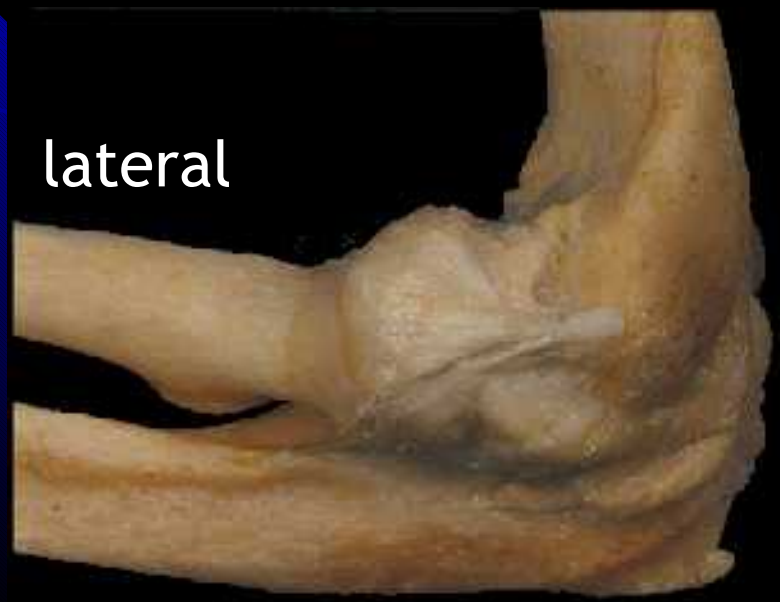
Elbow Arthroscopy

Christos K. Yiannakopoulos

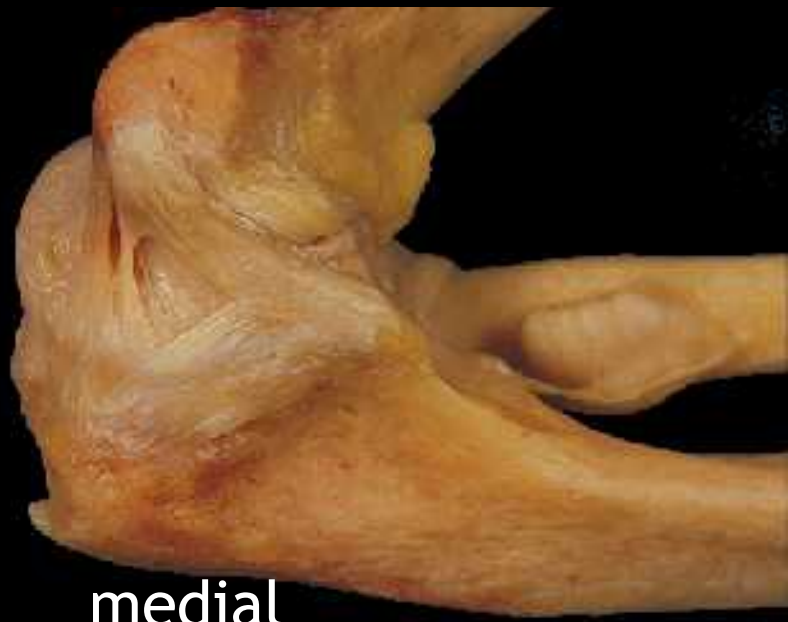
IASO General Hospital, Athens

Elbow Anatomy

anterior



lateral

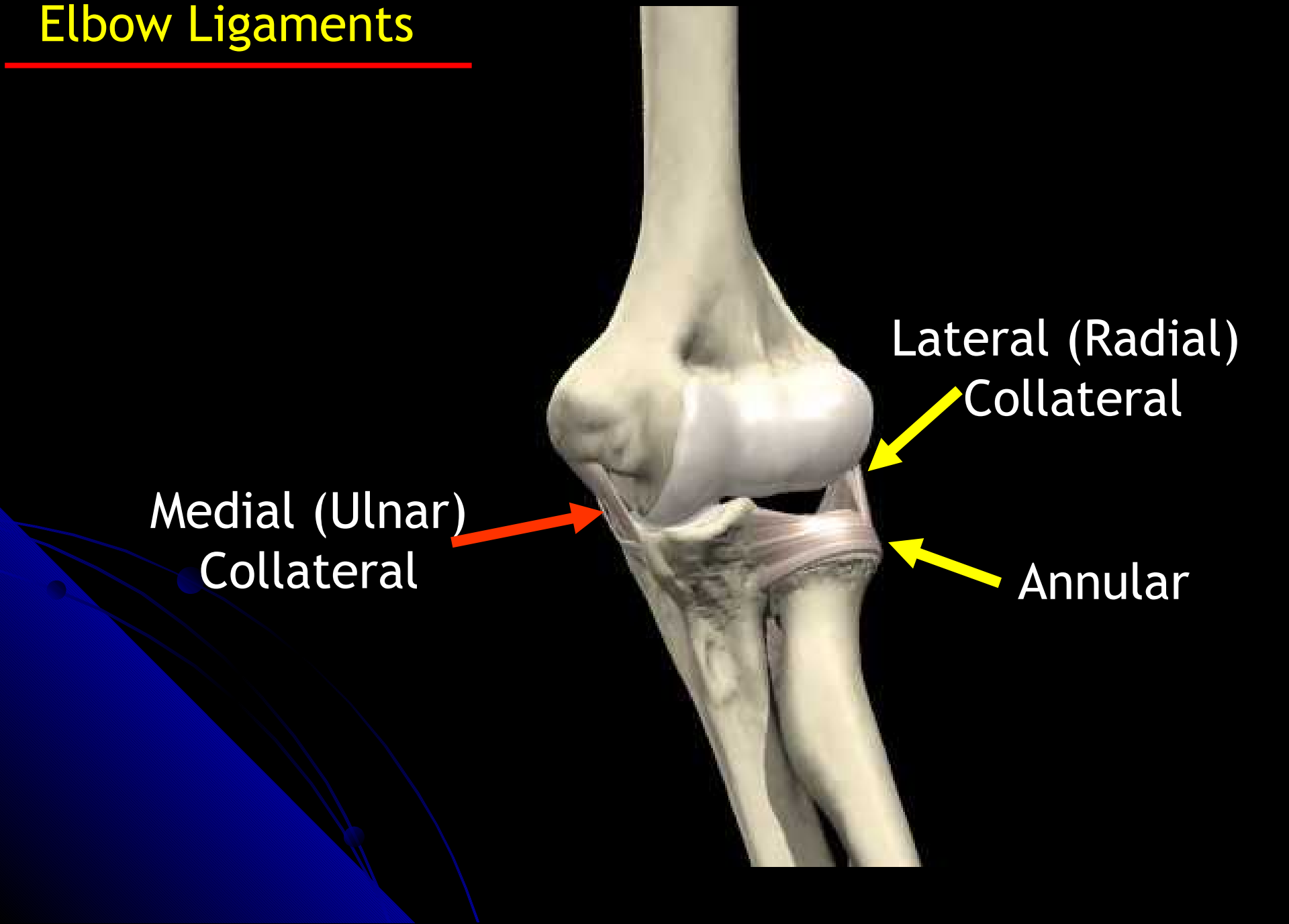


medial

1 elbow = 3 joints in one joint capsule!

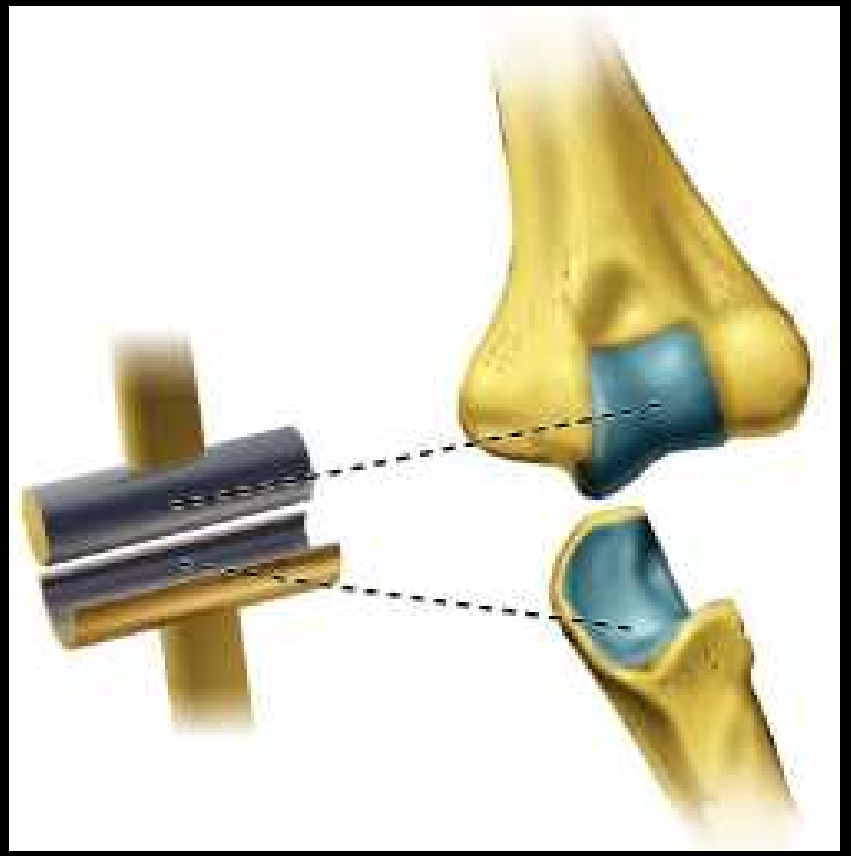
- Ulnohumeral (flexion/extension)
- Radiohumeral (pivoting and rotation for pronation and supination)
- Radioulnar (pivot/glide motions)

Elbow Ligaments



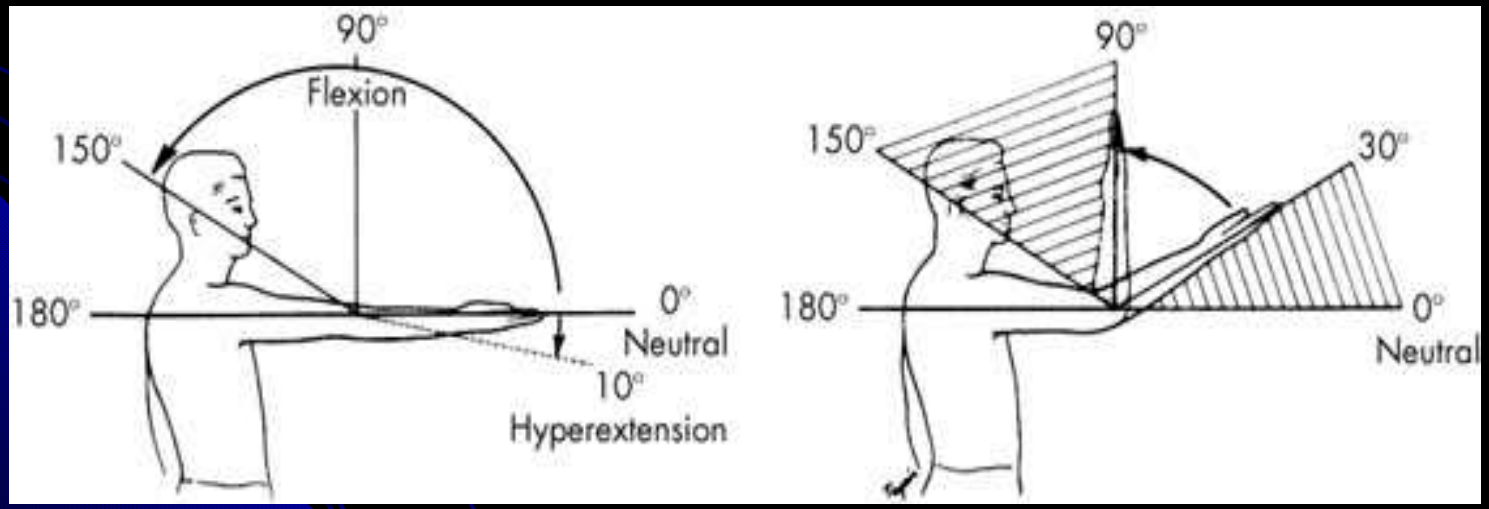
1 elbow = 3 joints in one joint capsule!

