

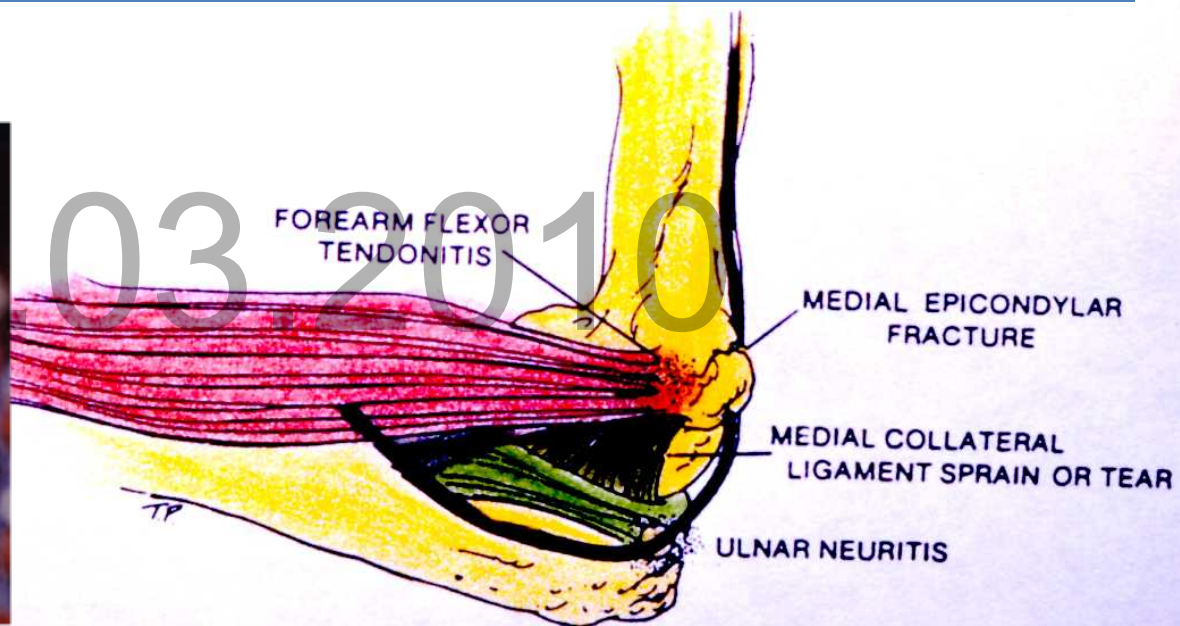
ELBOW LIGAMENT AND IMPIGMENT INJURIES IN ATHLETES



GILLES DAUBINET MD

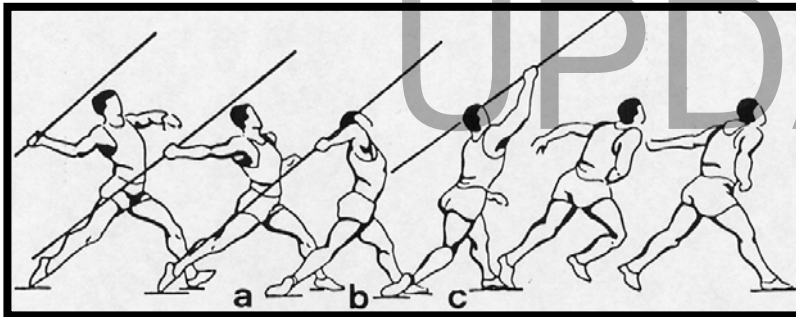
- THROWING = OVERLOAD ELBOW VALGUS STRESS :
ACUTE – CHRONIC INJURY

- UCL STRAIN << LAXITY - PAIN
- MEDIAL EPICONDYLE FRACTURE / AVULSION
- ULNAR NEURITIS
- FOREARM FLEXOR TENDONITIS

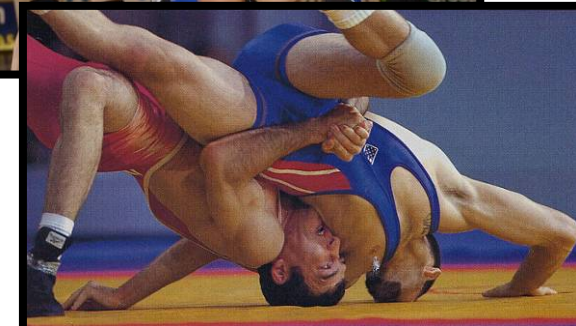


ULNAR COLLATERAL LIGAMENT STRAIN

- LATE COCKING /ACCELERATION +++
OVERLOAD IN VALGUS IN
JAVELIN – BASEBALL- TENNIS – VOLLEY - HANDBALL

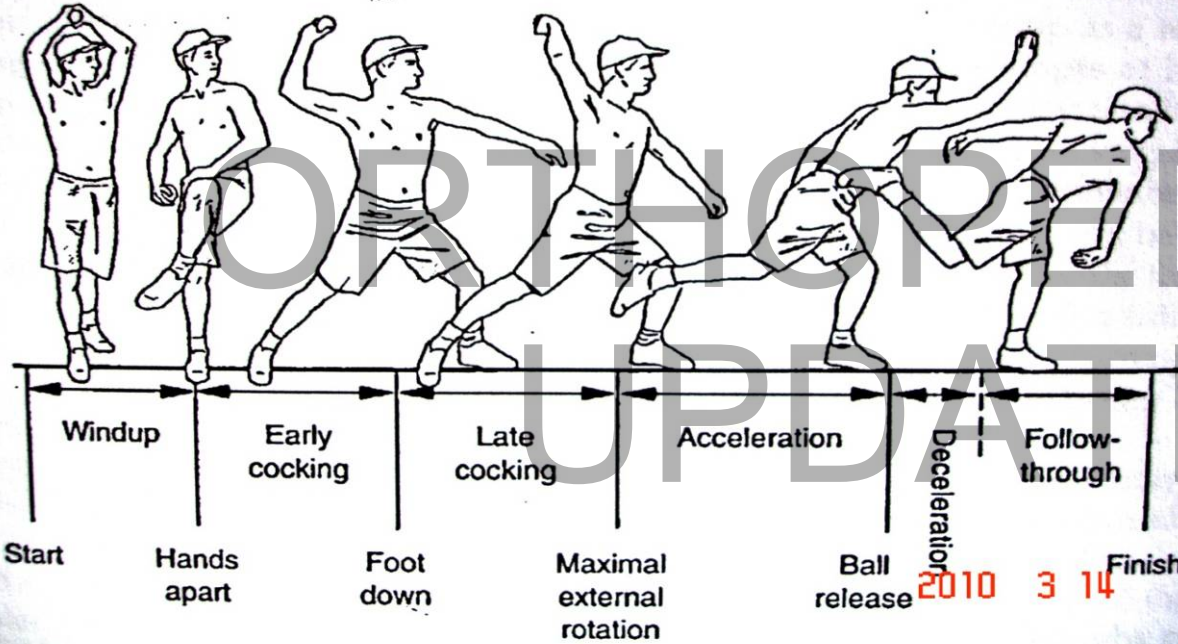


- SHOOT WITH OPPOSITION :
HANDBALL
- FALLING IN VALGUS POSITION
WRESTLER -JUDO

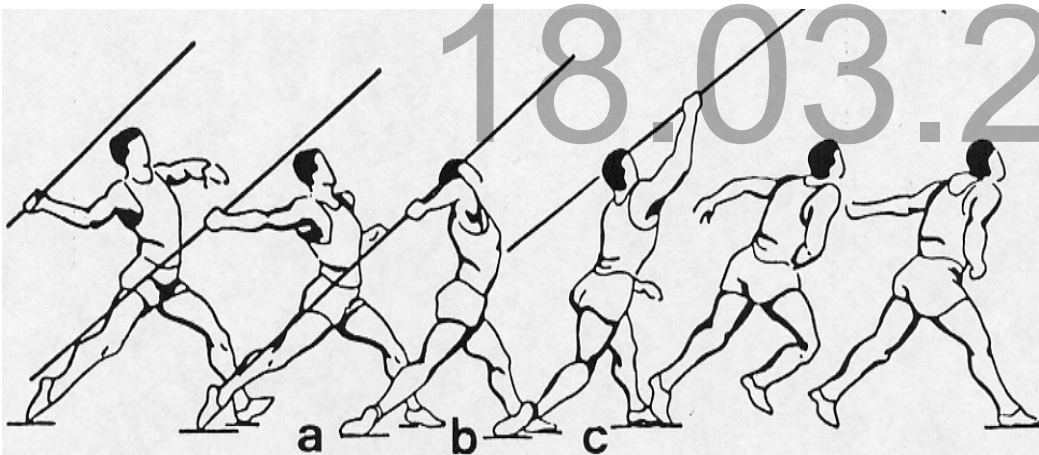
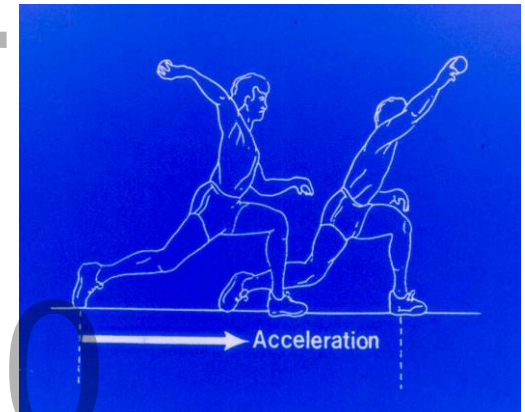


CRITICAL PHASE : LATE COCKING – ACCELERATION

120° - 30°



Late cocking



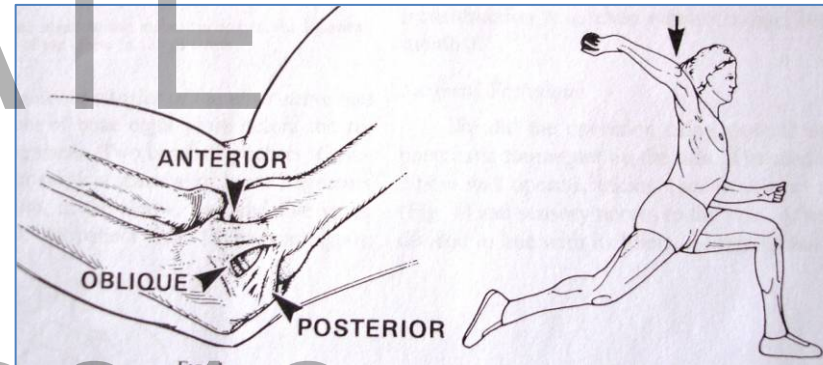
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ULNAR COLLATERAL LIGAMENT INJURY

- First described **BENNET** *jama 1941* pitcher
- **WARIS** *act chir scand 1946* : 17 javelin
Posteriomedial osteophytes
- **ARGO** *am j sports med 2006* : first description in female athletes , 19 softball
- **LARSON** *am j sports med 1976* :
little league survey (Baseball)
elbow = most frequent site of injury in children

