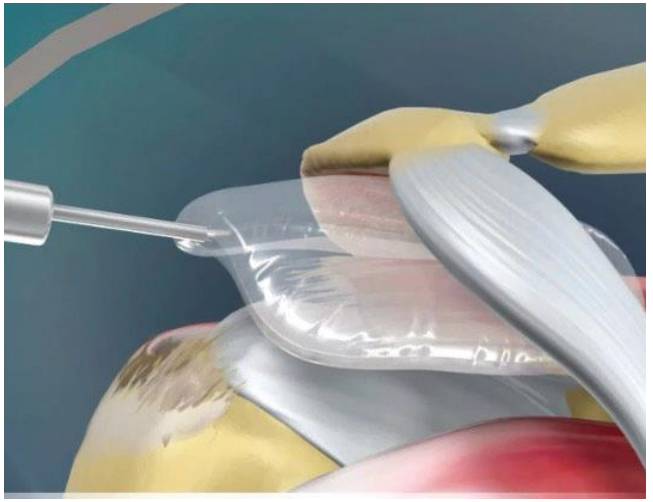
Or Passive spacers

Subacromial Spacer (InSpace Balloon)

copolymer of poly-lactide and ε-caprolactone

Goal is to achieve painless ROM avoiding superior migration of the humeral head.

Provides sufficient lever and tension to the Deltoid to produce forward flexion and abduction



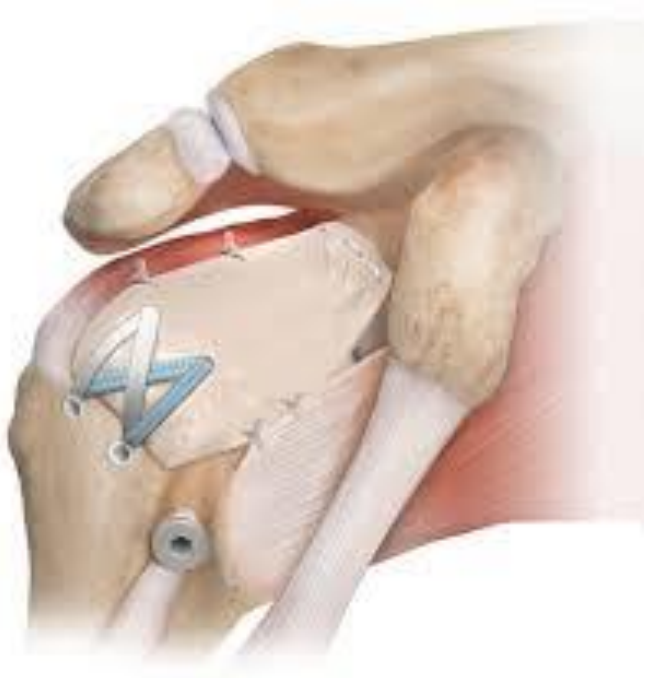
Superior capsule reconstruction

- Human Dermal allograft reconstruction of the superior capsule
- Attachement to the superior rim of the glenoid and the greater tuberosity
- Passive suppressor of the humeral head
- Promising results

Superior Capsular Reconstruction

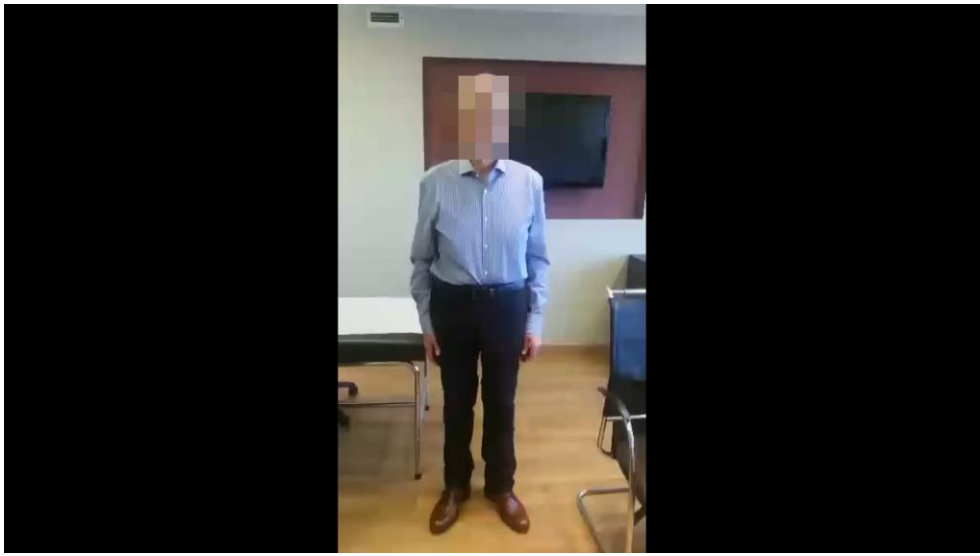
Clinical results of Arthroscopic superior capsule reconstruction of Irreparable rot cuff tears

Mihata et all Arthroscopy 2013



And the results . The amazing ability of human organism to incorporate sound mechanical principles

Double row repair of massive cuff tear
(Subscapularis- Supraspinatus)
8 weeks post--op



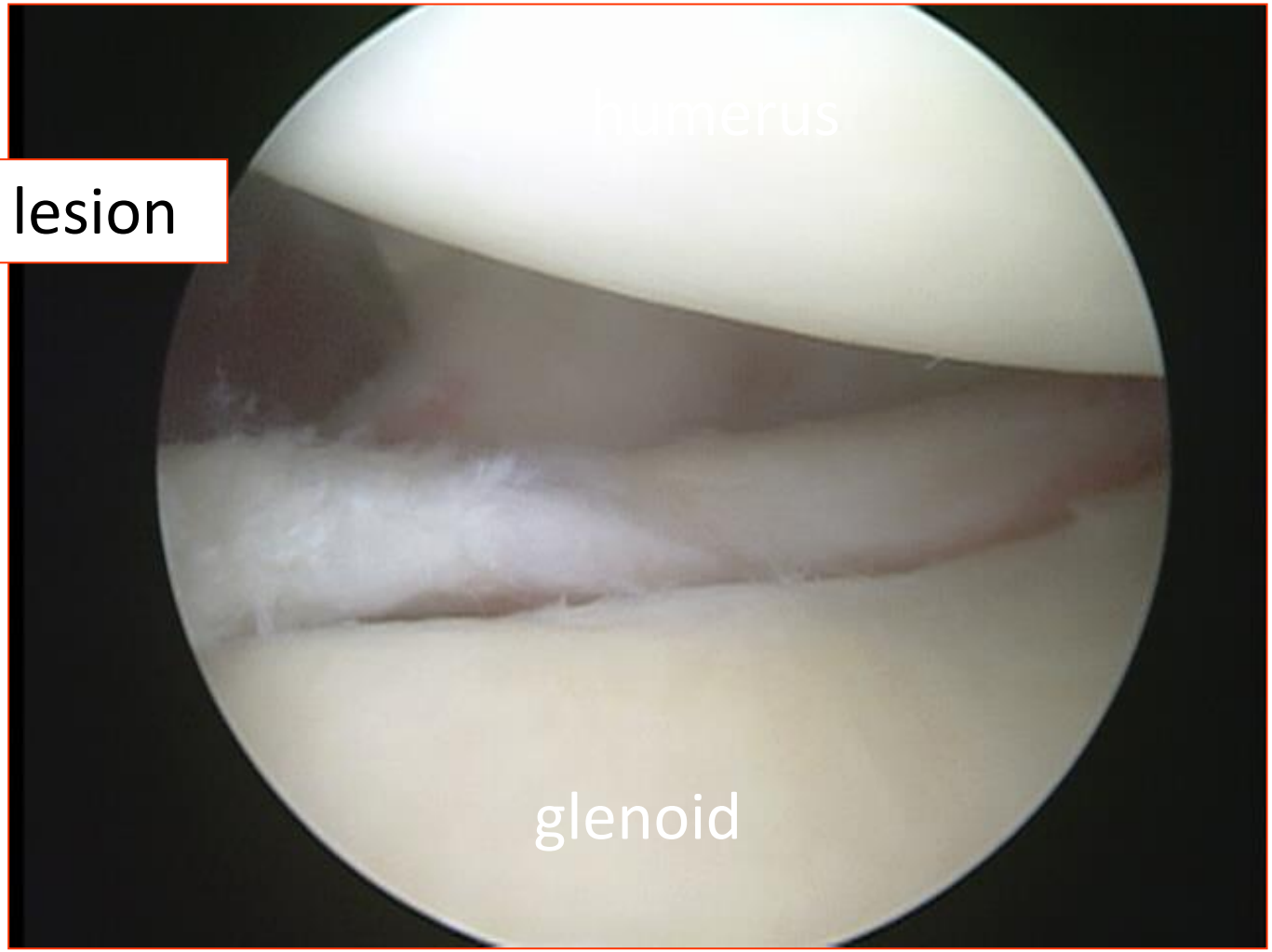
Massive cuff tear-medialized repair-inspace ballon
6 weeks post-op