- Ginglymus or hinge joint



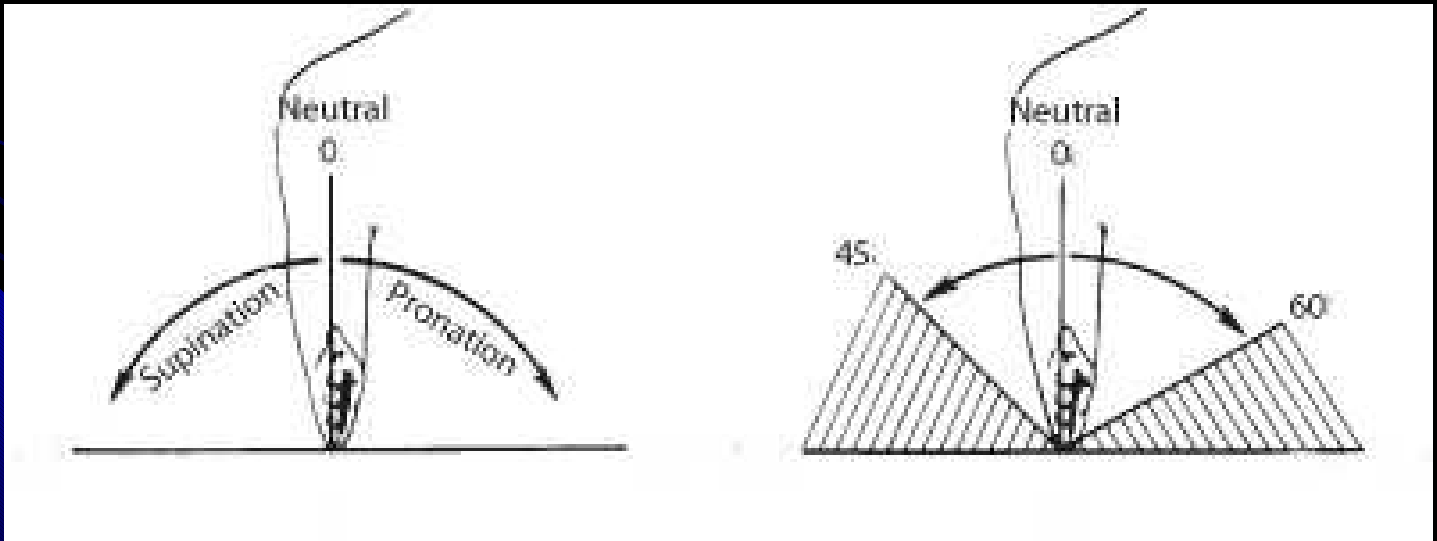
Elbow Joint Kinematics

- Normal Motion
  - Flexion: 145°
  - Extension: -5° (hyperextension)

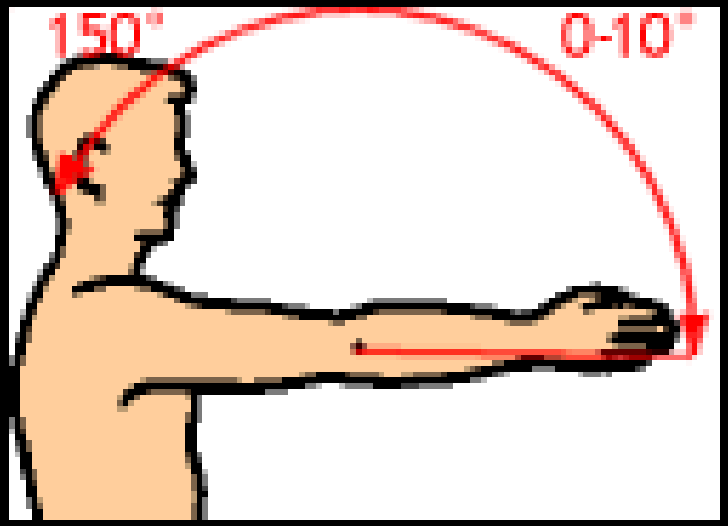


Elbow Joint Kinematics

- Radiohumeral joint
  - Supinate 80 to 90 degrees from neutral
  - Pronate 70 to 90 degrees from neutral



Functional Arc



- ✓ flexion and extension 100 degrees (30 to 130)
- ✓ rotation 100 degrees (50 pronation, 50 supination)

Elbow Arthroscopy

- Doesn’t replace exams
- Bounded by nerves
- Time constraints

Arthroscopy advantages

- Thorough inspection of the joint
- Can address multiple lesions
- Small Incisions
- Less Pain
- Day case operation
- Shorter and more agressive rehab
- Decreased risk of infection

Disadvantages:

- Risk of neurovascular injury
- Increased operative times
- Technique dependent
- Steep learning curve

What can be done

- Anything intra-articular
- Extra-articular
  - Posterior central→lateral
  - Lateral
  - Anterior

What can’t be done

- MCL (ulnar nerve) ?
- Biceps (PIN) ?

Indications:

- Diagnosis of chronic elbow pain
- Loose body removal
- Chondral and osteochondral lesions
- Treatment of osteochondritis lesions
- Excision olecranon osteophytes
- Radial head excision
- Synovectomy
- Evaluation of valgus instability in overhead athletes
- Posterior impingement

Indications:

- Lysis and debridement of post-traumatic adhesions
- Fracture evaluation and treatment
- Septic arthritis
- Ligament reconstruction
- Epicondylitis
- Symptomatic plicae
- Olecranon bursectomy
- Adjunct to open surgery

Level of Experience

Early

Diagnostic arthroscopy
Loose body removal
Plicae excision
Lateral epicondylitis release

Advanced

- Synovectomy
- Capsulotomy
- Radial head excision
- Debridement of OCD

Most experienced only

- Capsulectomy
- Osteocapsular arthroplasty
- Fracture fixation

Elbow Capsulotomy

Elbow Arthroscopy

Safety not established →
- Posteromedial release
- Medial epicondylectomy
- Ligament repair

Not possible →
- Ligament reconstruction
- Radial tunnel release

Contra-indications

- Bony Ankylosis
- History of Nerve Transposition or Muscle/Tendon Transfer
- Bleeding Disorder

Elbow Scope Complications

11% minor complications, 0.8% major

- Compartment syndrome
- Septic arthritis / infection: 0.8%
- Nerve injury
- CutAneous neuromas
- 4% transient radial-nerve palsy after intraarticular anesthetic injection
- Vascular injury
- Prolonged drainage (portal sites): 4% aseptic drainage
- Stiffness / flexion contracture

