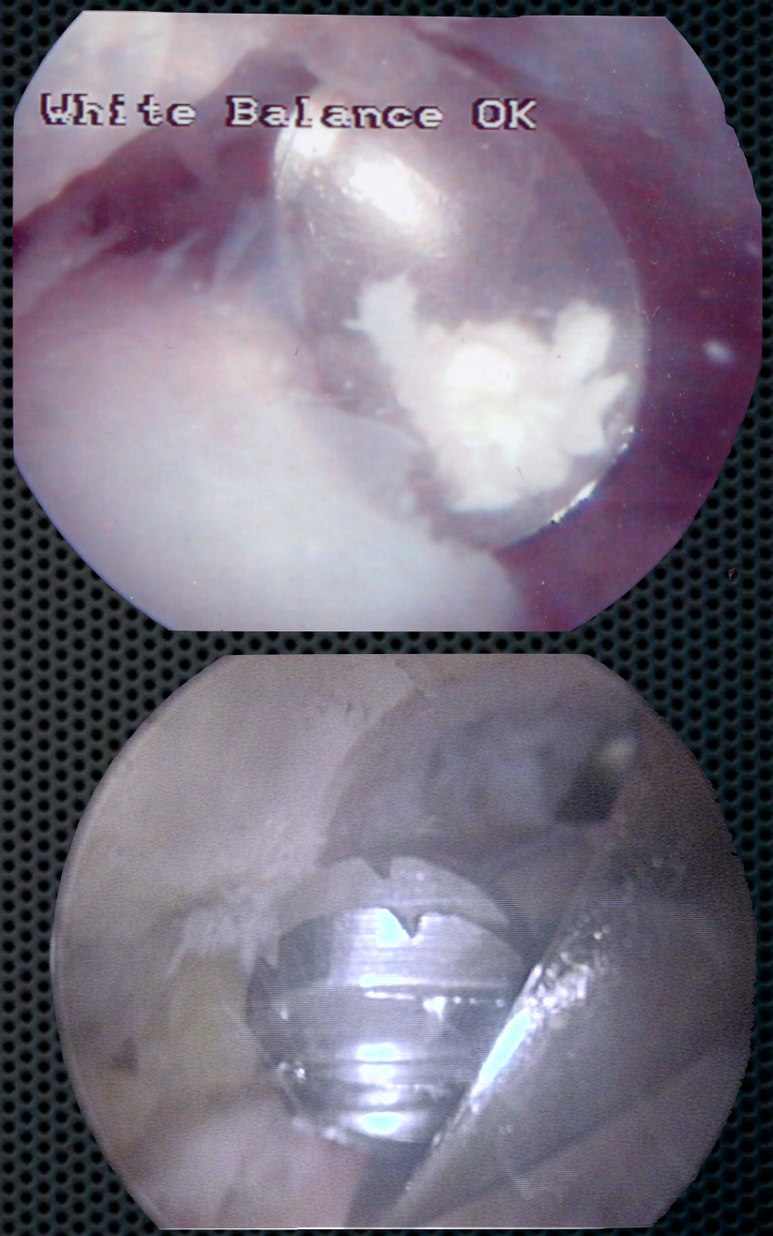
Acromioplasty & Calcifications

IRCAD theoretical session



Christian Dumontier, MD, PhD

Institut de la Main & hôpital saint Antoine, Paris

Dear colleagues
The topic I have to present is entitled: acromioplasty and calcifications

Two different topics

- Acromioplasty = subacromial bursa débridement + AC ligament resection + anterior acromion resection
  - Neer 1972 (open), Ellman 1983 (arthroscopic)
- Calcification = Excision of intratendinous calcification

One common feature: It is done with a scope placed in the subacromial space

There are in fact two different topics in one title. Acromioplasty is a common term which includes subacromial bursa débridement, AC ligament resection and resection of the antero-inferior edge of the acromion. It was first standardized by Neer and performed arthroscopically by Ellman in the early 80's.
Calcification refers to the treatment of calcification of the rotator cuff tendons. The only common feature to these two topics is that both are performed in the subacromial space.

The plan

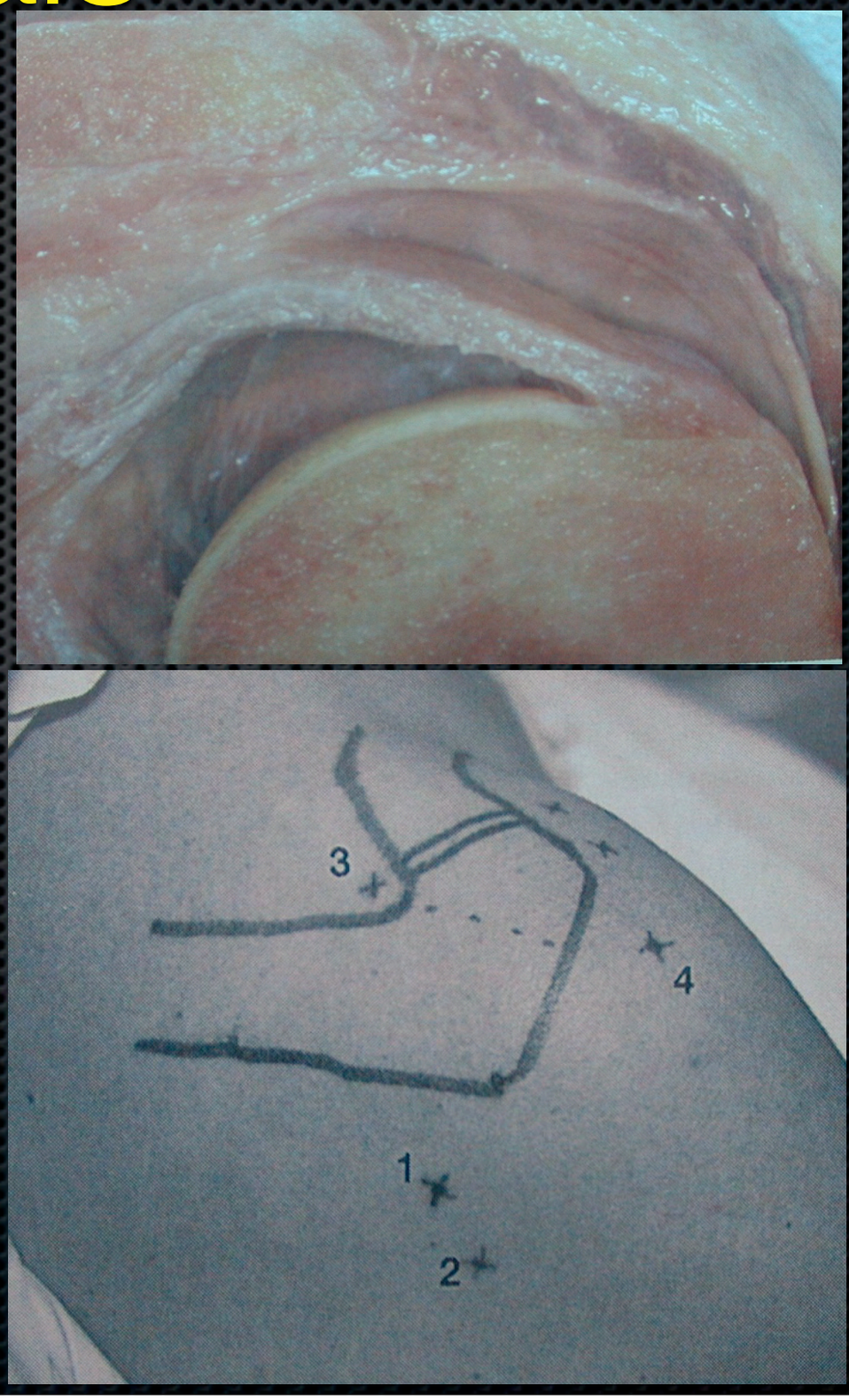
- Portals of the subacromial space
- Arthroscopic anatomy of the subacromial space
- Subacromial débridement (technique and tips)
- “Acromioplasty”: why and how ?
- Calcium removal (technique, tips, indications)

In this topic we will follow this plan.
1- describe the arthroscopic portals you can use
2- describe the normal anatomy of the subacromial space
3- describe the technique of subacromial débridement
4- then discuss when and how an “acromioplasty” should be done
5 - and finally describe the technique for calcification removal

1

Subacromial portals

- Posterior portal
  - Postero-lateral portal
- Lateral portal
  - For acromioplasty
  - For rotator cuff suture
- Anterior portal
  - Drainage (cuff suture)

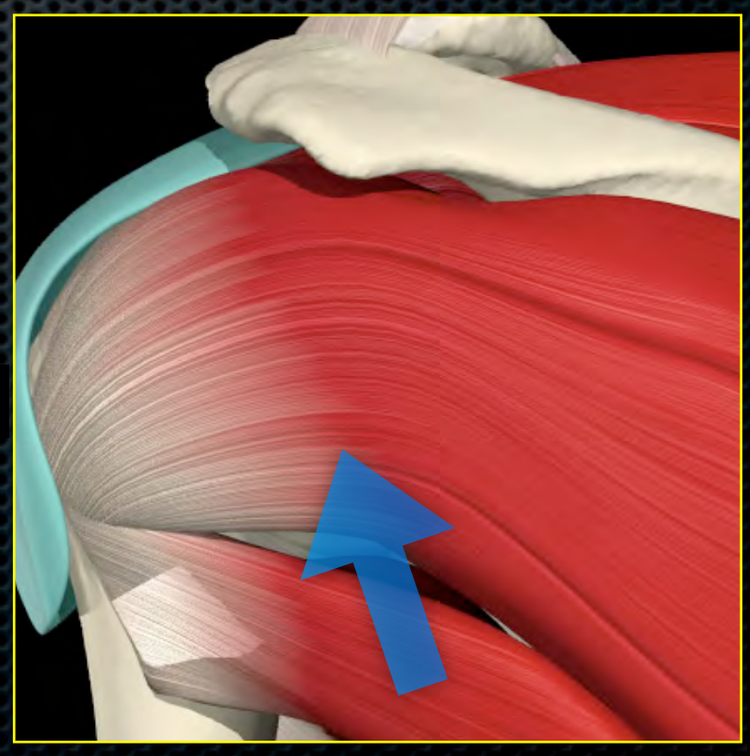


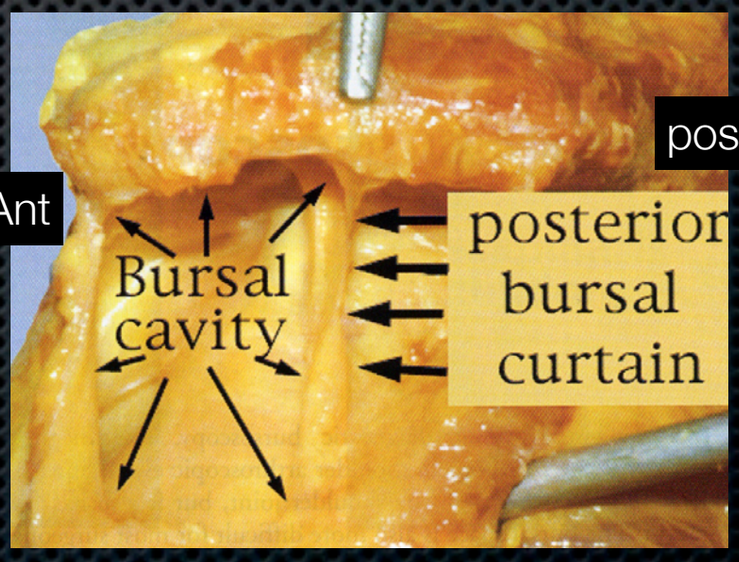
Three main portals are used for subacromial arthroscopy.
One is posterior or postero-lateral
one is lateral
and one, optional, is anterior

1

Posterior portal

- Identical to the intra-articular posterior portal
- Feel the posterior border of the acromion
- Enter the subacromial bursa which is very anterior - Palpate the tip of the canula with your finger



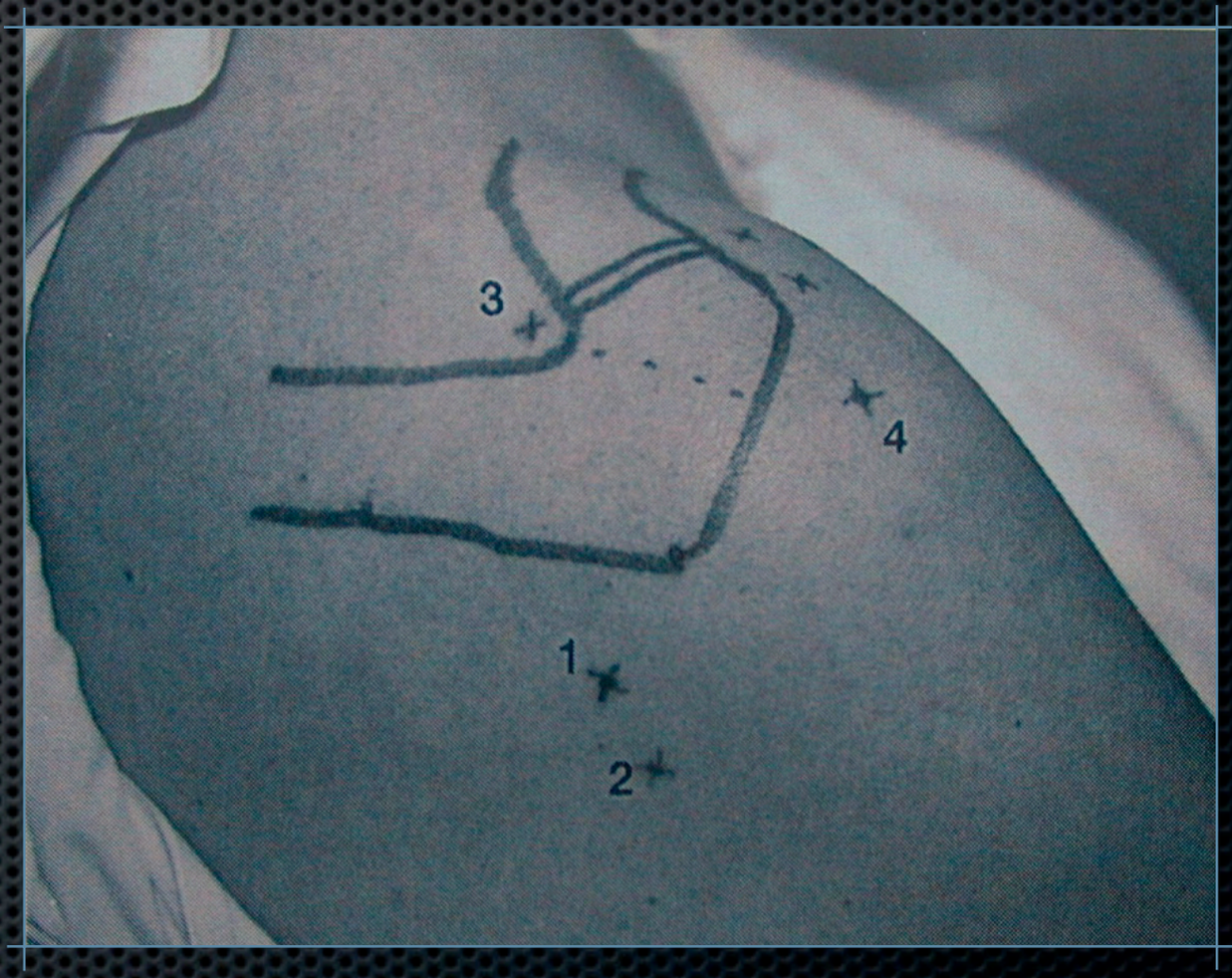


The mostly used posterior portal is the same portal as used for intra-articular arthroscopy. With the sheath you enter the skin and palpate the posterior border of the acromion and then you go directly up to the anterior border, through the bursa

1

Lateral portal

- Mostly instrumental portal
- 2-3 cm distal to the lateral border of the acromion



The lateral portal is mostly used for the instruments. It is located about 2-3 cm from the lateral border of the acromion

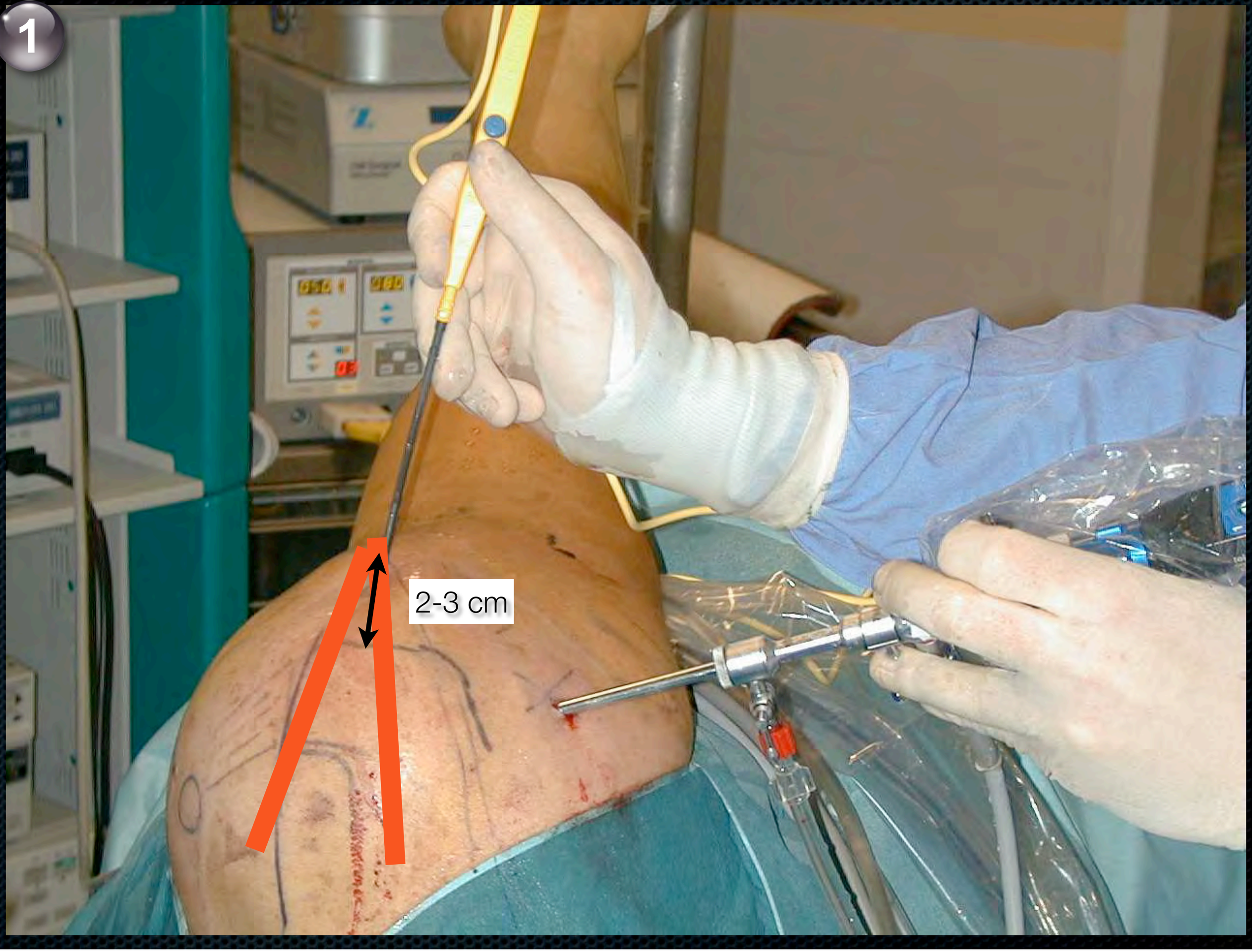
1

Lateral portal

- Tangent to the anterior border of the acromion (take care if entesophytes)
- On the bisecting line between the clavicle and the spine of the scapula

The incision is either drawn tangent to the anterior edge of the acromion but you must take care of any bony spur that may make you do a mis-drawing, or it is drawn on the bisecting line between the clavicle and the spine of the scapula.