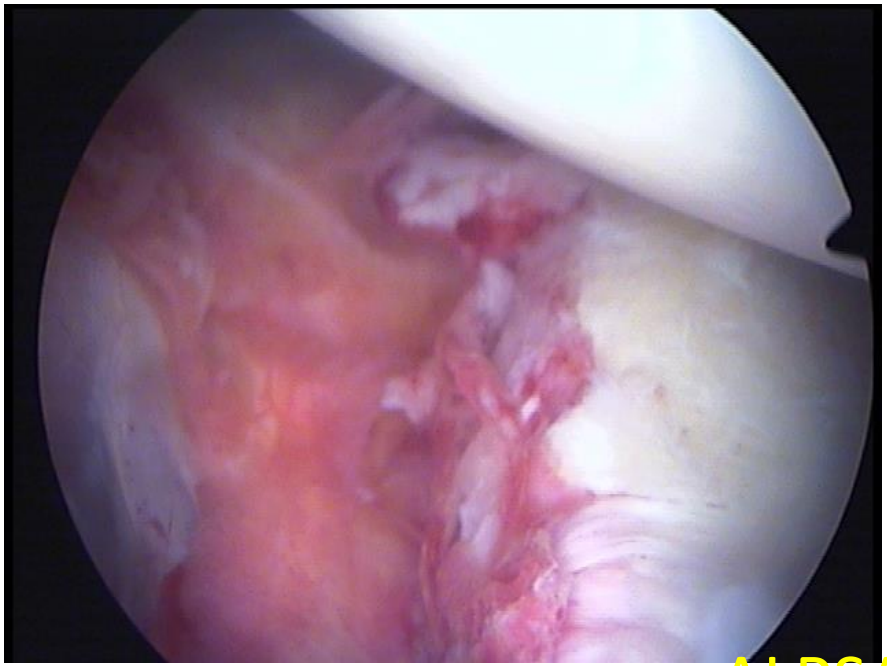
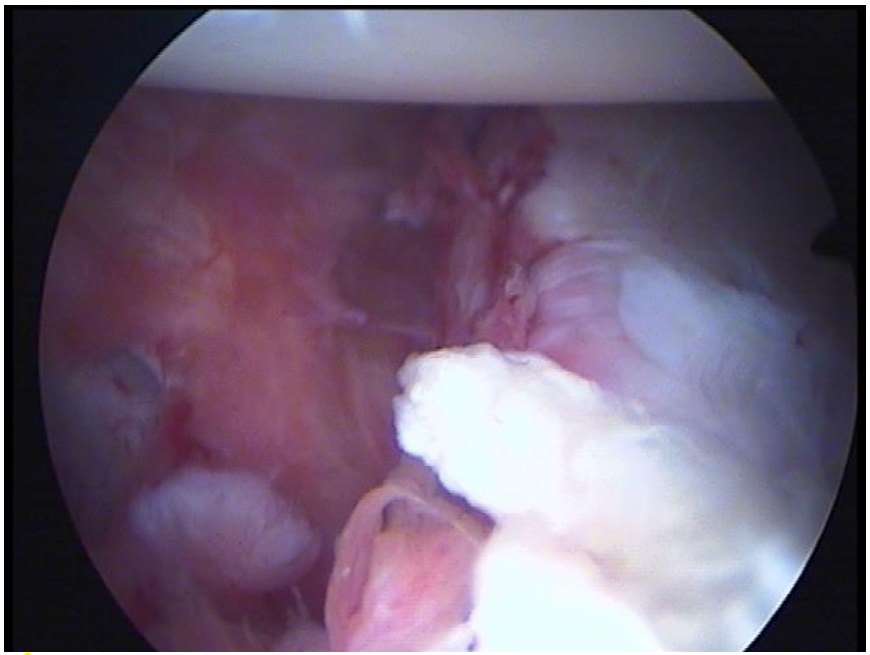
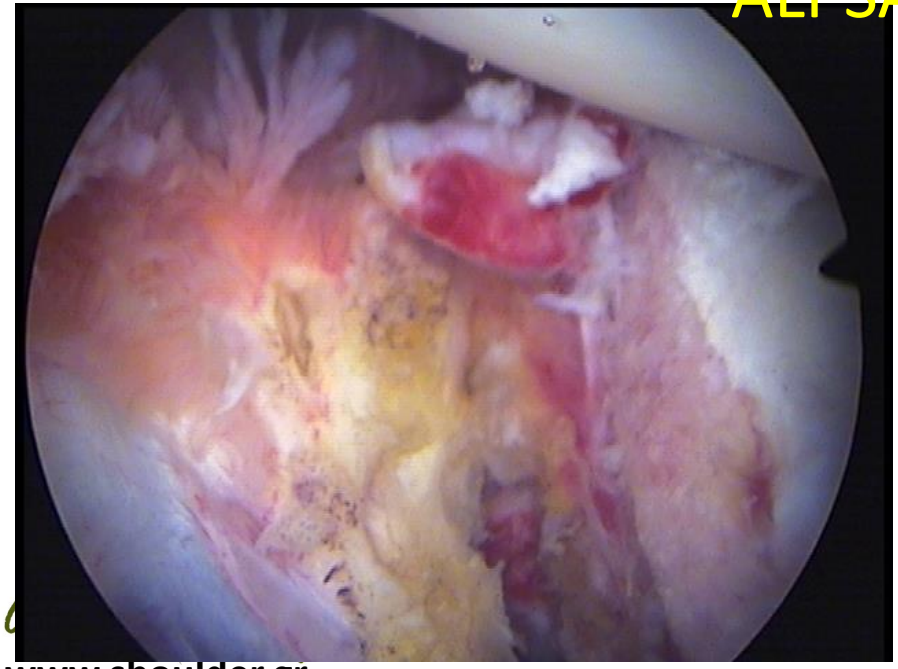
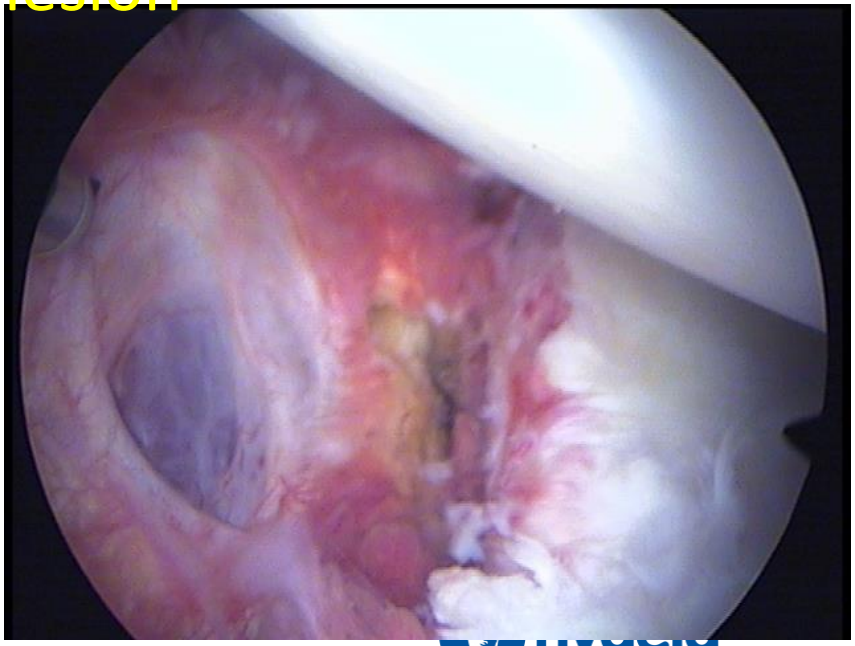
Shoulder Instability-the next revolution