ULNAR COLLATERAL LIGAMENT INJURY

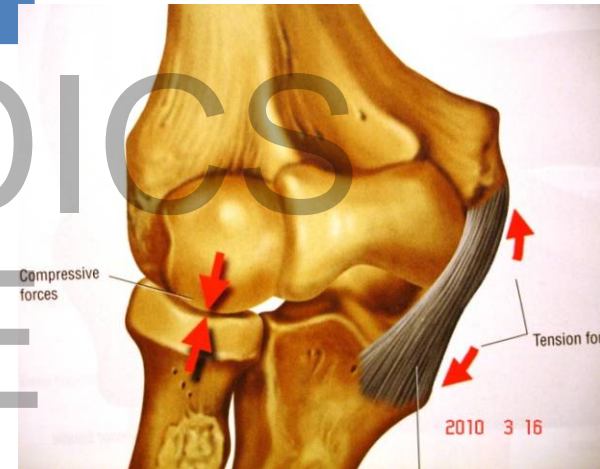
- Throwing provide valgus elbow load
- Medial elbow pain can be difficult to interpret
- reduce performance
- Career threatening injury
- Acute or chronic injury with progressive adaptive structural changes



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Elbow stability

- **Passive** : bone + ligaments
- **Active** : muscles + tendons
- Valgus load is absorbed
 - First by UCL (stretching)
 - secondary by radiocapital articulation

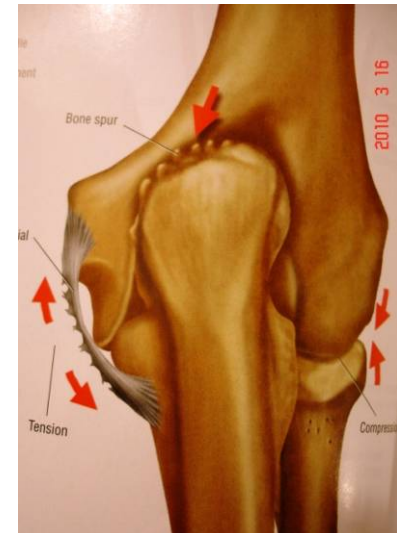


compression

- Throwing Valgus load = 64 Nm
- Maximal load in cadaveric study 33Nm

FLEISIG *am j sports med* 1995

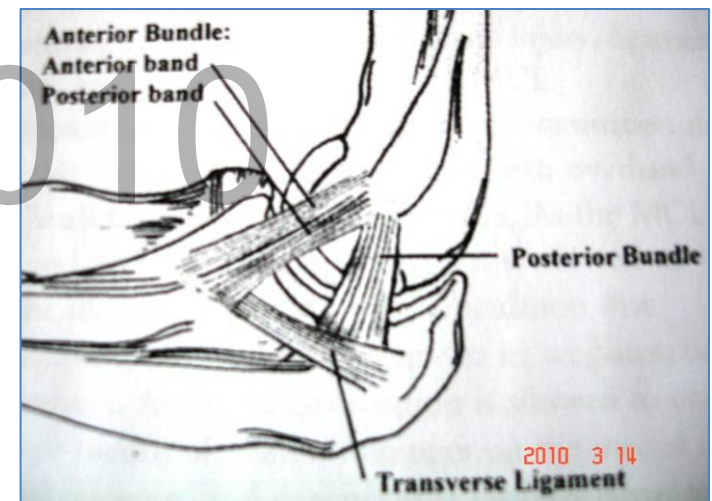
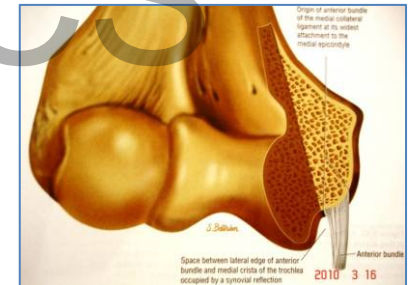
AHMAD *am j sports med* 2003



Passive Elbow stability

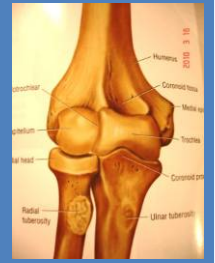
UCL ligament complex

- UCL : 4,7mm length - 2,7 mm wide
- 3 bundles : ant / post / transverse
- Anterior bundle is the primary constraint resisting to valgus load $\ll 120^\circ - 30^\circ$
 - Failure at 260N
 - Throwing = 290N



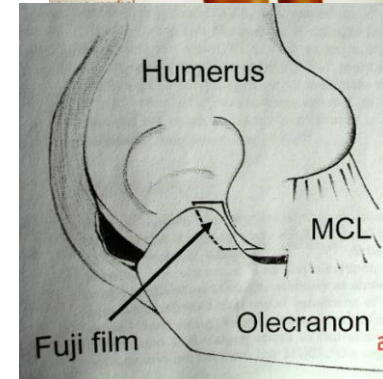
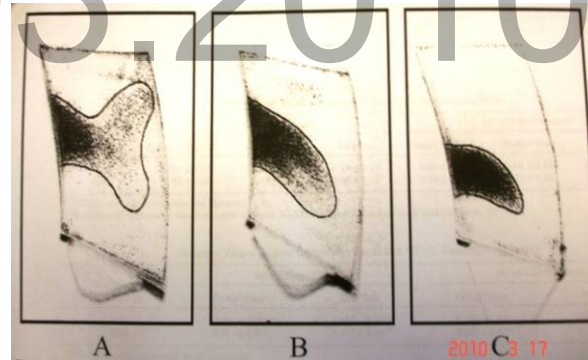
REGAN *chir orthop 1991*
SJOBERG *chir orthop 1987*
SCHWAB *clin orthop relat res 1980*

Passive Elbow stability



The bones

- Olecranon / olecranon fossa / radiocapitellar joint
Provide to stability 0-20° and 120-140°
- IF Insufficiency of UCL :
Trochlea contact area decrease
Pressure m² increase



MORREY *clin orthop* 1991

AHMAD *am j sports med* 2003

Active elbow stability

- GENERATES VARUS MOTION ++++
- Relief of UCL
- Muscular activation : concentric / excentric ++
- Biceps / triceps couple = compression
- Extensor / flexor – pronator couple
(fcu , fds , fcr ,)

MORREY *clin orthop relat res* 1991

LIN *j shoulder elbow surg* 2007

SAFRAN *j shoulder elbow surg* 2005



Throwing physiology

- **Throwing combine**

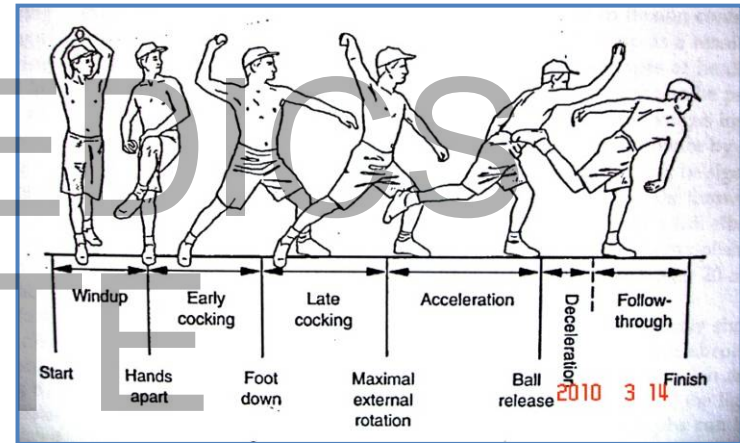
Rapid extension
high valgus stress

- Maximum valgus stress phase :

Late cocking – acceleration : 120° - 20°

- Peak of valgus stress : 70° - 85°

- Extension speed : $3000d^{\circ}$ /second

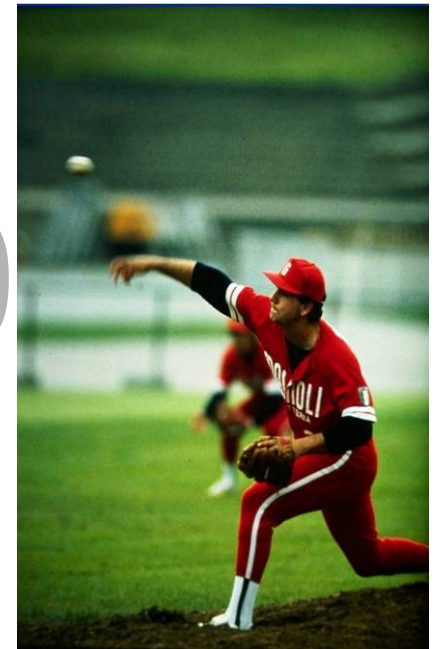


- FLEISIG *am j sports med 1995*

- PAPPAS *am j sports med 1985*

Throwing physiology EMG analysis

- GLOUSMAN : *am j sports med* 1992
- Maximum muscular activity during acceleration phase
- **In athletes with medial instability**
 - Decrease of medial epic muscles
 - Increase of lateral epic muscles
 - excentric strenght >> concentric
 - base of medical treatment
 - = regain normal strenght



Ligament's lesions

**Collagen lesions generates
ligamentous insufficiency**

O'DRISCOLL am j sports med 2005

- Stage 1 : debounding
Intact , no laxity
- Stage 2 : partial tears
Healing with lengthened occurring laxity
- Stage 3 : complete tears
Laxity ++

UCL INJURY :CLINICAL FINDINGS

- Thorough detailed :
history /physical examination
- Acute or chronic
- Medial pain during late cocking - acceleration
- Popping sensation
- Clicking sensation
- Ulnar nerve irritation
- Instability
- Unable to throw more than 50/70%
- [CAIN](#) *am j sports med* 2003



UCL INJURY : CLINICAL FINDINGS

HISTORY

- When ,how and before injury
- Time of onset syndrom
- Painfull Phase of throwing
- Research neurologic symptoms
 - Cold intolerance , tingling hand or fingers
 - shooting pain sensation
 - tendency to drop objects ...

UCL INJURY : CLINICAL FINDINGS

Physical examination

- Resting position
- Effusion
- Normal carrying angle
- Ecchymosis
- Range of motion : 1 active and 2 passive
Research crepitus , noise , pain
loss of extension ++ (flexion)



UCL INJURY : CLINICAL FINDINGS

Physical examination

- Palpation

- Bony landmarks : medial epic
- Posteromedial olecranon
- radial head – humeral condyle
- Soft tissues : tendons , muscles
- UCL 50-70° flexion
- Ulnar nerve course (fcu)

- Muscular testing = no pain +++

- Neurological assessment

clinical findings

- Valgus stress : pain - laxity
- 20° – 30° (unlock olecranon)
- Comparative ++++
- supine / normal position
- Normal = less than 1mm



MILKING MANŒUVRE

70°-90° CHEN

j am acad orthop surg 2001



MOVING VALGUS STRESS

120°-70° O'DRISCOLL

Am j sports med 2005

CLINICAL FINDINGS

SHOULDER EXAMINATION ++++

- Pain , tendinitis
 - Weakness ++ neuropathy
- increase prehension strenght
- Increase valgus load