1

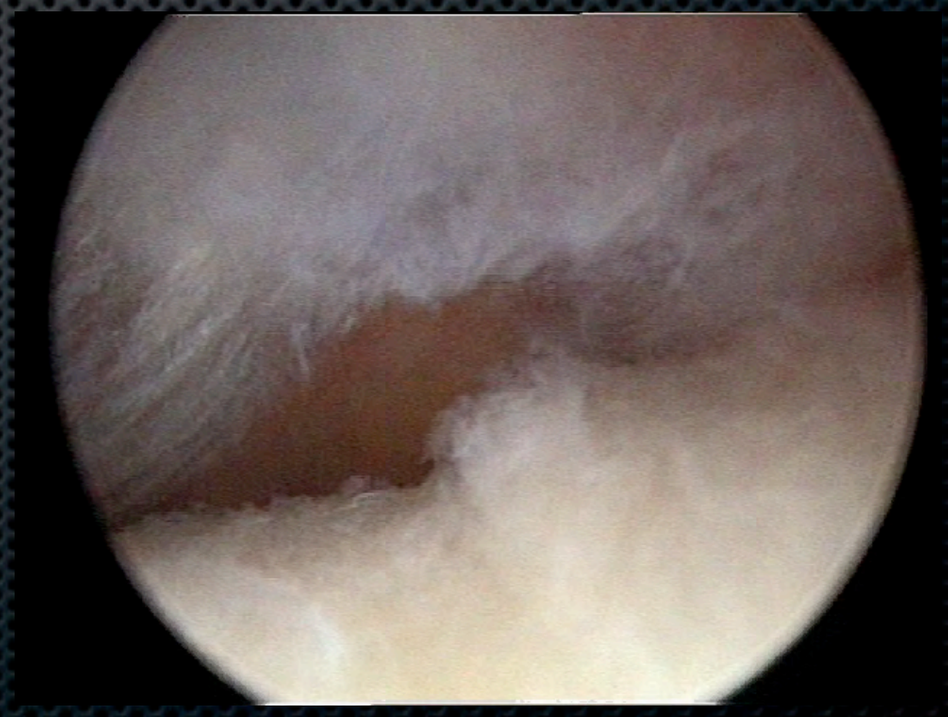


as shown here

1

Lateral portal

- Must be direct, perpendicular to the deltoid (a needle is useful)

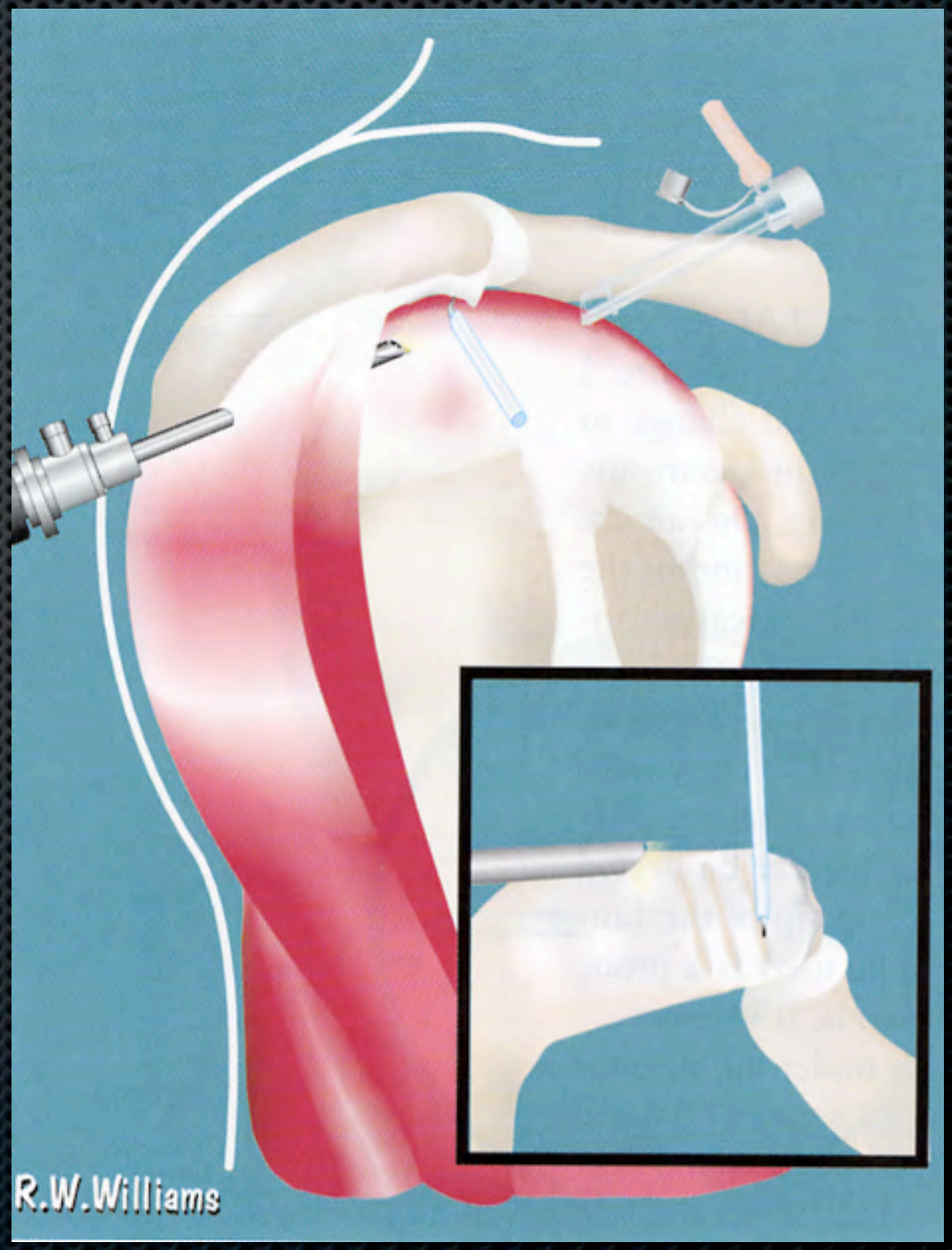


It must be direct, perpendicular to the deltoid muscle fibers and it is useful to use a needle to better control your direction.

1

Anterior portal

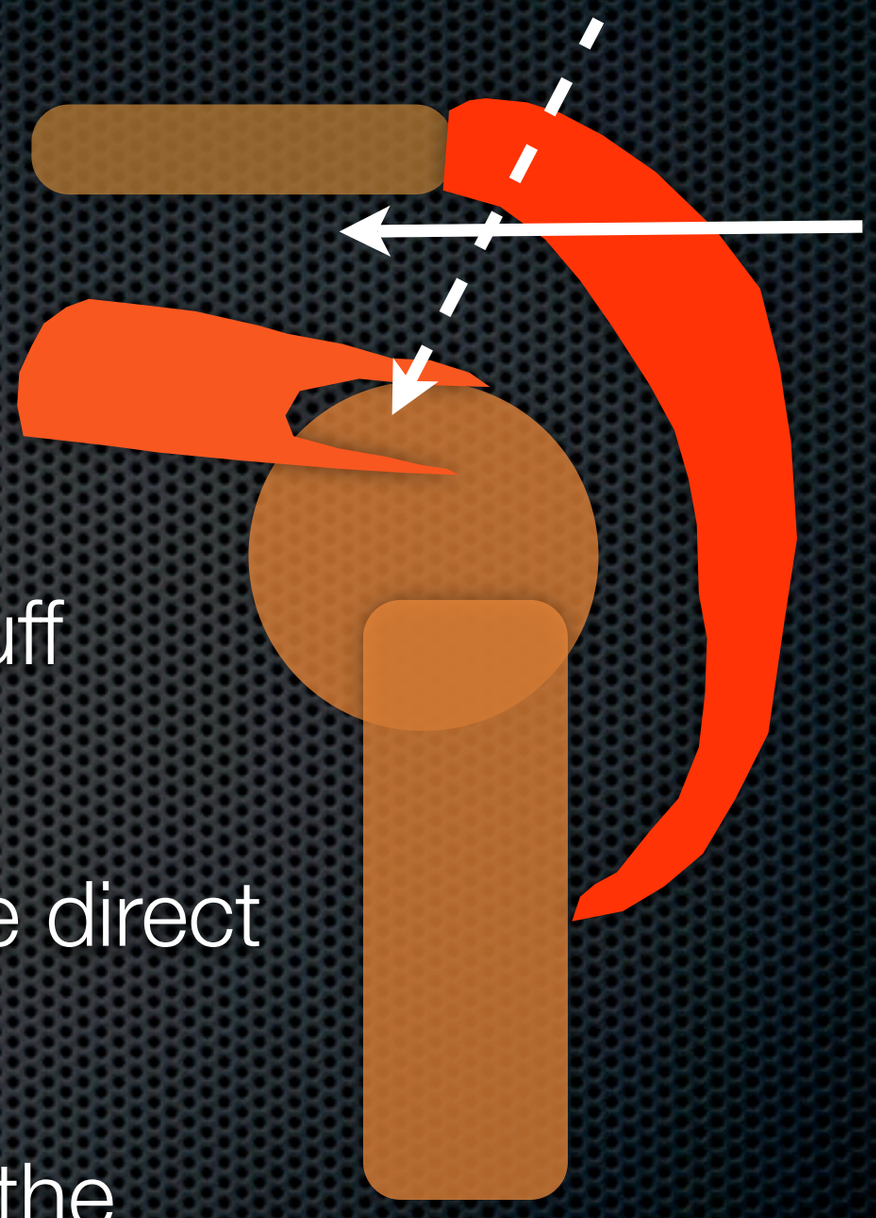
- May be used for drainage
- Very useful for cuff suture
- 1 cm anterior to the acromion



An anterior portal, 1 cm anterior from the anterior edge of the acromion can be used for drainage, but it is mostly used for cuff repair.

1

Other portals



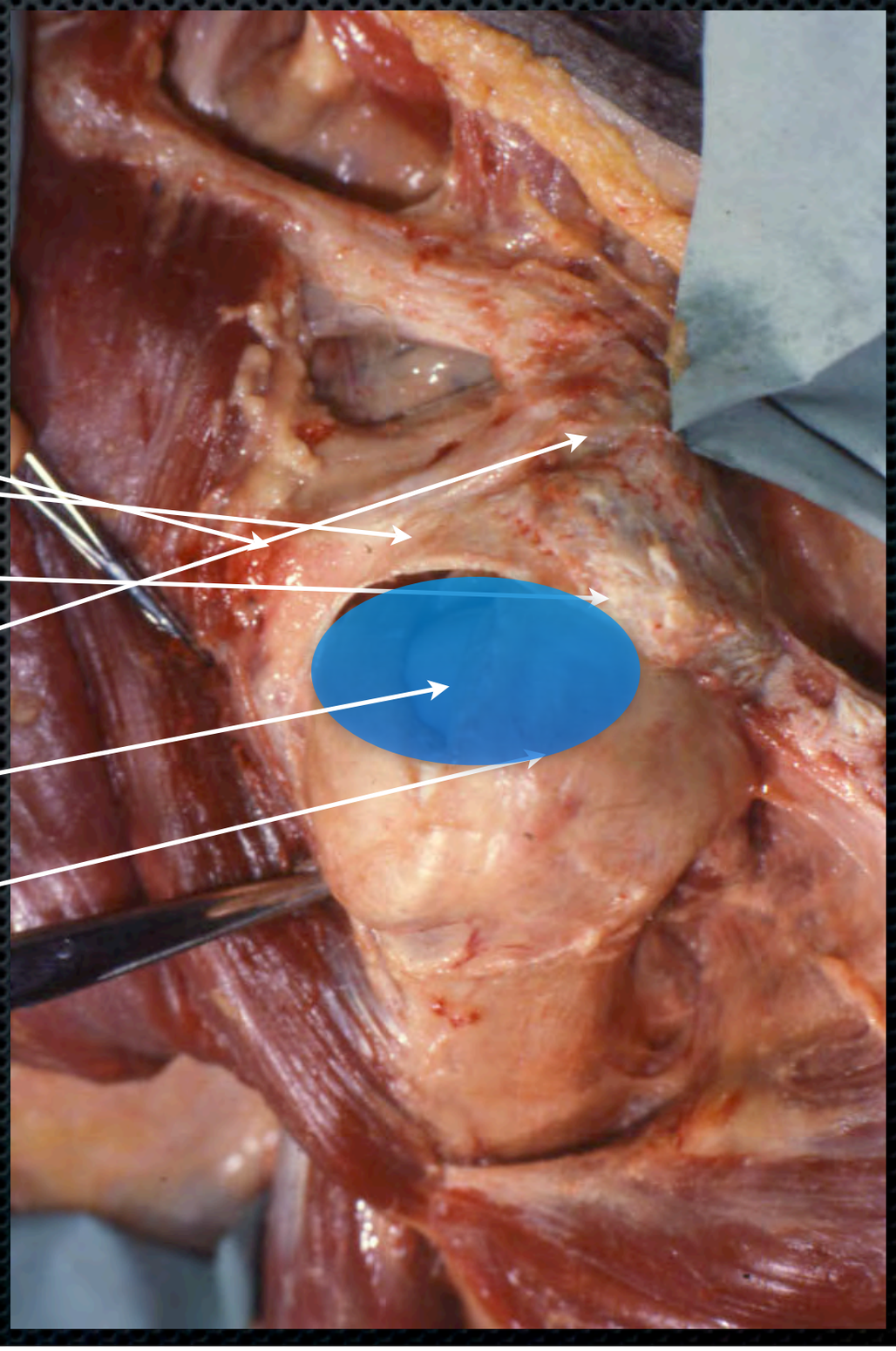
- Posterior portal may be limited for cuff suture
  - Postero-lateral portal offers a more direct view on the rupture
- Lateral portal may be not located on the rupture
  - Use a direct portal onto the rupture (more anterior or posterior) and closer to the acromion

Other portals can also be used. A postero-lateral portal give you a better vision over the cuff and is mostly used for cuff repair. If you plan a cuff suture, the location for débridement may not be over the rupture and is not properly directed for repair.

2

Arthroscopic anatomy

- Coracoid
- AC ligament
- Undersurface of the Acromion
- Acromio-Clavicular joint
- Subacromial bursa
- Rotator cuff

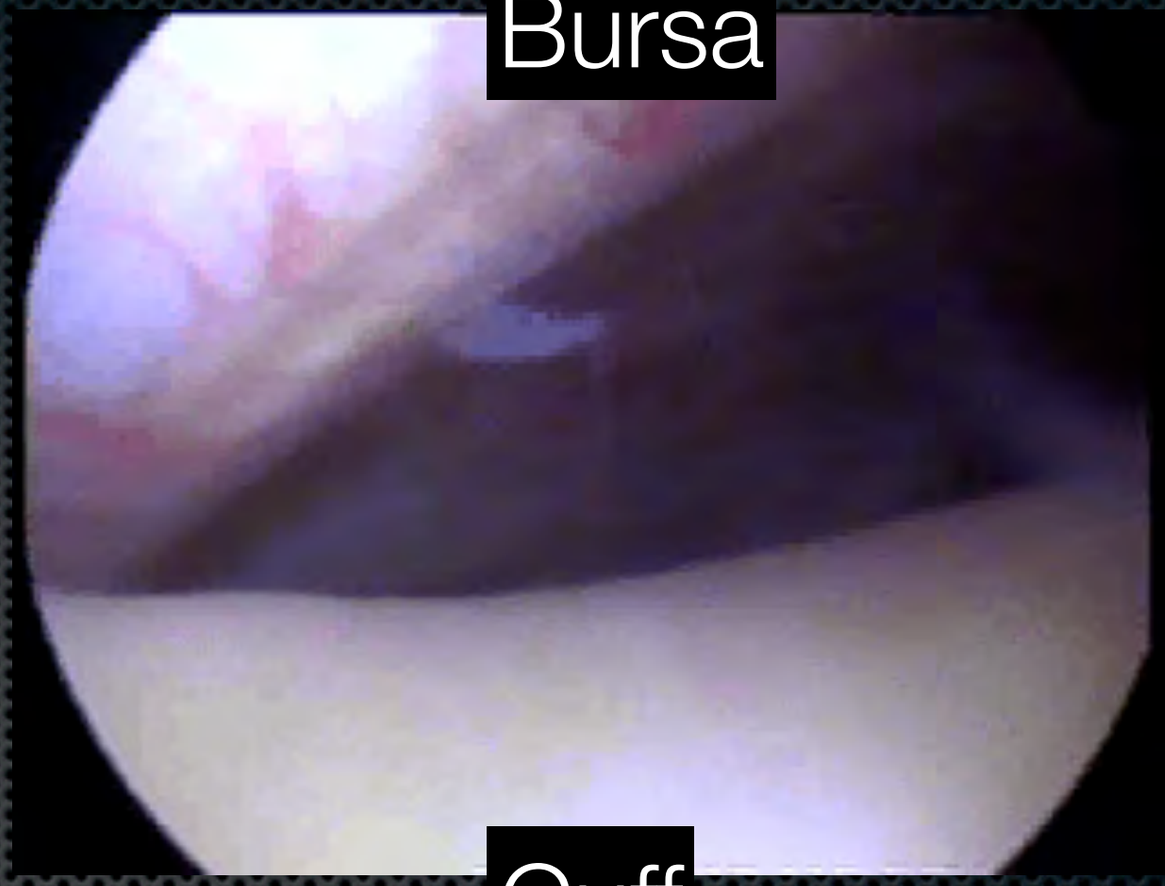


Anatomy is well known to all of you and I won't insist. at the top, from anterior to posterior we will find the coracoid, the AC ligament, the acromion, the AC joint. At the bottom the rotator cuff and between the two the subacromial bursa.