www.shoulder.gr

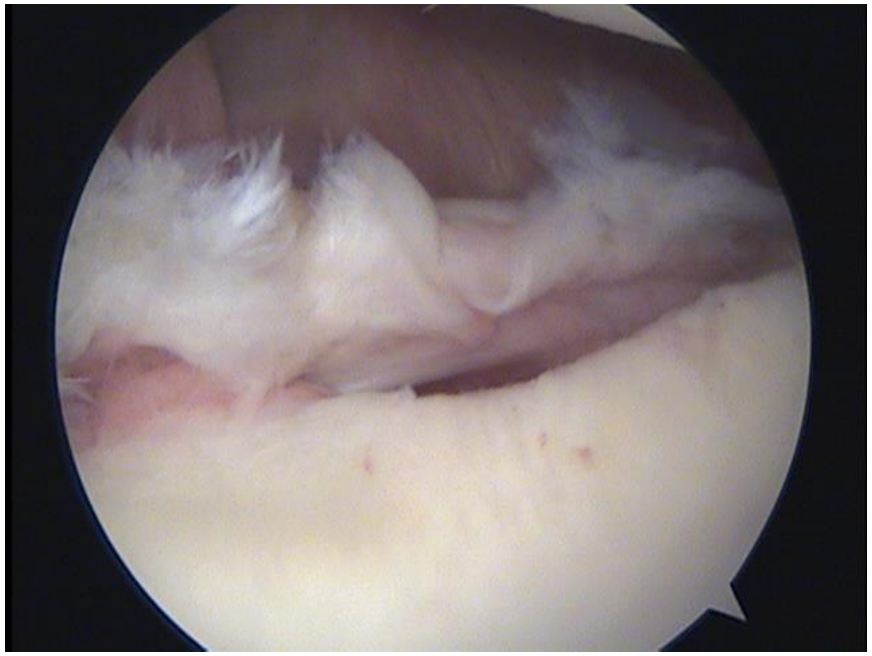
The ability to recognize the lesions

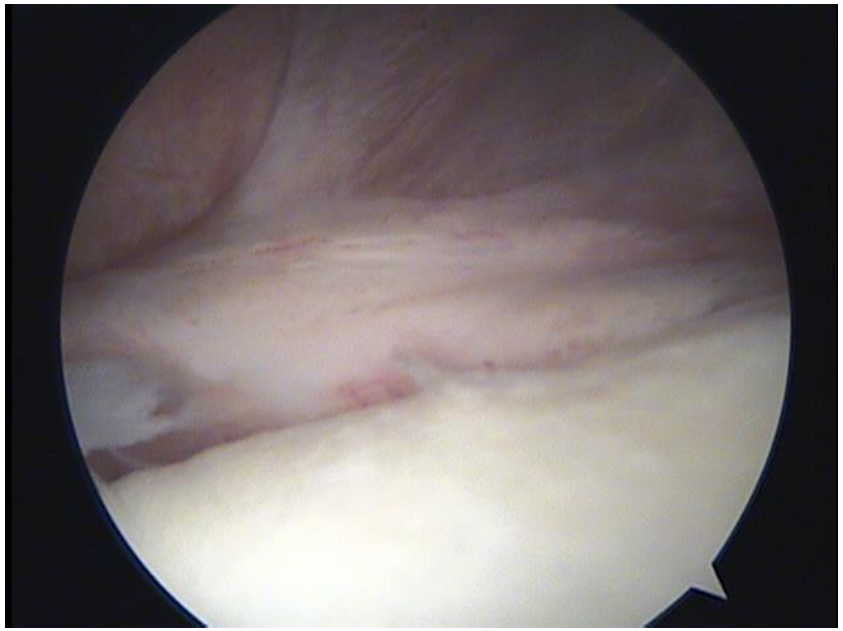
Bankart lesion

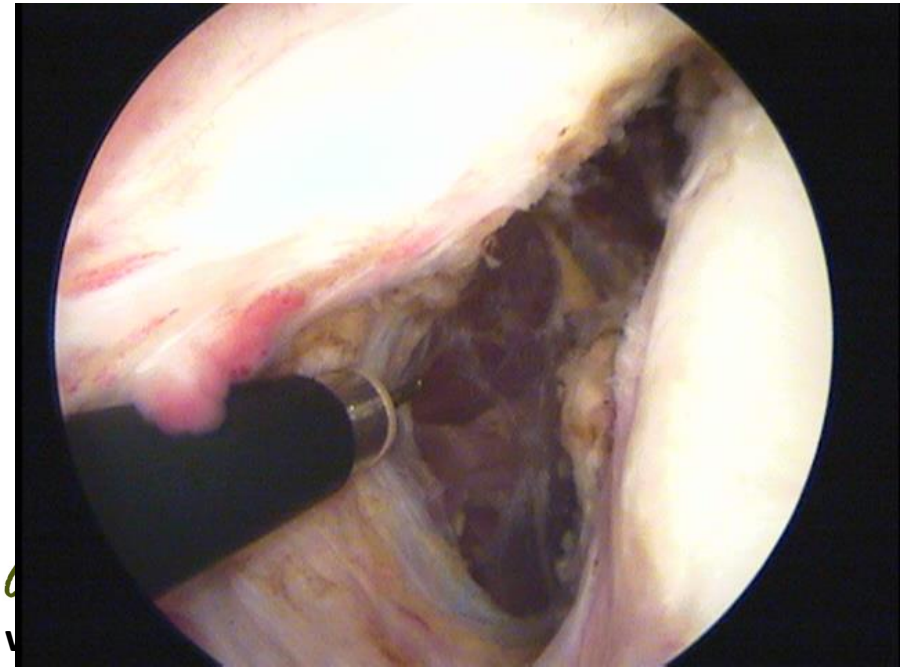


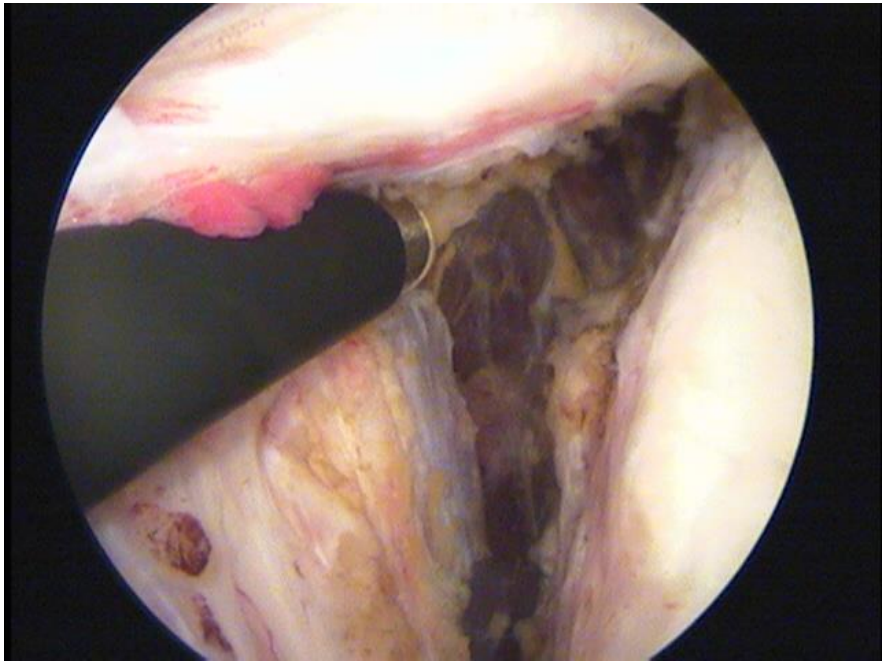





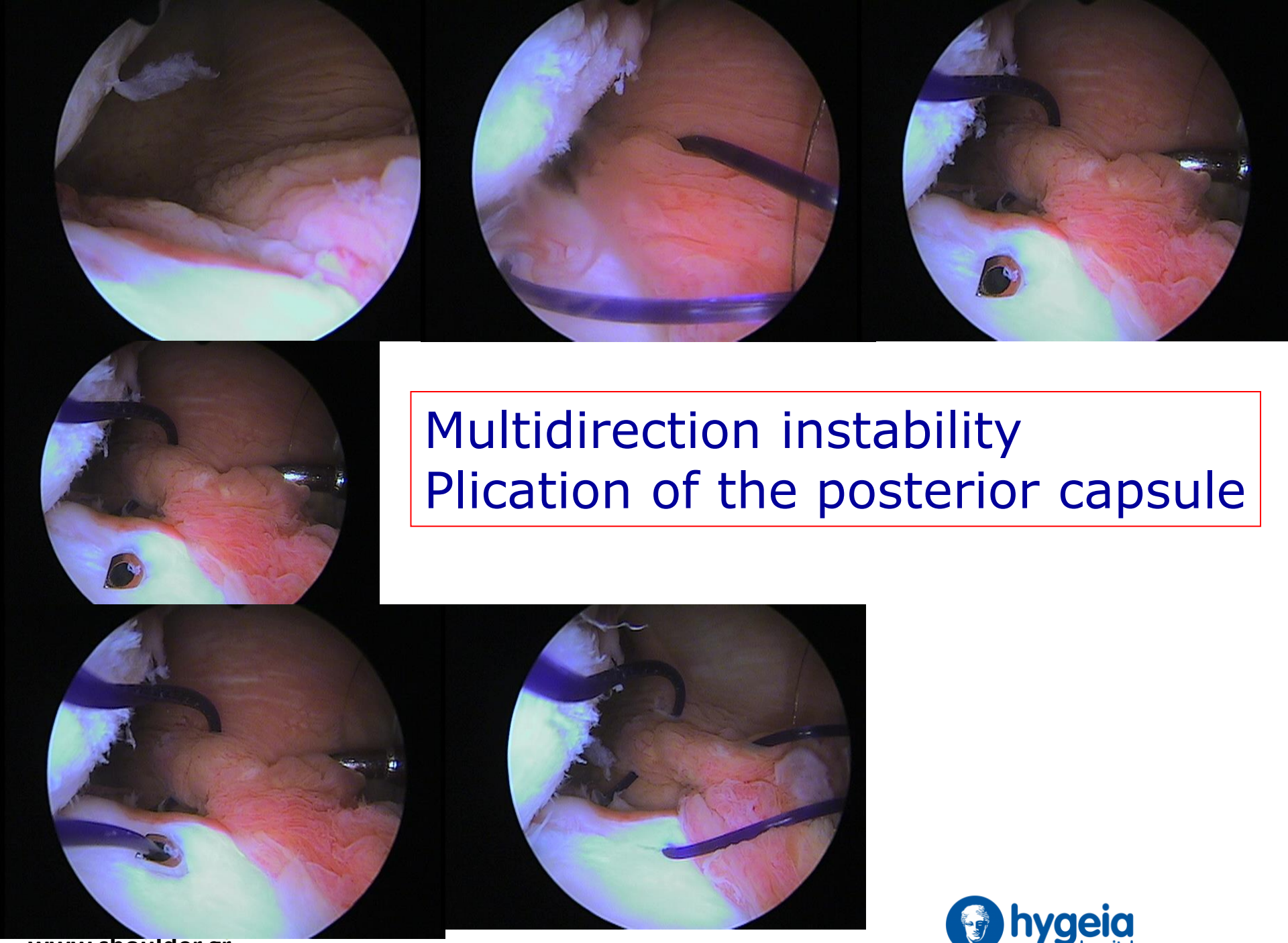
ALPSA lesion











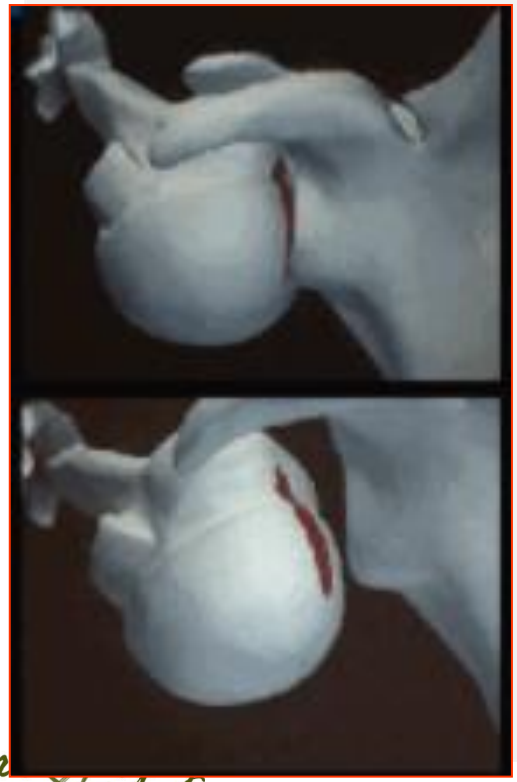
Multidirection instability
Plication of the posterior capsule

hygeia hospital

Instability

Anterior Instability.

The importance of Bony defects – Hill Sachs

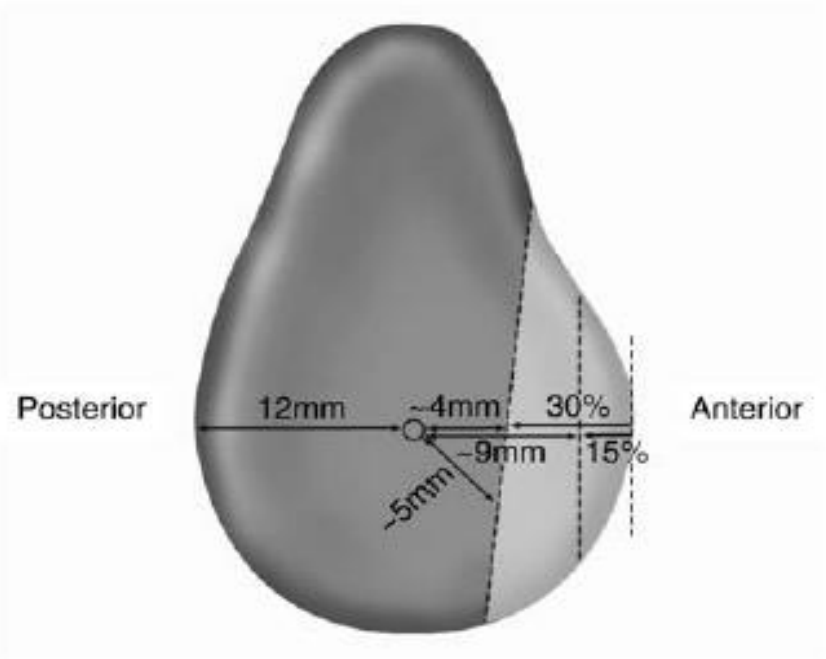


Instability

Anterior Instability. Bony defects Glenoid bone loss

Glenoid Bone Defects

What is the critical size?