SPINE EXAMINATION

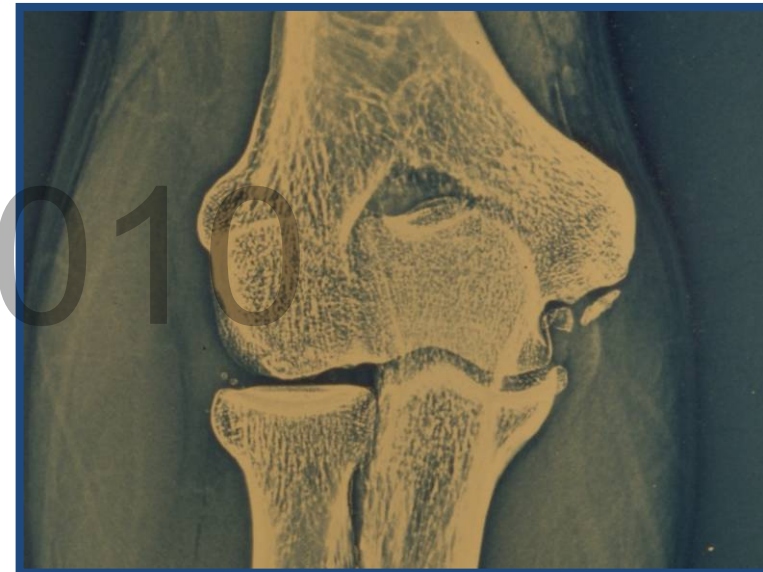


Imaging

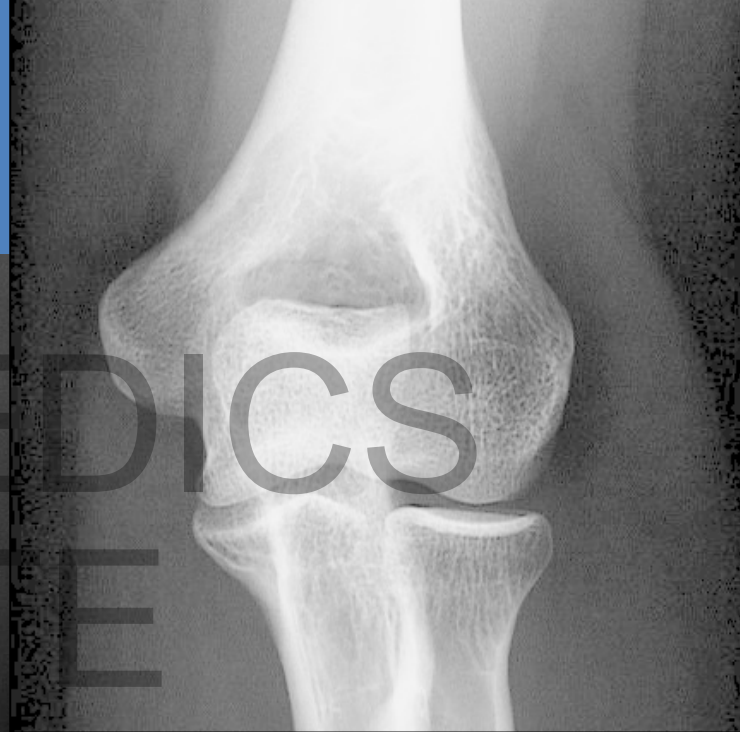
RADIOGRAPHY

Antpost / lateral / 2 obliques
olecranon throwers view ++

- Bone spurs , osteophytes
- Calcification , ossification
- avulsion-fracture (child)
- Malunion
- Loose body



4 Normal views



GAUCHE

Olecranon thrower's view

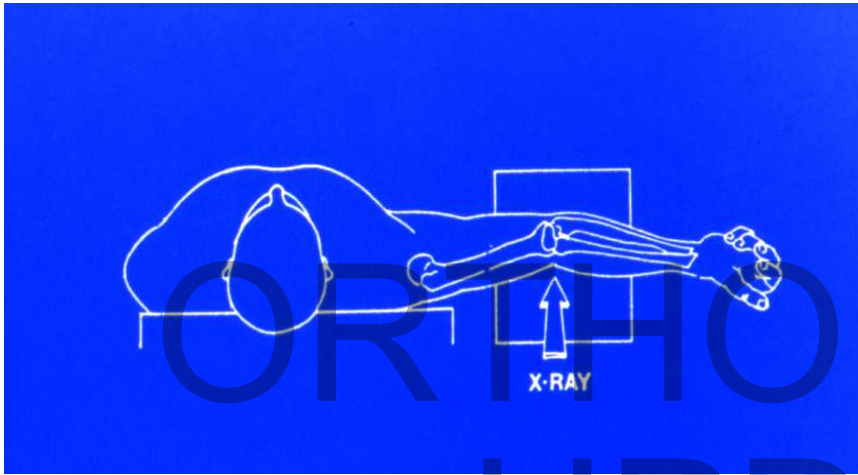


Imaging

Valgus stress test : comparative ++

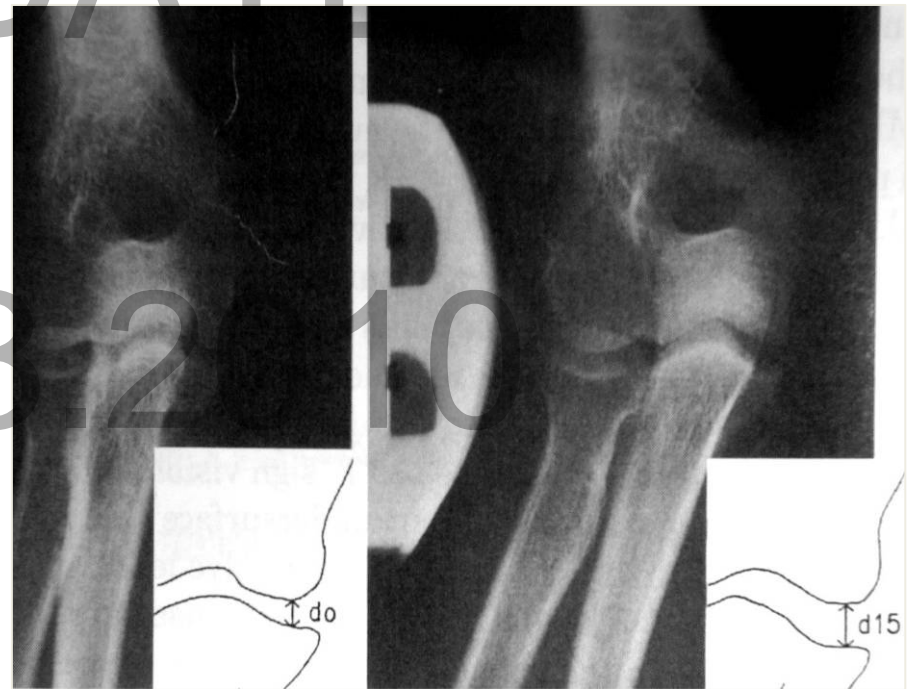
- Telos 15 N
- 25° flexion + supine
- General anesthesia ???
- symptomatic : 1 – 3 mm
- asymptomatic players develop an acquired laxity

- ELLENBACKER *am j sports med 1998*
- SAFRAN *am j sport med 2005*
- EYGENDAAL *act orthop scand 2000*



ORTHOPEDICS UPDATE

Ucl rupture if
différential > 5mm

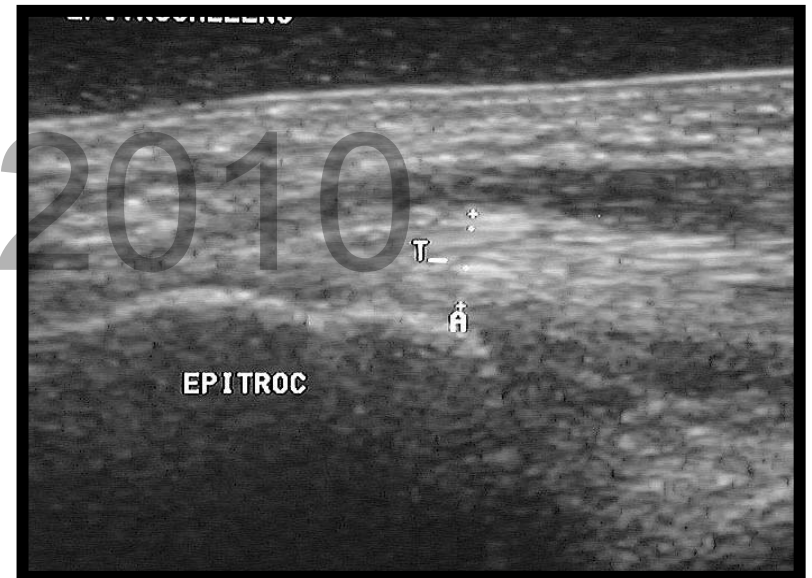


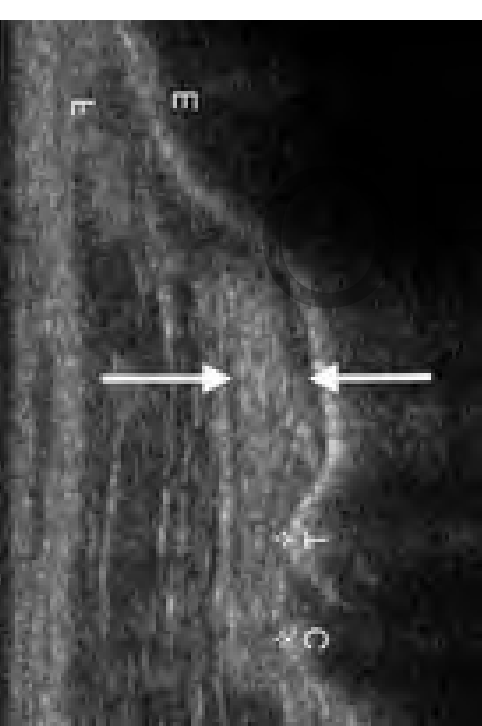
Imaging

Echography

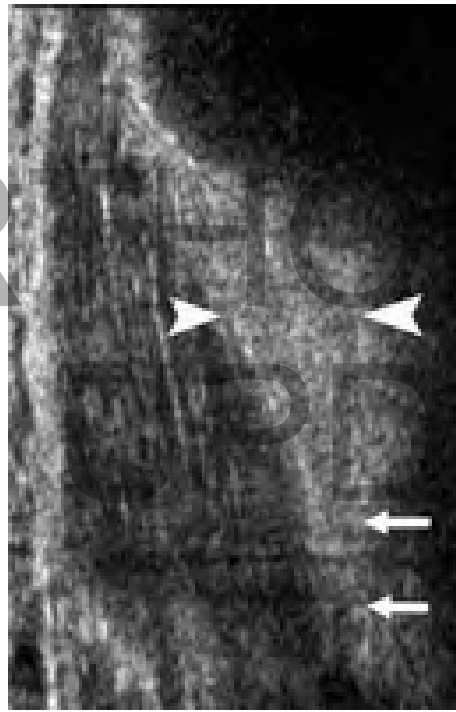
- Good visualisation soft tissues
- Dynamic study with valgus stress

- NAZARIAN *radiology* 2003
- SASAKI *j bone joint surg A* 2002

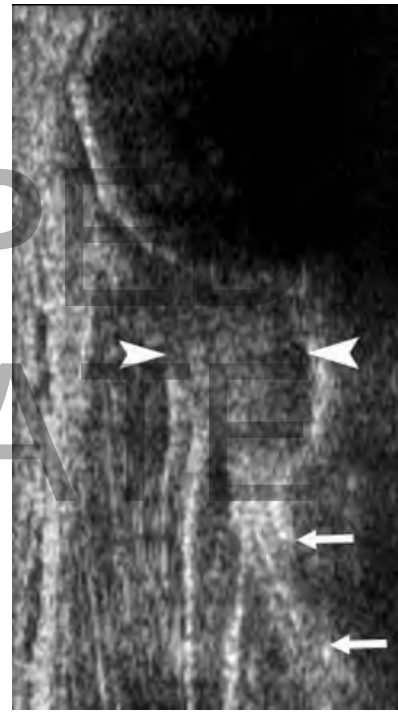




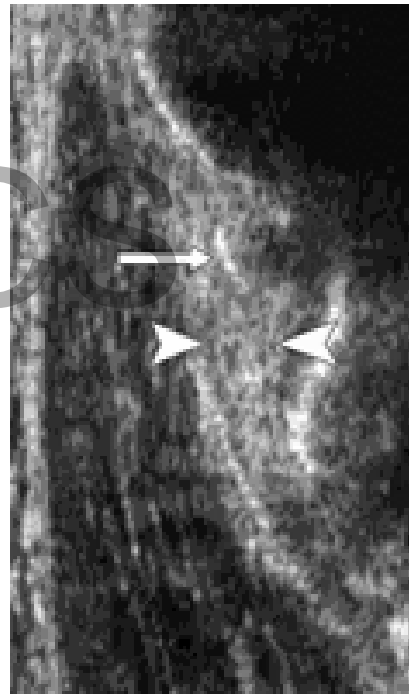
normal



thicken



STRESS



avulsion

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NAZARIAN Radiology 2003
Asymptomatic base ball pitcher
Progressive and adaptative changes

Imaging

- **MRI – MRI arthrogram**

- Thickening / signal heterogeneity / tears
- Screening tool ? Player / agent / parents / staff
- Enhanced gadolinium
- Soft tissues and bone
- Symptomatic lesions ????? Adaptive lesion
must be in corresponding with clinical findings
is MRI a good factor in treatment decision ?????