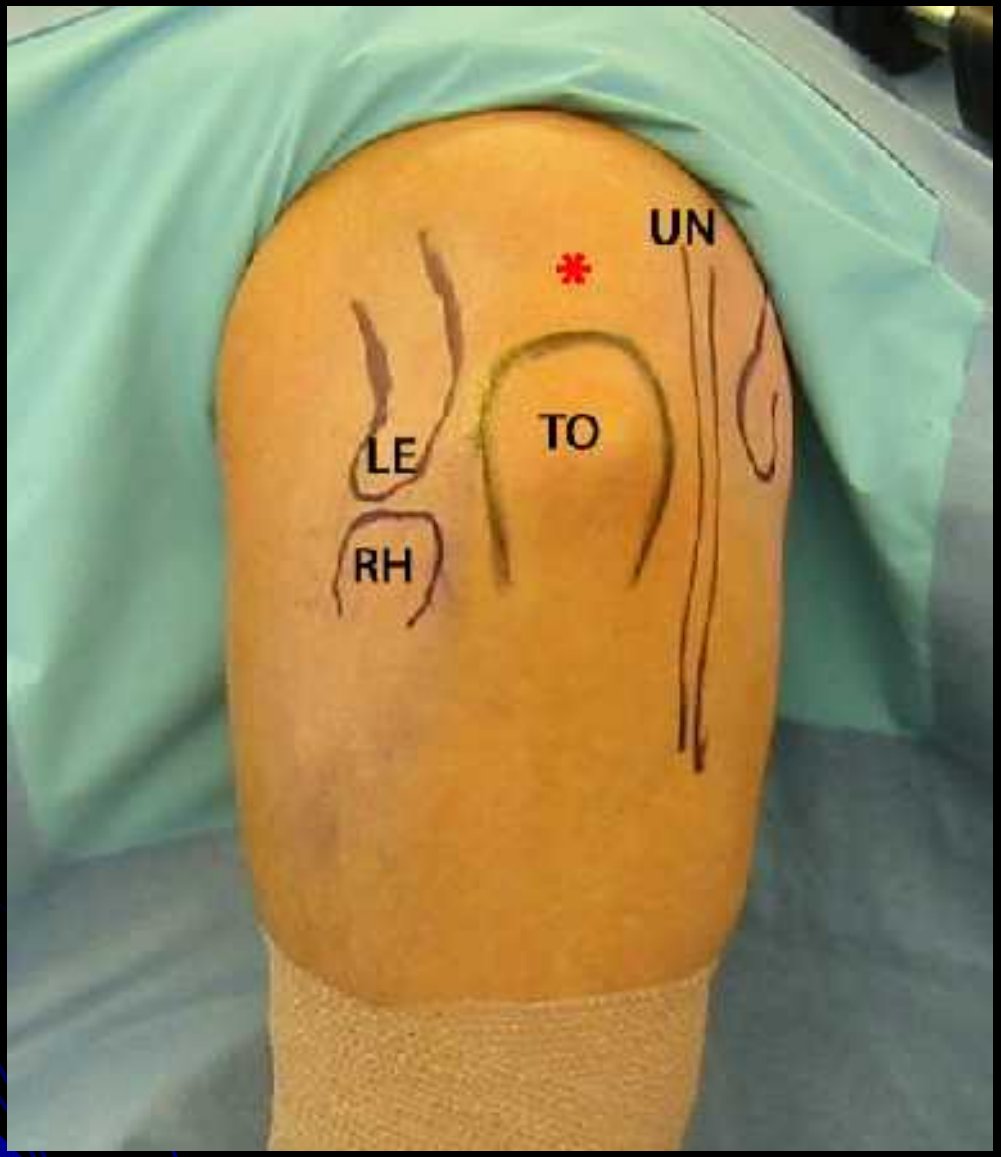
Surgical Technique

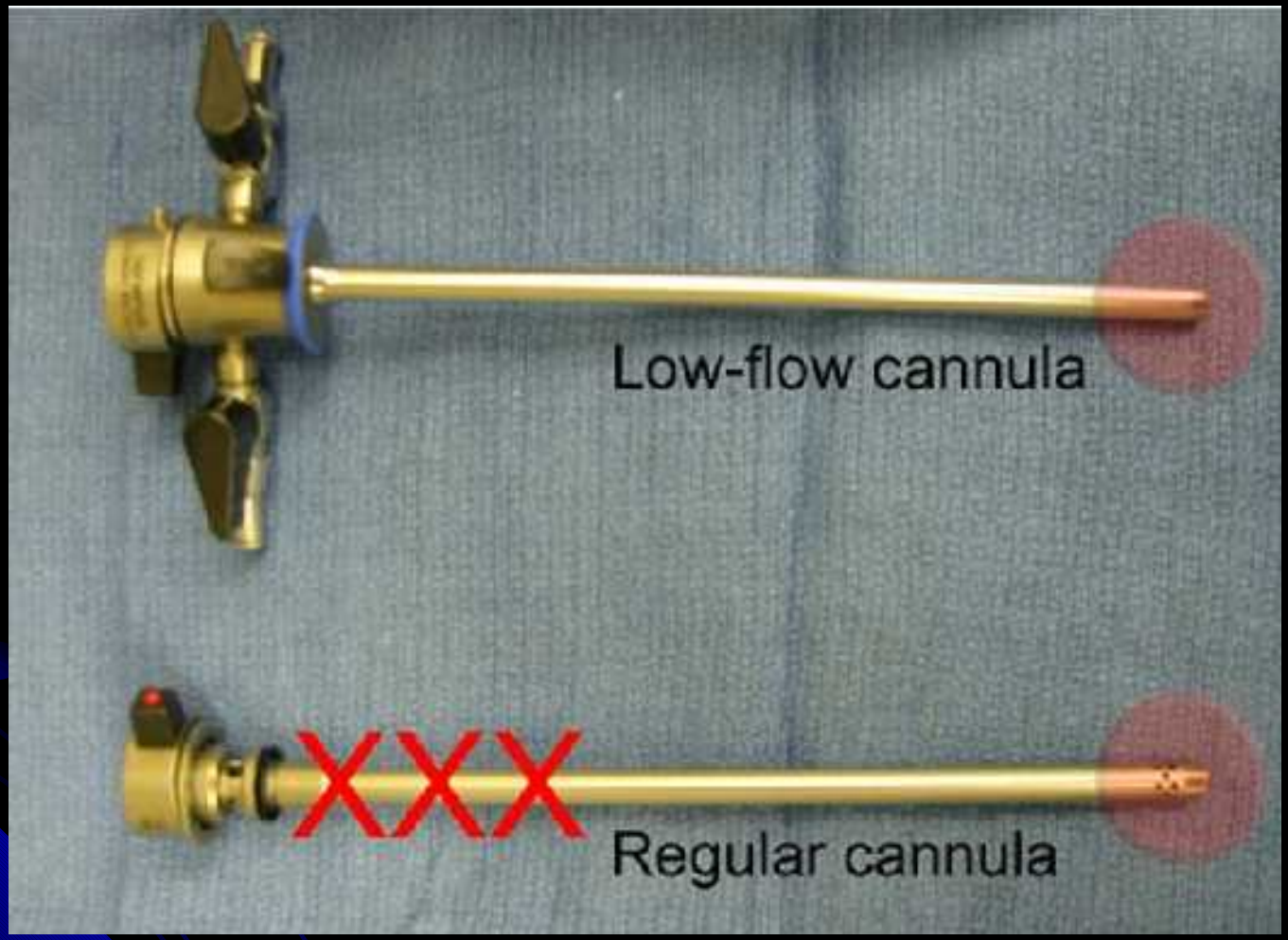
Patient Positioning

- Prone
- Supine
- Modified Supine
- Lateral decubitus

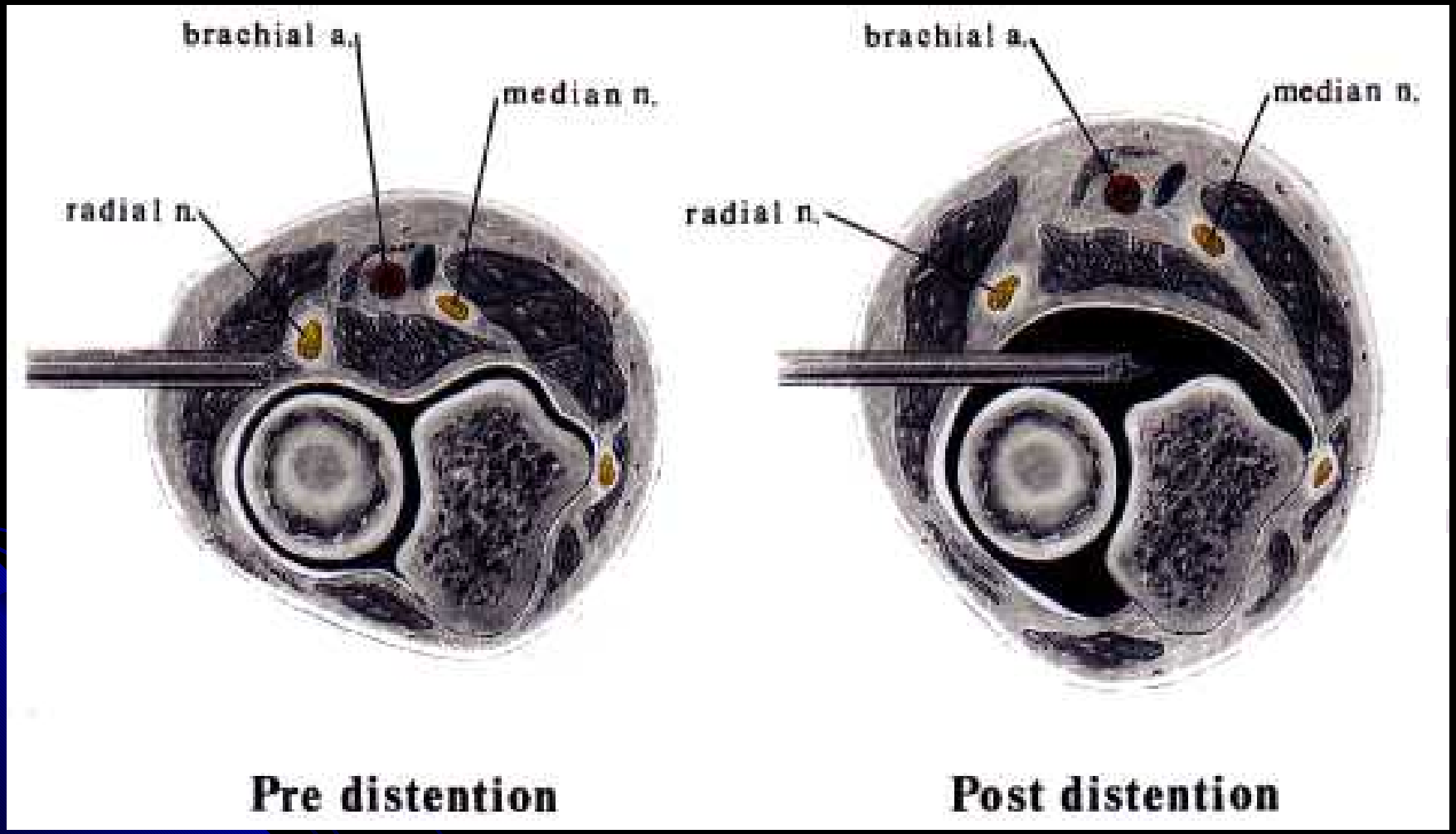
Positioning

Topographic anatomy




Low-flow cannula
XXX
Regular cannula

Surgical Technique: Joint Distention

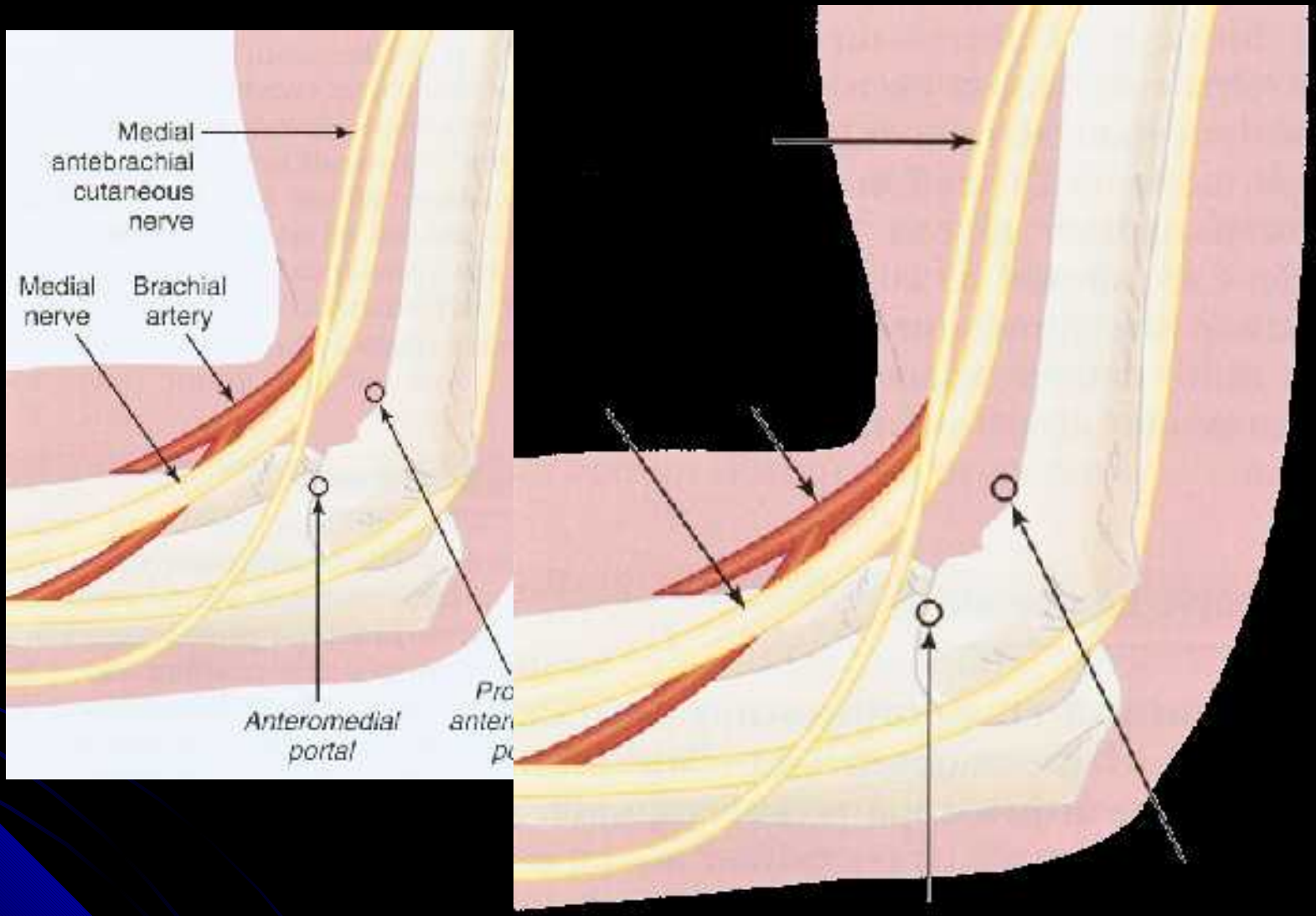


Capsular volume may be as little as

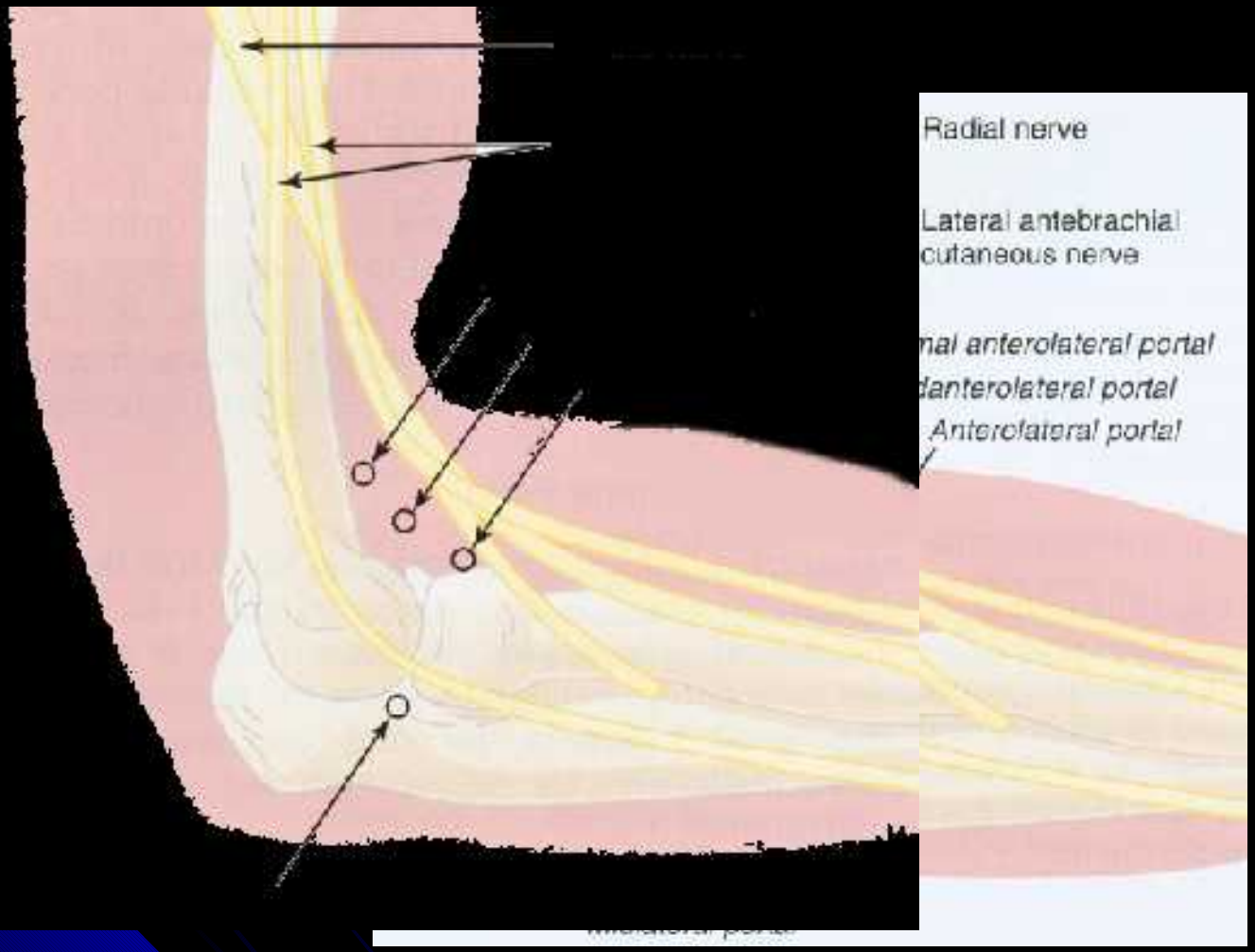
6 mL in elbows with capsular contracture

Surgical Technique

- Portals
  - Skin Incisions
  - Blunt dissection
  - Perforate capsule