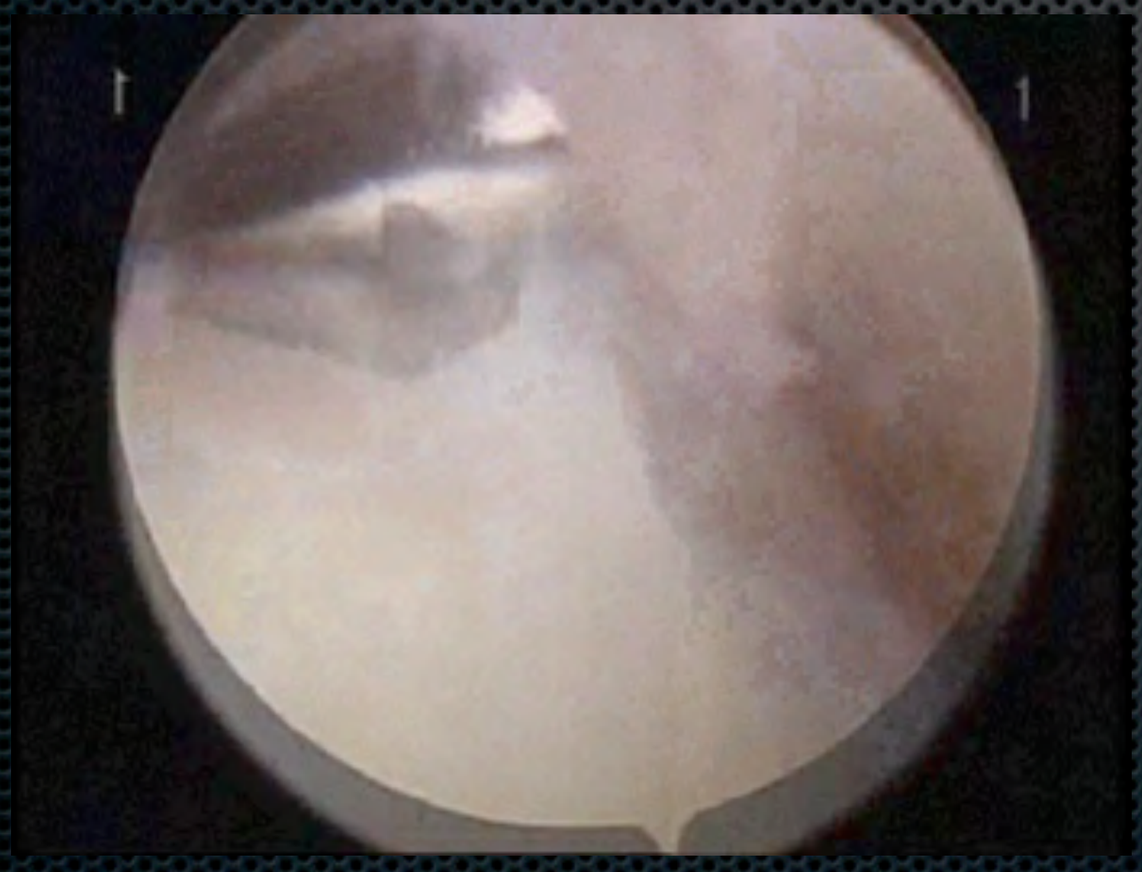
2

AC-joint

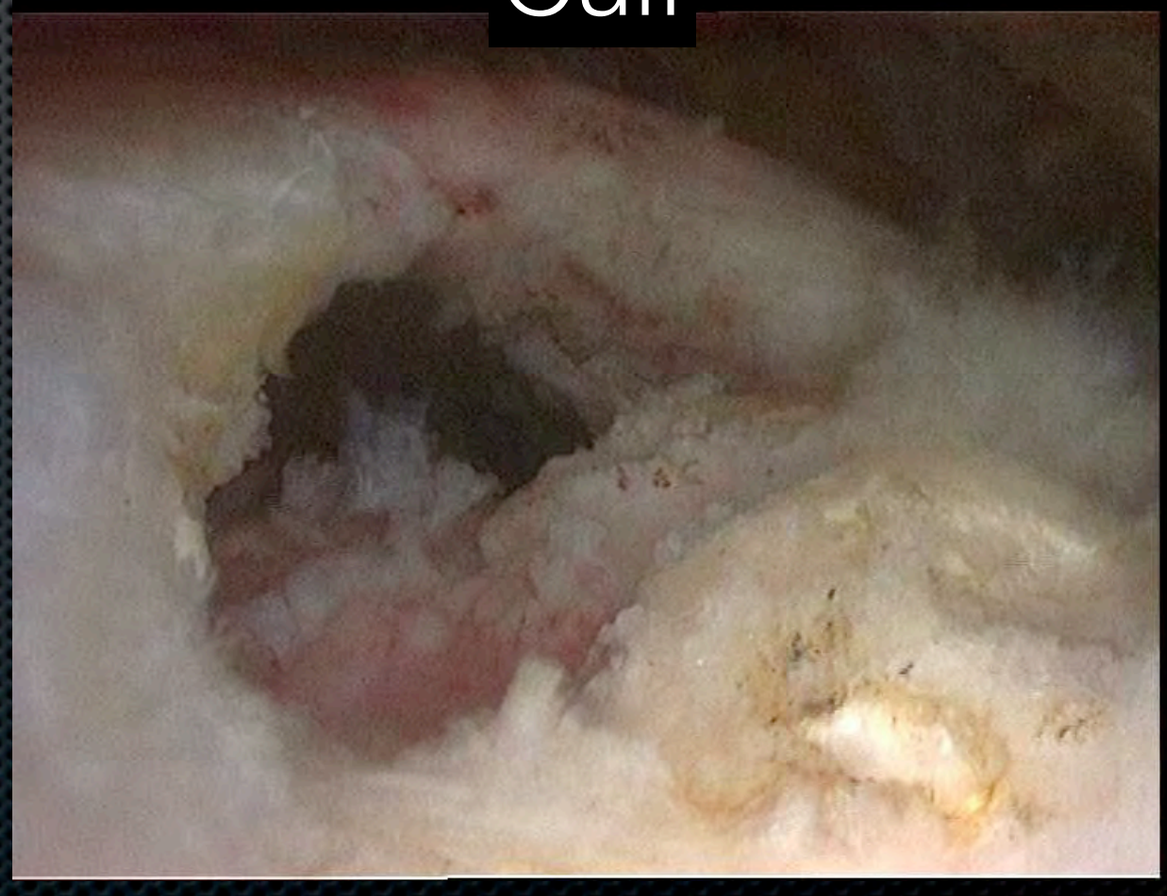
Bursa



posterior wall of bursa



Cuff

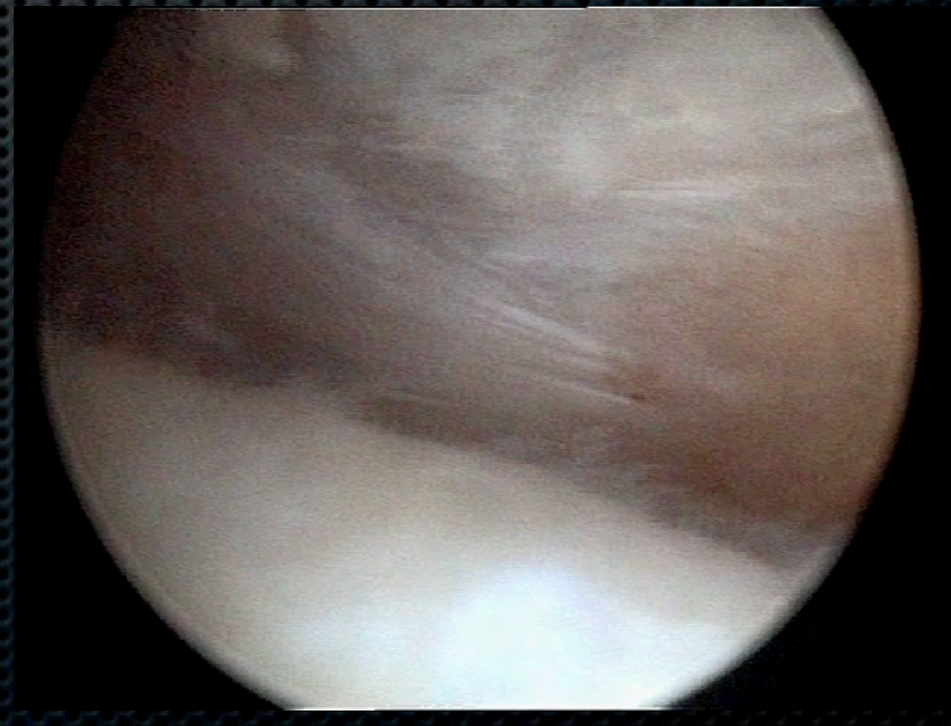


Here are some arthroscopic view of this anatomy

3

Once into the bursa

- Usually you do not see anything !
- How to improve the vision ?
  - Increase distention
  - Limit bleeding
  - Withdraw the scope

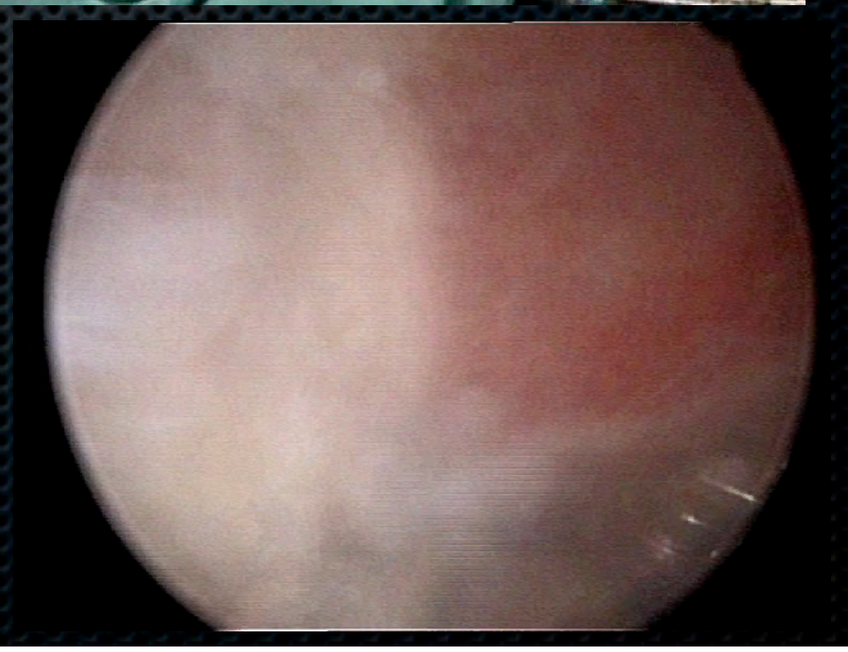


When you perform a subacromial arthroscopy, once you enter the joint you usually have your vision hidden by many fibrous bands. To improve your vision, you must increase the distention, limit the bleeding and try to work with your scope as far as possible from the structures.

3

Improve distention

- Wait 1-2 mn for pressure distention
- Mobilize the scope (↗ bleeding)
- Increase pressure
- Limit fluid leakage (limit suction)

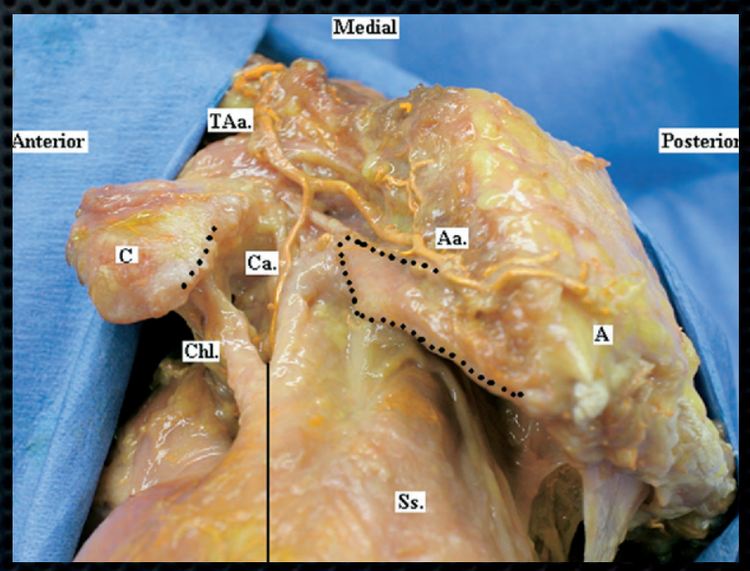


To improve distention, first you must have the patience to wait for the fluid to distend the bursa. You may mobilize the scope but it may increase bleeding. During surgery you will have to control the pressure: increasing the pressure may help to control bleeding but it may end with an athlete's shoulder and it is very difficult to work in a swollen shoulder. It is then better to limit the suction

3

Limit bleeding

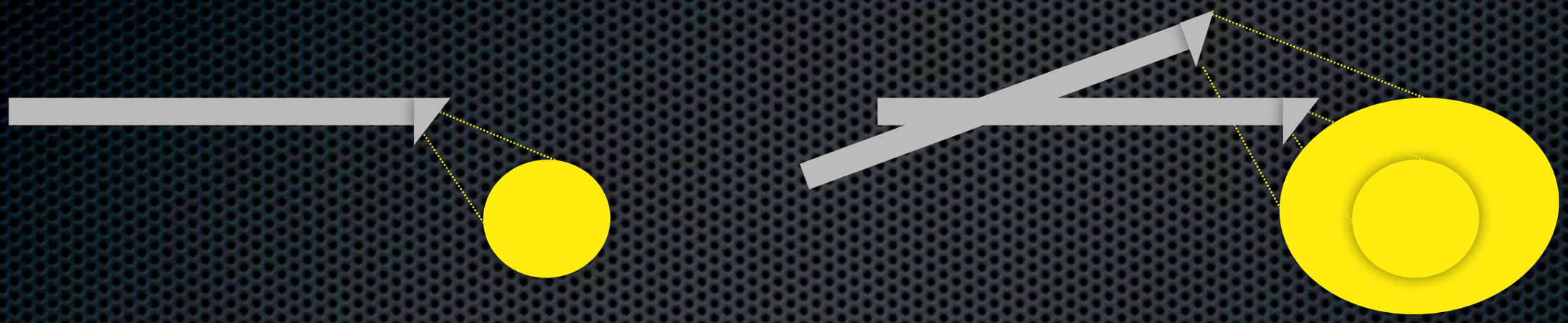
- ↘ Patient blood pressure - 50 mmHg between systolic blood pressure and subacromial pressure-
(Morrison, Arthroscopy 1995; 11: 57-60)
- Use serum with adrenalin
(Jensen, Arthroscopy 2001; 17: 578-581)
- Limit fluid leakage (Bernouilli's effect)
(Burkhart, Arthroscopy 2001; 17: 209-212)
- Hemostasis +++
- Know the vascular anatomy
(Yepes, Arthroscopy 2007; 23: 978-984)



Some tricks may help.
- diminish as much as you can the patient blood's pressure
- use serum with adrenalin as it has been shown to limit bleeding without side-effect of the patient's cardiac function
- Limit fluid leakage will also limit turbulence that hide the vision
- make the hemostatis every time you see a bleeding tissue and know the vascular anatomy of the subacromial space in order to avoid inadvertent wound.

3

Withdraw the scope

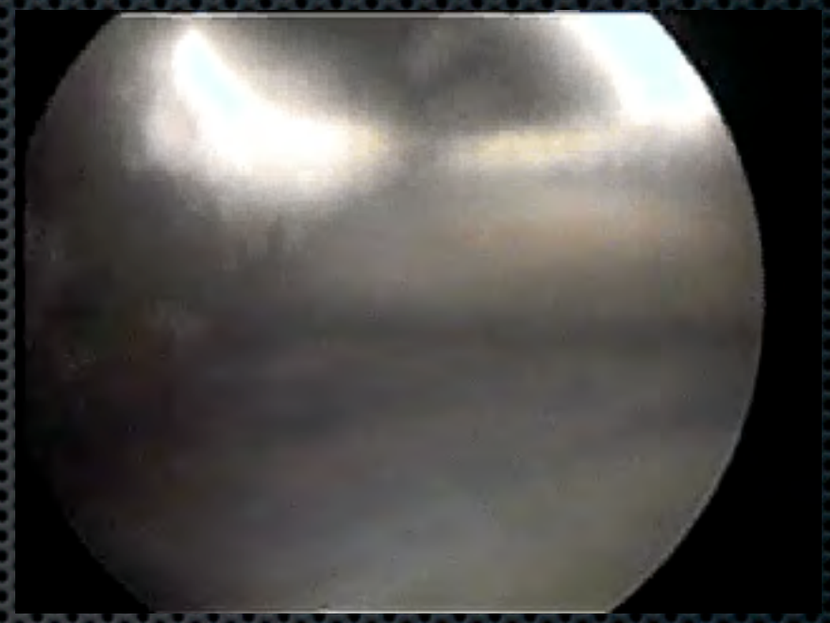


- Withdrawing the scope and moving away the lens from the lesion increase your field-of-vision

And try as much as you can to work far from the structures to increase your field-of-vision

3

Start débridement



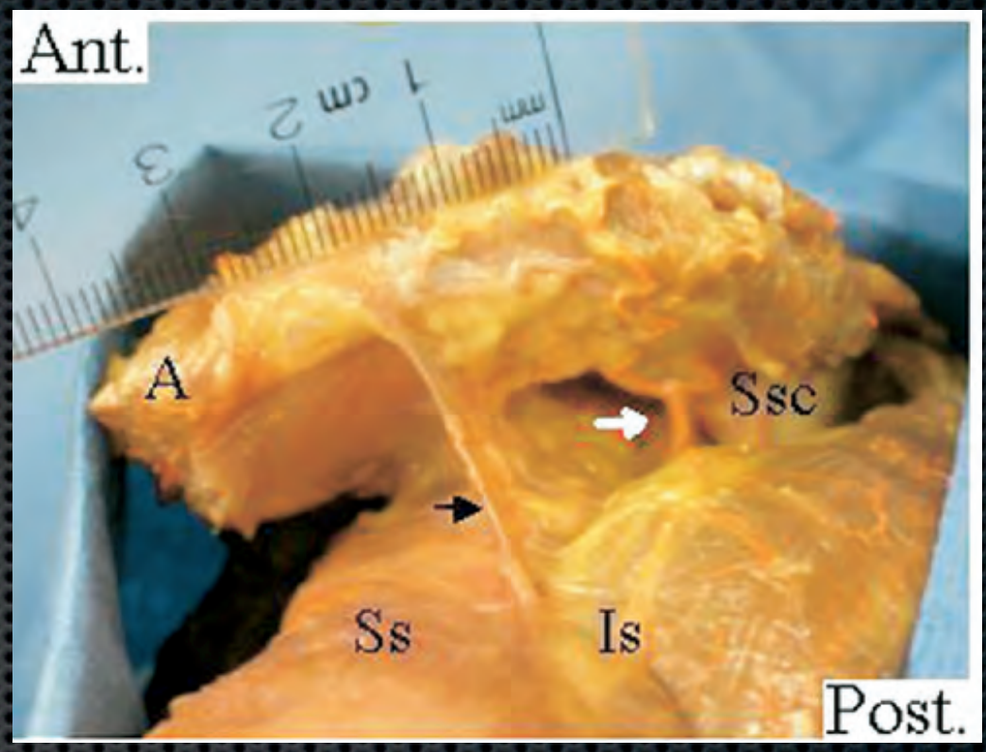
- Removing the pathologic bursa is always difficult and always the most important step
- Start by touching the scope with the shaver/RF cautery
- Work away from the lens to create a working space

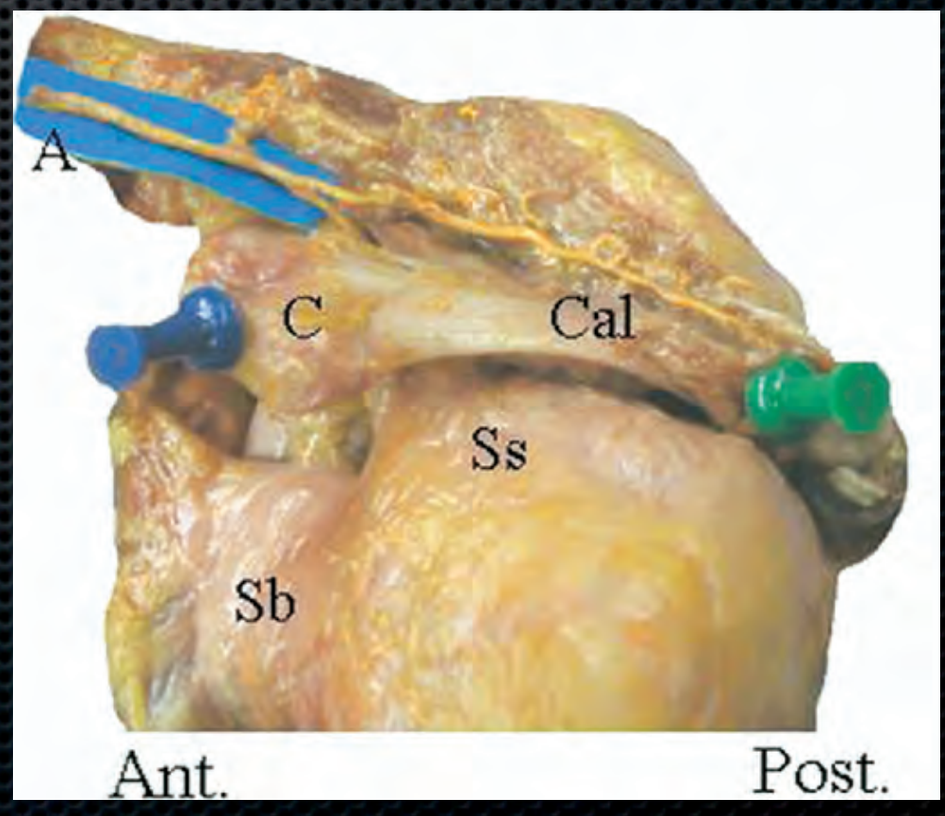
It is always difficult to perform a good débridement. The best way is to enter your scope and not moving it. Then you try to find the lens with your shaver or radio-frequency cautery. Once found, you work by moving away from the lens until you have created your working space.