- SONIN *Am J Radiology 1996*

Sensitivity 57% specificity 100%

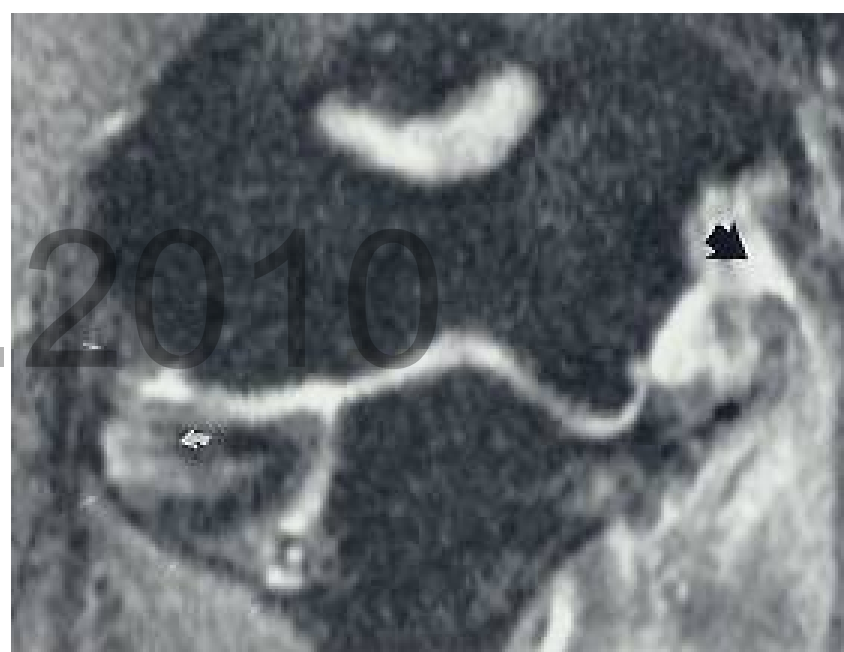
- Schwartz *radiology 1995*

Sensitivity : partial tears 86% // complete tears 95%

- KOOIMA *am j sports med 2004*



FIGURE 10-23. Muscle strain and partial tear of the medial collateral ligament (MCL). T2-weighted sagittal (A) and coronal (B) images reveal increased signal within the flexor digitorum superficialis muscle (*large arrow*), as well as partial tearing of the anterior bundle of the MCL from the coronoid (*open arrow*). The common flexor tendon (*curved arrow*) is intact.

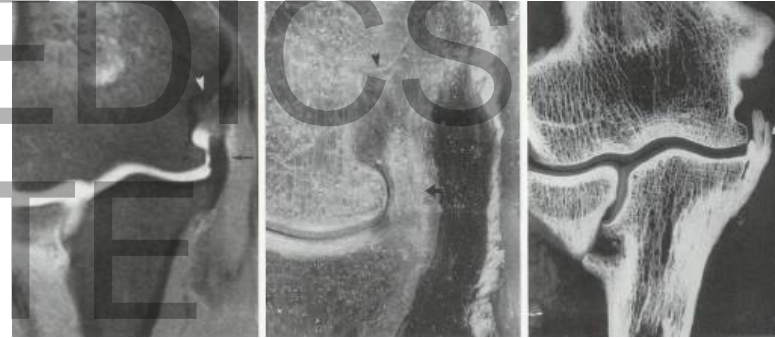


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Imaging

CT SCAN – CT ARTHROGRAM

Bone +++ , osteophytes , spurs
Fracture , avulsion , malunion



- TIMMERNAN *am j sports med 1994*

ct arthrogram sensitivity 86%

specificity 100%

MRI sensibility 57%

specificity 100%

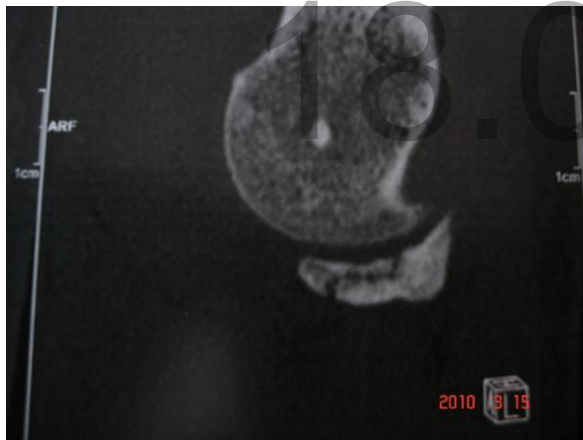
Progressive Distal avulsion UCL

ORTHOPEDICS UPDATE



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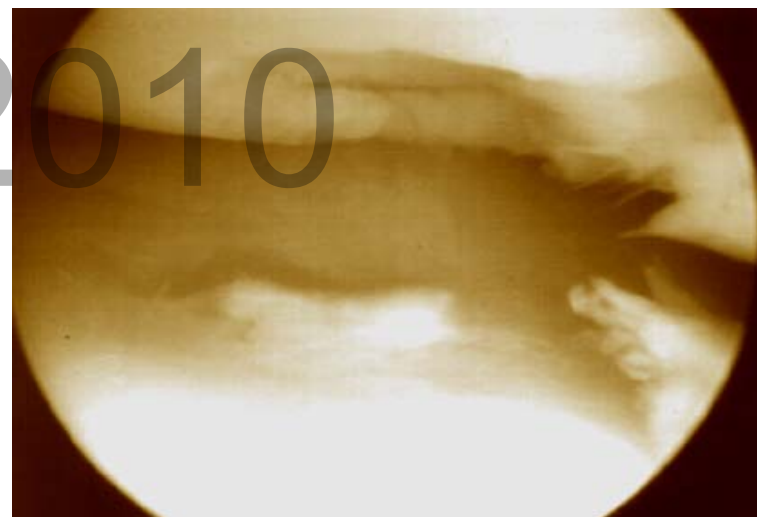
Asymptomatic handball goalkeeper loss of extension 5°



ORTHOPEDICS
UPDATE
18.03.2010

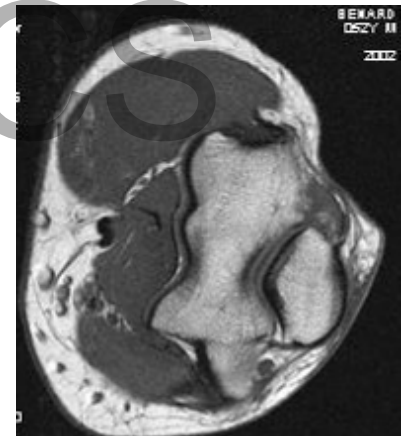
Lateral compression lesions

ORTHOPEDIC CS
UPDATE

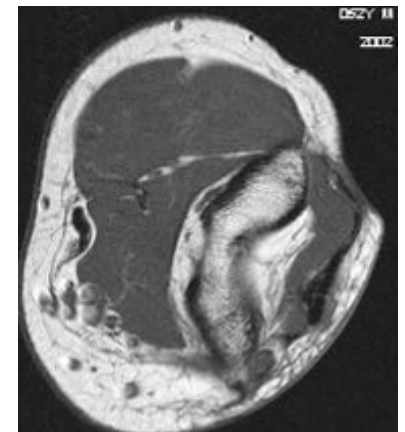


Differentials diagnosis

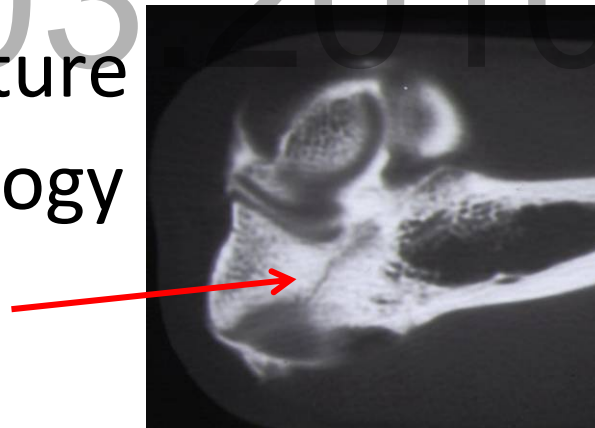
- Medial epicondylitis
- Posteromedial impingement
- Ulnar nerve pathology
- Medial epic apophysis or avulsion
- Median nerve pathology
- Flexor / pronator strain – tears
- Olecranon stress fracture
- Intraarticular pathology



normal



neuritis



Non operative treatment

6 months minimum

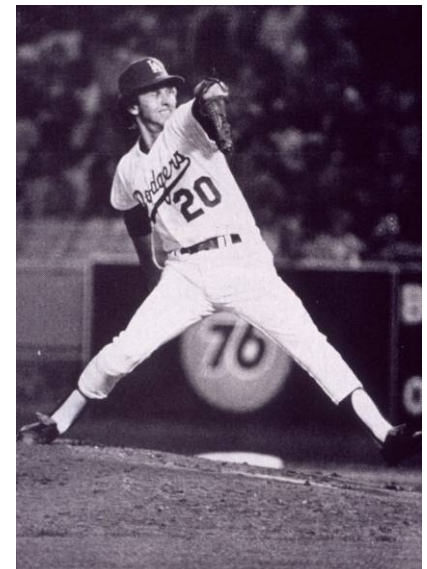
- **0-4 weeks** : rest + nsai + ice + physiotherapy
Splint to Control Pain
- **4 w – 3 months** : flexibility / strenghtening progam to restaure muscle tone , strenght , endurance and provide dynamic elbow stability
(concentric , excentric)

shoulder / spine strenghtening +++ : rehab of any elbow injury must include treatment of concomittant shoulder or spine deficiencies