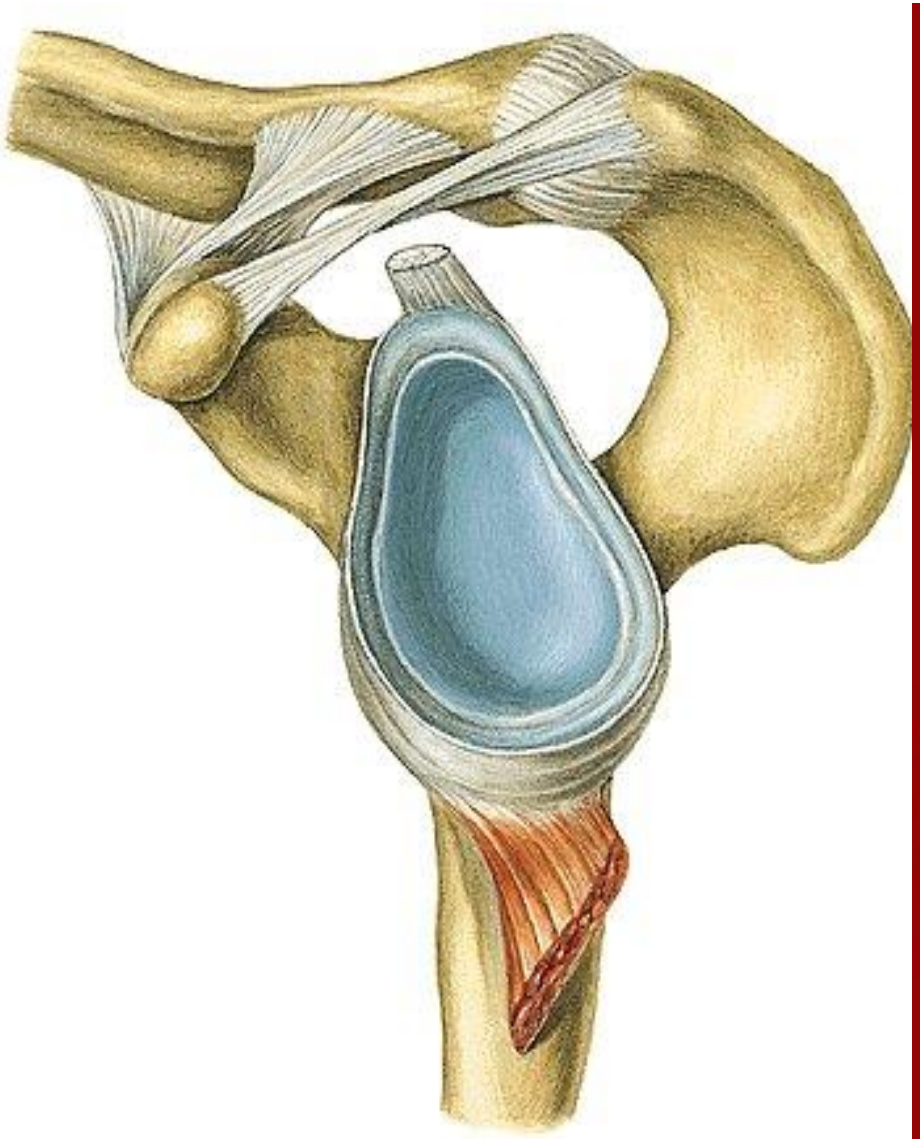
>25% bone loss

6.5 – 8.6mm AP width

Inverted pear appearance

Piasecki et al. AAOS J17 (8): 482. (2009)

The normal glenoid shape



Inverted pear glenoid

Quantification of Glenoid Bone loss

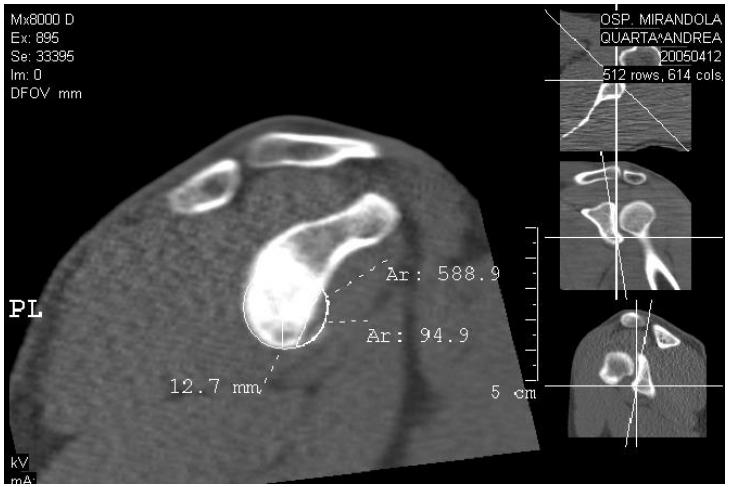
Pico Method

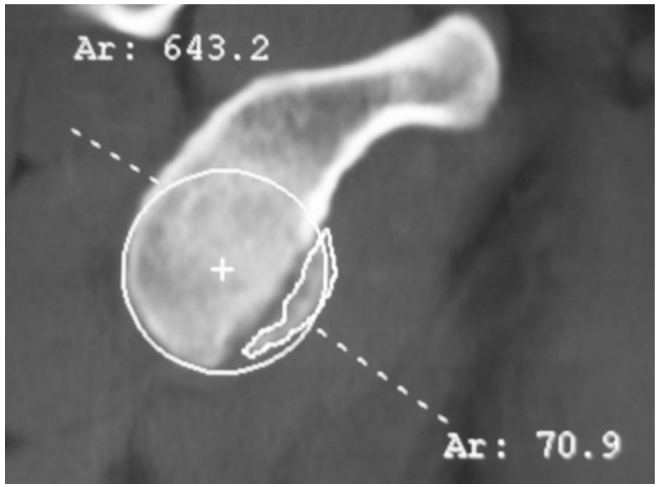
2D CT – measurement of contralateral glenoid surface

Transferring the circle to the injured glenoid

Manually tracing out the glenoid defect

Calculating the bone loss using appropriate software





Bois et al - Am J Sports Med. 2012

Glenoid Bone Defects

"Sub-critical" size

13.5%

Shaha JS, Cook JB, Song DJ, Rowles DJ, Bottoni CR, Shaha SH, Tokish JM

Redefining "Critical" Bone Loss in Shoulder Instability: Functional Outcomes Worsen With "Subcritical" Bone Loss.

Am J Sports Med. 2015 Jul;43(7):1719-25

Arthroscopic View

From

Engaging Hill-Sachs lesion

To

“On-Track/Off-Track” Lesion

Stephen Burkhart (2000)

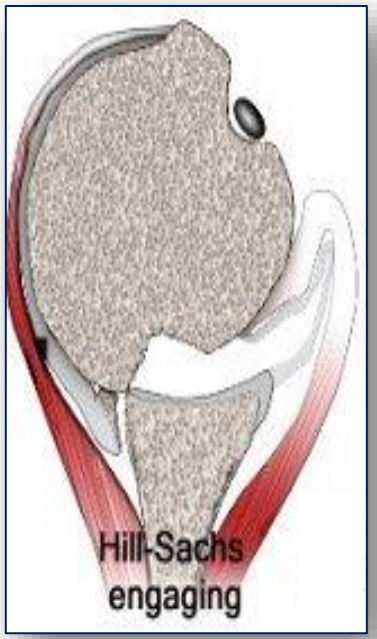
Giovanni Di Giacomo (2014)

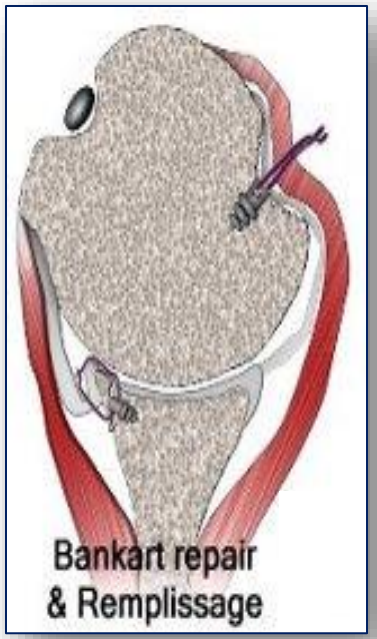
REMPLISSAGE

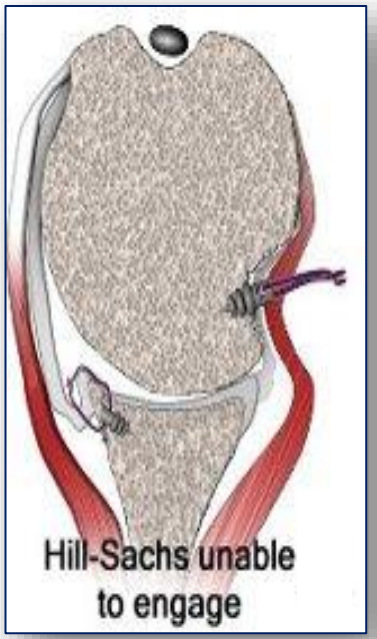
French for “Fill-in”

Eugene Wolf (2008)

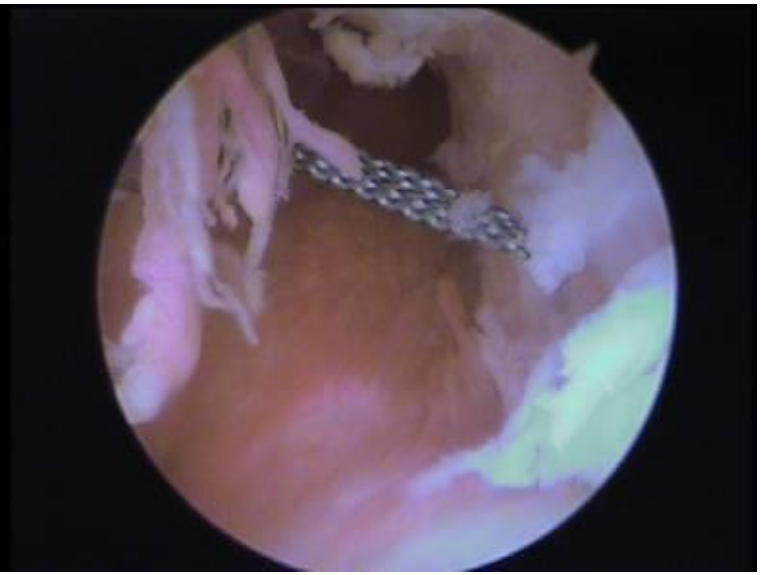
Remplissage-a posterior pulling force not allowing the humeral head to dislocate anteriorly