3

Difficulties

- The posterior wall of the bursa +++
- Tissues medial to the acromion (bleeding++)



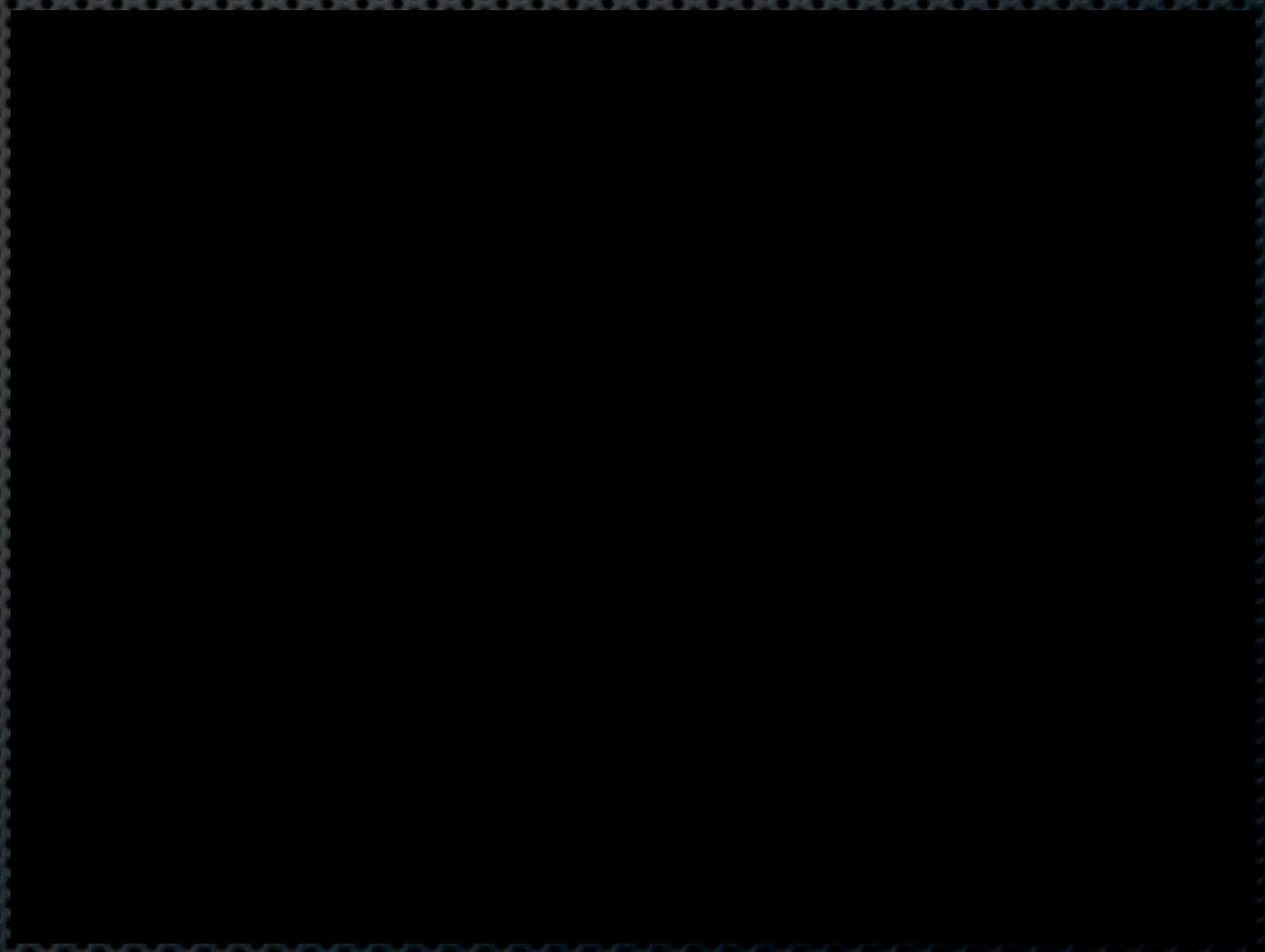


The two main difficulties are the posterior wall of the bursa. Each time you withdraw your scope, the posterior wall comes to hide your vision
And the medial border of the acromion whose tissues contain a lot of vessels.

4

Acromioplasty

- Removal / thinning of the coraco-acromial arch to limit rotator cuff impingement

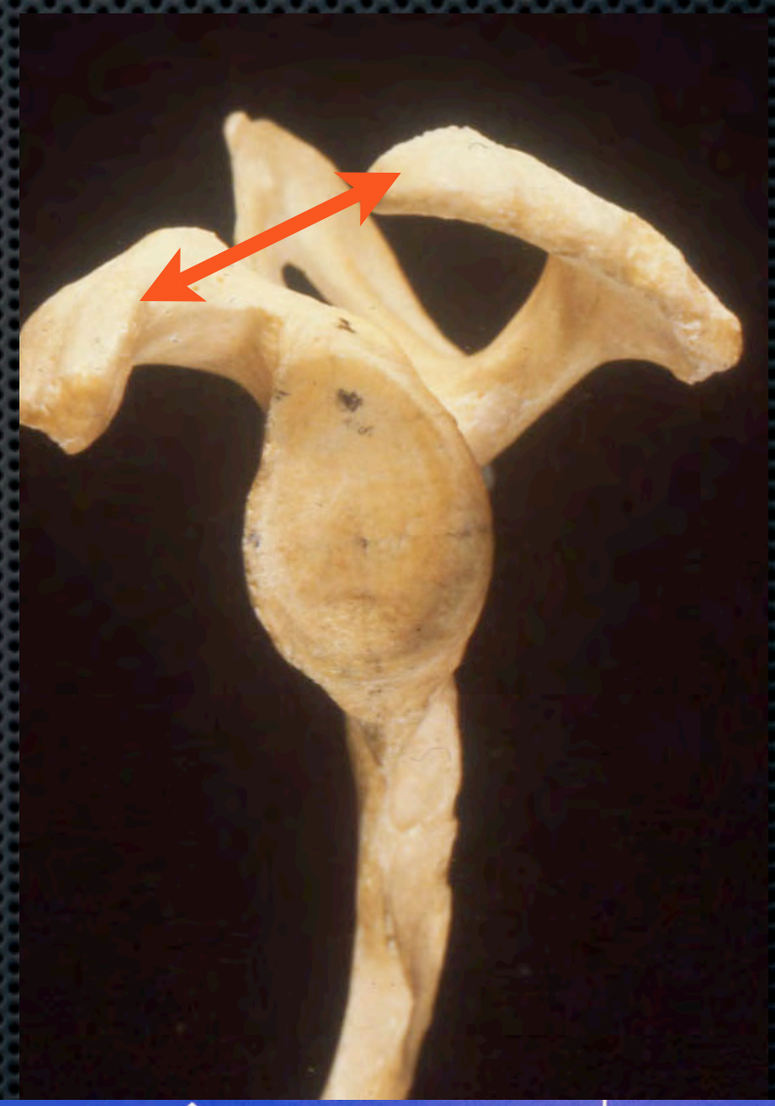


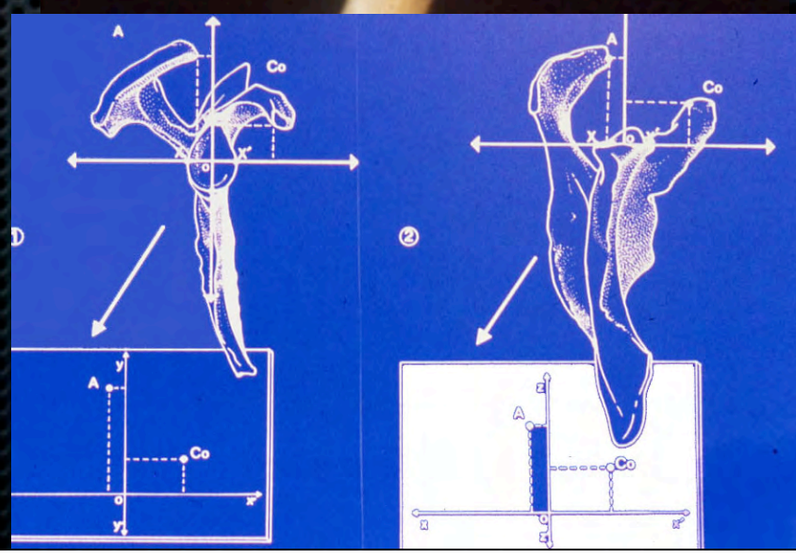
Why do we perform an acromioplasty. In order to remove or in fact to thin the roof of the subacromial space against which the rotator cuff impinge.

4

Treating the roof ?

- The CA ligament is a tensioning structure between coracoid and acromion (Potau, Int J Antropol 2007; 28: 865-880)
- Variation of the shape of the coraco-acromial arch is due to variation in the coracoid shape and position, not to the acromion (Renoux, SRA 1986: 8: 189-195)





However we must remember that our binary vision does not fit with our experimental and anatomical knowledge. The CA ligament is a tensioning structure, and variations in the shape of the coraco-acromial arch are due to variations of the coracoid, not the acromion.

4

Treating the roof ?

- There are no reproducible X-rays to establish whether or not the acromion is “hooked” (Stehle JSE 2007; 16: 135-142)
- Type III acromion is due to aging (Nottage, Arthroscopy 2004; 19: 229-232)

the famous type III acromion as defined by Morrison and Bigliani is difficult to assess and is believed to be due to aging

4

Treating the roof ?

- A hooked acromion does not exist. It is the ossification of the insertion of the CA ligament in response to increased tension (more frequent in apes that use knuckle-walking for locomotion without cuff ruptures)

And basically, a hooked acromion does not really exist. It is the ossification of the CA ligament as a reaction to increased tensioning. It is much more frequent in apes, and apes do not have cuff rupture.

4

Treating the roof ?

- The CA ligament has a biomechanical role and protect the humeral head from upward migration
- Its resection w/wo acromioplasty increases humeral head translation
- CA ligament reconstruction can protect against upward migration (Fagelman, JSE 2007; 16: 101-106)
- CA ligament regenerate after resection and regain function (Levy, JSE 2001; 10: 317-320; Hansen, JSE 2004; 13: 51-56)
- Acromioplasty decreases compression forces by only 5% (Weulker, JSE 1995; 4: 462-467)

The CA ligament has a important mechanical role and protect the humeral head from upward migration. If you remove it, you will increase humeral head translation while if you respect it you may prevent upward migration.
However if you resect it, nature will allow the CA ligament to regenerate and regain its normal function as already demonstrated.

4

Treating the roof ?

- Retrospective:
- Cuff débridement without acromioplasty (Budoff, Arthroscopy 2005; 21: 1081-1089)
- Cuff repair without acromioplasty (Goldberg, CORR 2001; 390: 142-150; McAllister, JBJS 2005; 87: 1278-1283)
- Prospective:
- Cuff repair w/wo decompression (Gartsman, JSE 2004; 13: 424-426; Milano, Arthroscopy 2007; 23: 81-88)
- Amount of bony resection has no influence (Soyer, Arthroscopy 2003; 19:34-39)

There are also clinical evidence with both retrospective and prospective studies showing that acromioplasty does not change the clinical outcome both in débridement and cuff repair.

4

Coraco-acromial ligament

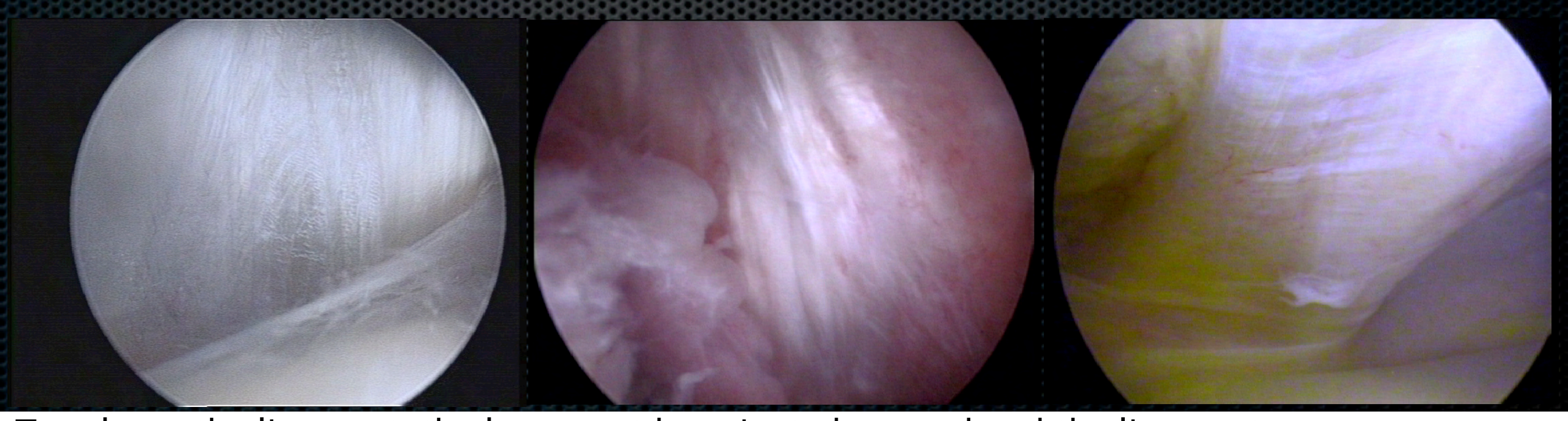
- Detach or resect ?
  - Detach leaving the superior fibers “deltoid-CA sleeve” to maintain its function ?
  - Resect to avoid the ligament to interfere with the instruments during cuff repair
- I usually only detach the ligament or respect it during cuff repair

Once this has been said, how to perform an acromioplasty. Should we resect or only detach the CA ligament. Resection is in fact only useful when you perform a cuff repair as the detached ligament will interpose into your repair and increase the difficulties.

4

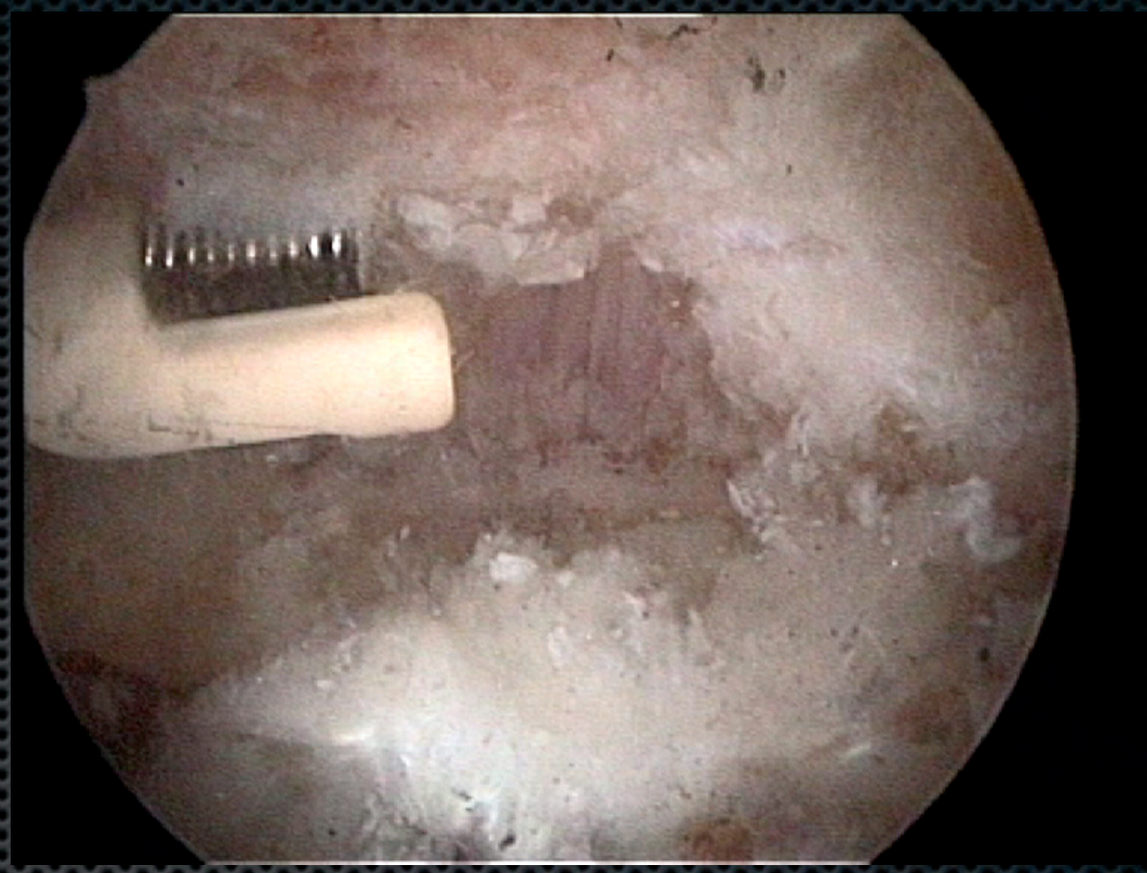
CA ligament

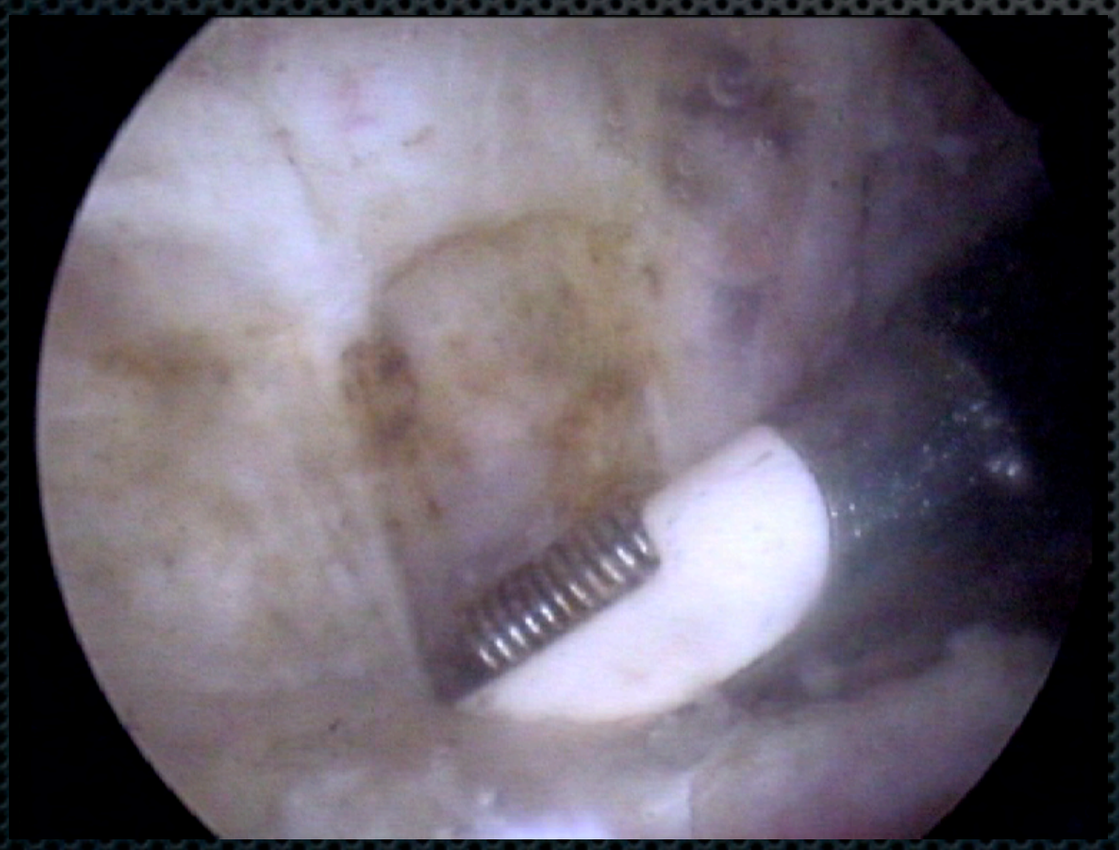
- Lens oriented upward
- White, pearly structure often with disrupted fibers
- ☢ Antero-lateral edge
- Cut from the acromion to the anterior edge not to violate the deltoid fibers