- **3 – 6 months** : progressive throwing program
- Avoid cortisone injection

- CHEN *am j acad orthop surg 2001*
50% excellent results

- RETTIG *am j sports med 2001*
42% excellent results



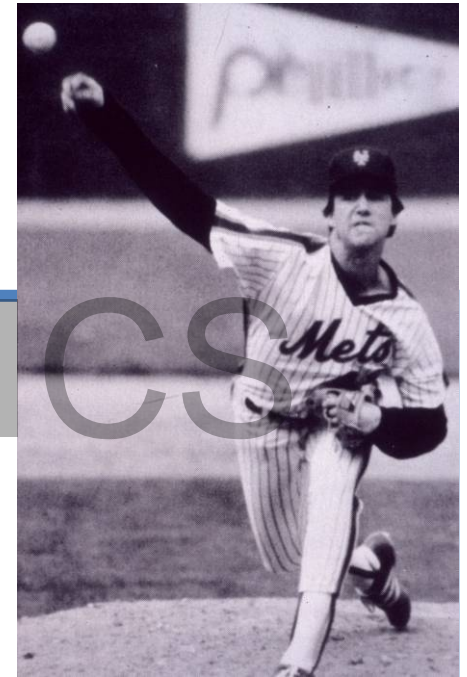
Surgical treatment

PAIN AFTER 6 MONTH OF MT

REPAIR – SUTURE (plicature)
RECONSTRUCTION

- ± ULNAR NERVE TRANSPOSITION OR NEUROLYSIS
 - ± ARTHROSCOPY : SPURS / LOOSE BODIES
- VALGUS STRESS TEST

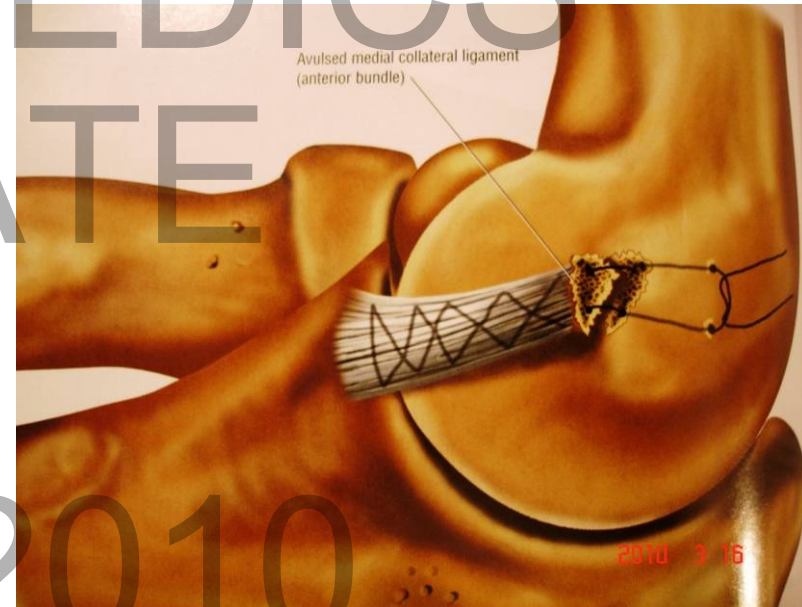
TIMMERMAN – ANDREW *am j sports med 1994*



Surgical treatment

Repair / plicature :

- Young player
- Proximal or distal lesion
- One site lesion
- No associated lesion
- Acute injury



Surgical treatment

Reconstruction :

palmaris longus / gracilis

JOBE *j bone joint surg A 1986*

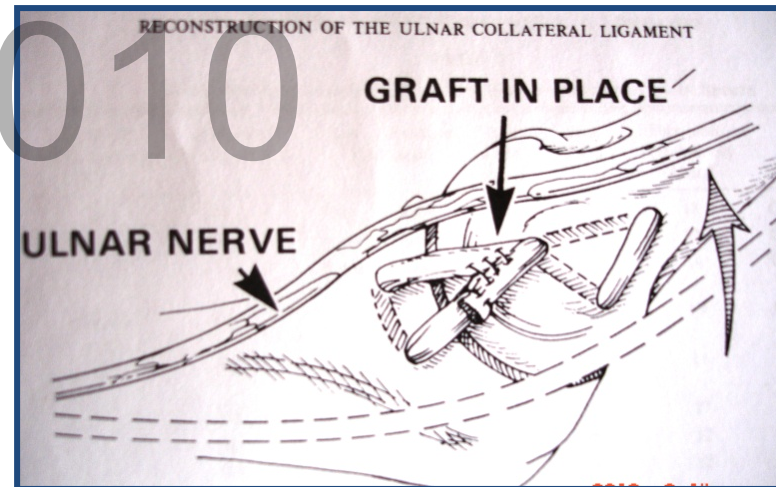
- 3 bundles strands
- Flexor/pronator mass detachment
- Ulnar nerve transposition
(31 % complication)
- 16 pitchers : 68% return playing same level
at 12 months

ANDREWS *am j sports med 2001*

Flexor/pronator splitting approach

Subcutaneous ulnar nerve transposition

Jobe reconstruction



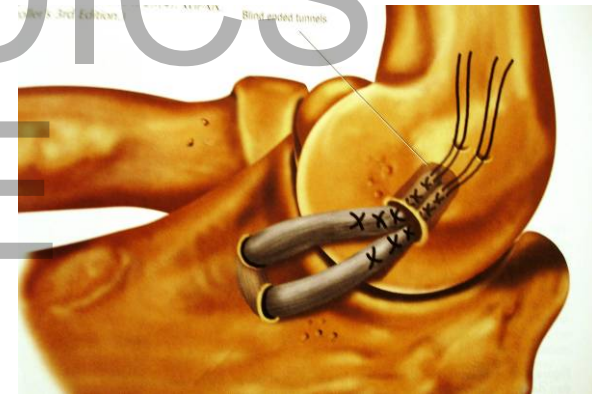
Surgical treatment

ORTHOPEDICS UPDATE

Reconstruction

ROHRBOUGH – ALTCHERK *am j sports med* 2002

- docking technique
- easier /higher tensioning graft
- no routine nerve transposition
- muscles splitting approach



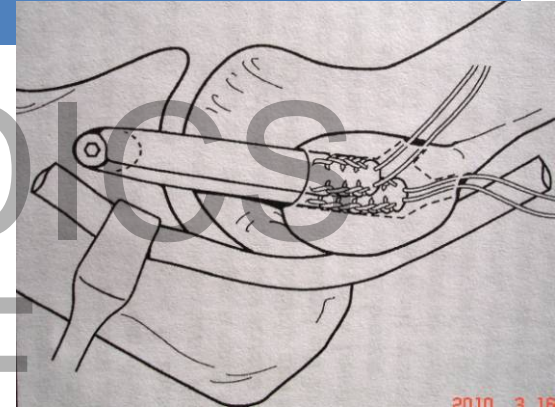
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Surgical treatment

Reconstruction

Dines am j sports med 2007

- DANE TJ technique
- Docking technique + 5 mm ulna screw fixation
- For revision surgery
- DA = david altchek
- NE = neal elahrache (screw fixation)
- TJ = tommy jones first operated pitcher by jobe



Surgical treatment

RESULTS

- **SAVOIE** *am j sports med 2008*
60 REPAIRS : 91% RSL 9 MONTHS
- **CONWAY** *am j sports med 1992*
14 REPAIRS : 50% + 12 MONTHS
56 RECONSTRUCTIONS : 68% + 12 MONTHS
- **AZAR** *am j sports med 2000*
13 REPAIRS : 69%
78 RECONSTRUCTIONS : 81% + 10 MONTHS



Surgical treatment

RESULTS

- **ROHRBOUGH** *AM J SPORTS MED 2002*
36 RECONSTRUCTIONS : 92% RSL 12 MONTHS
- **DODSON** *AM J SPORTS MED 2006*
100 RECONSTRUCTIONS
90% RSL MIN 12 MONTHS



Postoperative management

REPAIR

- Phase 1 : 0-8 days
Posterior sling immobilization 90°
hand grasping exercises
hand / wrist mobilization
- Phase 2 : 8 – 21 days
Passive / active mobilization
Range of motion brace 30° – 100°
more 5° ext / 10° flex each week
muscle strengthening shoulder : arm



2010 3 1

Postoperative management

REPAIR

- Phase 3 : 3 – 8 weeks

Brace discontinued at 8 weeks

Isotonic exercise shoulder / elbow

- Phase 4 : 9 – 13 weeks

Sports specific rehabilitation program

Stretching , dynamic stabilisation , proprioceptive

- Phase 5 : 3 – 12 months

Plyometric specific program

Progressive throwing program

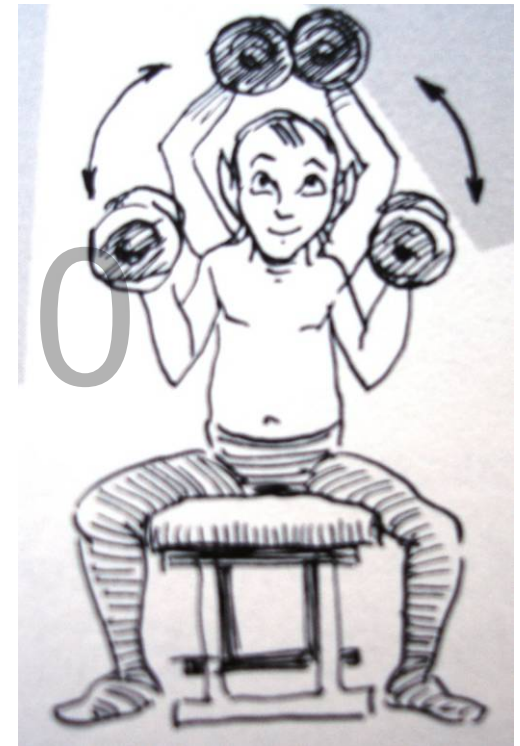


Postoperative management

RECONSTRUCTION

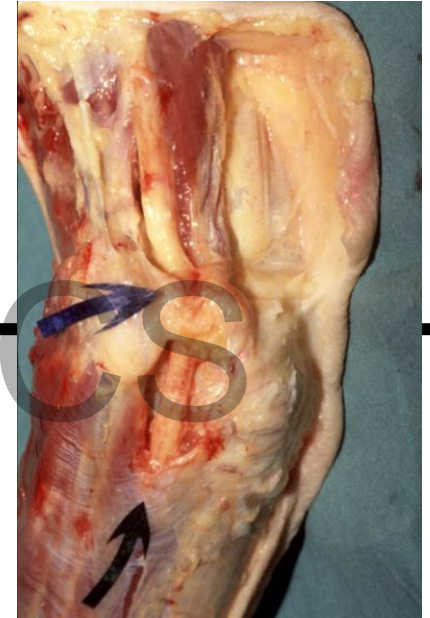
- All phases was delayed 4 weeks longer
- Adaptive / progressive rehabilitation

- CONWAY *j bone joint surg a 1992*
- WILK *j ortho sports phys ther 1993*
- AZAR *am j sports med 2000*