lateral portals



medial portals

Anteromedial View

Anteromedial View

Anterolateral View

Ulnotrochlear Joint

Anterior Capsule

Soft Spot Portal

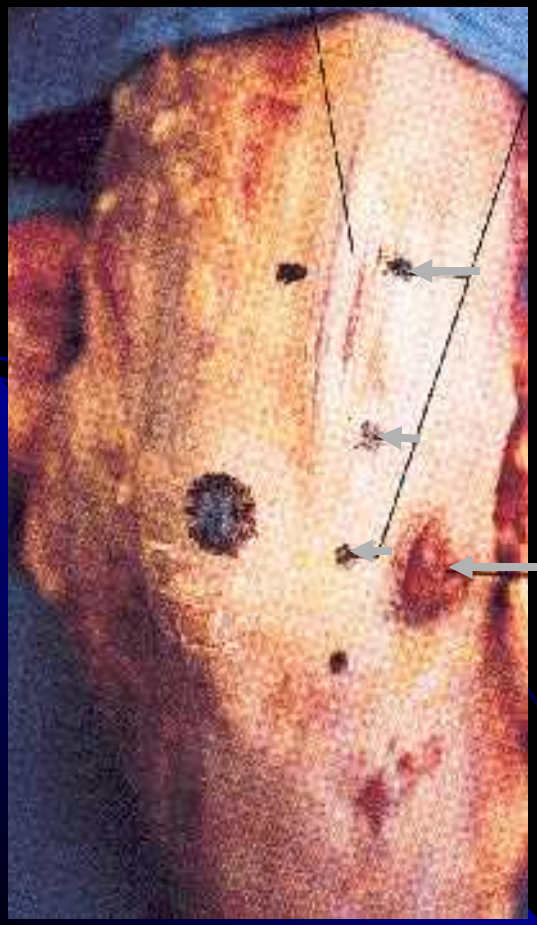
Trochlea (above)

Radial Head (left)

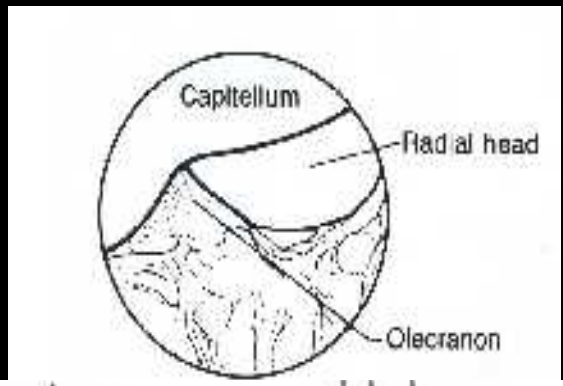
Olecranon Bare Spot

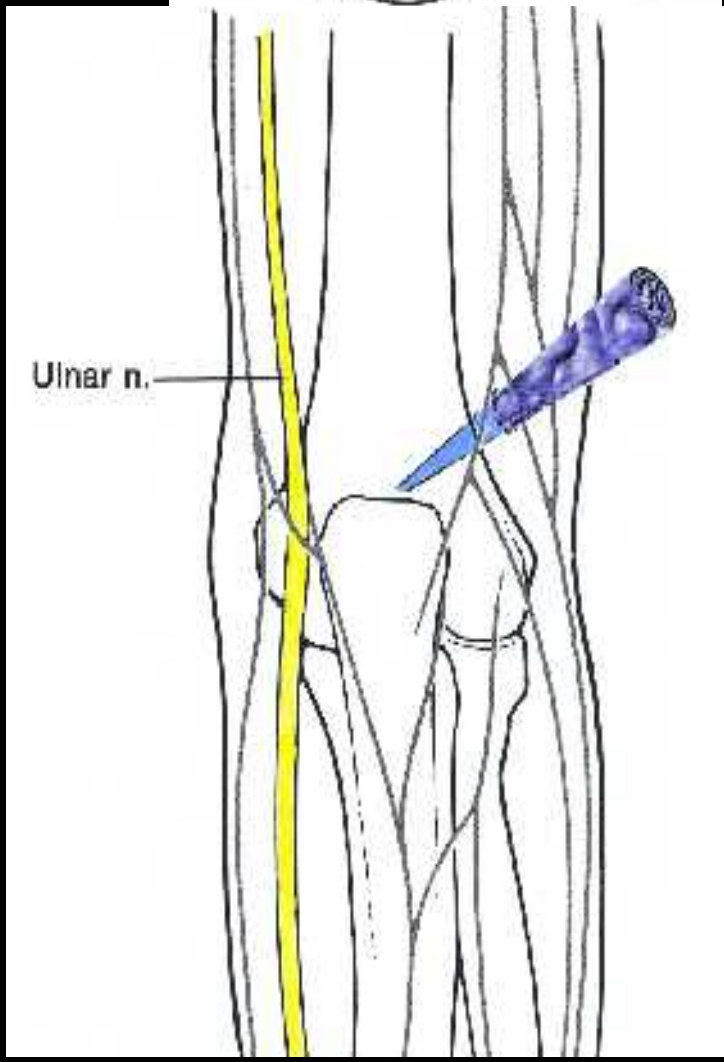
Tip of Olecranon (right)

Postero-Lateral Portal



Lateral condyle





Posterolateral Portal

Olecranon
Fossa

Posterolateral

Radiocapitellar
Articulation

Caveats

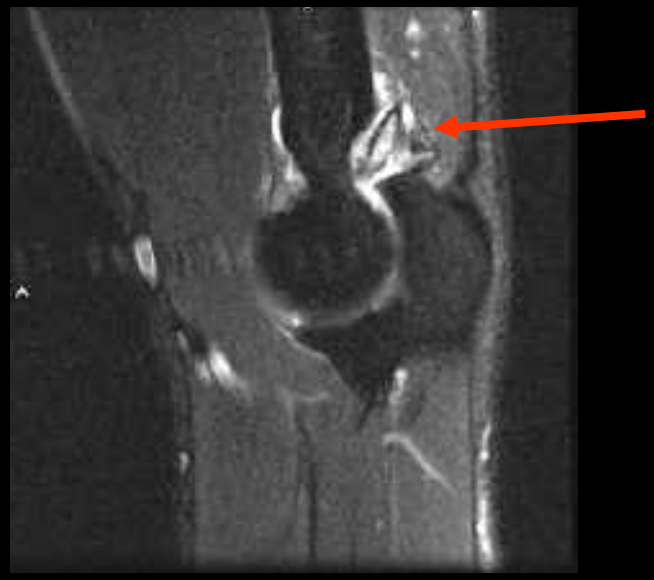
1. Avoid Stab Wounds
2. 90° Flexion
3. Bony Landmarks