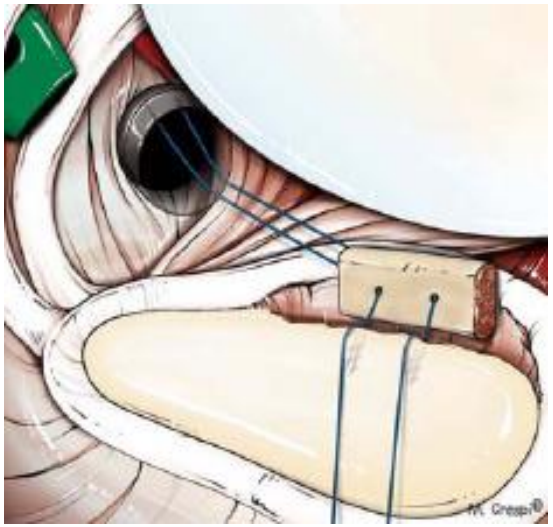


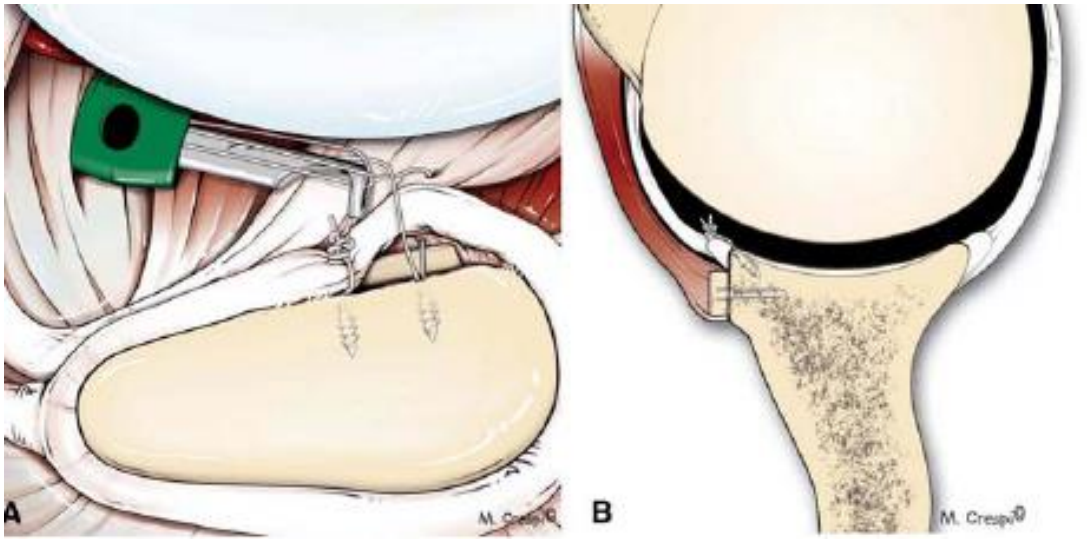
Remplissage



Bone Block technique

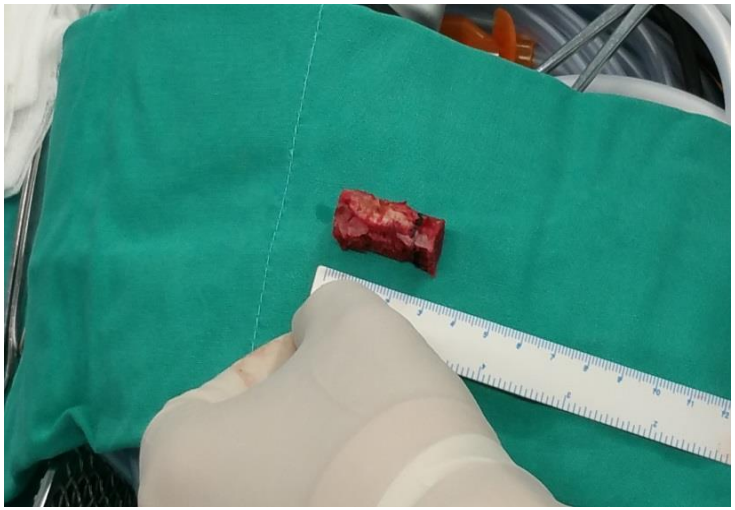
- ✓Described by E.Taverna

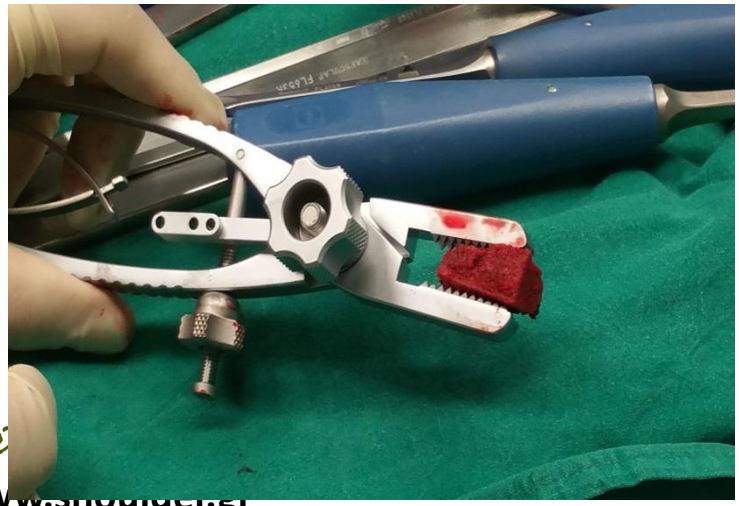




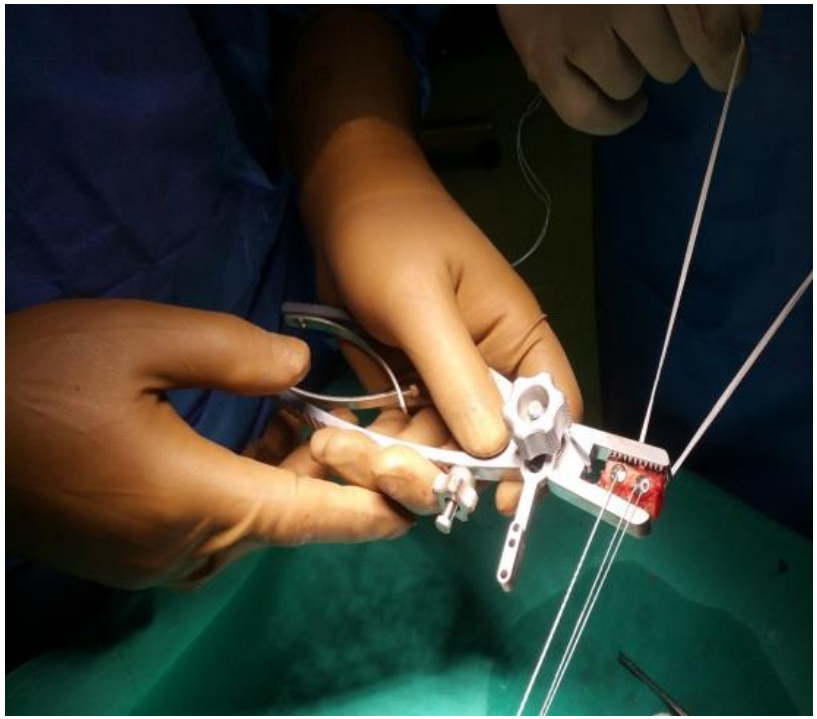
E.Taverna, et.al,Knee Surg Sports Traumatol Arthrosc (2008) 16:872–875

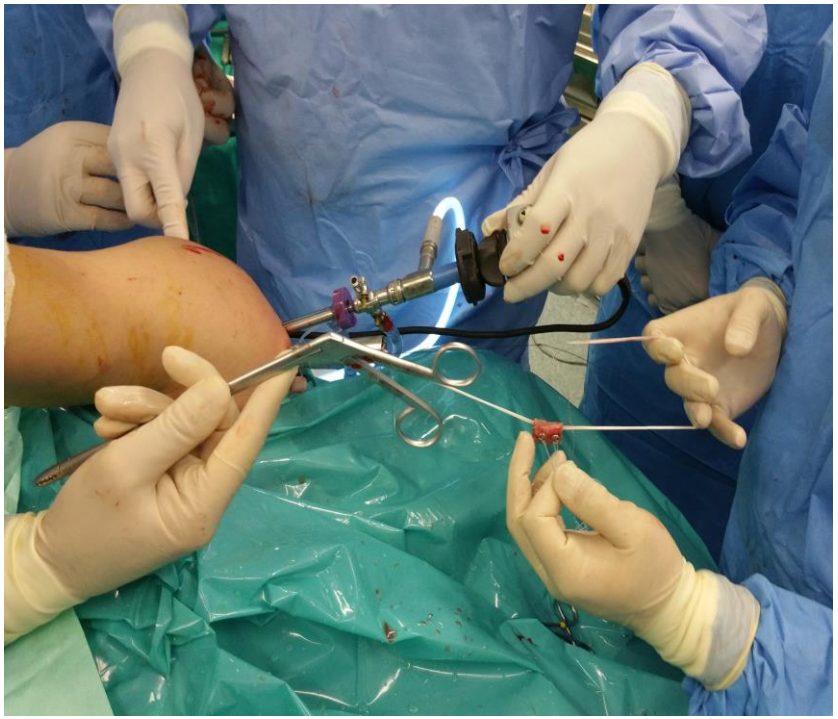
PREPARING THE GRAFT WITH SPECIFIC INSTRUMENTATION BE CERTAIN THAT THE GRAFT PASS EASILY THROUGH THE METAL CANULLA