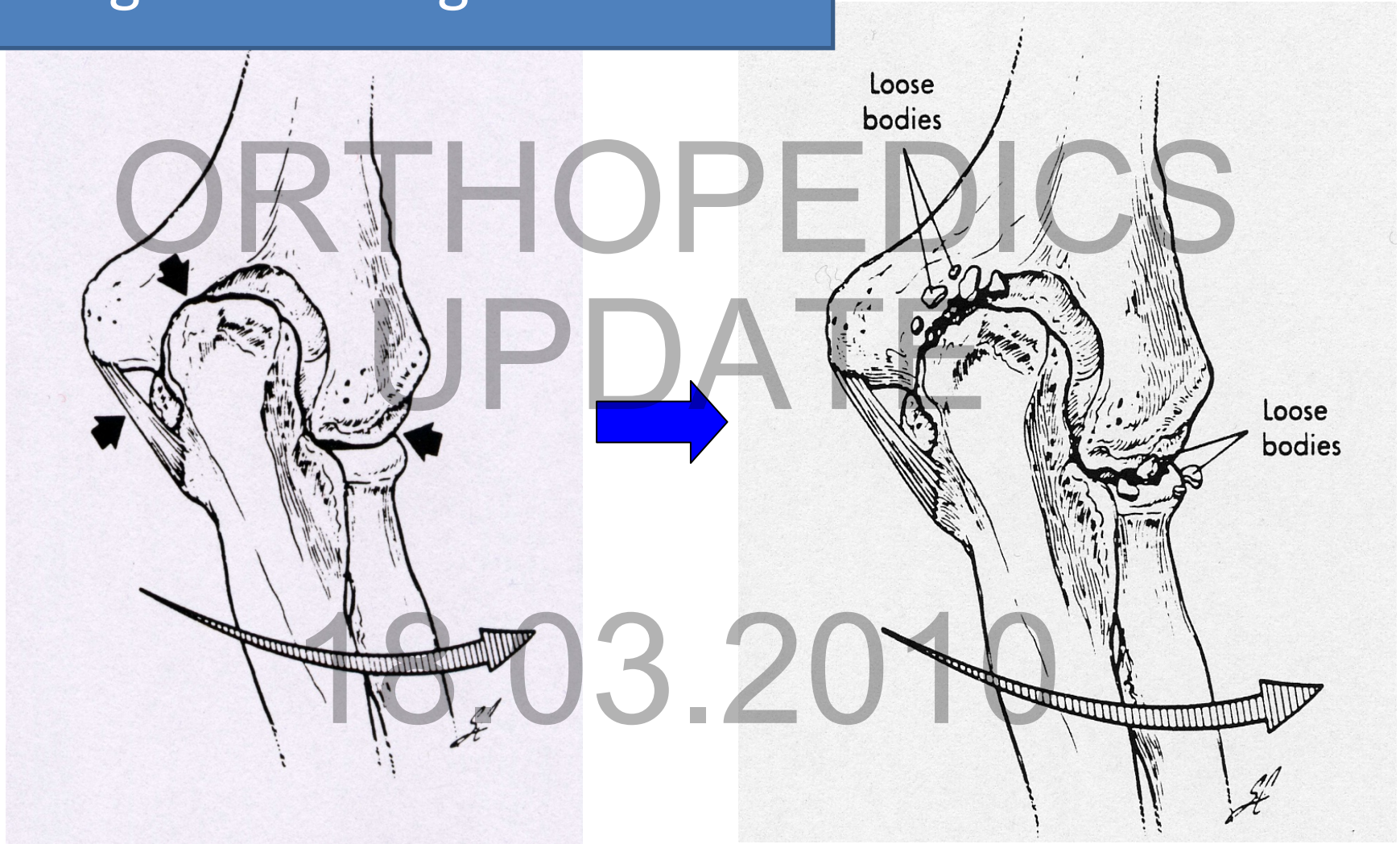
UCL STRAIN

PROGRESSIVE OR TRAUMATIC VALGUS STRESS



- ULNAR NERVE TRACTION : **CONWAY** *j bone joint surg 1992*
- HUMERORADIAL DEGENERATIVE CHANGES
- LATERAL EPICONDYLAR MUSCLES STRENGTHENING : **GLOUSMAN** *clin sports med 1990*
- POSTEROMEDIAL DEGENERATIVE CHANGES

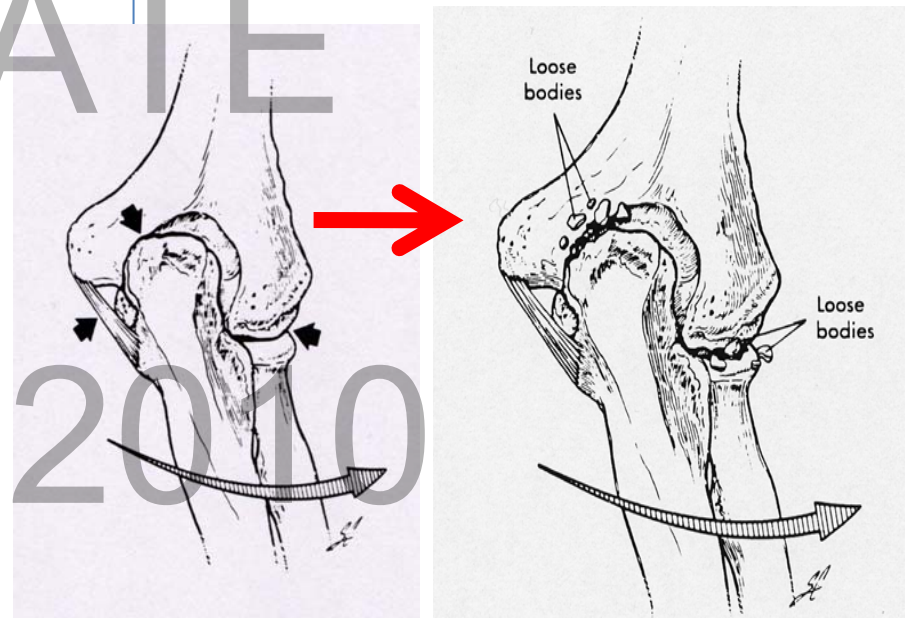
Progressive Valgus overload



Posteromedial impingement

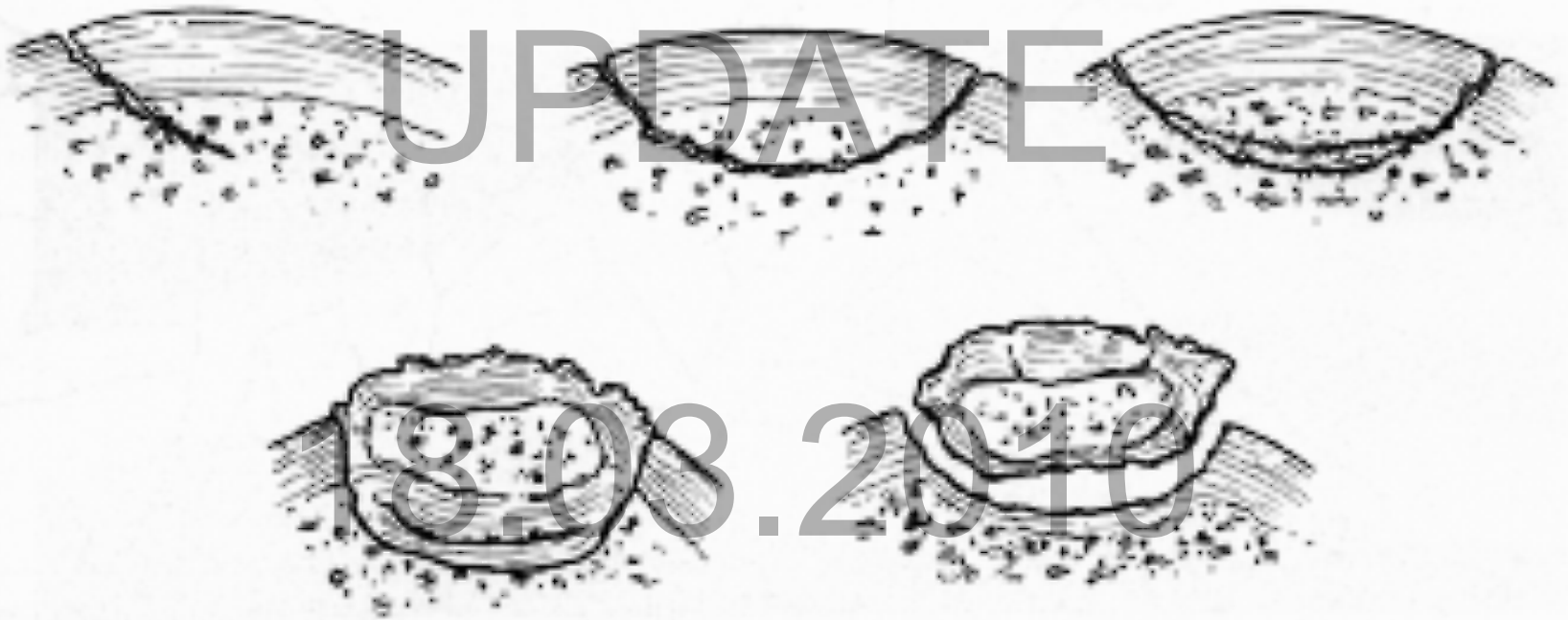
MEDIAL ELBOW STRESS SYNDROME

- **KING** : *clin orthop* 1969
first description
- Triad
 - Medial tissue insufficiency
 - Posteromedial impingement
 - Lateral compression chondrosis



Postéromedial-impingement

ORTHOPEDICS
UPDATE

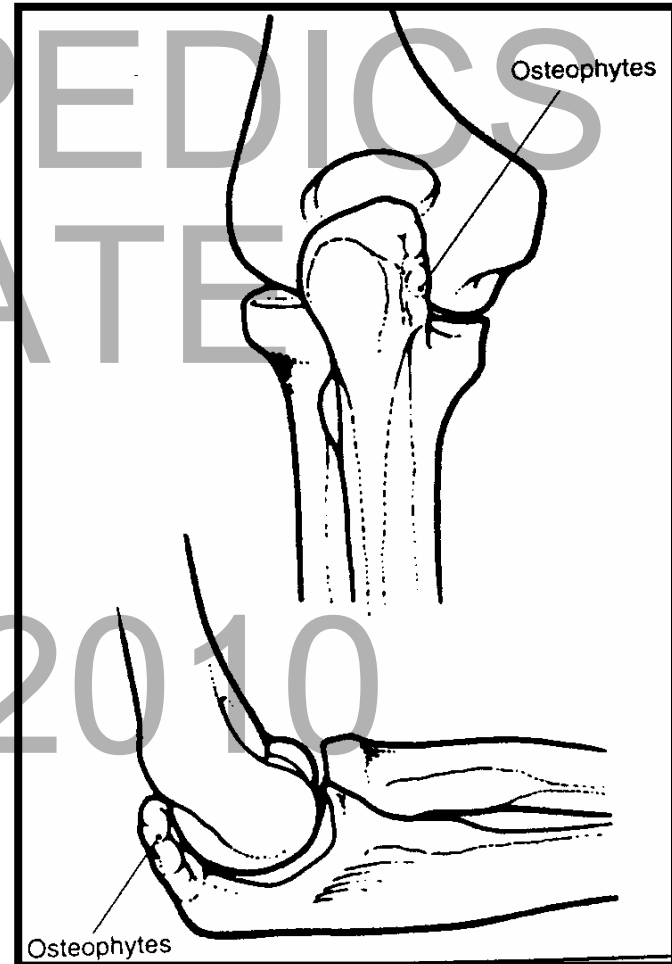


18.08.2010

Postéro-medial impingement

Clinical findings

- Pain if extension > valgus
- Loss extension > flexion limitation
- Muscular weakness
- (effusion)
- Locking , crepitus