Caveats

4. Measure Precisely
5. Direction Critical
6. Post-Op Neurovascular Examination Mandatory

PATOLOGIE

Corpi Liberi



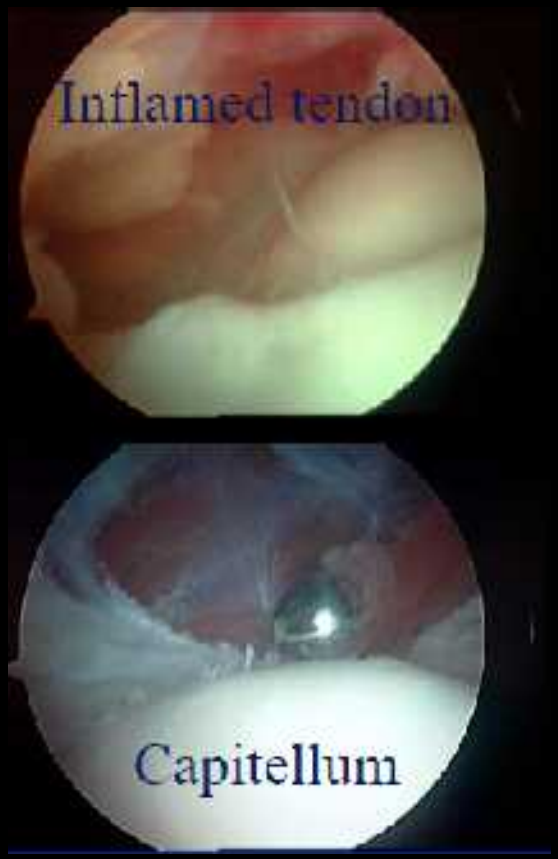
Lateral Epicondylitis

Surgical treatment

- Open treatment simple and straight forward

- Arthroscopic treatment may allow quicker return to work with less pain

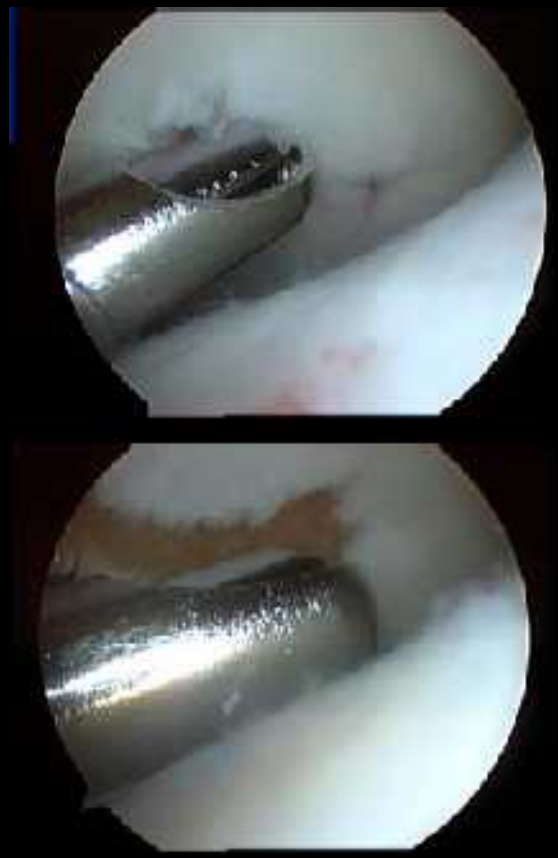
Inflamed tendon



Osteochondritis Dissecans

Osteochondritis Dissecans

X-ray
- Radiolucency of entire capitellum
- Subchondral fragment
- If x ray changes exist, MRI / bone scan may be helpful in directing further therapy, surgery, and activity



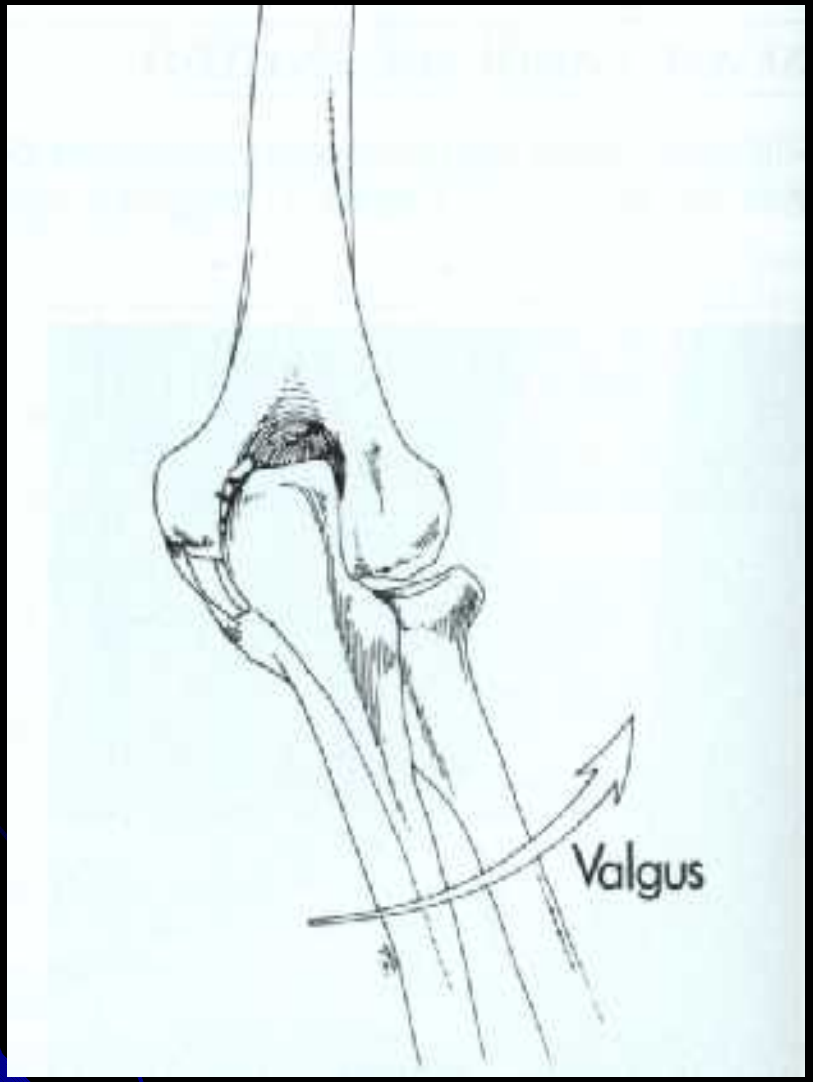
Osteochondritis Dissecans

- Activity modification
- NSAID's
- Brace in painless range range-of of-motion
- Catching/effusion/+ imaging
- Consider arthroscopy and drilling

Removal of loose bodies

Radial Head Resection

Impingement postero-mediale: *Debride dell'olecrano*



Posterolateral spur inidicative of posterior impingement of the elbow in a young tennis player

Posterior impingement

Surgical Technique

Elbow Stiffness

1. Anterior ulnar nerve transfer before or after arthroscopy in cases with significant loss of flexion.

2. The open incision is used for the portal access.

3. The ulnar nerve is kept under direct visualization the whole time.

1. Synovectomy

Synovectomy and removal of any soft tissue
that may block motion due to its bulk,
such as scar tissue in the

2. Removal of osteophytes from the olecranon and coronoid as well as restoration of the normal depth and contour of the fossae

3. Radial Head Excision

4. Ulnohumeral Arthroplasty

5. Excision of Spurs

5. Excision of Spurs

6. Capsular Release

If motion is still limited,

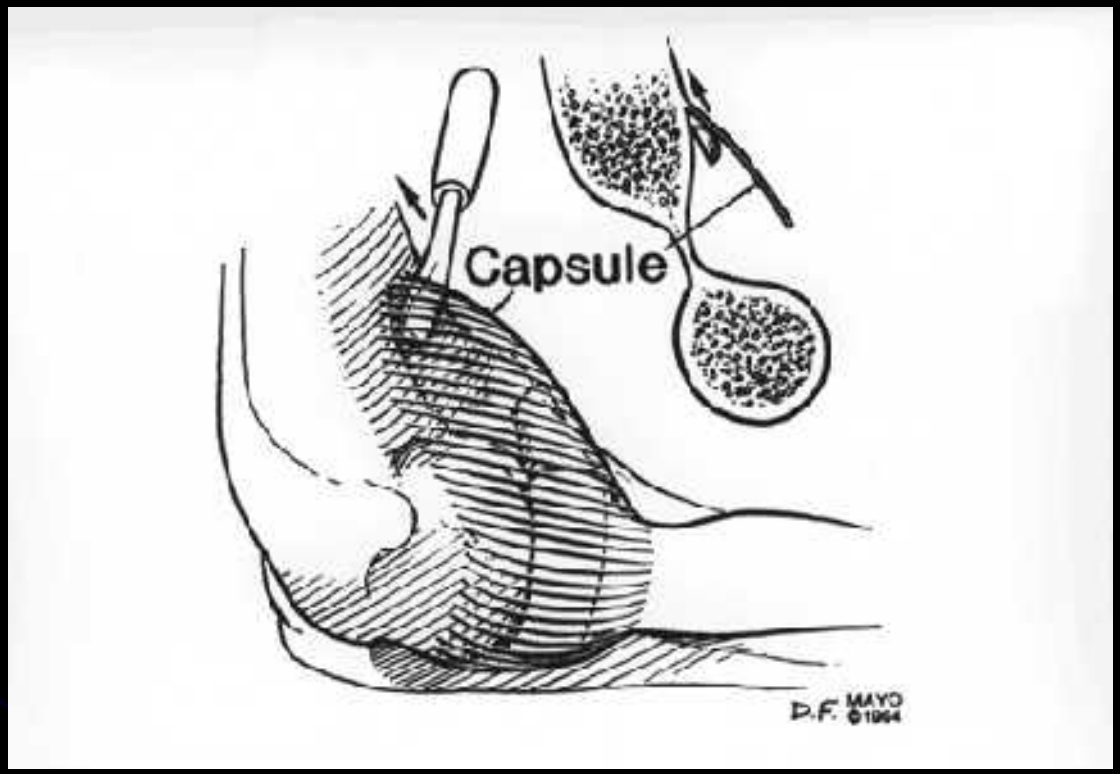
as is almost always the case,

the final stage is capsular release.

Capsular Release

1. Blunt stripping of the capsule off the humerus
2. Capsulotomy (punch)
3. Capsulectomy (shaver, no suction)

Capsular stripping

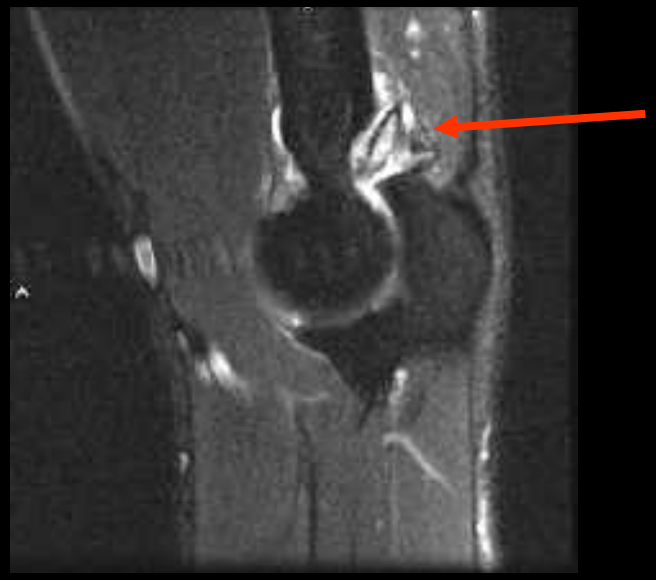


The anterior capsule is stripped off the humerus with a blunt periosteal elevator

After capsulectomy the muscle fibres of the brachialis are evident.

