Elbow injuries in the Athlete

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Joint types

- Elbow
  - Ulno-humeral and radio-humeral joint
    - Hinge
  - Proximal radio-ulnar
Joint types

- Elbow
  - Ulno-humeral
    - Hinge
  - Proximal radio-ulnar
Varus or valgus?
Energy transfer with overhead throwing

- Late cocking and early acceleration phase
- Compressive forces of 500 N at the lateral radiocapitellar articulation
- Extention from 110° to 20° velocities as high as 3000 deg/sec
Sports causing valgus overload
Other types of injuries

- Distal biceps tendon injuries
- Elbow dislocation
Other types of injuries

- Distal biceps tendon injuries
- Elbow dislocation
Valgus restraints during throwing

- Olecranon in fossa > restraint in 0 - 20deg flexion in overhead throwing
- Anterior bundle of UCL and other soft tissues valgus restraint 20 - 120 deg flexion
Valgus restraints during throwing

- Olecranon in fossa > 0 - 20° flexion in overhead throwing
- Anterior bundle of UCL and other soft tissues > 20 - 120° flexion
Other valgus restraints

- Flexor/pronator origin
- Radial head
Other valgus restraints

- Flexor/pronator origin
- Radial head
Forceful internal rotation of humerus with valgus force during extension
Elbow injuries

- **Athlete background**
  - Immature skeleton
    - Physis
    - Soft bone with sensitive blood supply
  - Competitive adult
    - Ligament injury
    - Trophic changes
Elbow injuries

- Anatomical location
  - Medial
  - Lateral
  - Posterior
  - Anterior
Child/Adolescent athlete’s elbow

- Medial (traction)
  - Bone
    - Stress #/Apophysitis medial epicondyle (little leaguer’s elbow)
    - Avulsion medial epicondyle
Child/Adolescent athlete’s elbow

- Lateral (compression)
  - Bone
    - Osteochondritis dissecans of capitellum (little leaguer's elbow)
    - Radial head deformity
Child/Adolescent athlete’s elbow

- Lateral (compression)
  - Bone
    - Osteochondritis dissecans of capitellum
    - Radial head deformity
Child/Adolescent athlete’s elbow

- Posterior
  - Failure of olecranon physis to mature
    - Constant excessive forces applied by triceps
    - Shear forces
Adult elbow

- Medial (traction)
  - Flexor/pronator origin strain (Medial epicondilitis)
  - Ulnar nerve neuritis
    - Subluxation > friction
    - Cubital tunnel compression from adhesions, flexor muscle hypertrophy or osteophytes
    - Valgus stress > traction
  - Ulnar collateral ligament rupture
Adult elbow

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    - Valgus stress > traction
- Ulnar collateral ligament attenuation/rupture
Adult athlete’s elbow

- Posterior (shear)
  - Valgus extension overload syndrome
    - General ligamentous laxity or chronic tensile strain medially > sagital rotation
    - Medial tip olecranon contacts posteromedial rim olecranon fossa in terminal phase of throwing
Adult elbow

- Posterior
  - Loose bodies
    - Olecranon fossa
      - Secondary to posteromedial impingement
      - Secondary to OD of capitellum
  - Olecranon stress #
Adult elbow

- Posterior
  - Loose bodies olecranon fossa
    - Secondary to posteromedial impingement
    - Secondary to OD of capitellum
  - Olecranon stress #
Adult elbow

- **Posterior**
  - Loose bodies
    - Olecranon fossa
      - Secondary to posteromedial impingement
      - Secondary to OD of capitellum
  - Olecranon stress #
Adult elbow

- Anterior
  - Biceps tendinosis/rupture
  - Tears of brachialis and capsule
Adult elbow

- Anterior
  - Biceps tendinosis/rupture
  - Tears of brachialis and capsule
Adult elbow

- Lateral
  - Epicondilitis 40-60 yrs (degenerative)
  - PLRI (posttraumatic subluxation/dislocation)
  - Degenerative arthritis radio-capitellar joint as progression of osteochondritis dissecans of capitellum
Adult elbow

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  - Degenerative arthritis radio-capitellar joint as result of osteochondritis dissecans of capitellum
History

- Changes in accuracy, velocity, stamina, strength
- Pain
- Neurological symptoms
  - Paraesthesia
  - Loss of grip strength
Examination Inspection

- Resting position 70 – 80 deg w effusion
- Carrying angle
- Ecchimosis
- Effusion
Examination
Inspection

- Resting position 70 - 80 deg w effusion
- Carrying angle
  - 11 - 13deg
  - 15deg
- Ecchimosis
- Effusion
Examination
Inspection