Postéromedial impingement

ORTHOPEDICS

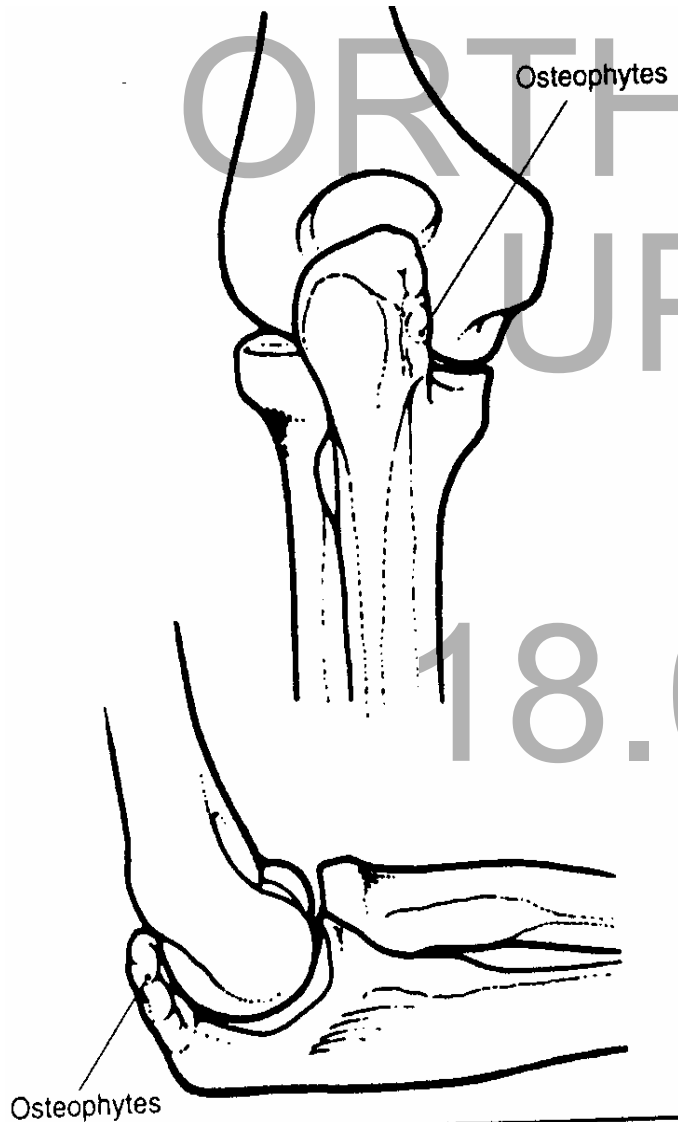
UPDATE

Imaging

- X ray
- Arthro ct scann +++ > mri

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Postéro-medial impingement



Postéro-medial impingement

ORTHOPEDICS

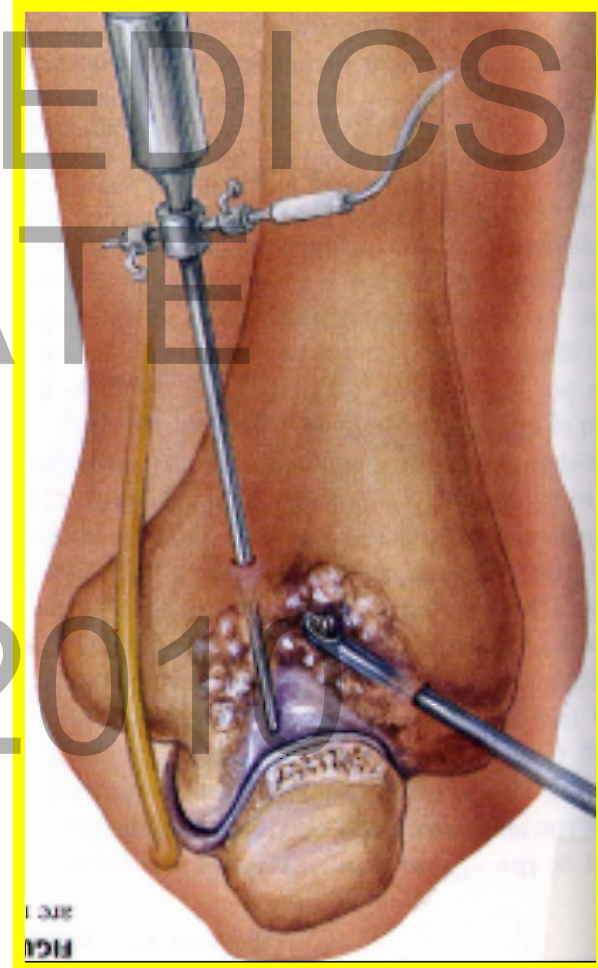
UPDATE

- Medical treatment
 - physiotherapy
 - Medial epic muscular strengtenning
- Surgical treatment : arthroscopy
 - remove bone spurs
 - deepening olecran fossa
 - Remove loose bodies
 - Synovectomy

UCL RECONSTRUCTION ?

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Postéromédial impingement



ORTHOPEDICS
UPDATE
18.03.2017

EXPLORATION

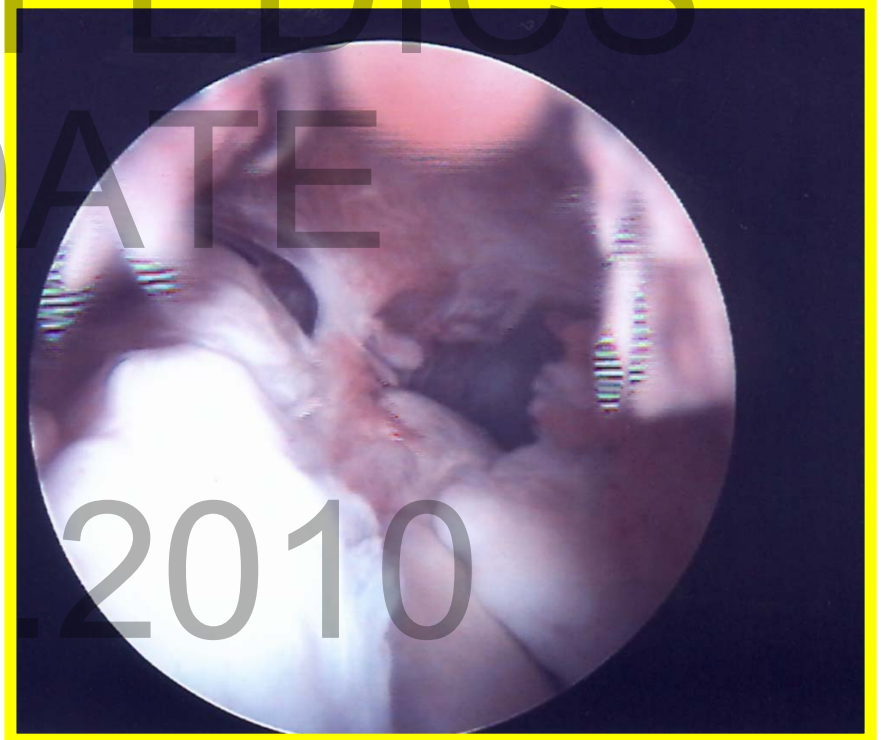
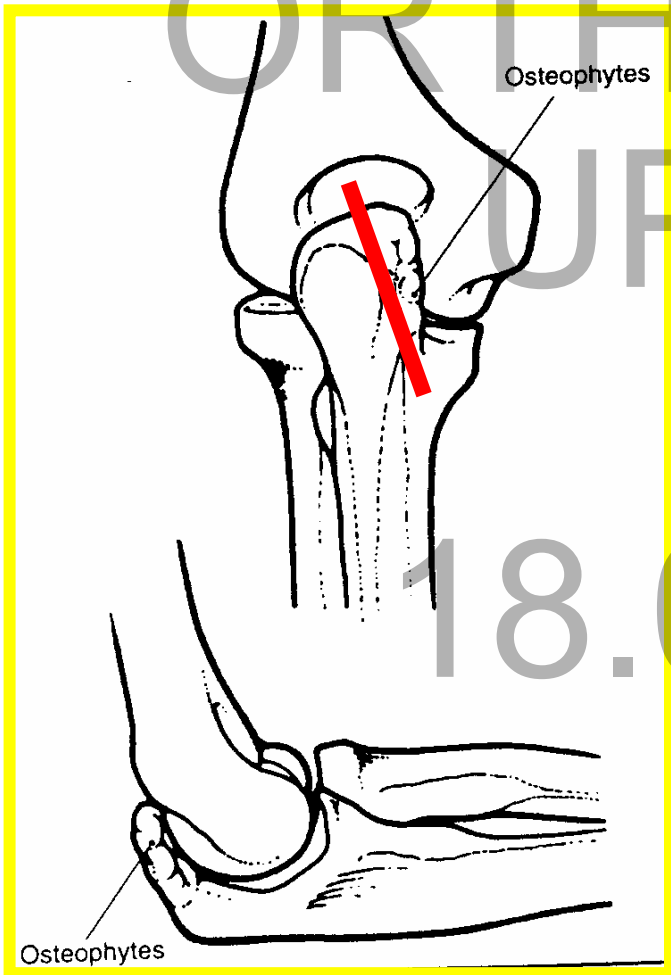
ORTHOPEDICS



UPDATE

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Postéromédial impingement



less than 3 mm

Postéromédial impingement



SHAVER OR OSTEOTOME

POSTEROMEDIAL IMPINGEMENT

WILSON (1983) – ANDREW (1995) *am j sports med*

- REMOVE BONE SPURS
- EXCELLENT RESULT
- 25% REQUIRED UCL RECONSTRUCTION

MOSKAL *am j sports med 2001*

- BASEBALL –
- REMOVE BONE SPURS / ARTHROSCOPY
GOOD VISUALISATION
LESS MORBIDITY
RECOVER SAME SPORT LEVEL
PITCHER

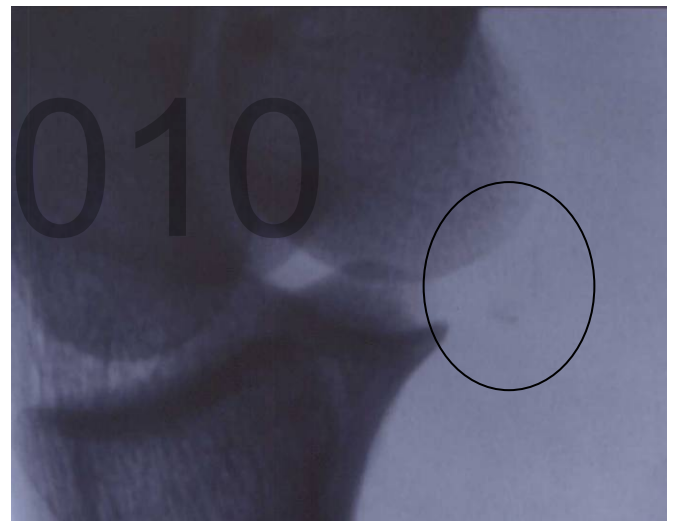
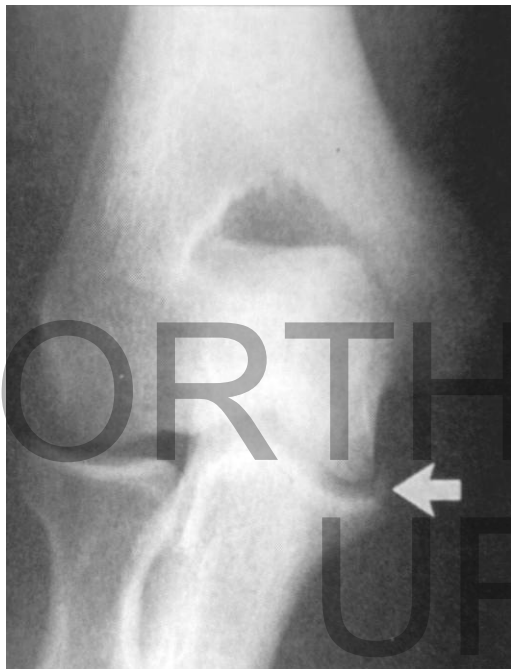
POSTEROMEDIAL IMPINGEMENT