PATOLOGIE

Corpi Liberi



removal of anterior and posterior osteophytes

OK Procedure

Radiologic diagnosis: PLRI

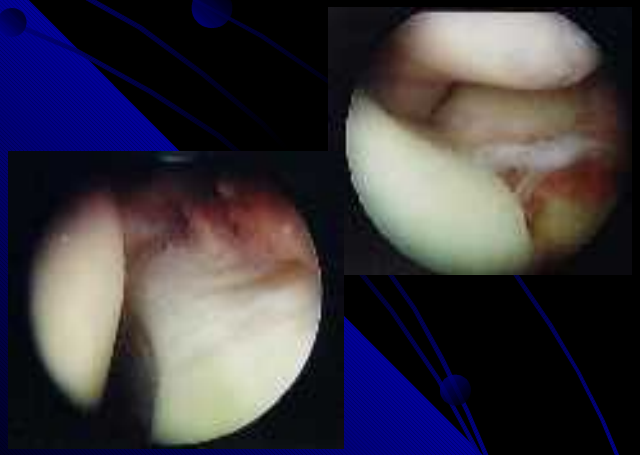
- **X-ray:** gapping joint,
  radial olecranon osteophyt

- **NMR:** extensor lesion, LCL lesion , effusion, joint widening

Functional testing under anesthesia

Elbow arthroscopy typical findings - instability

- spontaneous gapping humero-ulnar joint
- abrasion of plica
- peripheral chondromalacia radial head (subluxation sign)



Arthroscopic staging of instability

- 90 ° flexion
- + - 3mm
- ++ - 6mm
- +++ - more than 6mm

- Humero-ulnar – LUCL lat. ulnar coll.lig.

- Humero-radial – RCL radial ligament

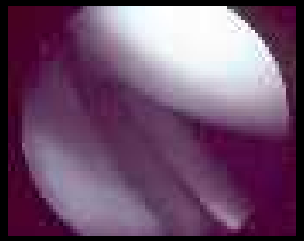
- Radio-ulnar - AL anular ligament

Posterolateral instability



- Extended extensor/LCL-lesion MRI
- Positive Pivot test and drawer test
- Joint gapping 3+
- No or soft end point

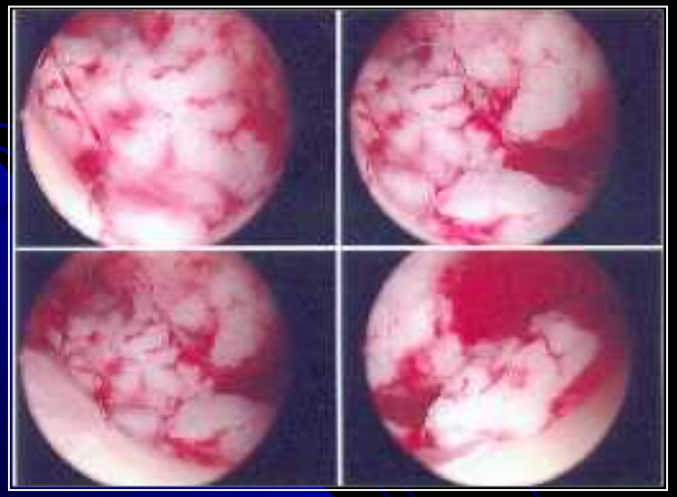





Chondromatosis

Metaplasic synovium - loos body of cartilage

1. Chondromas within the synovium
2. Free loos bodies
3. Normal synovium - volume increase of the LB



Rare

Symptomatic

Imaging studies are helpfull

Chondromatosis

Standard XRays ++

Artho-CT +++

MRI & Arthro-MRI +

Surgical procedure

Arthroscopy

Removal of the loose bodies

Synovectomy if needed ++

Osteochondritis Dissecans

- Definition - Franz Konig - 1889

  Focused avascular necrosis of the sub-condral bone - no more cartilage support

- Rare at the elbow
  - Only 6% of the patients with an OCD

- Adolescent
  - Fusion of the growth plate of the capitulum
  - ≠ Osteochondrosis (Panne's deasis)

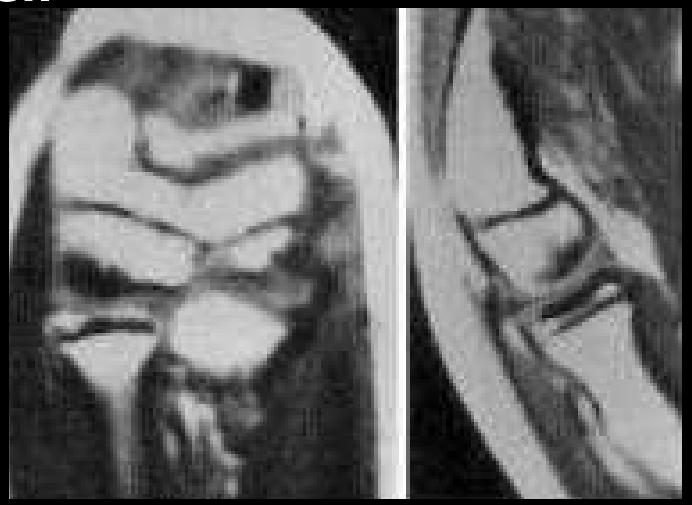
Standard Xrays

Need of an Xray with the elbow flexed at 45°

(Takahara - JBJS Am - 1998)

MRI

- Early diagnosis - infraclinical
  - Hyposignal in T1
  - Normal signal in T2 or hypersignal



Prognostic and therapeutic Value

Takahara - JBJS 19

Classification - indications

Type	Cartilage aspect arthroscopy	Indication
I - IA	Smooth - regular	Abstention or micro-fractures / rest
II - IB	Degenerative - Fissured	Debridement
III - II	Mobile flap	Fixation of the flap
IV - III	Free flap	Resection of the flap
V - IV	Loose body	Resection of the LB + debridement +/- synovectomy

Baumgarten et al. AJSM

Petrie & Bradley - 2003

Retrospective study

- Demographic data:
  - 12 patients (13 elbows)
  - 9 boys (1 bilat) / 3 girls
  - Age: 16 y (10-22)
  - Dominant side: 11/13 (85%)
  - Prior elbow trauma: 15%
  - Repetitive microtrauma: 85%
  - Sports: tennis (7); gym (3); table tennis (1)

Retrospective study

- Clinical presentation
  - Blockages: 10/13
  - Cracking: 13/13
  - Swelling: 12/13
  - Pain at rest: 13/13
  - Discomfort: 13/13
- Arc of motion
  - F/E: -21° / 123°
  - P/S: 85° / 77°

- Radiology:
  - LB (1 à 2) : 9/13
  - Osteophytes: 2/13
  - JS narrowing: 5/13
  - True OCD: 12/13
- Arthro-CT: 6/13
- MRI: 5/13
  - Synovitis: 9/11

Retrospective study arthroscopic evaluation

13/13

13/13 (free flap)

1/13 (miror lesion)

1.7 (1 à 3)

Retrospective study
Procedures

17

3

13/13

8/13

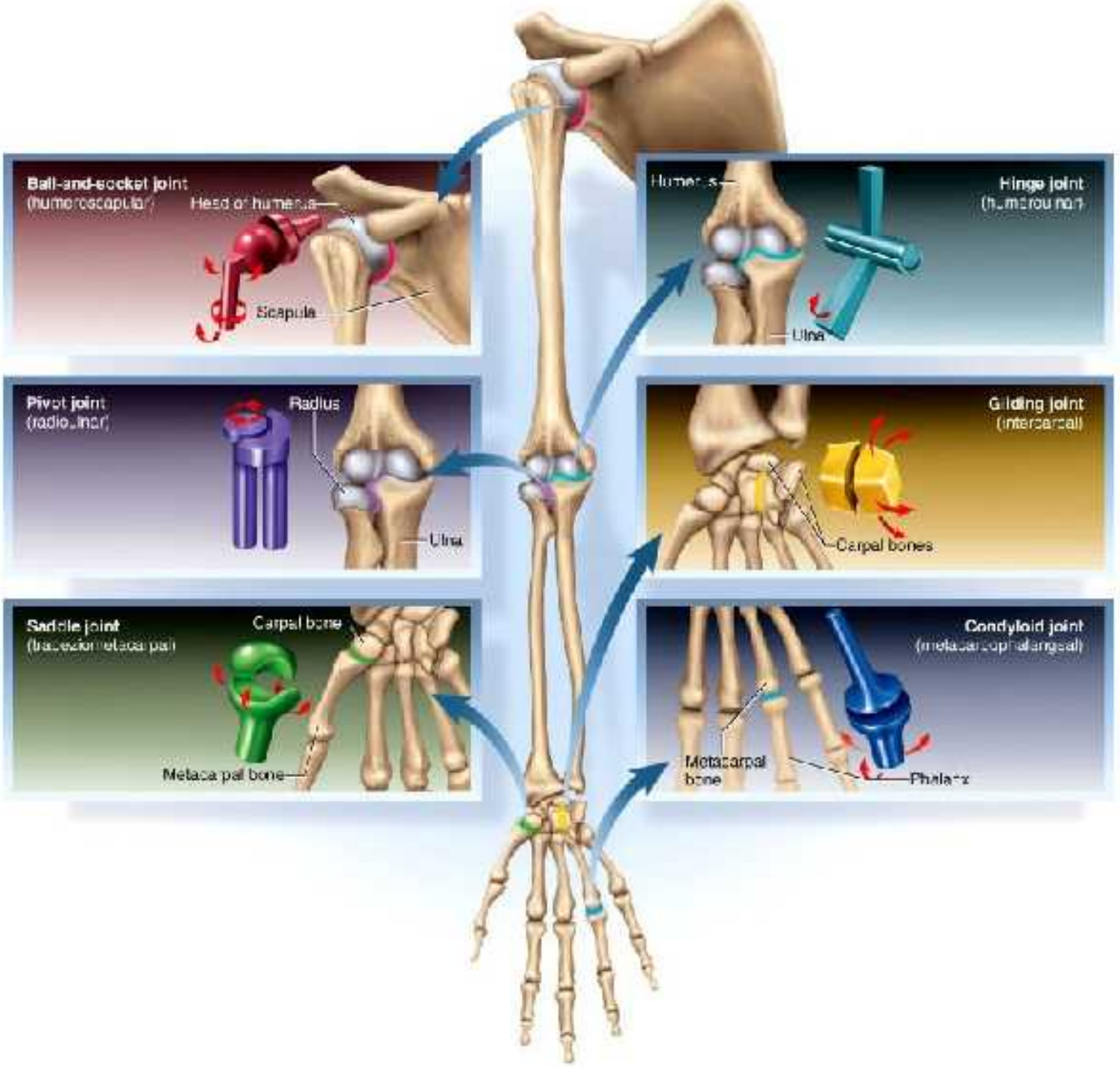
13/13

3/13

6/13

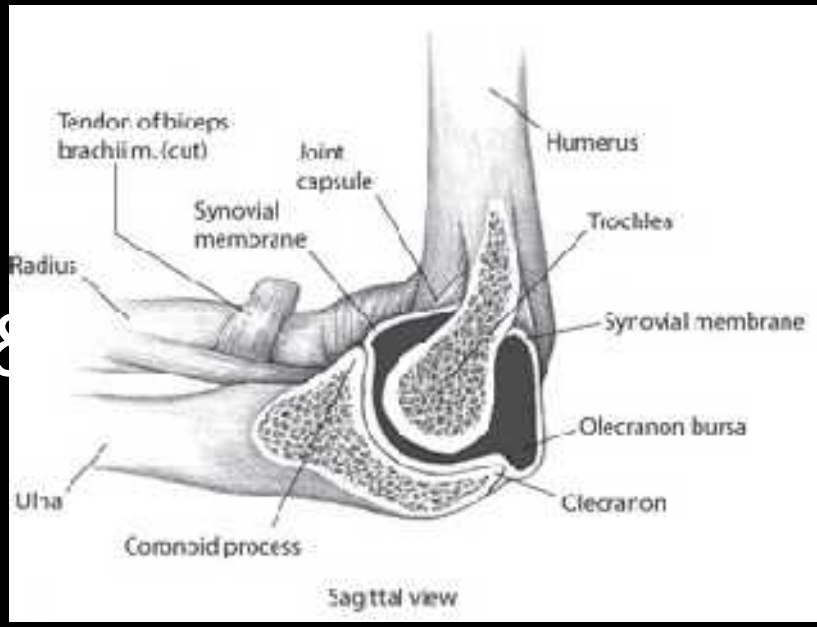
- Syno

- **No complication**


Ball-and-socket joint
(humeroscapular)
Head of humerus
Scapula
Hinge joint
(humeroulnar)
Ulna
Pivot joint
(radioulnar)
Radius
Ulna
Gliding joint
(intercarpal)
Carpal bones
Saddle joint
(trapezium–metacarpal)
Carpal bone
Metacarpal bone
Condyloid joint
(metacarpophalangeal)
Metacarpal bone
Phalanx