- Resting position 70 - 80 deg w effusion
- Carrying angle
- Ecchymosis/deformity
- Effusion
Examination
Inspection

- Resting position 70 – 80 deg w effusion
- Carrying angle
- Ecchimosis
- Effusion
Elbow examination

Palpation

- Lateral
  - Radio-capitellar joint
  - Lateral epichondyle
  - Radial head
    - Rotation
Elbow examination
Palpation

- Lateral
  - Radio-capitellar joint
  - Lateral epichondyle
  - Radial head
    - Rotation
Elbow examination
Palpation

- Medial
  - Epichondyle
  - F/P origin
  - Ulnar nerve
Elbow examination
Palpation

- Medial
  - Epichondyle
  - F/P origin
  - Ulnar nerve
Elbow examination

Palpation

- Medial
  - Epichondyle
  - F/P origin
  - Ulnar nerve
    - Tenderness/dislocation
Elbow examination
Palpation

- Posterior
  - Joint line tenderness (and loss of extension)
  - Olecranon growthplate/stress #
  - Triceps insertion tenderness
Elbow examination
Palpation

- Anterior
  - Tenderness over distal biceps tendon
    - Tendinosis
    - Bursitis
    - Rupture
Elbow examination
Special tests

- Neurovascular upper limb
- Hand intrinsic muscles
  - Hypo tenar
  - 1\textsuperscript{st} dorsal interosseus
- Cervical spine
Elbow examination
Special tests

- Lateral
  - Epichondilitis
Elbow examination
Special tests

- Lateral
  - Postero-lateral rotatory instability
    - Post traumatic
    - Pivot shift test
Elbow examination
Special tests

- Lateral
  - Postero-lateral rotatory instability
    - Post traumatic
    - Pivot shift test
    - Arm chair test
Elbow examination

Special tests

- **Medial**
  - F/P origin
    - Resist pronation
    - Pain over flexor origin
    - Resist flexion of fingers
  - Ulnar nerve
    - Tinel > paraesthesia
  - Valgus stress in 30 deg flexion
Elbow examination
Special tests

- Medial
  - F/P origin
    - Resist pronation
    - Pain over flexor origin
    - Resist flexion of fingers
  - Ulnar nerve
    - Tinel > paraesthesia
    - Valgus stress in 30 deg flexion
Elbow examination
Special tests

- Medial
  - F/P origin
    - Resist pronation
    - Resist flexion of fingers
    - Pain over flexor origin
  - Ulnar nerve
    - Tinel > paraesthesia
  - Valgus stress in 30 deg flexion
Elbow examination
Special tests

- Medial
  - F/P origin
    - Resist pronation
    - Resist flexion of fingers
    - Pain over flexor origin
  - Ulnar nerve
    - Tinel > paraesthesia
- Valgus stress in 30 deg flexion + full pronation
  - Medial pain/joint line opening
Elbow examination
Special tests

- Anterior
  - Distal biceps
  - Pain on resisted elbow flexion and forearm supination (uncorking wine bottle)
Elbow examination
Special tests

- Posterior
  - Valgus stress while moving into full extension
    - Posteromedial impingement pain
X-rays

- AP, lateral, 2 oblique views
- Open growthplates > comparative views contra lateral
- Radial head deformity
X-rays

- Radial head deformity
- Osteochondritis dissecans
- Medial epichondyle apophysitis/avulsion
- Olecranon stress #
X-rays

- Radial head deformity
- Osteochondritis dissecans
- Medial epichondylar apophysitis/avulsion
- Olecranon stress #
X-rays

- Radial head deformity
- Osteochondritis dissecans
- Medial epichondyle apophysitis/avulsion
- Olecranon stress #
Imaging

- CT
  - Osteochondritis dissecans
  - Olecranon stress #
- Bone scan
  - Olecranon stress #
MRI

- OD capitellum
- Medial collateral ligament rupture
- Biceps tendinosis/rupture
- Olecranon stress #
MRI arthrogram

- OD capitellum
- Medial collateral ligament rupture
- Biceps tendinosis/rupture
- Olecranon stress #
MRI

- OD capitellum
- Medial collateral ligament rupture
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- Olecranon stress #
MRI

- OD capitellum
- Medial collateral ligament rupture
- Biceps tendinosis/rupture
- Olecranon stress #
Treatment

- Ulnar collateral ligament injury
  - Non-surgical treatment
    - More successful in non-throwing athlete / non-competitive throwing athlete
    - Cease sport
    - Cryotherapy
    - Regain motion
    - For 2-6 weeks/until pain free
Treatment