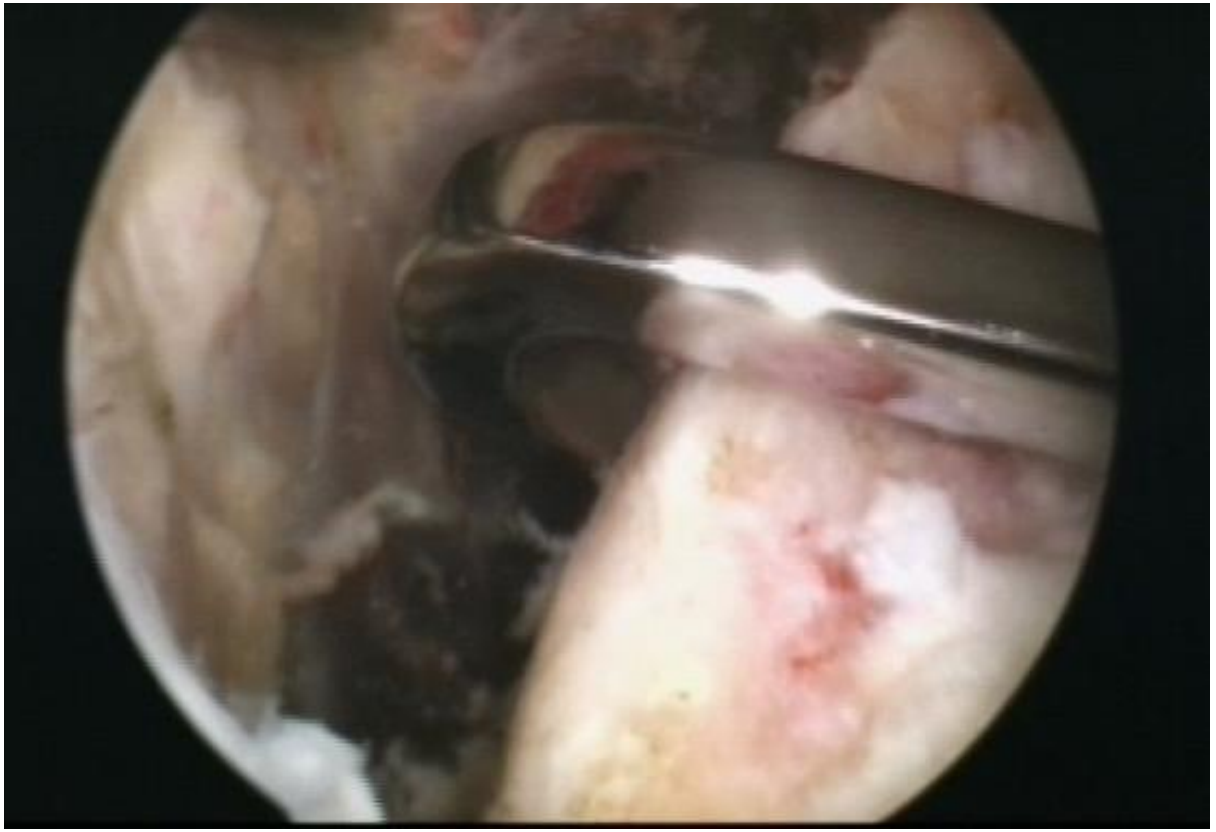


BUTTONS VS SCREWS- LESS METAL HARDWARE NEAR THE JOINT





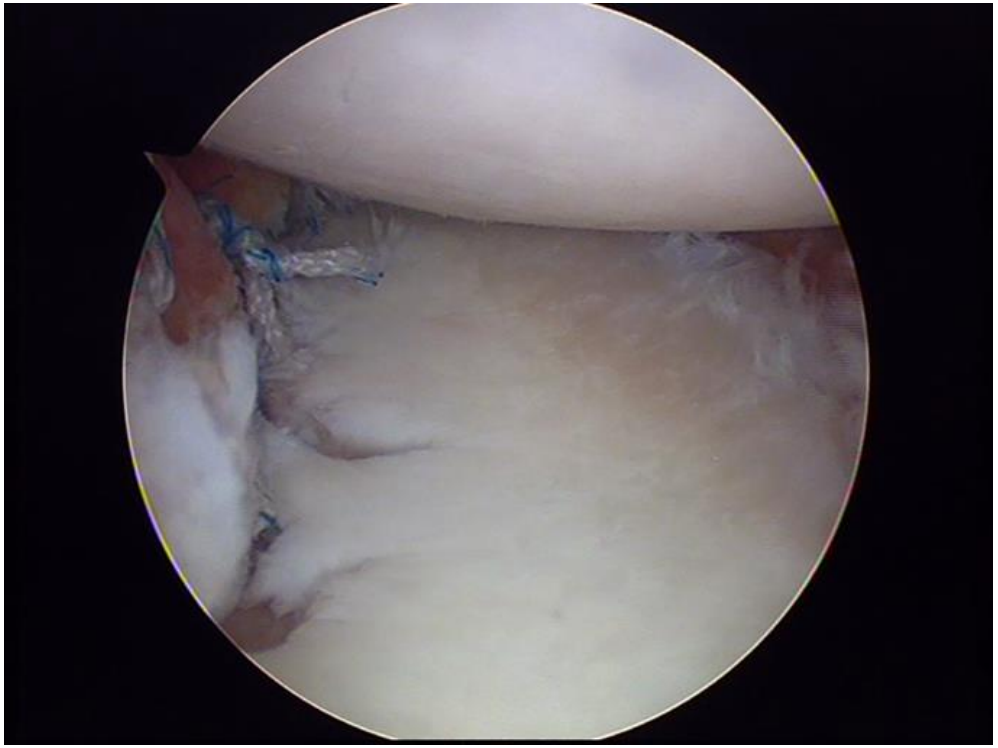
DRILL THROUGH GLENOID WITH A SPECIFIC GUIDE

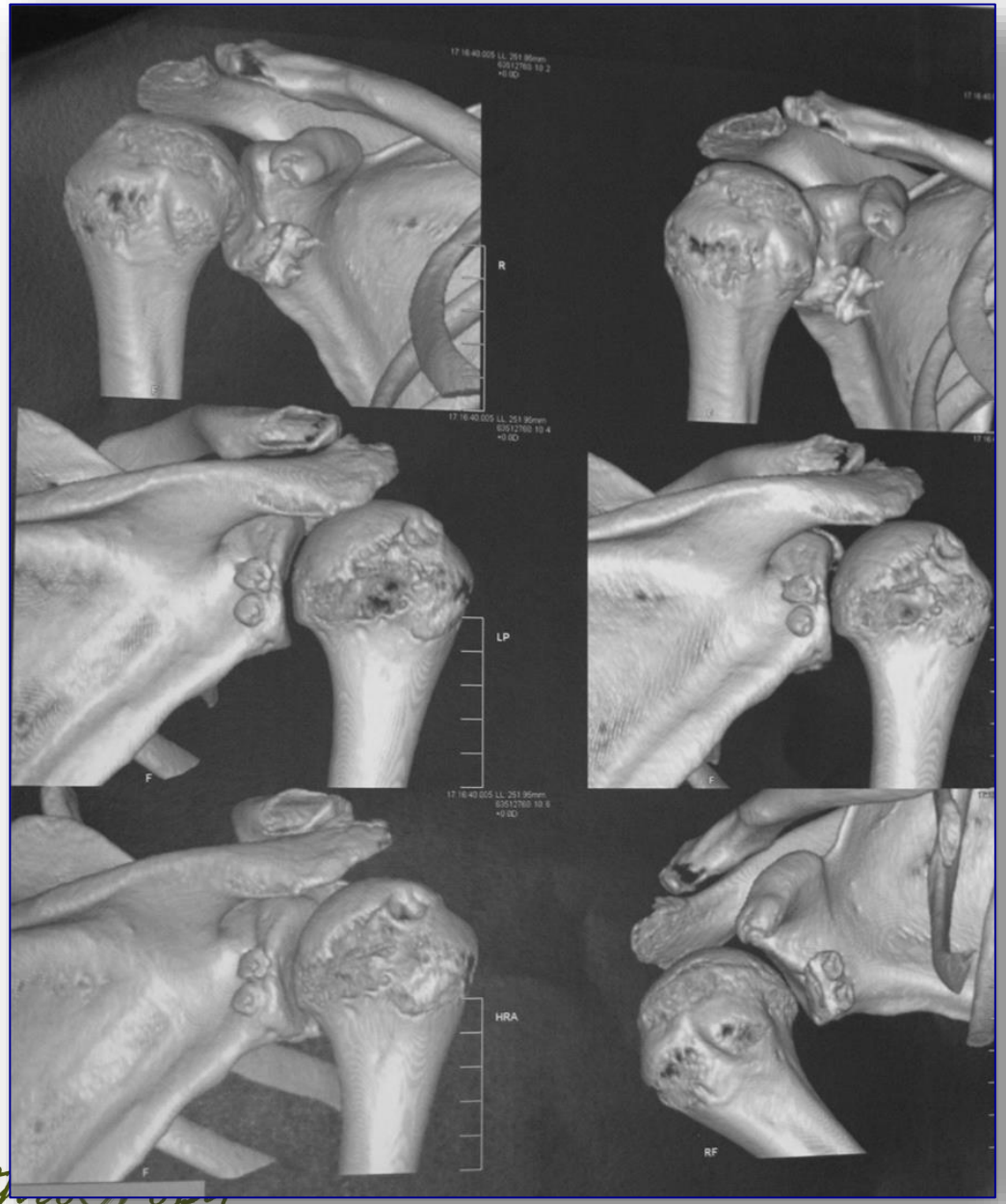


PASS GUIDE WIRES IN ORDER TO KNOW THE LOCATION OF THE TUNNELS AND INSERT SUTURE ANCHORS

- ✓Final positioning

✓Repair the capsule & ligamentes





3 months
Post-op

OUR INDICATIONS

- Primary operation when Glenoid bone loss >13.5%
- Revisions
- High level Contact sports
- Increased number of dislocations