Joints

- As elbow flexes 20 degrees or more, its bony stability is unlocked, allowing for more side-to-side laxity
- Stability in flexion is more dependent on the lateral (radial collateral ligament) & the medial or (ulnar collateral ligament)



Contraindications to Elbow Arthroscopy

Relative contraindications

- Surgeon inexperience with proposed procedure
- Patient reluctance or inability to perform requisite rehabilitation
- Moderate to severe intra-articular deformity
- Extra-articular deformity/malunion or heterotopic ossification that will preclude functional recovery of acceptable motion arc
- Elbow instability
- Pain throughout arc of flexion-extension
- Loss of ulnohumeral joint space
- Anterior subcutaneous ulnar nerve transposition

Strict contraindications

- Previous submuscular ulnar nerve transposition

Complications of Elbow Arthroscopy

- Recurrence of symptoms
- Prolonged portal drainage/superficial infection
- Temporary neuropraxia
- Deep infection
- Catastrophic nerve or vessel injury or transection
- Compartment syndrome
- Wound drainage
- Fracture
- Vascular injury
- Dystrophy

Instrumentation

- 20 cc Syringe and Steril I.V. Tubing
- 18 Gauge Needle
- Sterile Marking Pen
- 11# Scapel
- Standard 4.0 mm scope

Instrumentation

- Switching Sticks
- Plastic Canula with Membrane
- Motorized Shaver and Burr
- Hand Held Arthroscopic Instruments
  - Suction Punch
  - Basket Punch
  - Grasper

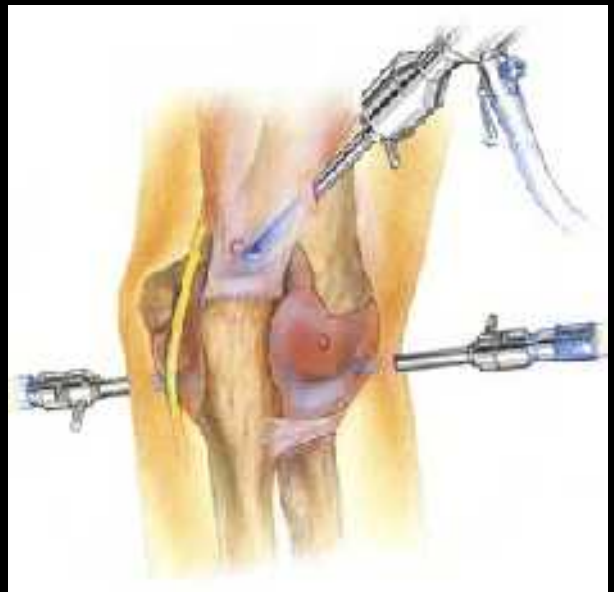
Arthroscopic Portals

Anterior

- Proximal Medial
- Anteromedial
- Anterolateral

Posterior

- Soft Spot
- Posterolateral
- Trans-Triceps Tendon

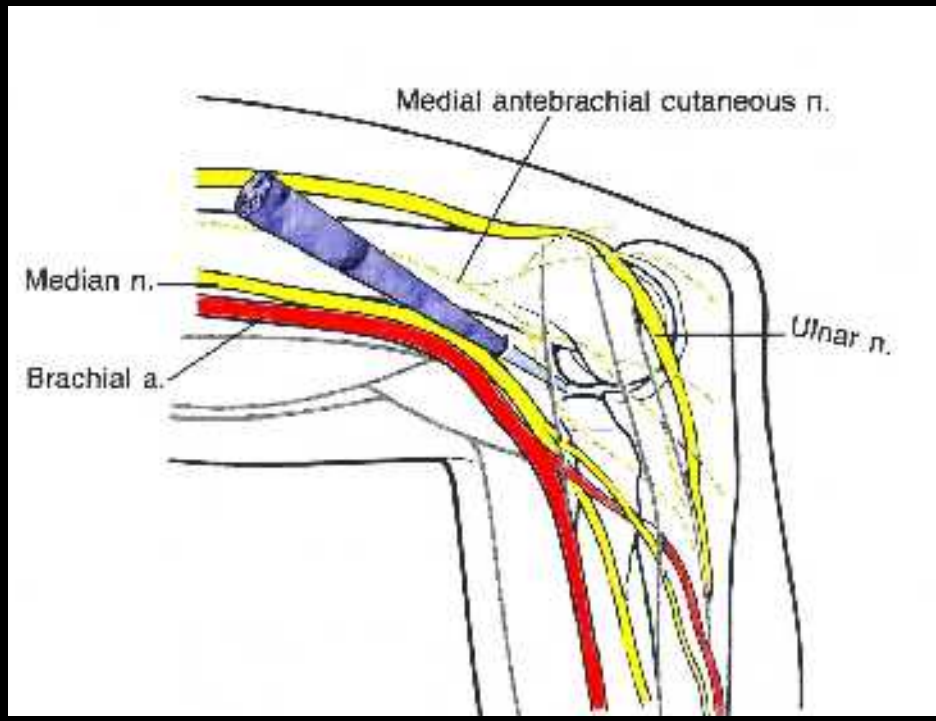


Portals: Lateral view

Portals: Medial view

Anteromedial Portal

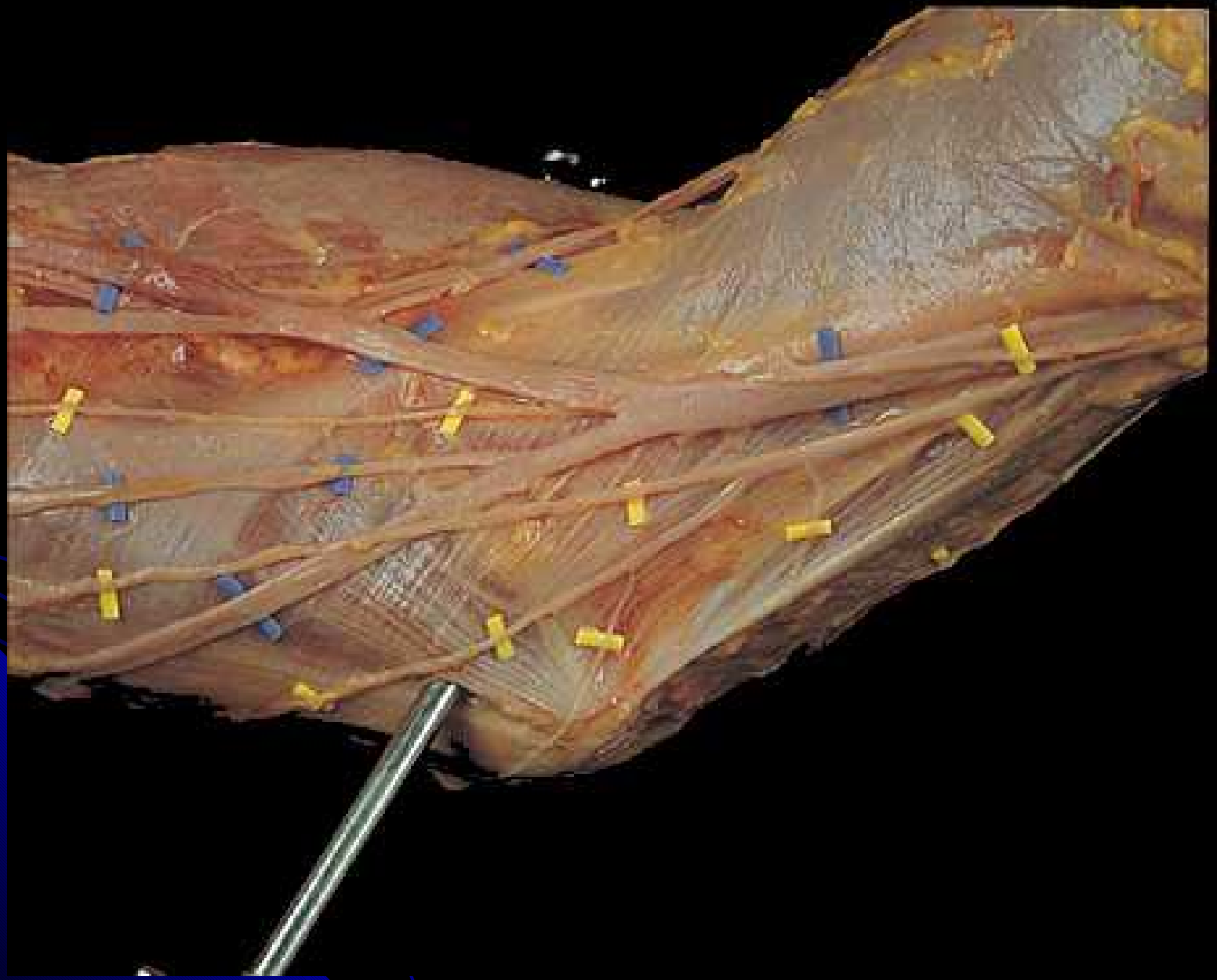
- 3 cm. distal and 1 cm. anterior to the medial humeral epicondyle



Structures

- At Risk
  - median nerve
  - brachial artery
  - medial antebrachial cutaneous nerve
- Best Seen
  - radial head
  - capitellum
  - coronoid process
  - trochlea
  - proximal radioulnar joint
  - anterior capsule