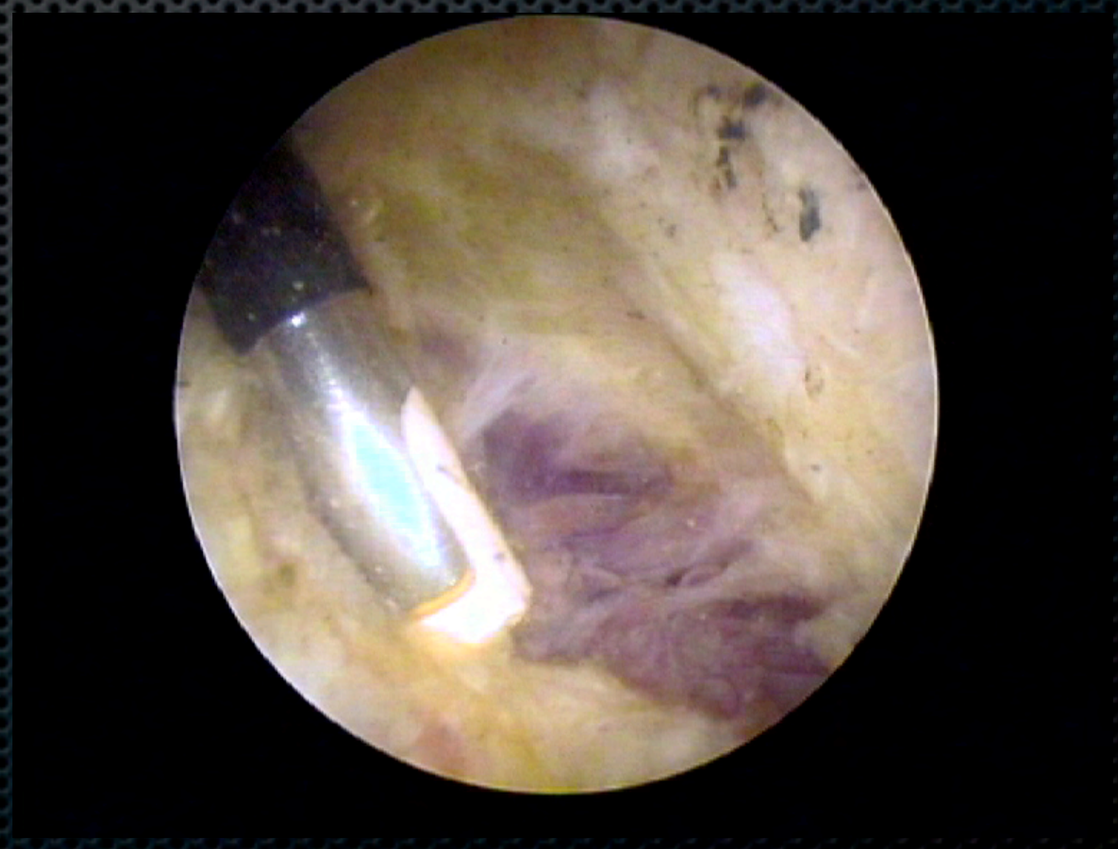


To release the ligament, the lens must be oriented upward and the ligament appears as a white pearly structure. The most difficult is to correctly delineate its antero-lateral border. Once found, the ligament is detached from the anterior acromion.

4

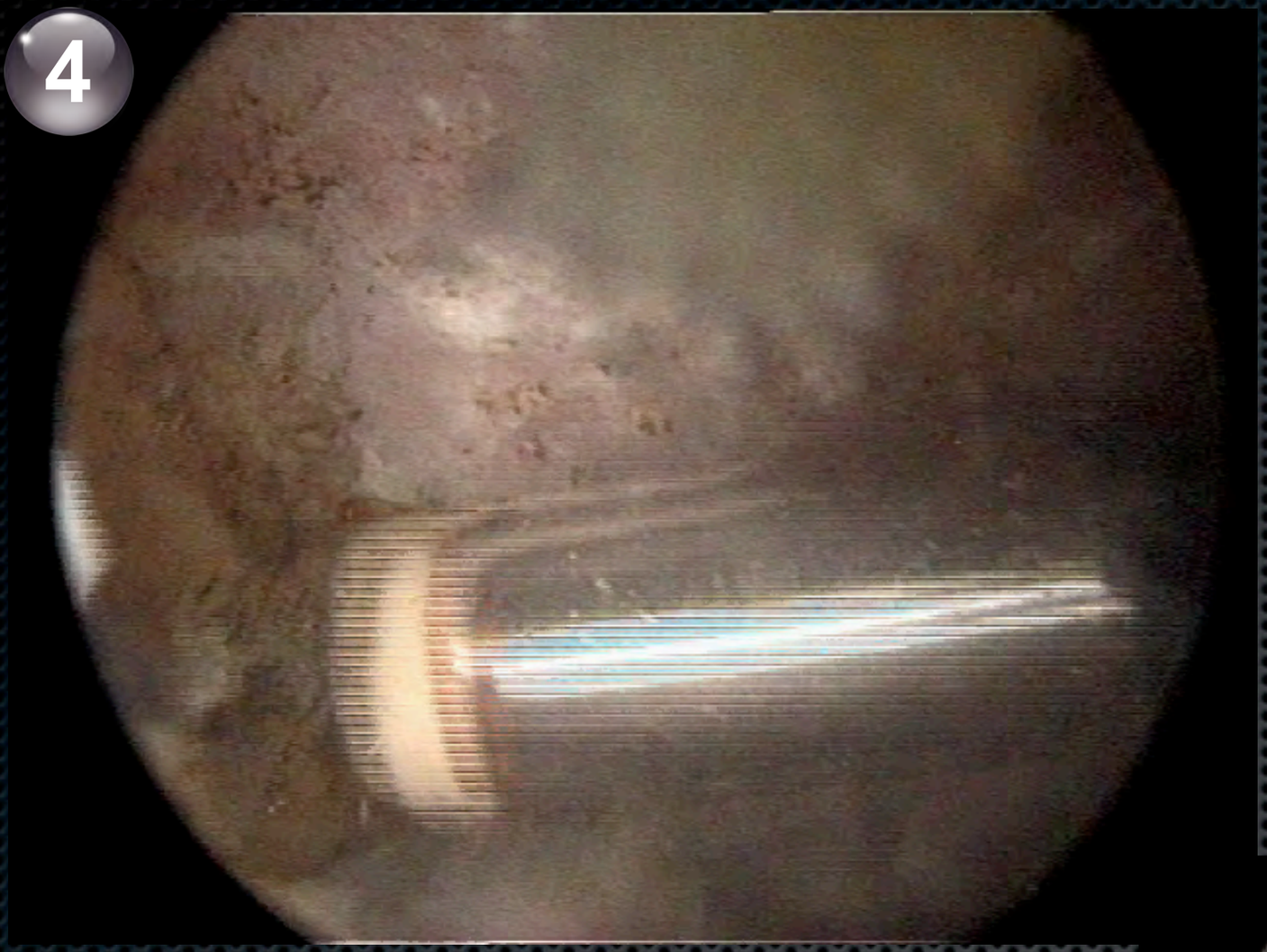


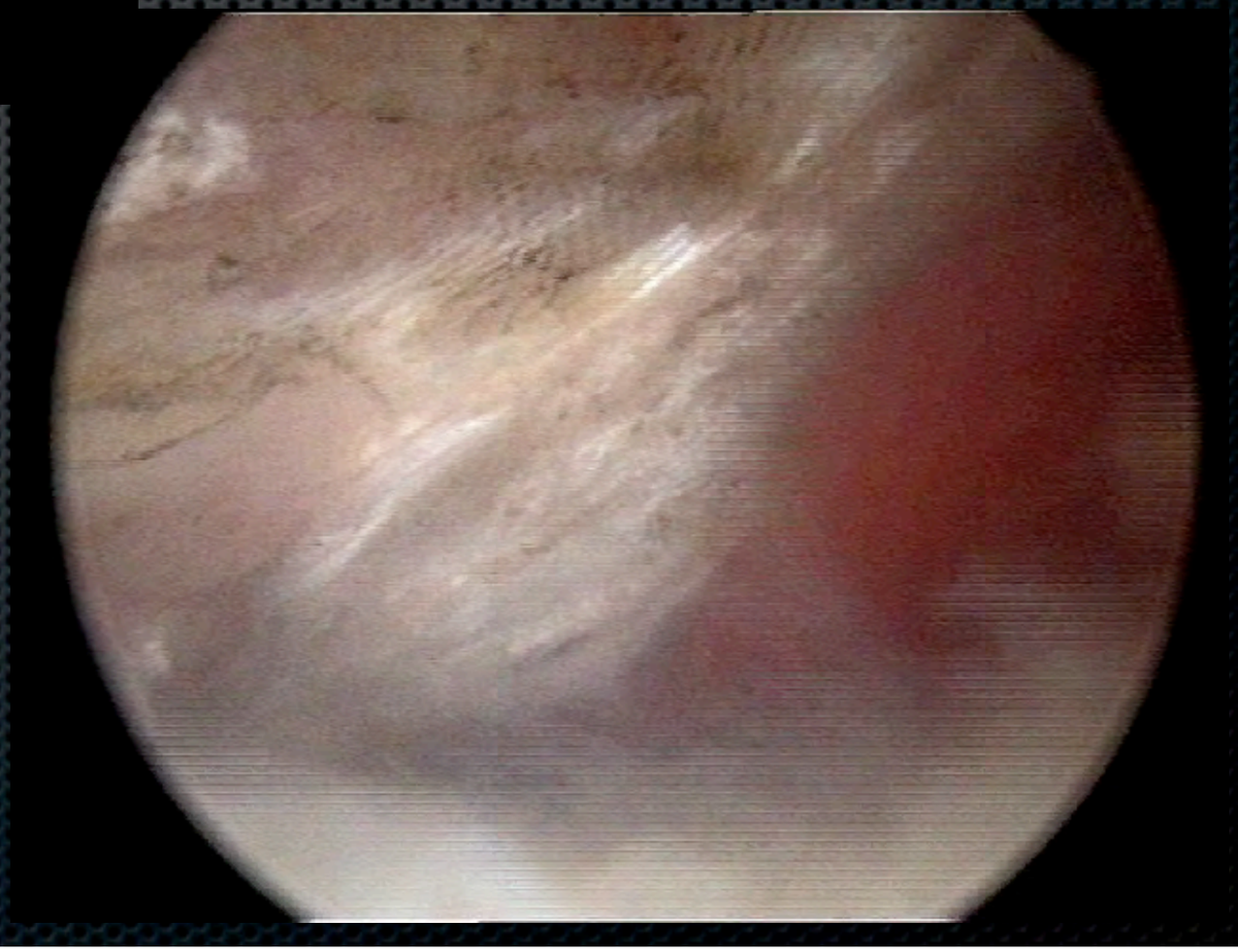




here are some examples with the deltoid fibers visible in the back.

4

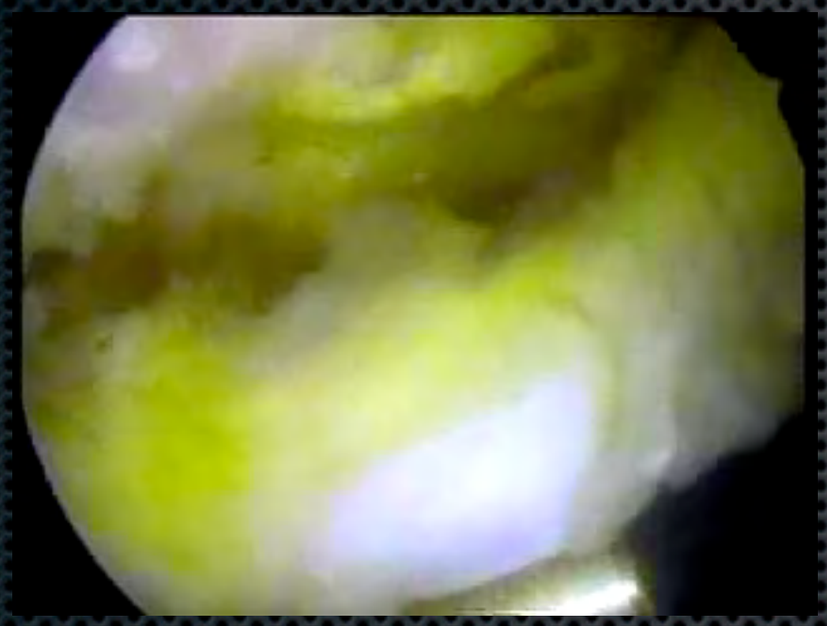


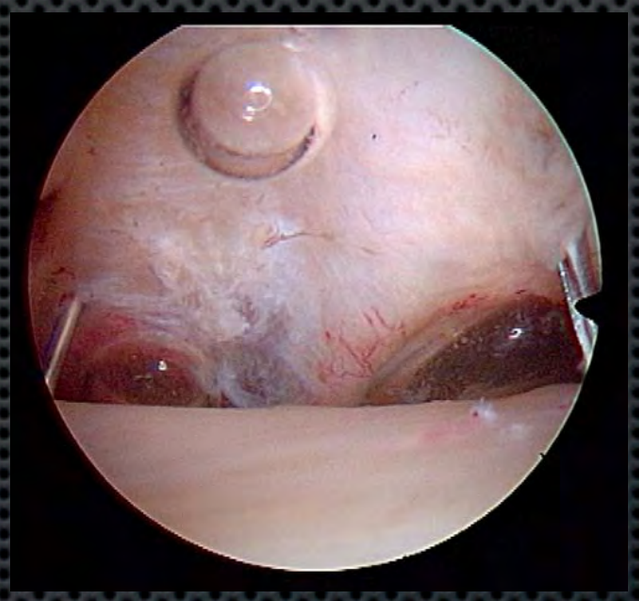


and some video examples

4

- Section from the lateral edge to the acromio-clavicular joint
- Use of needle may help to better delineate the limits of the CA ligament



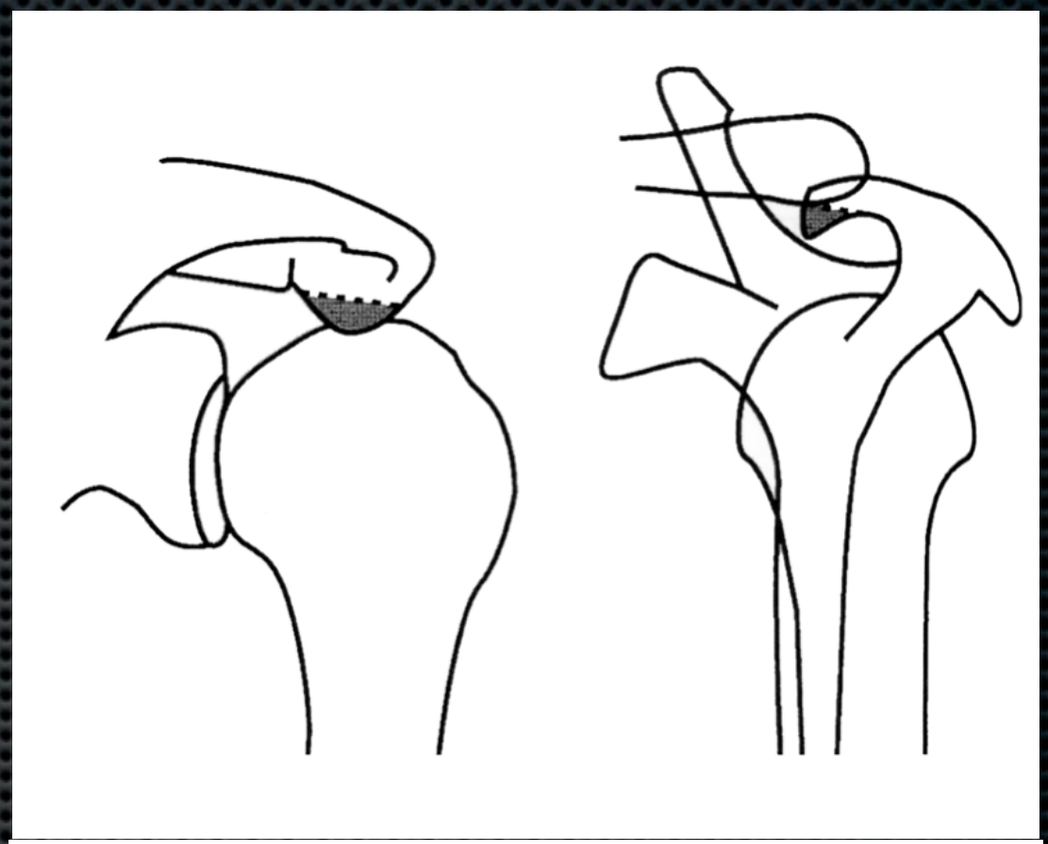


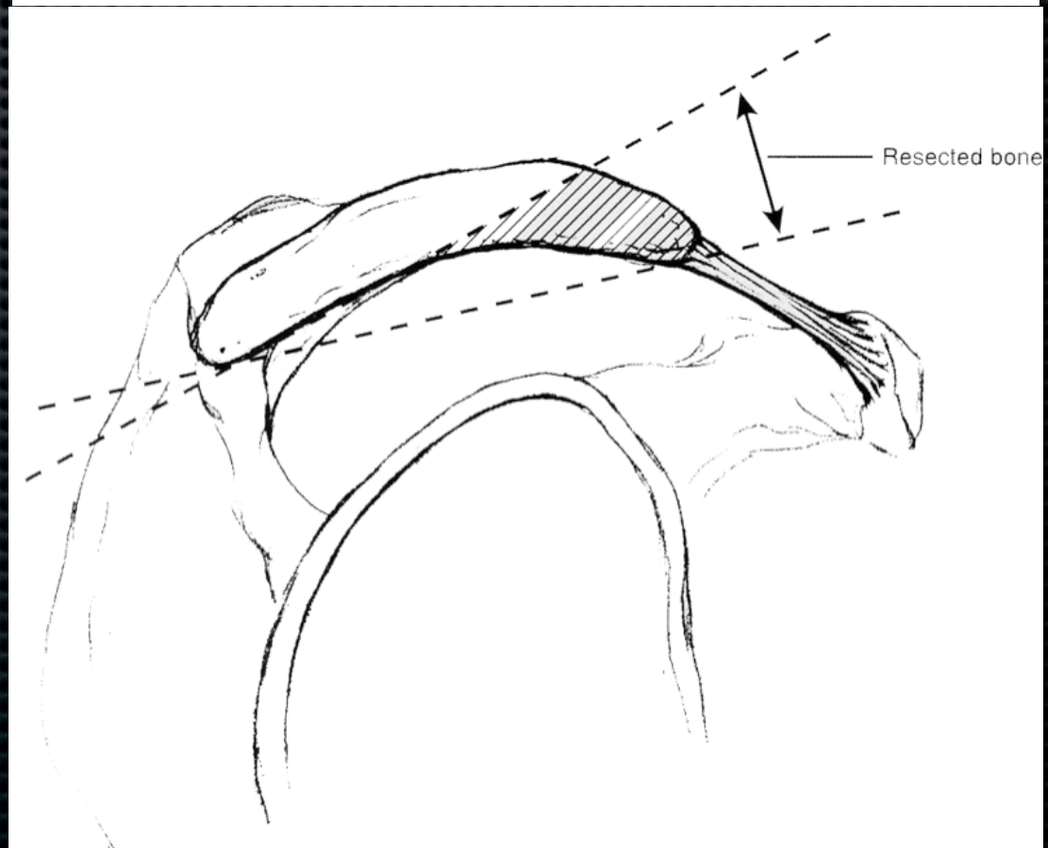
If you have any doubt, you may use needles placed percutaneously to delineate the limits of the CA ligament.