Bone block technique 3 months post op

Management of Bone Defects in Anterior Shoulder Instability

ROM

3 months
Post-op

Conclusion

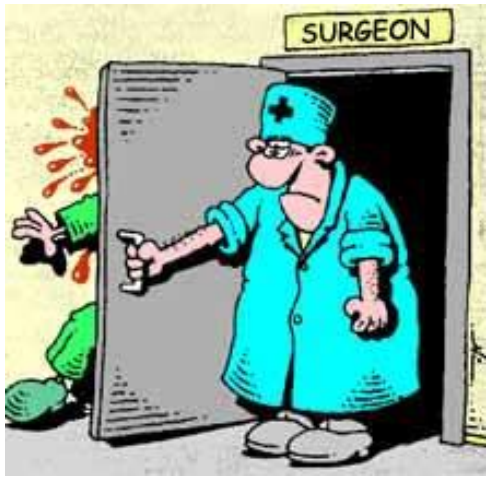
Today, apart from Shoulder Replacement and major Shoulder Fractures,

all Shoulder Pathology

can be treated

With arthroscopic techniques

with arthroscopic techniques that succeed



Lower Morbidity

Day Case surgery

Smalls Incisions

No Deltoid injury

Earlier Mobilization

Less Pain

Earlier Return to Daily Activities

Better Understanding of Shoulder Pathology

And are continuesly evolving

Total shoulder arthroplasty.the other revolution in shoulder surgery

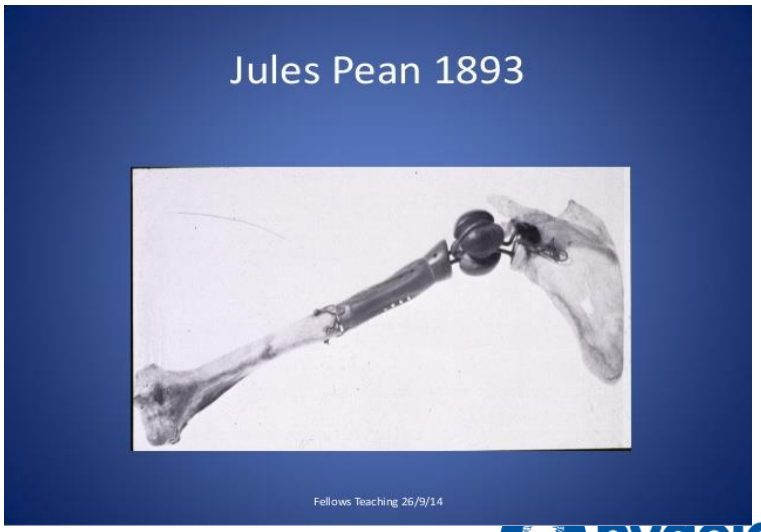
Fig. 41. — Jules-Emile PEAN
Quelques mois après avoir quitté l'Hôpital Saint-Louis. 1893

1893 Jules E. Pean

1st successful shoulder replacement

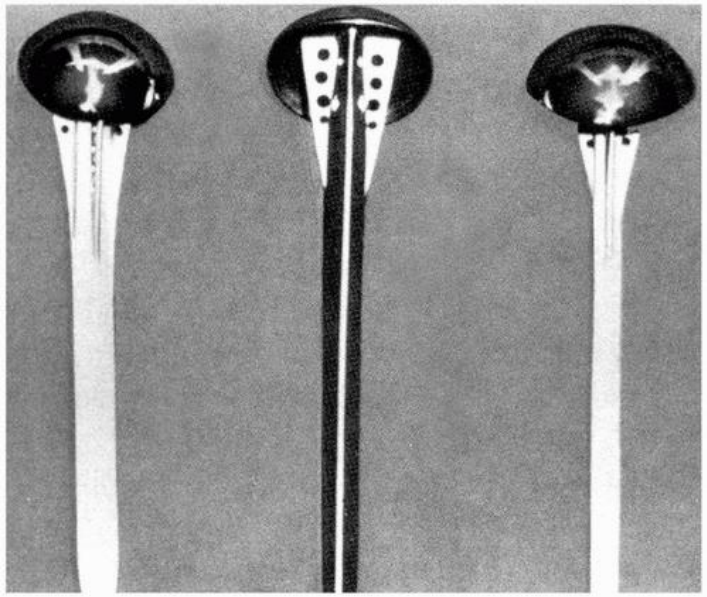
-26 years before the first hip replacement
-tuberculosis infected shoulder of a 32-year-old Parisian
-2 years later implant removed because of sepsis

2 platinum loops connecting the scapula to a paraffin-hardened rubber ball



The Story started back in1953
Charles S. The original Neer I

Vitallium (cobalt-chrome alloy)
One stem size & 44mm radius head
Hole in the lateral neck
Top of the head slightly flattened



1953, the Neer I prosthesis available in three stem sizes

1955, that number increased to five,
four fins, multiple fenestrations for bone ingrowth

1955 Neer's clinical series was first published in the Journal of Bone and Joint Surgery and consisted of using his shoulder prosthesis in 12 cases with excellent and satisfactory results.

Development of the Neer II in 1970 & 1st generation prosthesis

Monoblock humeral stem and cemented, all-polyethlene keeled component

flute for cement egress
2 holes for suture fixation
standard stem lengths
with 3 diameters
& 2 head lengths

Arthroplasty Options

Hemiarthroplasty

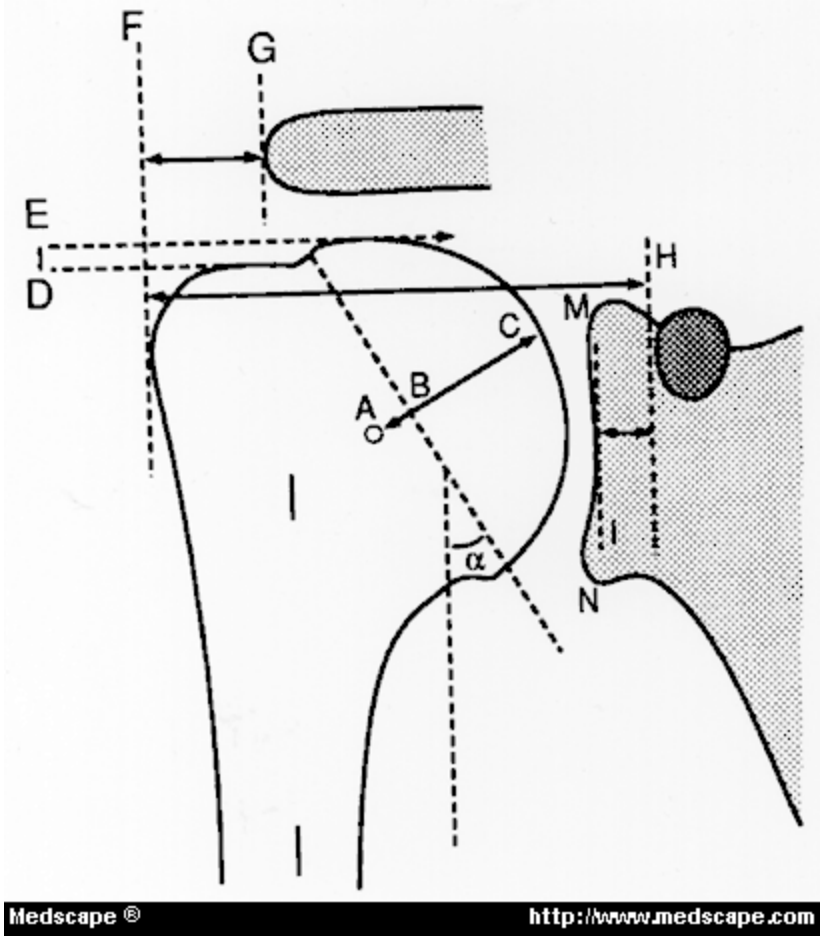
Total Shoulder

Reverse Total Shoulder

The Need for Modularity

- F-H Offset
- B-C Head thickness
- D-E = 8mm

  Top of humeral head is higher than greater tuberosity



Modular or 2nd generation prosthesis in 1980 Biomet, Cofield, Global

Did not achieve Neer's aim of mimicking the normal anatomy restoring the center of rotation

Two major problems were encountered:
1.the prosthetic head was often malpositioned
2.the head was frequently oversized.

Modular & Adaptable 3rd generation prosthesis in 1990

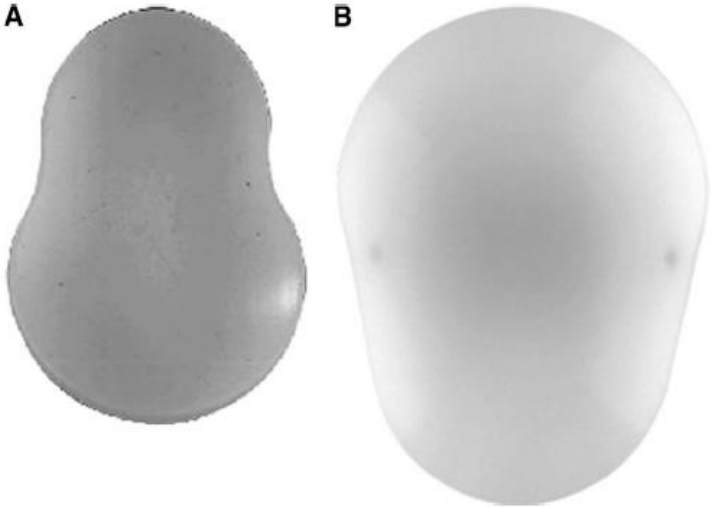
Modularity = different sizes
Adaptability = restoration of the COR

anatomical unconstrained
recreate normal anatomy
variable inclination and offset

The Aequalis prosthesis adopted
these criteria and became the first
third-generation shoulder replacement
Gilles Walch , Pascal Boilleau , Christian Gerber

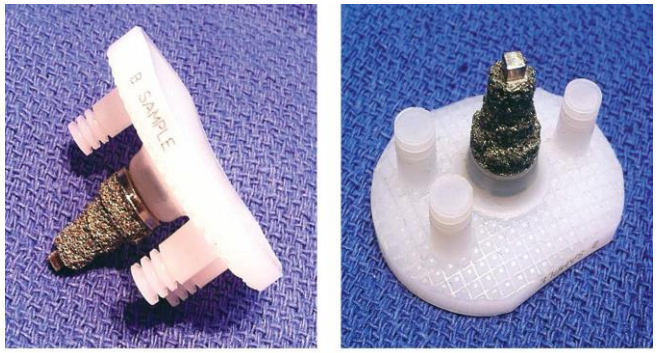
What surface geometry?

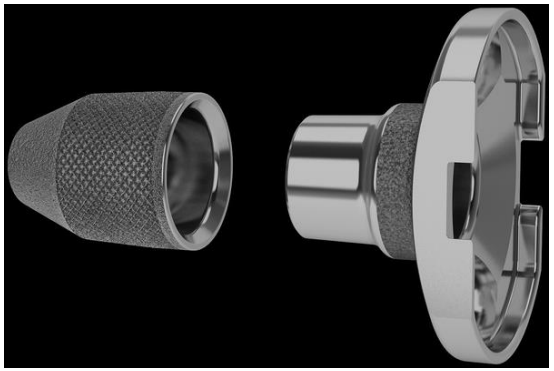
Anatomic versus oval
Flat or Convex back
keeled or pegged designs

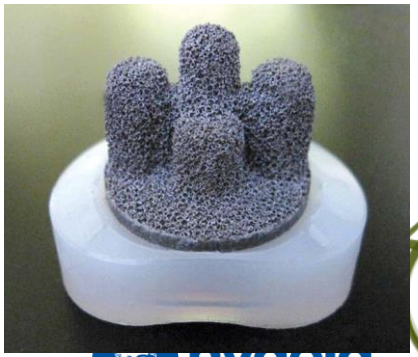


What material?