- Ulnar collateral ligament injury
  - Non-surgical treatment
    - Strengthening shoulder girdle, RC, scapula stabilisers
    - Strengthening flexor pronator mass
    - Functional exercises
    - Plyometrics (exercise without weights or machines)
    - Interval throwing program
    - Return to competitive when pain free during rehab
Treatment

- Interval throwing program

- Prerequisites
  - Clearance by physician
  - Pain free ROM
  - Adequate muscle power
  - Resistance to fatigue
Treatment

- Interval throwing program
  - Aim to achieve each level of throwing without pain
  - Supplemented with weight training
  - Alternated with flexibility program and rest days
  - Emphasis on warm-up, stretch, proper throwing technique and body mechanics
Treatment

- Interval throwing program
  - Start short distance
  - Aim to throw 75 times without pain
  - Individual thrower’s goal reached before advancement to next goal instead of advancement at specified time
Treatment

- Ulnar collateral ligament injury
  - Surgical treatment
    - Failure of comprehensive rehab program
    - Tear of anterior band of UCL
    - Throwing athlete who wishes to return to throwing sports
    - Non-thrower that remains symptomatic
Treatment

- Ulnar collateral ligament injury
  - Surgical treatment
    - Drill holes
    - Free tendon graft
Treatment

- Prevention is most effective treatment
  - Education of coaches, parents and throwers
  - Limit season length
  - Divide competitive activity into age specific groups
Treatment

- Medial epichondyle avulsion
  - Splint 1-2 weeks > early motion
  - Symptom free before gradual return to sport
  - ORIF
    - Fragment in joint
    - Valgus instability
    - Ulnar nerve symptoms
    - Displaced > 5mm
Treatment

- Ulnar neuritis
  - Exclude posteromedial osteophytes by x-rays or CT
  - Rest 6/52
  - NSAID’S, cryotherapy
  - Splint elbow to immobilize nerve if subluxating
  - Return to interval throwing
Treatment

- Ulnar neuritis
  - Surgical
    - Failure non-surgical treatment
      - Neurolysis
      - Subcutaneous transposition
    - Ulnar collateral ligament reconstruction if insufficient
    - Posteromedial olecranon osteophyte/loose body removal
Treatment

- Ulnar neuritis
  - Surgical
Treatment valgus extension overload syndrome

- Non-surgical
  - Rest
  - Rehab shoulder and elbow musculature
  - Gradual resumption of throwing (ITP)
  - Physiotherapy not effective in high demand pt with osteophytes
Treatment valgus extension overload syndrome

- **Surgical**
  - Osteophyte excision
    - Open/arthroscopic
  - Explore for and remove loose bodies
    - Arthroscopic
  - +/- UCL reconstruction and N. ulnaris transposition
  - 68-85% return to previous level of sport
Treatment

- Medial epichondilitis
  - Non-surgical
    - Rest 2-6/52
    - NSAIDs
  - Physiotherapy
  - Occasional steroid injection
    - Avoid UCL
  - Gradual return to sport
Treatment

- Medial epichondilitis
  - Surgical
    - ? UCL reconstruction
    - Release, partial cortical removal, reattachment
    - ?N. ulnaris transposition
Treatment

- Olecranon stress fracture
  - Cease throwing
  - Rest
  - Competitive athlete > ORIF
  - Scope to evaluate for and remove loose bodies
Treatment

- Osteochondritis dissecans
  - Cease sport
  - Maintain mobility within pain limits
  - Rest up to 6/12
Treatment

- Osteochondritis dissecans
  - Symptoms despite conservative treatment
  - Scope evaluation advantages
    - Dx loose bodies
    - Visualise entire joint
    - Lower post-op morbidity
  - Remove > debride + micro fracture if small
    - Fix with thin k-wires if involve lateral edge
    - Mosaic plasty osteochondral autograft if large and displaced – results not better than debr + micro#
  - Return to sport 40%-90%
Elbow arthroscopy
Elbow arthroscopy
Elbow arthroscopy
Conclusion

- Large valgus and extension moments
  - Tensile medial
  - Compression lateral
  - Shear posterior

- Always consider
  - Immature skeleton different pathology
  - UCL importance as valgus restraint in adult
Conclusion

- Competitive/highly motivated athlete continued forces on joint
  - Pt must understand that symptoms can return
  - Treatment then palliative
  - < 90% return to previous level especially valgus extension overload syndrome
  - Adolescent: prevention > training and length of season adjusted to age group