4

Acromioplasty

- How much to resect ? = pre-op planification
- Find its undersurface
- Appreciate how much you have resected ?

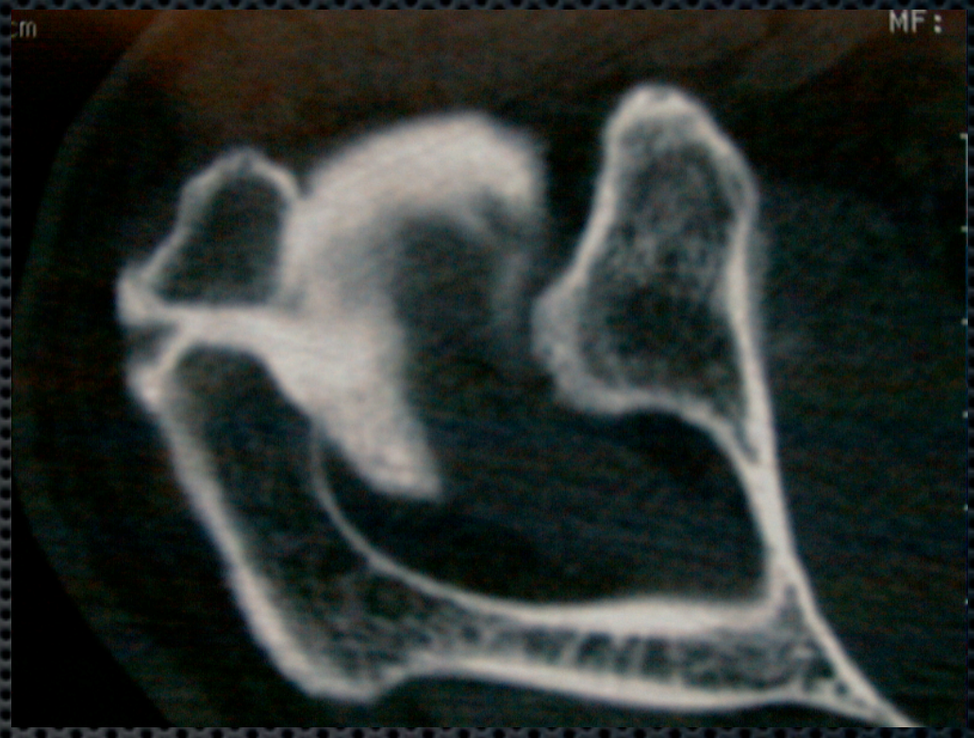




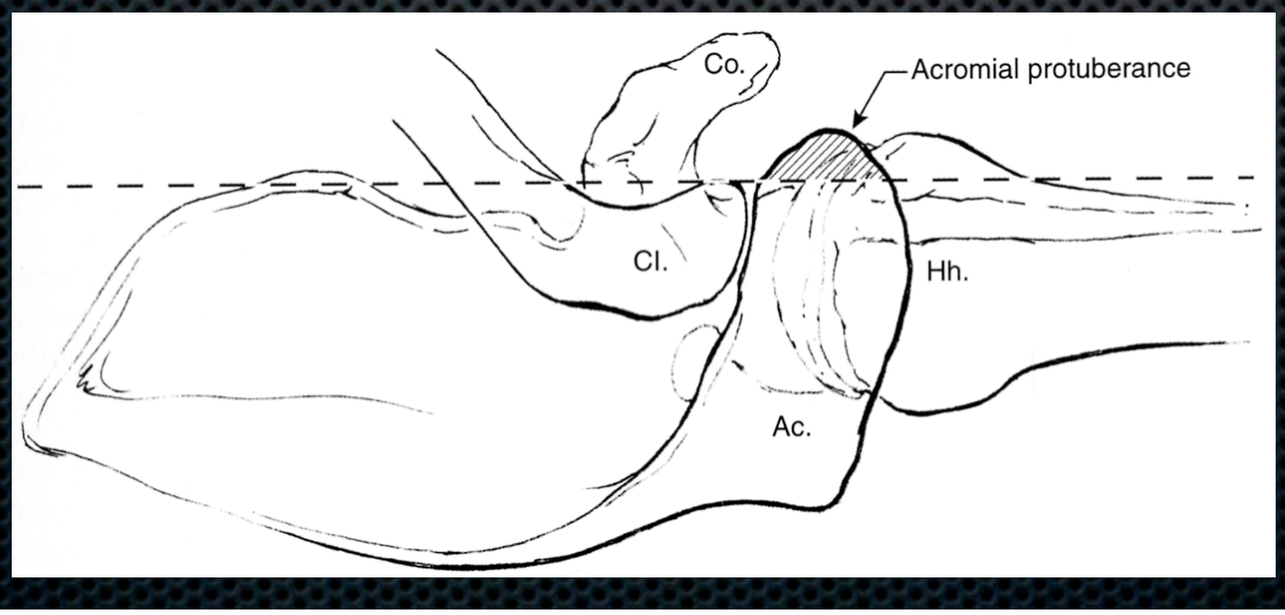
If you decide to perform an acromioplasty, you must preoperatively define how much you want to resect, then find the acromion and resect the amount you have planified.

4

Axillary view

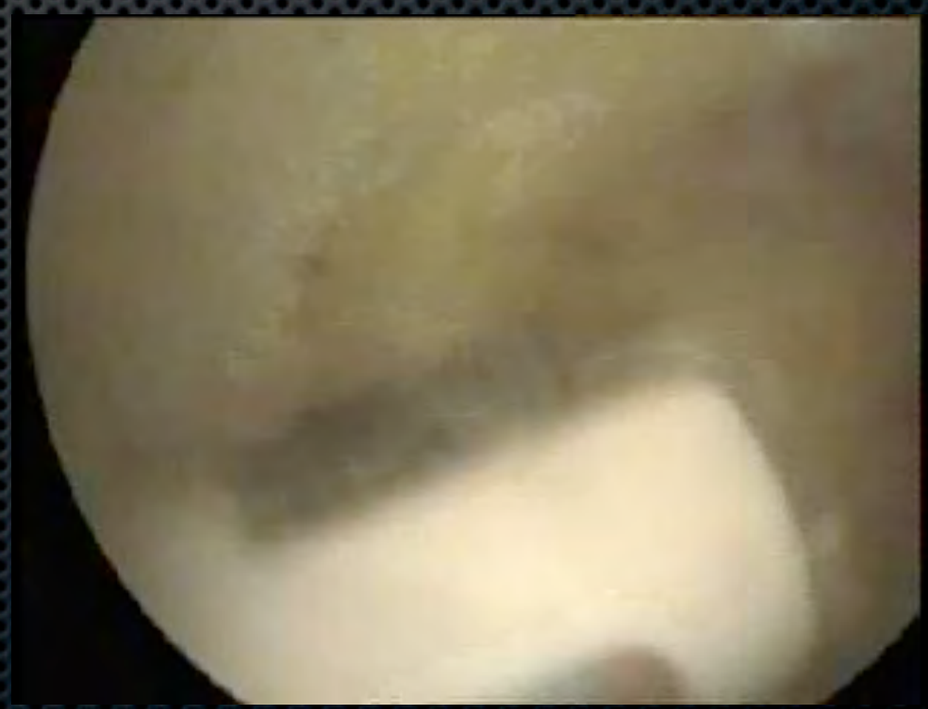


- May help to delineate the anterior spur
- Os acromiale (2-15%) (Peckett, JSE 2004, 13:381-385)



Do not forget in your planification to obtain an axillary view in case of a meso or a tele-acromion. In those cases, your acromioplasty should not be too wide in order not to de-stabilize the acromion.

Acromioplasty



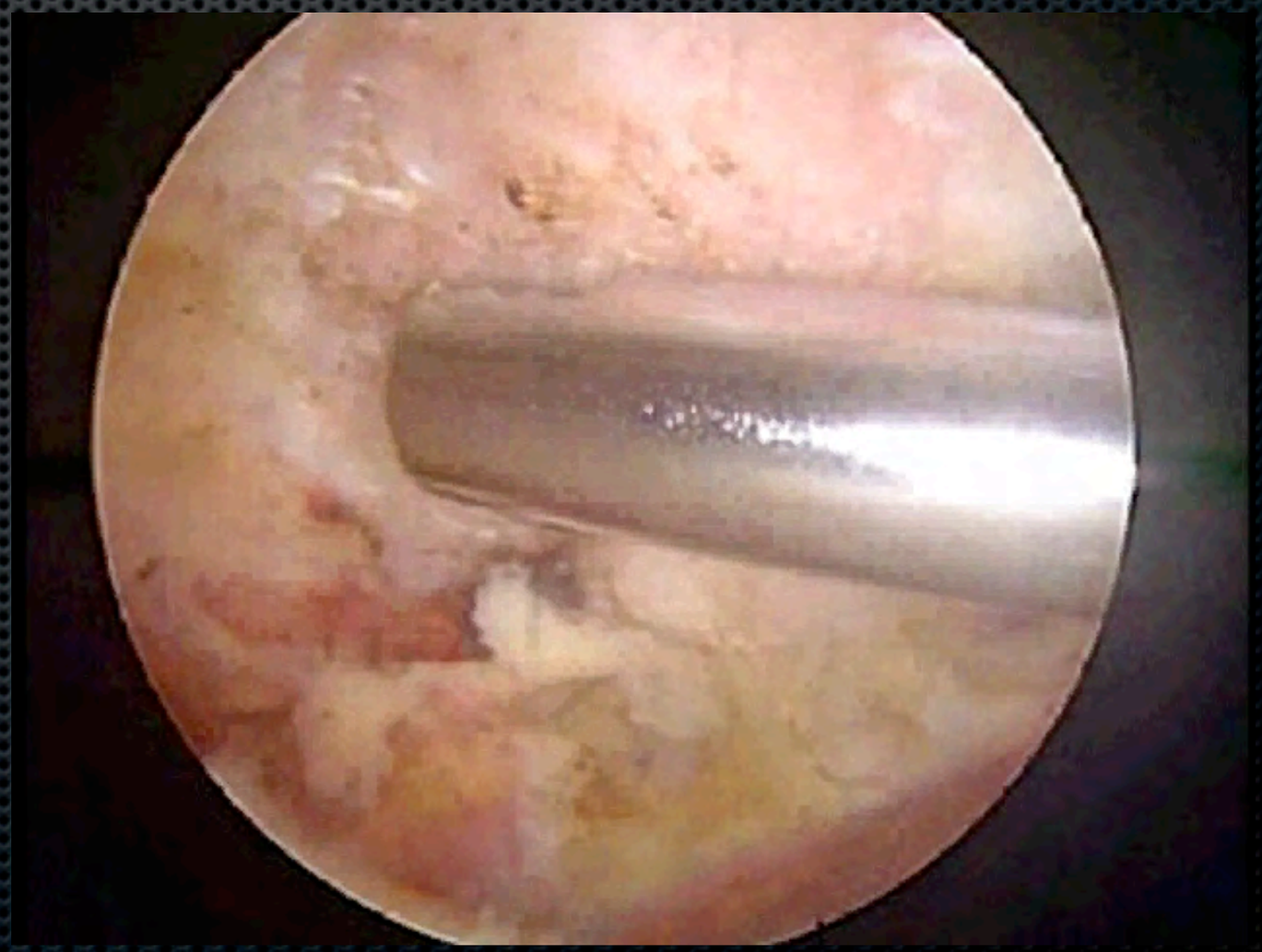
- Find the undersurface by using the bony contact (easy)

Technical steps include to find the undersurface of the acromion, which is relatively easy

4

Acromioplasty

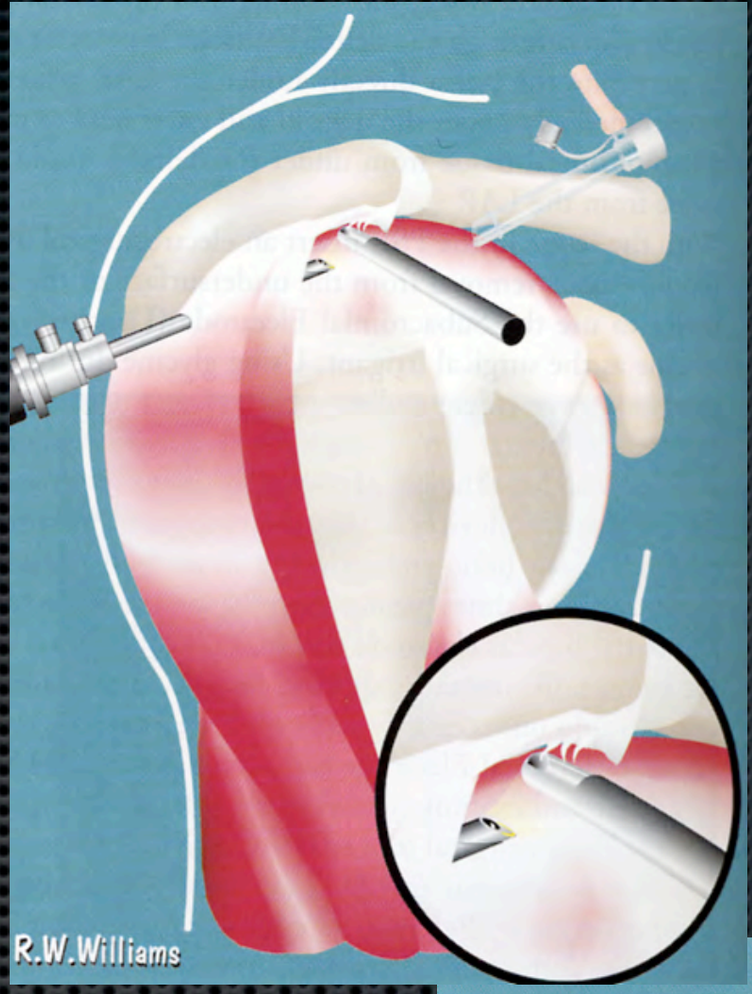
- Débride from posterior to anterior up to the CA ligament