Portals: Medial

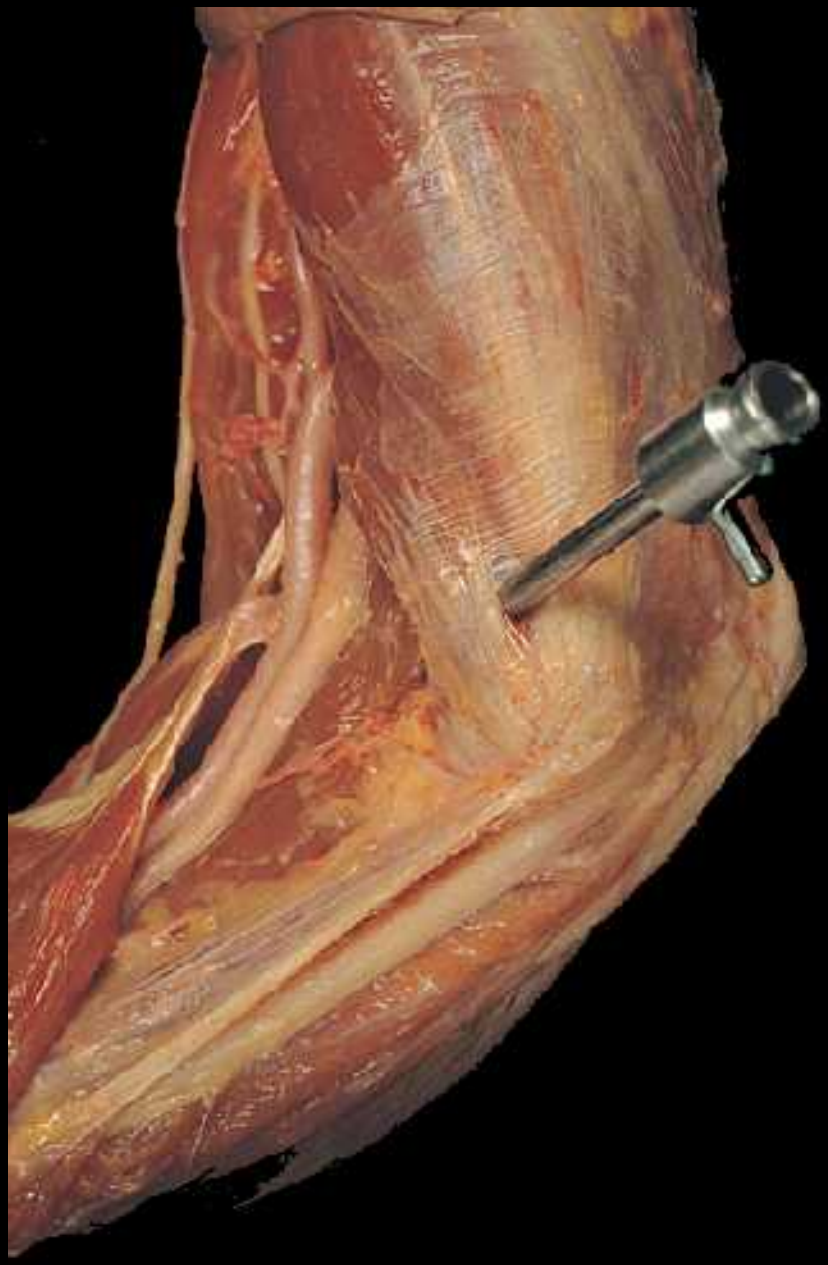


Proximal Medial Portal

- 2-3 cm. proximal to the medial humeral epicondyle
- anterior to the medial intra-muscular septum

- At Risk
  - ulnar nerve
  - medial antebrachial cutaneous nerve
  - median nerve
  - brachial artery
- Best Seen
  - radial head
  - capitellum
  - coronoid process
  - trochlea
  - proximal radio-ulnar joint
  - anterior capsule

Portals: Medial



Anterolateral Portal

- 2 cm. anterior and 2 cm. distal to the lateral humeral epicondyle

Structures

- At Risk
  - radial nerve
  - lateral and posterior brachial cutaneous nerves
- Best Seen
  - coronoid process
  - trochlea
  - proximal radioulnar joint
  - anterior capsule

Soft Spot Portal

- In the center of a triangle formed be the radial head, the lateral humeral epicondyle and the olecranon

Structures Best Seen

- Posterior Surface of the Radial Head
- Posterior Capitellum
- Radial Surface of the Olecranon

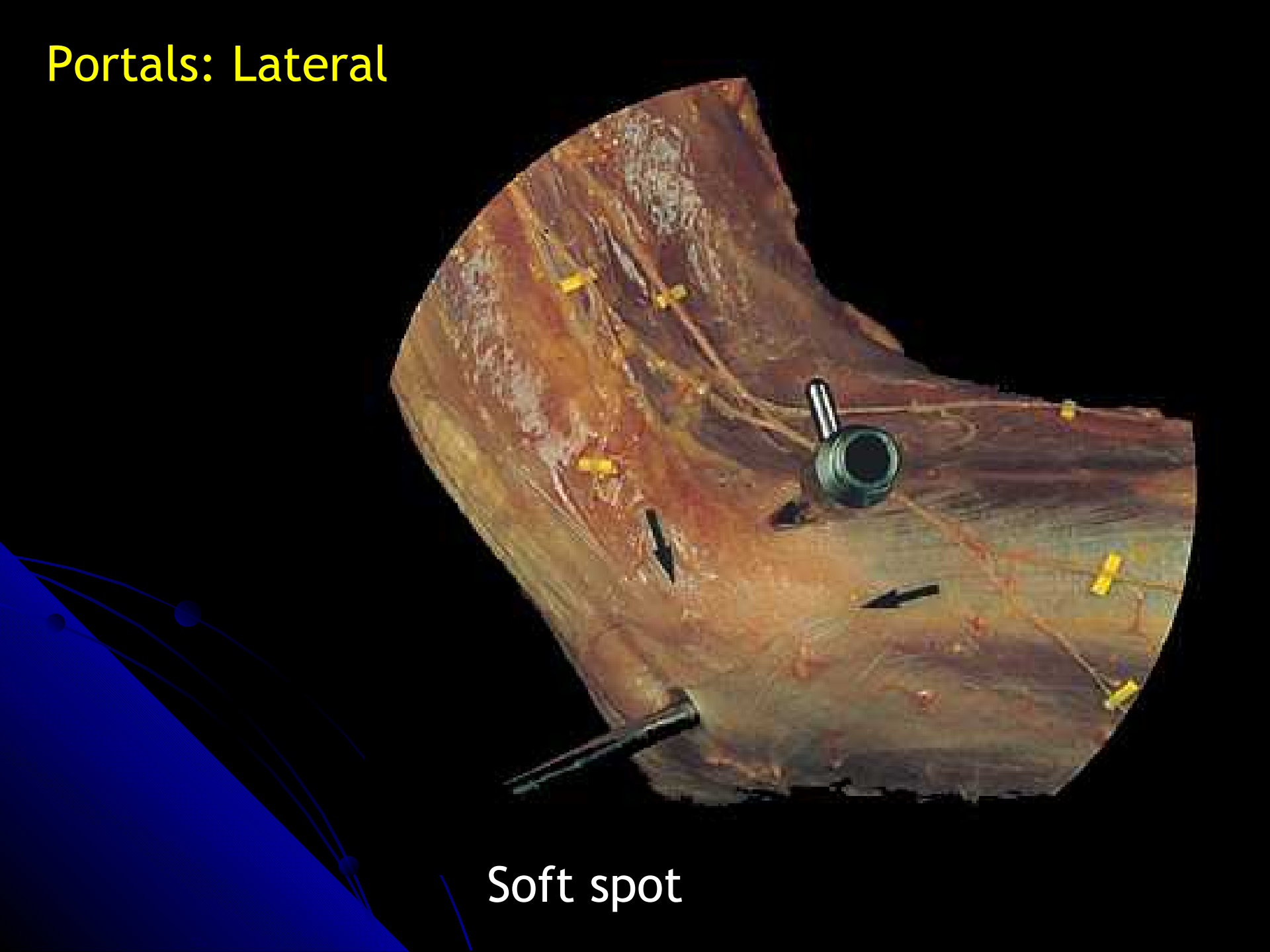
Posterolateral Portal

- 3 cm. proximal to the olecranon process tip at the lateral border of the triceps tendon

Structures Best Seen

- Olecranon Process
- Olecranon Fossa
- Posterior Ulnar Gutter

Portals: Lateral



Soft spot

Trans-Triceps Tendon Portal

- 2 - 3 cm. proximal to the tip of the olecranon process

Structures Best Seen

- Olecranon Process
- Olecranon Fossa
- Posterior Radial and Ulnar Gutters

Anteromedial Portal

- 3 cm. distal and 1 cm. anterior to the medial epicondyle
- Passes through common flexor origin
- (2 cm. distal, 2 cm anterior - Lynch, Whipple, Meyers)

Anteromedial

Anteromedial Portal

Best Visualization for:

- Radiocapitellar Joint
- Coronoid Fossa
- Trochlea
- Radio-ulnar Joint
- Anterior Capsule

Anteromedial Portal

At Risk

- MABC Nerve (6mm)
- Median (19mm distended, 12mm non-distended)
  - sheath lies in contact with nerve in 56% of extended elbows
- Brachial Artery

Anterolateral Portal

- 2 cm. anterior and 2 cm. distal to the lateral epicondyle
- Passes through ECRB and Supinator posterolateral to radial nerve
- (3cm distal and 2cm anterior Andrews and Carson)

Anterolateral

Anterolateral Portal

Best Visualization for:

- Coronoid
- Trochlea
- Radioulnar articulation
- Anterior Capsule
- Valgus Instability test (70 degree flexion, full pronation, Ulnohumeral opening - Andrews and Timmerman)

Anterolateral Portal

At Risk

- Radial Nerve (as close as 3 mm)
- PIN (1 to 13 mm increasing with pronation)
- Posterior Antebrachial Cutaneous Nerve (2mm)

Proximal Medial Portal

- Usually start medially
- 2-3 cm. Proximal to the Medial Humeral epicondyle
- Just Anterior to the Medial Intermuscular Septum

Proximal Medial Portal

Proximal Medial Portal

Best Visualization for:

- Radiocapitellar joint
- Coronoid
- Trochlea
- Radio-ulnar joint
- Anterior capsule

Proximal Medial Portal

At Risk

- Ulnar Nerve
- MABC Nerve
- Median
- Brachial Artery

Soft Spot Portal

- Center of triangle formed by the radial head, lateral epicondyle, and olecranon
- Passes through anconeus and triceps
- Posterior Antebrachial Cutaneous Nerve (7 mm average)

Soft Spot Portal

Soft Spot Portal

Best Visualization

- Posterior Surface of Radial Head
- Posterior Capitellum
- Radial Surface of Olecranon

Soft Spot Portal

- Olecranon - R
- Fossa - L

Soft Spot Portal

Posterolateral

Posterolateral Portal

Best Visualization for:

- Olecranon Process
- Olecranon Fossa
- Posterior Ulnar Gutter
- 70 degree scope - Posterior portion of UCL

Trans-Triceps Tendon Portal

- 2 - 3 cm. proximal to the tip of the olecranon process

Structures Best Seen

- Olecranon Process
- Olecranon Fossa

Structures Best Seen

- Posterior Radial and Ulnar Gutters
- (Loose Bodies, Osteophytes, Synovectomy)

PORTALI

Portale Posteriore Diretto

•Attraverso una perforazione del forame olecranico è possibile visualizzare l'aspetto anteriore del gomito (approccio transolecranico) utile nei casi di trasposizioni del N. Ulnare.

Redden JF, Stanley DS. Arthroscopic fenestration of the olecranon fossa in the treatment of osteoarthritis of the elbow. *Arthroscopy* 1993; 1:14-16.