All-polyethylene
Metalbacked (1984 Neer)
Hydroxyapatite-coated
Plasma-sprayed
Tantalum (Zimmer)
Trabecular Titanium
(Lima)







The Reverse TSA a revolution

- Although very good results were obtained with the Anatomic TSA it required a functioning rotator cuff
- Reverse shoulder arthroplasty became the solution for that problem

1991 Delta III (the first reverse that survived the test of time)

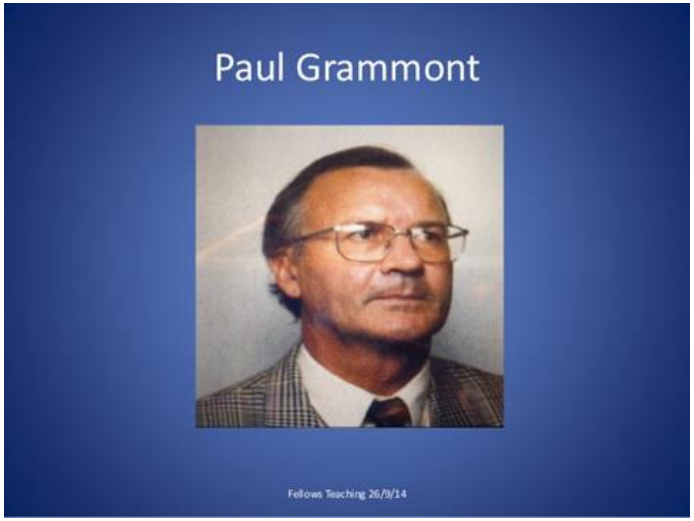
<u>2 innovations</u>
glenoid large ball
humerus inclination of 155˚(non anatomic)

1. Half of sphere
2. Polyethylene cup
3. Modular
4. Baseplate fixed with two diverging polar screws & two equatorial screws
   In 1995 glenoid fixed with a porus coating central peg

COR AT THE LEVEL OF THE GLENOID MEDIALIZATION &DISTALIZATION OF THE CENTER OF ROTATION

in order to restore deltoid function

A paradigm shift



Instead of trying to restore the anatomy

To change the natural anatomy in order to have better functional results

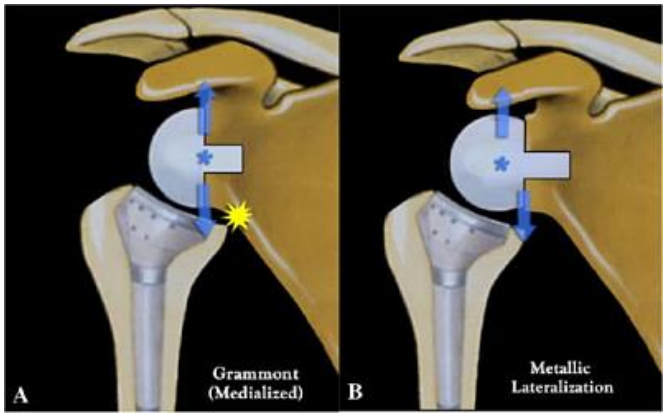
Instead of mimicking Nature

Improve Nature

LATERALIZATION OF THE GLENOSPHERE

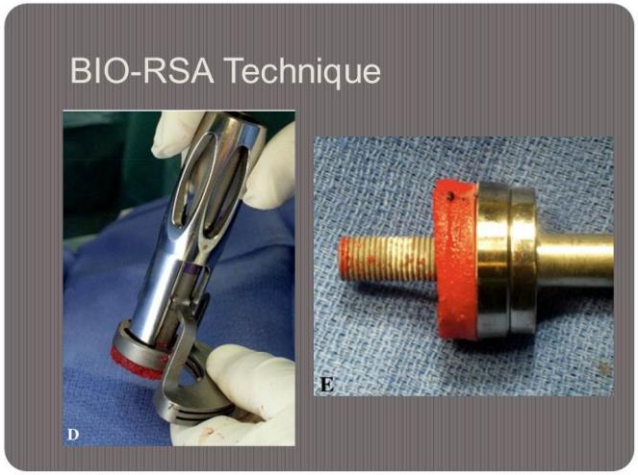
1.Metallic offset lateralization

2/3 of a sphere (DJO) &
glenosphere over the baseplate



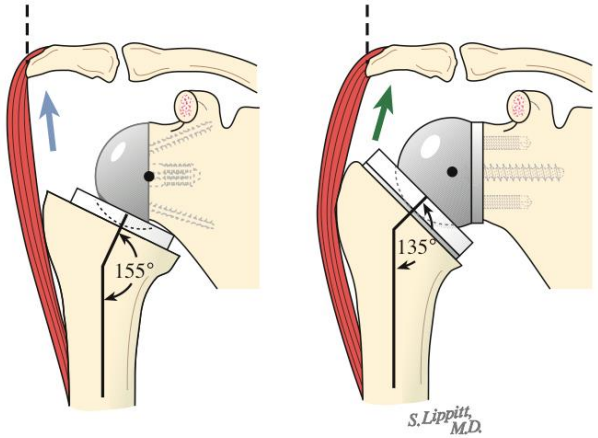
2.Bony increased offset

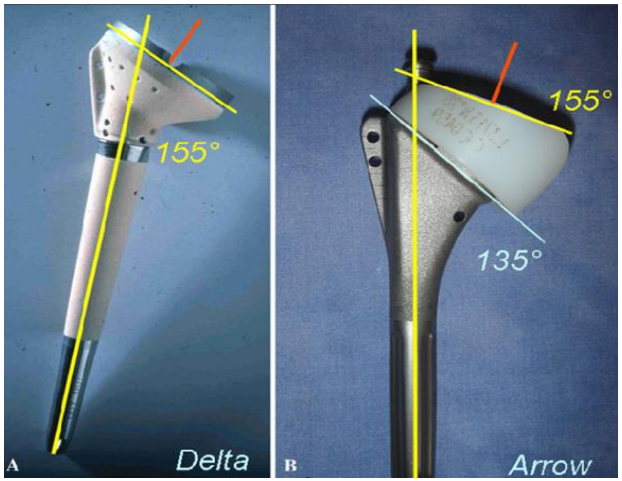
BIO RSA (P.Boileau)



LATERALIZATION IN HUMERUS

Humeral cut 155˚ vs 135˚
PE inlay distalization
PE onlay lateralization & distalization





The Swedish Registry from 1999

Survival curves

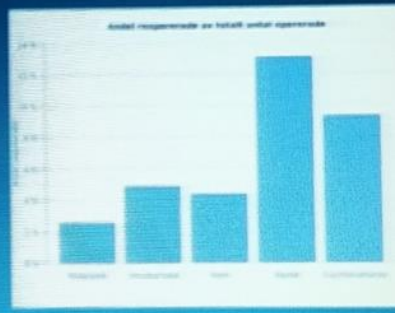
Revision rate TSA
107/4232= 2,5%

Revision RSA
59/1216= 4,8%

Over 90% survival at 15 years for both concepts

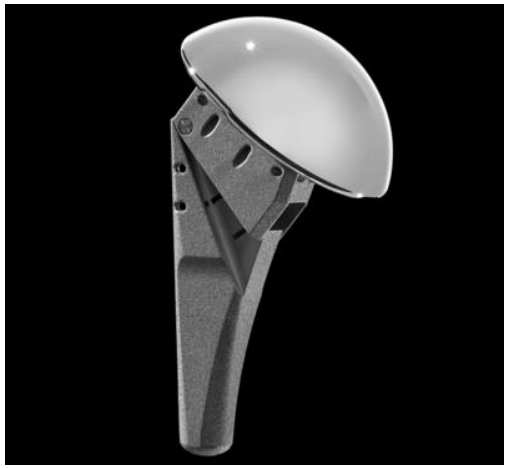
Revision

- Resurfacing revision rate >9%
- RSA 4,8%
- TSA 2,5%



Short stem & Stemless Humeral

Bone preserving
Avoidance of stress risers
Recreated the anatomy
Hydroxyapatite (HA) coating
A need of good metaphyseal bone stock



CONVERTIBILITY

Revise hemi & total-shoulder arthroplasties to a reverse shoulder

Anatomical Shoulder
Inverse/Reverse System, Zimmer

The Aequalis Ascend Flex
convertible shoulder system

Zimmer Trabecular Tantalum

- Exceptional initial fixation
- High coefficient of friction
  between Trabecular Metal Material
  & cancellous bone
- Enables vascularization
- Maximizes bone and soft-tissue ingrowth
- More normal bone remodeling

Lima Trabecular Titanium
an effort to increase fixation strength to the sceleton

a **biomaterial** that
imitates trabecular bone morphology
light weight
corrosion resistance
excellent biocompatibility
high mechanical performance

High open porosity & adequate pore size
enhance cell migration
vascularization
transport of oxygen & nutrients
ions & bone inducing factors
osteoconduction & **osteoinduction**

higher bone neo-formation

Arthroscopy
www.shoulder.gr

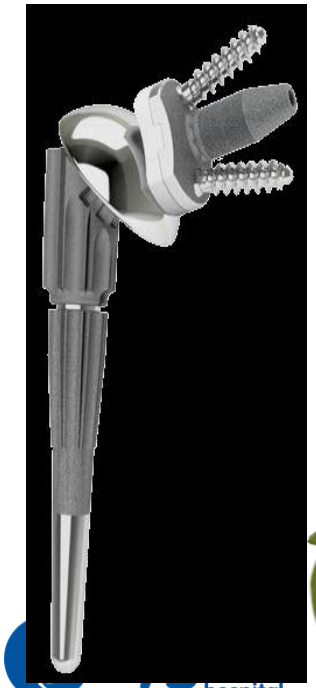
hygeia hospital

Electron Beam Melting technology

creation of any three-dimensional design
either dense or porous parts
produce **exclusive implants**
reconstruct 3D patient anatomy
through 3D printing
(CT scans and MRI data)

PROMADE

focused on implants designed
specifically for the sole use
of particular patient.



SMR AXIOMA TT
METAL BACK

It is a long road traveled

- Today we can succed results of a magnitude unimaginable 20 gears ago

Anatomic TSA 9 months post -op

Reverse shoulder arthroplasty 9 months post-op

And the evolution continues as ingenious surgeons strive to lessen human suffering and improve the quality of life of our patients

The main issue being the longevity of the results


Thank you for your attention and the opportunity you gave to me to share a short glimpse to the magic of shoulder surgery