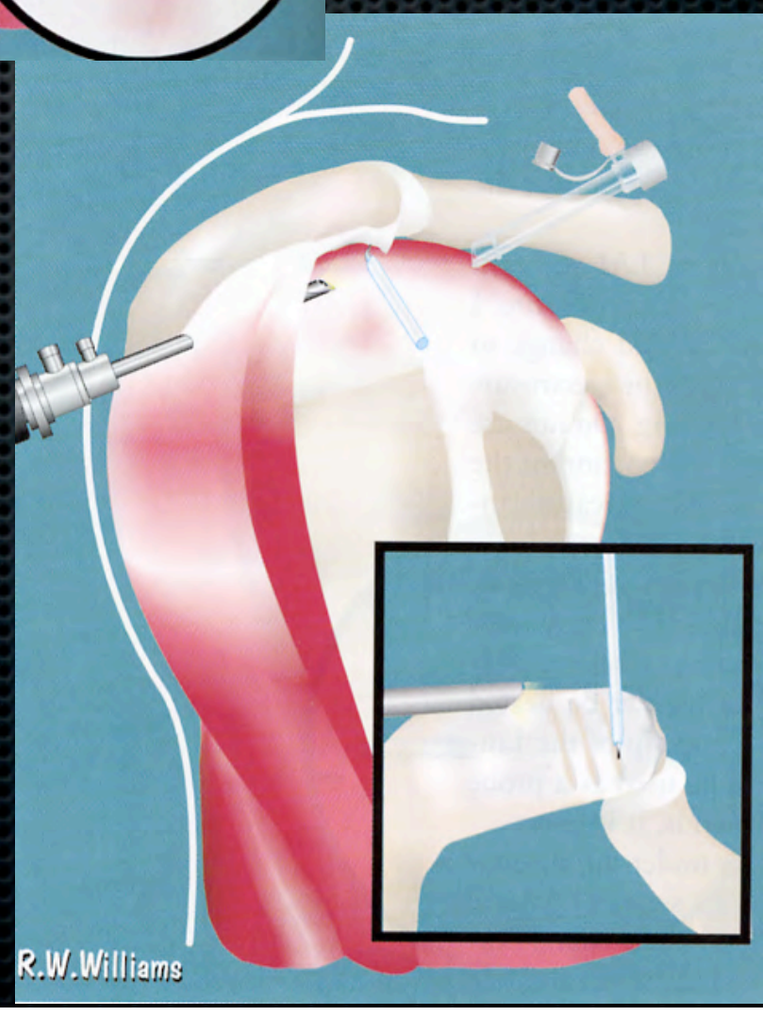


Then to debride from posterior to anterior, up to the CA ligament

4

Acromioplasty



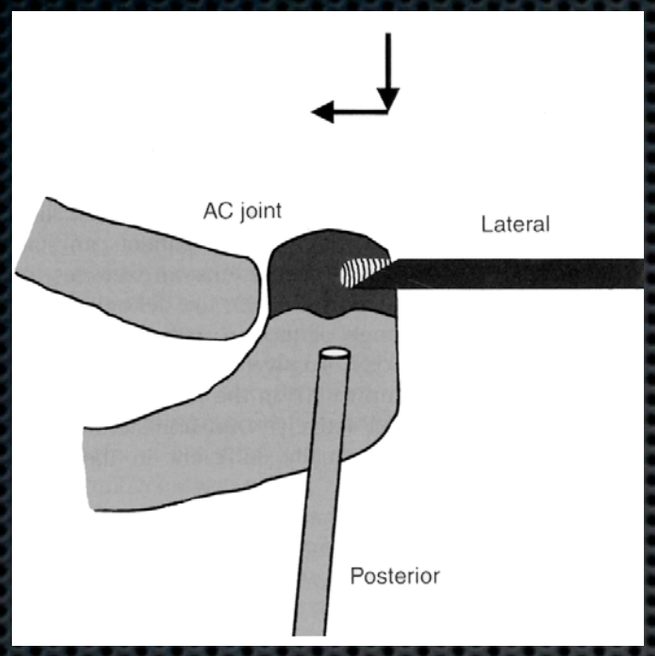


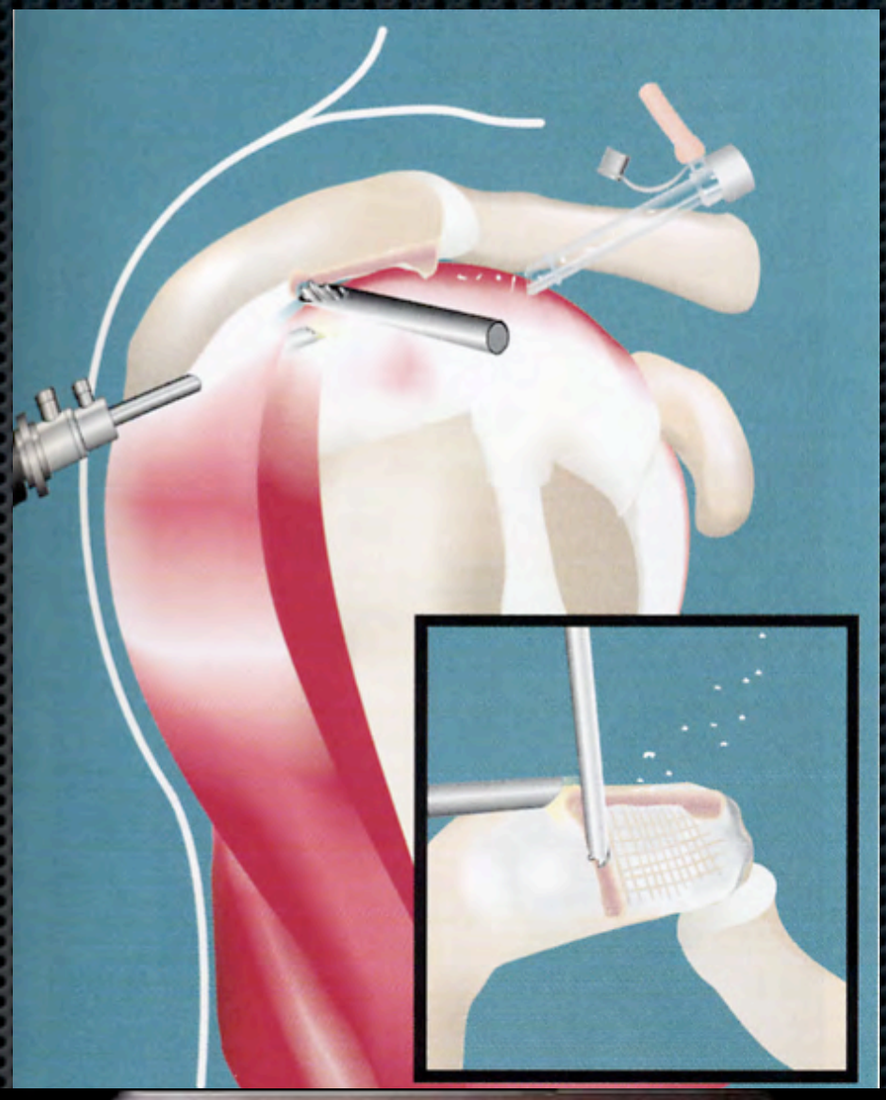
- Find the lateral edge
- Find the acromio-clavicular joint medially (press the clavicle)

Then find the two edges both laterally and medially. You may also use needles to confirm that you see all the acromion

4

Acromioplasty

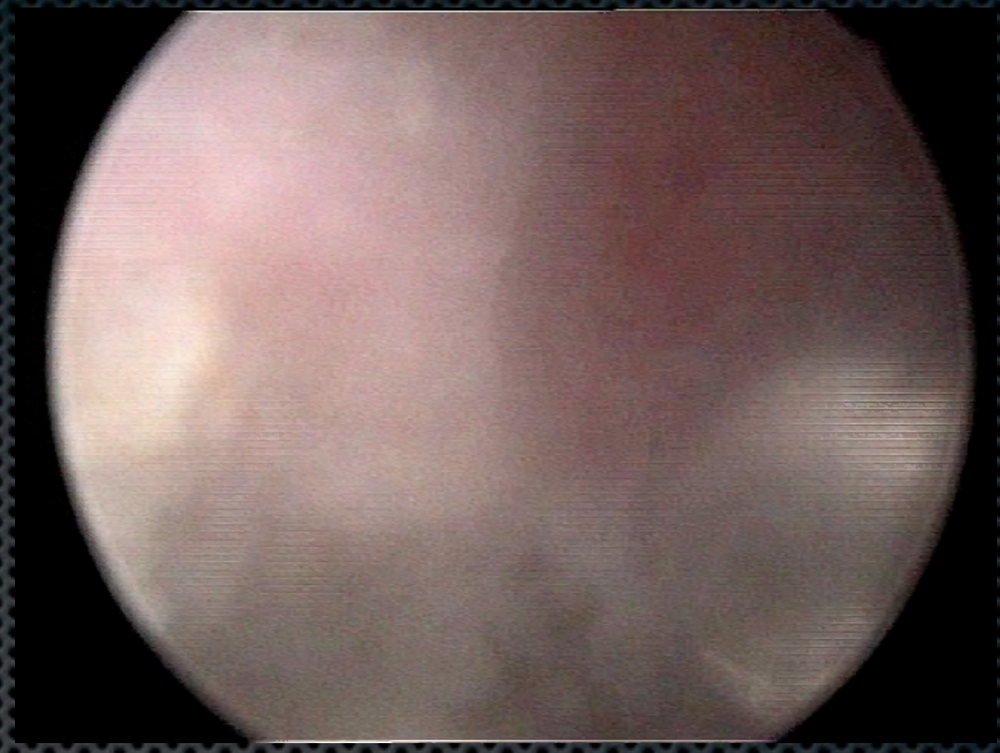


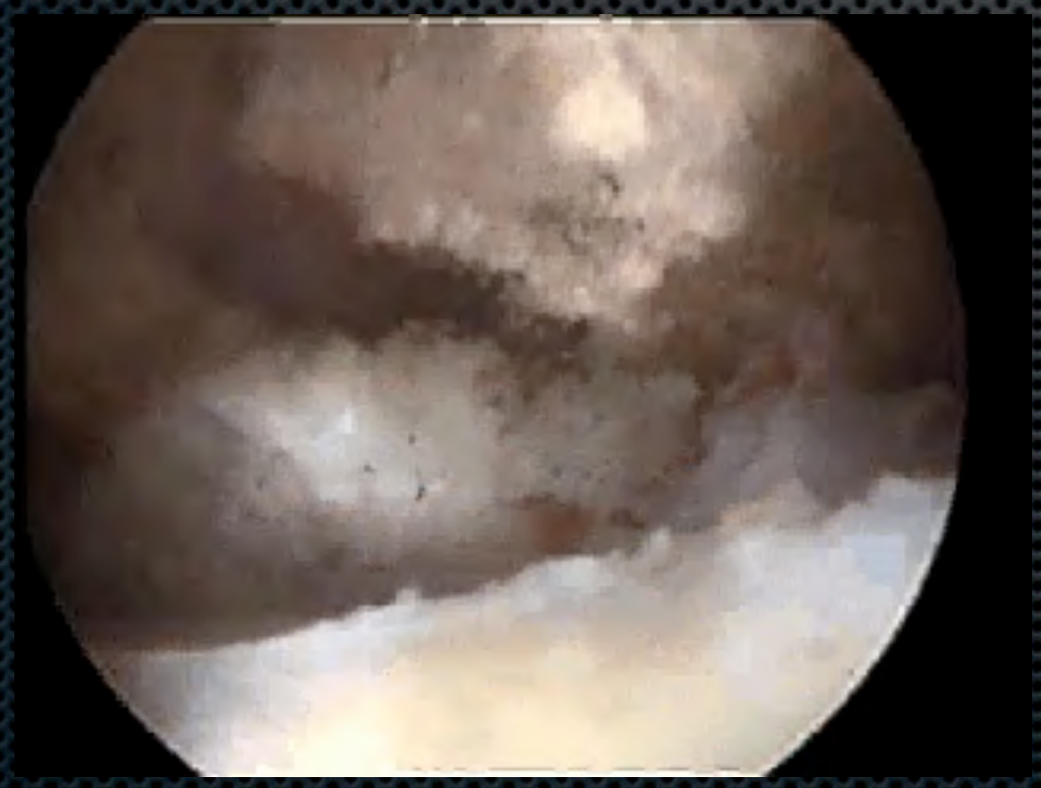


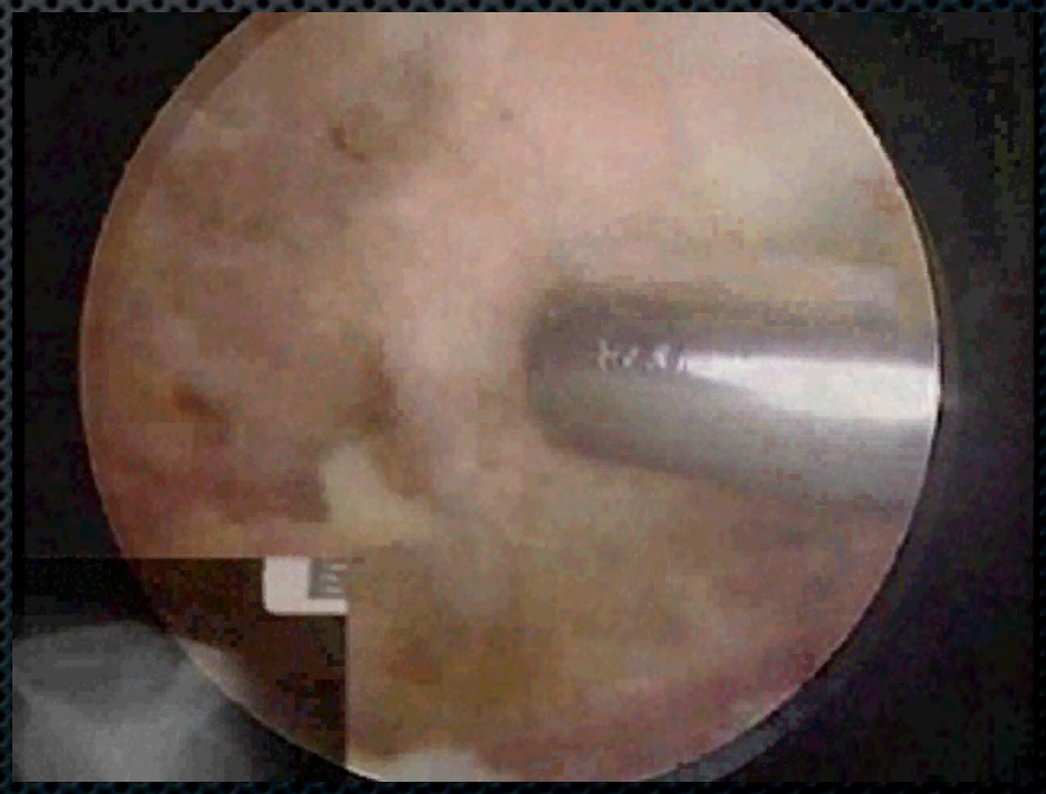
- Start laterally
- Make a trench into the acromion that gives you the amount of bony resection

THen you can start the bony resection. IT is important to start laterally first not to forget a bony spur. In the beginning of your practive, may I suggest that you do a bony trench with your burr, about 3 mm that will give you the amount of bone to resect.

4







Here are some examples. Take care in case of a bony spur, not to violate the deltoid fibers.

4

Technical variations

- Scope in the lateral portal
- Shaver in the posterior portal
- The shaver must be tangent to the undersurface at the end of the procedure

You may also change the position of intruments and place the scope laterally and the burr from the posterior portal. The landmark in this position is that your acromion must be flat at the end of the procedure, that is your shaver must be tangent to a flat acromion

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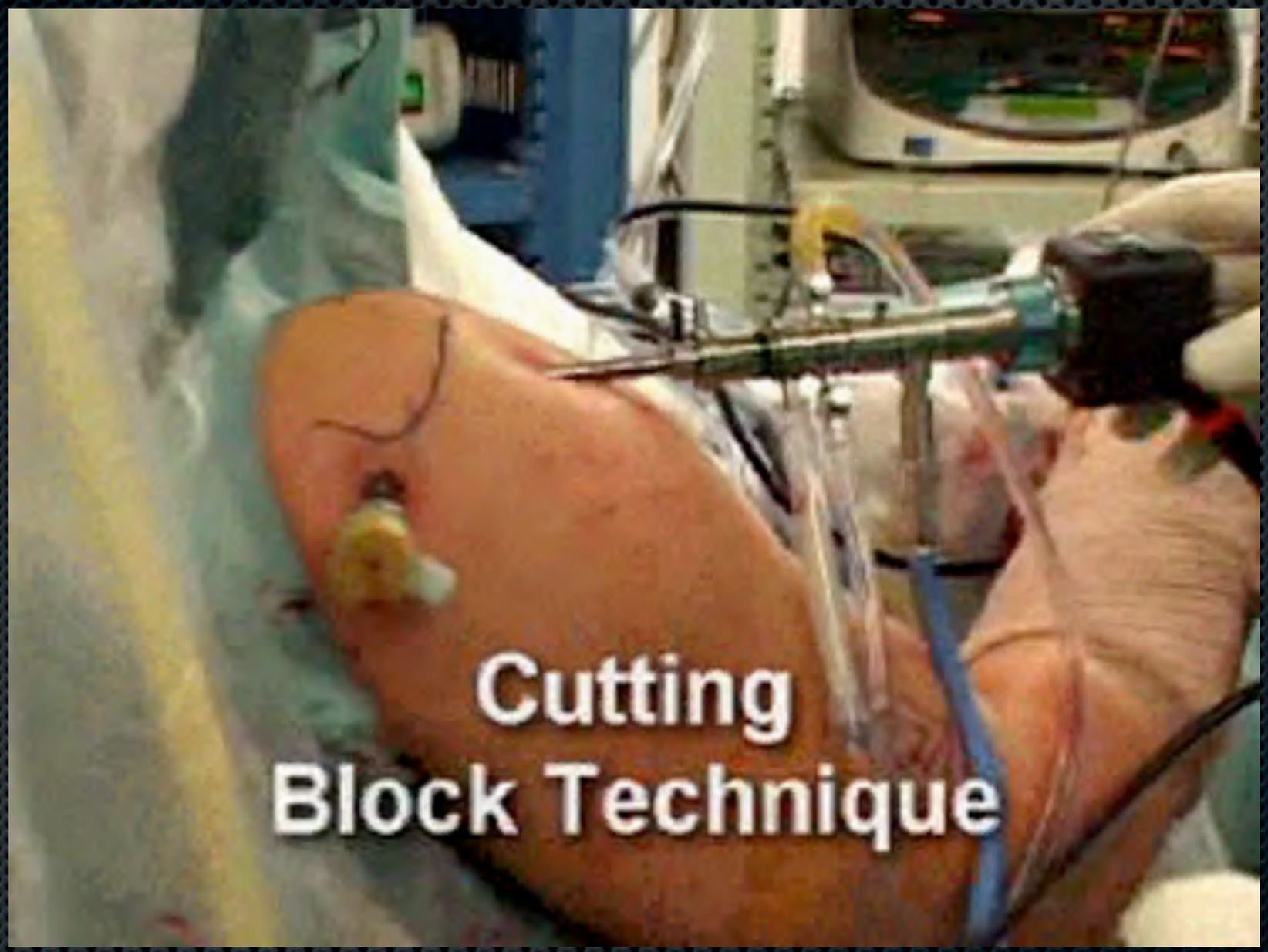


From Snyder

However the vision of the lateral edge is more difficult.

4

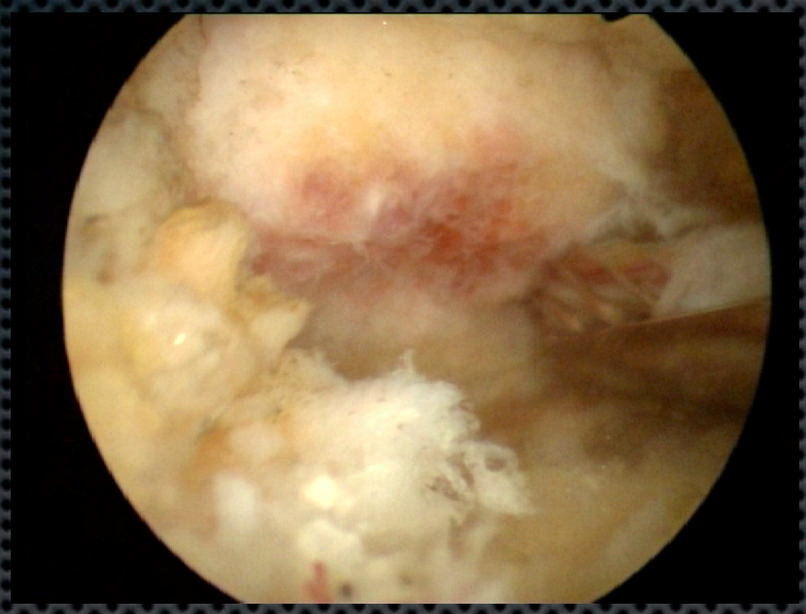
The AC joint ?