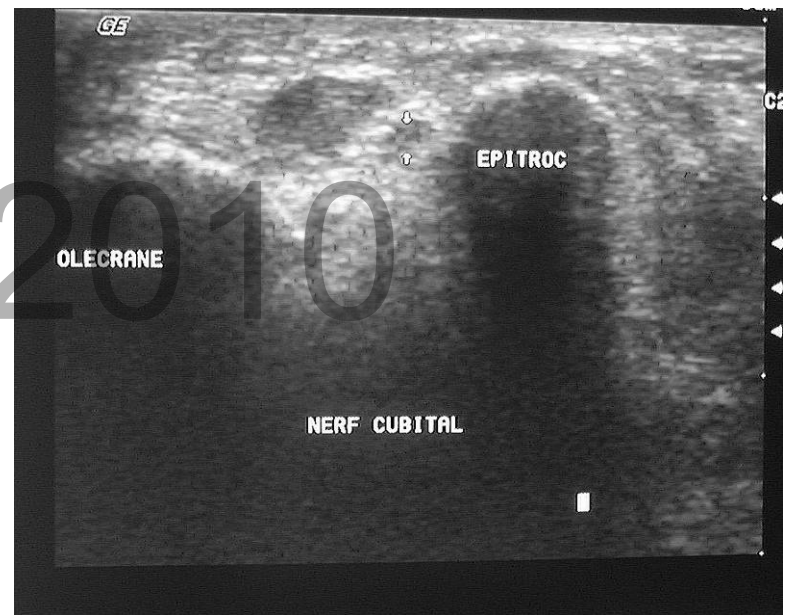
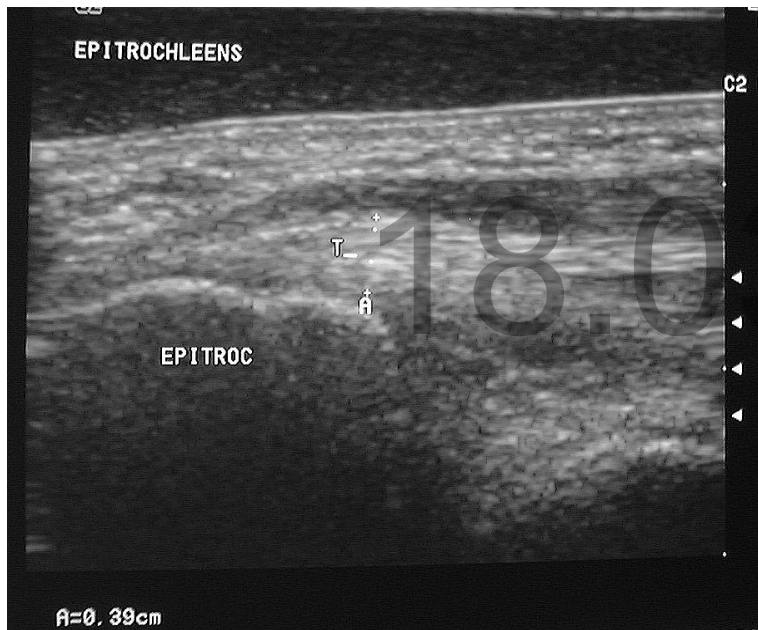
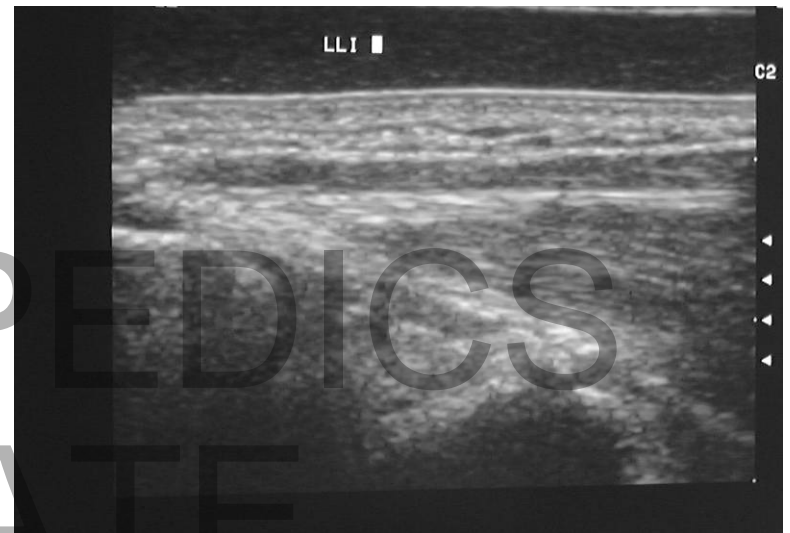
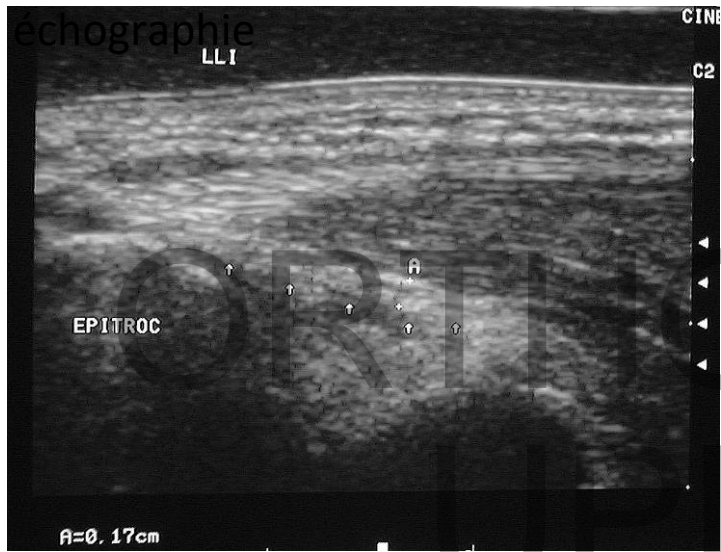
ORTHOPEDICS

- **KAMINEMI – O'DRISCOLL *j hand surg 2004***
- CADAVERIC STUDY : 21 CASES
- REMOVE BONE SPURS
+ POSTEROMEDIAL REMOVING OLECRANE < 3mm
- **AHMAD *am j sports med 2004***
treating bony impingement with osteotomy may convert an asymptomatic medially lax elbow into an unstable painful elbow

THANKS FOR YOUR ATTENTION







arthro-scanner



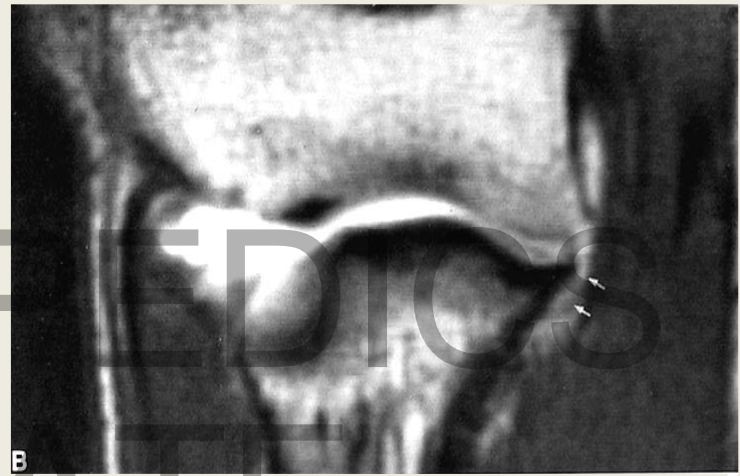
image en T



**rupture
médiane
86%**

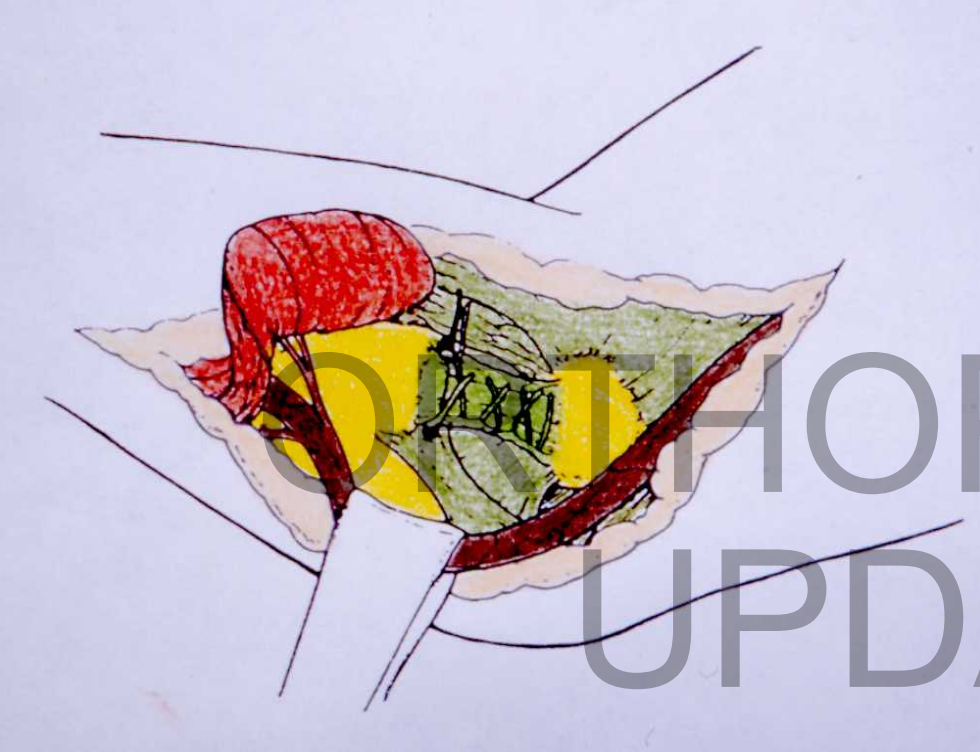
**désinsertion
proximale
10%**

**désinsertion
distale
3%**



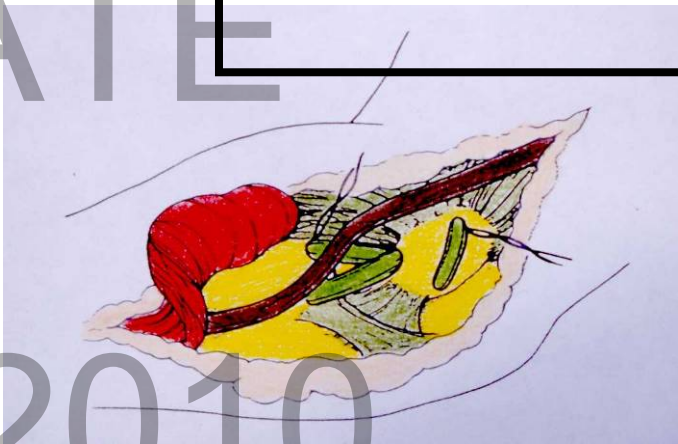
ORTHOPEDICS
UPDATE

18.03.2019



reconstruction

suture



18.03.2010