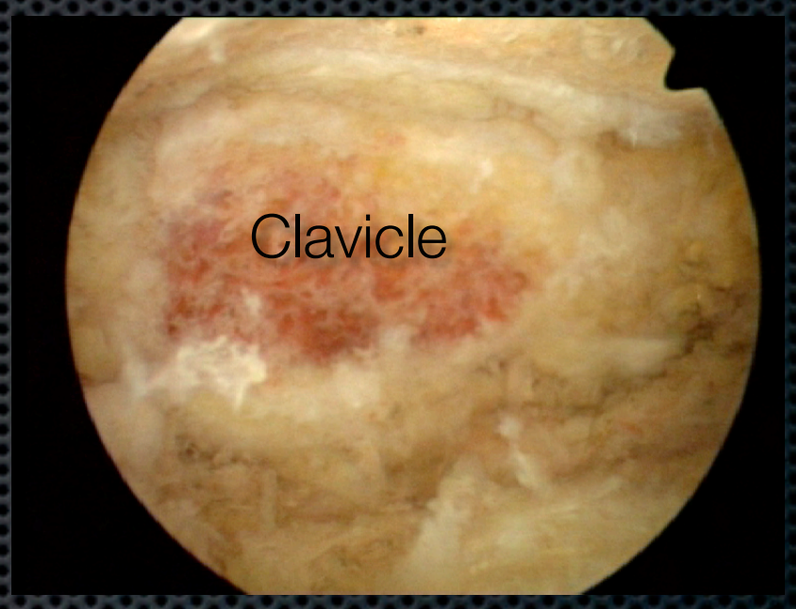
- > 90% of patients present with arthritis after 35 yrs
- Very rarely symptomatic
- Co-planing gives bad results or does not improve the results (Barber, Arthroscopy 2006; 22: 125-129)
- 1,5% of patients require re-operation on the AC joint, whether or not it was treated during arthroscopy (Kharrazi Arthroscopy 2007; 23: 804-808)

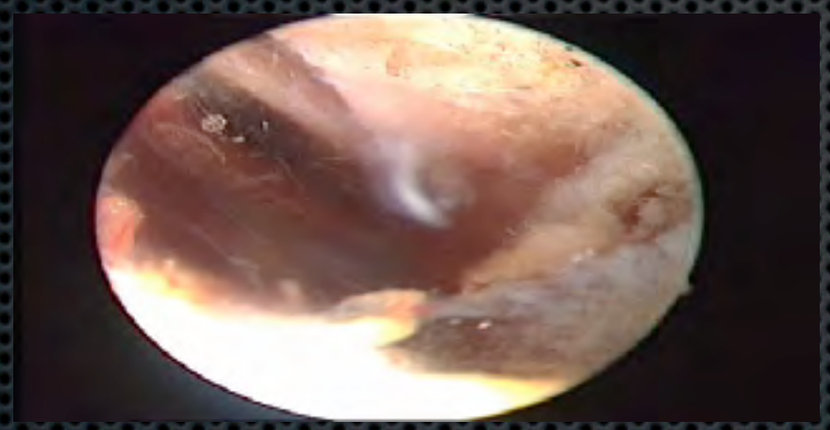
What about the AC joint. Almost all patients over 35 years of age present with some degree of radiologic degeneration but no clinical symptoms.
IF you plan to do a co-planing, then literature suggest that results are poorer or not better than doing nothing.
A recent paper on more than 1500 arthroscopies has shown than 1,5% of patients require re-operation on their AC joint, whether or not it was treated during the initial procedure. 60% of these patients were work related injuries.

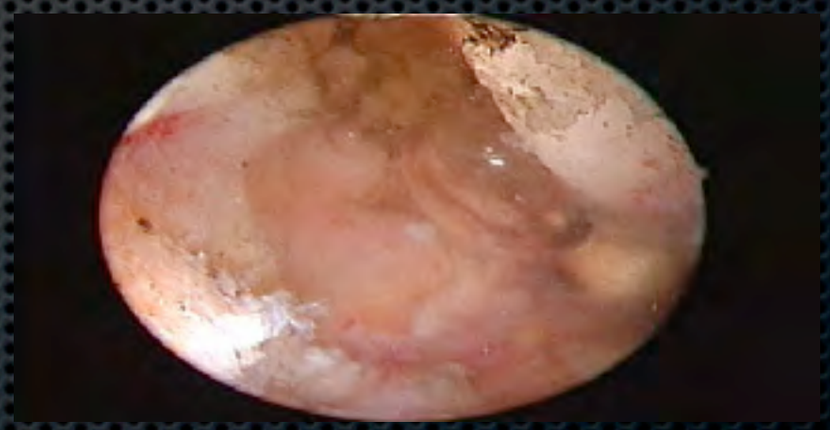
4

The AC joint ?









- If symptomatic, resect < 1 cm, otherwise do not touch the AC joint

So I do not touch this articulation if it not symptomatic. In case of AC-joint pathology I do a distal clavicle resection

5

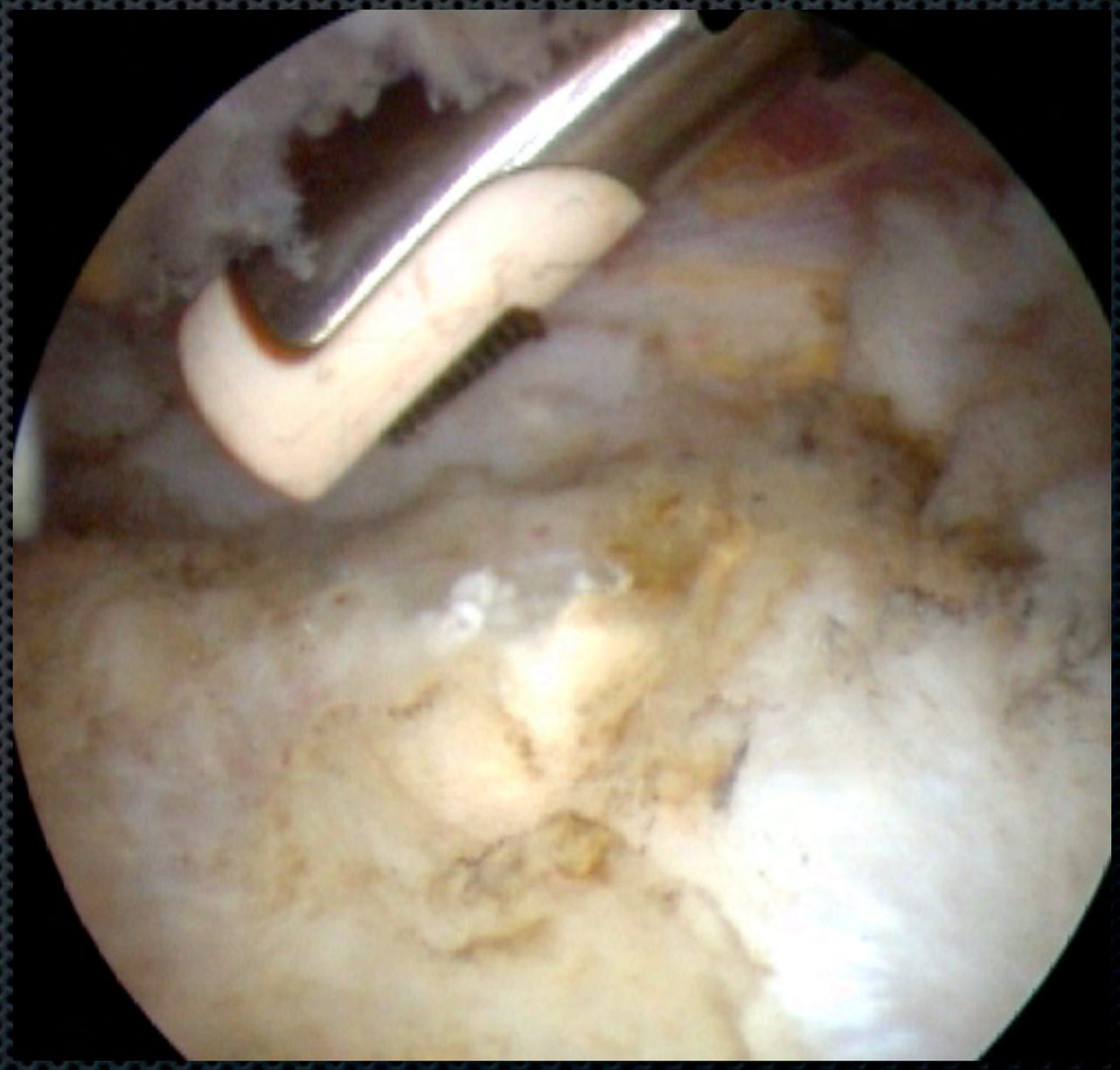
Calcifications

And finally what about calcifications ?

5

Calcifications

- Epidemiology
- Classification
- Technique



I believe that we must talk, briefly on the epidemiology and classification and then about the technique which depends on the two previous topics.

Epidemiology

- 3-7 % of normal population (22% of the diabetic population) - Less than 35% symptomatic
- 2 ♀/ 1♂, mean age 50 yrs
- Supraspinatus (80%)
- 30% spontaneous disappearance at 4 yrs FU

Shoulder calcifications are very frequent, especially in diabetics, and rarely symptomatic
They involve the supraspinatus tendon in up to 80% of cases and at least 30% will disappear spontaneously within 4 years.

Classification

Calcium removal without acromioplasty

- Type A: Unique, round, dense, homogenous with regular contours
- Type B: Multiple or poly-lobulated but homogenous and regular contours
- Type C: Cloudy calcification with blurred contour

Acromioplasty w/wo calcium removal

The classification we use in France is as follow. Type A is a unique calcification, round and dense with regular contours.
Type B are multiple or poly-lobulated calcifications but they are still homogenous and with regular contours. Both type A and B are removed without doing a acromioplasty.
Type C are cloudy, badly defined calcifications with blurred contours. A acromioplasty must be done at the same time of calcium removal

5

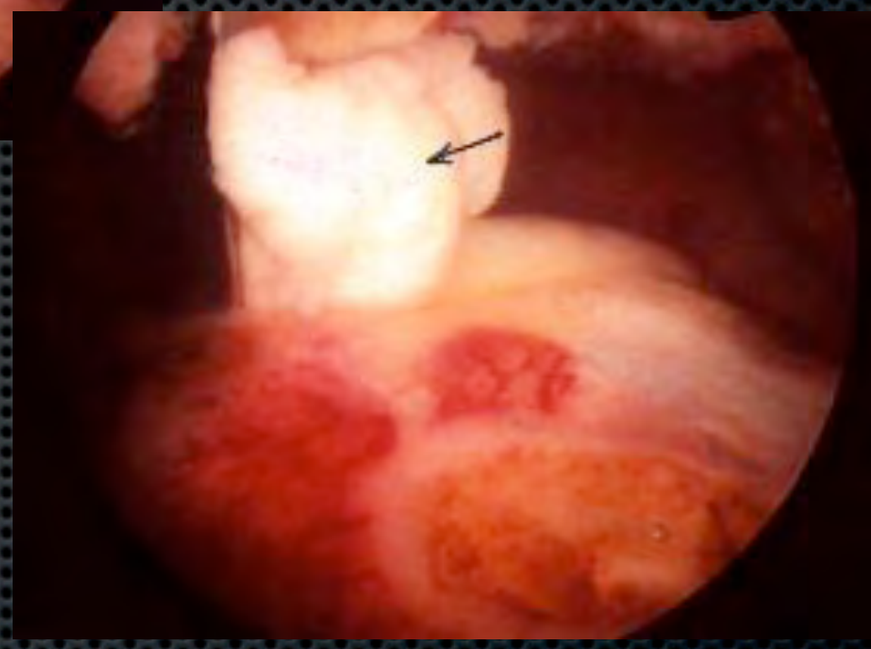
Technique

- Recent pre-op X-ray ⇨ Localization
- Intra-articular visualization
  - Negative effect (Sirveaux, RCO 2005; 91: 295-299)
  - May help to localize the calcification (place a PDS suture through a needle)
- Clinical results are correlated to the amount of calcium removal (Porcellini, JSE 2004; 13: 503-508)

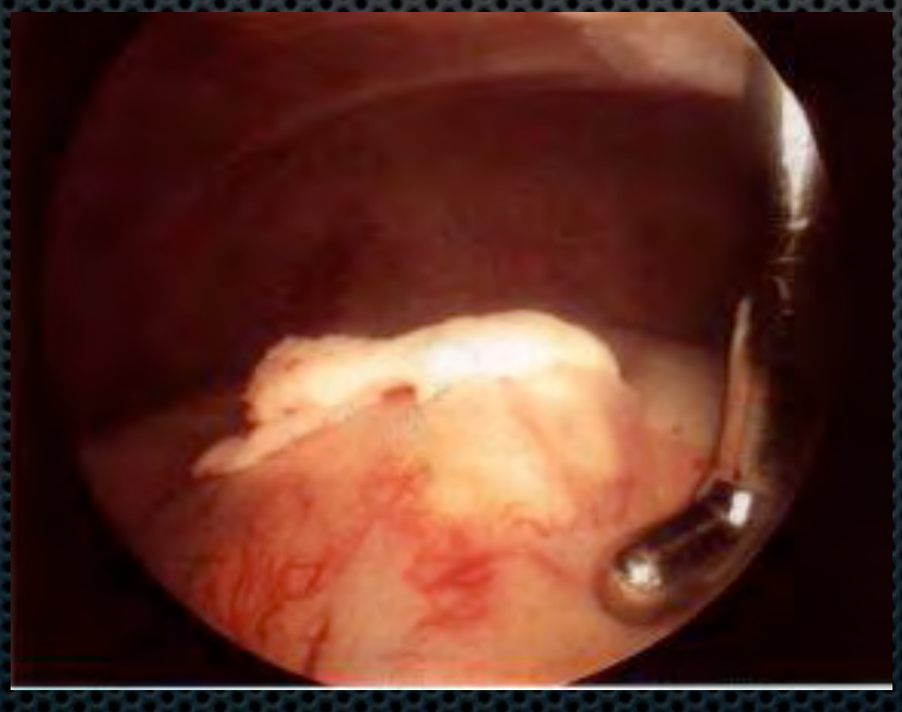
A recent pre-op X-ray is mandatory before surgery in order to be sure that the calcification is still there and if it is, where is it localized.
Should we enter the gleno-humeral joint ? Sirveaux and colleagues suggested that it increases morbidity and is associated with poorer results. However, I perform it routinely to be sure that there is no intra-articular pathology and, in some cases when it is difficult to find the calcification from above, I place a needle and a PDS suture through the tendon which helps me to find the calcification in the subacromial space like in this case.
What is important to remember, is that clinical results are correlated with the amount of calcium removal. So do not hesitate to remove part of the tendon.

5

Technique



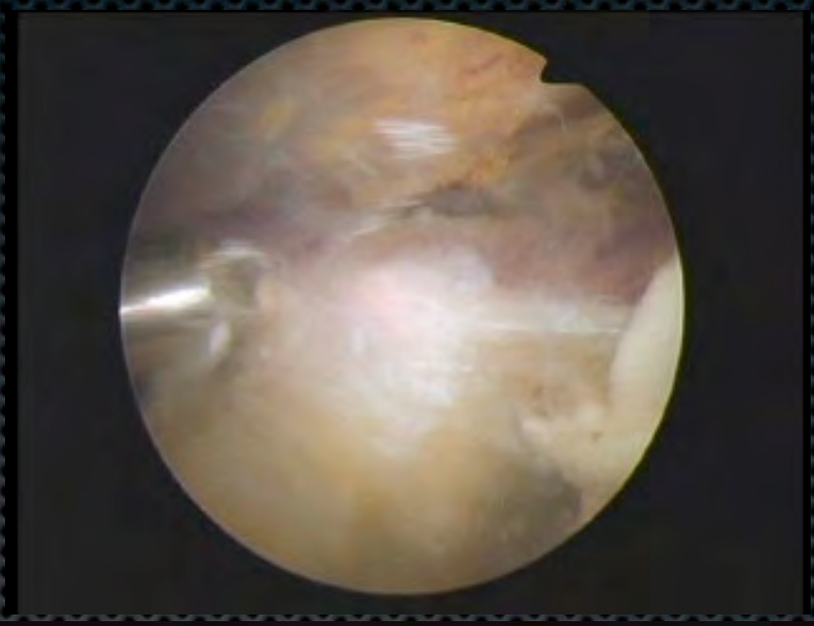
- Identify the calcification
  - Easy

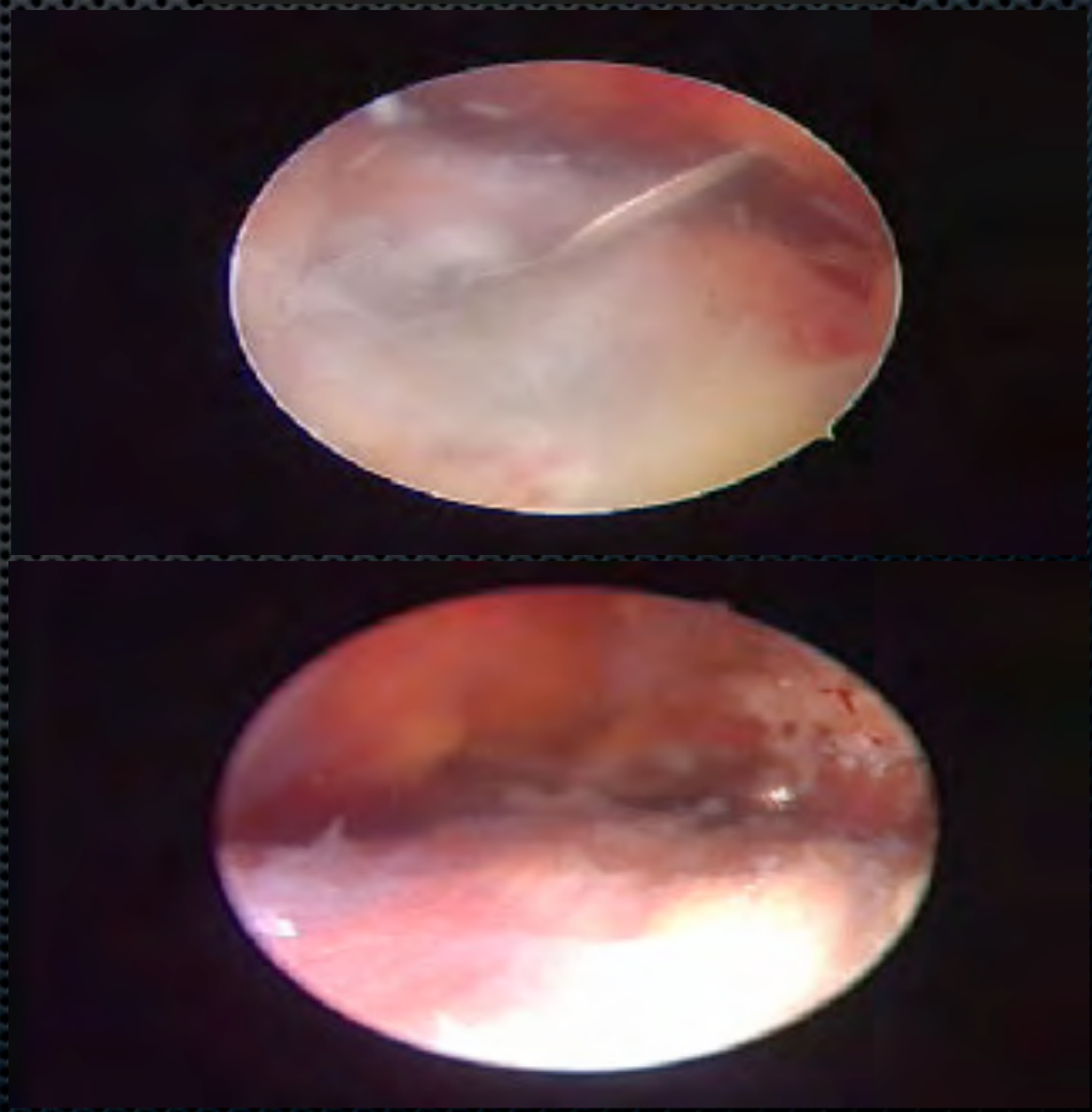


Once in the subacromial space, you must identify the calcification which is sometimes easy

5

Technique





- Identify the calcification
  - Easy
  - Débride, Palpate, dig holes...with needle, curette, shaver...

and sometimes very difficult and you then need to dig holes to find some calcium that will tell you that you are at the good position.

Primary		Secondary
Extrinsic	Intrinsic	
Shape of acromion	Bursitis	Instability
Os acromiale	Tendinopathy	Frozen shoulder
Malunion of greater tuberosity	Partial cuff rupture	Posterior capsule retraction
AC joint arthritis	Calcifications	Neurological disorders

To summarize, arthroscopic subacromial decompression can be done for primary or secondary shoulder problems and in primary problems, it could be for intrinsic or extrinsic reasons which are quoted in this scheme.