Common Fractures and Musculoskeletal Injuries on the Field

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Overuse Injuries
Sprains (ligaments) and Strains (muscles)
Ligament Tears
Fractures

Epidemiology
Straccolini et al. Boston 2013
2133 pts 10 year period
5-12 year olds
upper extremity
fractures, apophysitis, OCD
13-17 year olds
more overuse
ACL, meniscus, spondylosis
Surgery in 40% of sample
Injury Prevention Programs

- Multi faceted IPP
  - warm-up, neuromuscular strength, proprioception training

- Meta-Analysis
  - Soomro N, et.al.
  - 10 studies combined
  - 32-40% reduction in Injury Rate Ratio

Overuse Injuries

- Risk Factors
  - Multiple sports
  - Year-round training
  - Sport Specialization
  - Growing Skeleton

Upper Extremity

- "Little League Shoulder"
  - proximal humeral physis

- "Little League Elbow"
  - medial epicondyle apophysis

- Olecranon stress fracture

- Capitellar OCD
Little League Shoulder
widened lateral epiphysis
Can result rarely in osteonecrosis and Limb Length Inequality

Little League Elbow
widened medial epicondylar apophysis

Olecranon Stress Fracture

Capitellar OCD

**Mechanism**

- Young Throwers
- Periscapular weakness and fatigue
- Transfers stress from the trunk to the throwing arm
- Valgus load and rapid extension
- tensile forces medially
- shear stress posterior
- compression to radiocapitellar joint
**Treatment**
- Activity restriction
- Physical therapy including scapular stabilization for dyskinesia
- Return to throw program - long toss
- Surgery - screw for medial epicondyle or olecranon, scope/microfracture for OCD

**Pitching Recommendations**
- 8-10y — 50/game  75/week
- 11-12y — 75/game  100/ week
- 13-14y — 75/game  125/week
- 15-16y — 90/game
- 17-18y — 105/game
- 2 games max per week
- Limits on age and pitch type (curve, slider, etc.)
- Limits on the catcher position

**Overuse Injuries**
- Lower Extremity
  - Osteochondroses
  - Tendinitis
  - Stress reaction
  - Exacerbation of anatomic condition
  - Idiopathic anterior knee pain
Osteochondroses

+ Osgood-Schlatter’s - tibial tubercle
+ Sinding-Larsen-Johannsen - distal pole of patella
+ Sever’s - calcaneal apophysis
+ Van Neck’s - ischial synchondrosis

Osgood-Schlatter’s

+ Traction induced inflammation of the tibial tubercle apophysis (growth plate)
+ Self-limited
+ Boys > girls ages 10-15
+ Prominent tibial tubercle and characteristic x-ray findings of fragmented appearance

Sinding-Larsen-Johannsen

+ Similar to Osgood-Schlatter but at the distal pole of the patella
+ Self-limited - ages 10-12
+ Traction changes on x-ray from the patellar tendon
+ Similar treatment with quad and hamstring stretching, ice massage, and activity modification
Sever’s

- Inflammation of the Calcaneal apophysis (growth plate)
- At the attachment of the Achilles tendon proximally and plantar fascia distally
- Ages 9-14 Boys > girls
- Achilles stretching, ice massage, +/- heel cups or orthotics, activity modification (may be necessary)

Tendinitis

- Quadriceps/Patellar tendon
- Pes anserine (hamstrings)
- Achilles
- Flexor Hallucis, Peroneals, Tibialis Posterior
- No x-ray changes
Patellar Tendinitis
- Very common in junior high athletes
- Girls > Boys
- Traction of tight quads, rapid growth and increased activity
- Responds well to stretching, activity modification and PT if they are deconditioned

Pes Tendinitis/Bursitis
- Extremely common in adolescents in conjunction with patellar tendinitis
- Medial hamstring insertions
- Anteromedial proximal tibia pain/tennderness
  - tenderness increased with resisted contraction of hamstrings
- Stretching, ice massage, activity modification, PT

Sprains
- Wrist
- Knee
  - MCL, LCL
- Ankle
  - lateral, medial, high
- Midfoot
  - many in soccer
SCFE

- Slipped Capital Femoral Epiphysis
  1. Consider in children with prolonged knee pain or hip pain
  2. Growth plate of the hip slips off of the neck of the femur either gradually or acutely (Surgical Emergency)
  3. Overweight children most at risk but exists in thin patients
  4. AP and Frog pelvis (not individual hip) x-rays

Pelvic Avulsion Fractures

- ASIS - Anterior Superior Iliac Spine (Sartorius)
- AIIS - Anterior Inferior Iliac Spine (Rectus femoris)
- Ischial tuberosity (Hamstrings)
- Many times sprinting injuries - acceleration or deceleration
Pelvic Avulsions

Spondylolysis

- Stress injury to the pars interarticularis
- not talking about isthmic chronic spondys

- Etiology
  - repetitive hyperextension
  - classically gymnasts, football lineman
    but seen in swimming, baseball,
    volleyball, running, etc.
- 1/3 of 5-12 year olds in Boston study
Spondylolysis

- Imaging
- Plain X-Rays - AP, lat, Obliques
- SPECT - bone scan nuclear study
- MRI - edema noted but bony detail minimal
- Thin cut limited CT - healing potential

Treatment

- Activity Restriction
- Rest
- Physical Therapy
- Bracing - traditionally for L4 and proximal but used for L5
- Surgery - for refractory cases or progressive listhesis (movement)

Fractures
Patellofemoral Instability
- Subluxation
- Identify anatomic abnormalities
- Brace and rehab
- First time Dislocation
  - Immobilize in extension 4 weeks
  - Rehab - we thing 75% success rate
- Recurrent instability or large OC fragments
- Surgery

Patellar Instability - Non-Operative Treatments
- Physical Therapy
- Bracing
  - Patellar Buttress
- Activity Modification

Patellar Instability - Operative Treatments
- MPFL Repair - if fresh injury
- Arthroscopic loose body removal (if needed)
- Fixation of Osseochondral lesions (if possible)
- MPFL Reconstruction
- Modified Insall - proximal soft tissue
- Galeazzi - Semitendinosis rerouting
- Roux - Goldthwaite - Patellar tendon underturn
Patellofemoral Instability

Small Cartilage Fragment
Osteochondral Fragment
Medial Structures Disrupted

Fractures

Clavicle Fractures

Full Fractures
Rarely surgery
Buckle Fractures
Humerus Fractures

Medial Epicondyle

Shaft

Throwers (acute on chronic)
or Gymnasts (associated with dislocation)

Forearm Fracture - Flex Nails

Fractures at different levels/100% displaced - often surgery

Distal radius epiphysis avoided
Olecranon apophysis crossed

Forearm Fracture - Closed Tx
Physeal Forearm Fracture

No growth arrest at final follow-up

Open Forearm Fracture

Air in the soft tissues

Usually further displacement

Common Hand and Wrist Fractures

Distal Radial Buckle (Torus) fracture cast or removable splint

Phalangeal fractures
Lower Extremity Fractures
- Femoral Shaft
- Proximal Tibia
  - Tibial Eminence
  - Tibial Tubercle
- Tibia Shaft
- Distal Tibia
  - Tillaux
  - Triplane

Femoral Shaft Fractures
- Treatments
  - up to 5 years - Spica casting
  - 5y - 12y - flexible nails
    - maturity
    - weight 100 lbs.
    - fracture pattern
  - 12y to mature rigid nail
    - sometimes younger - pediatric nail

Femur - Flexible Nails
Femur - Rigid Nail

More mature
Proximal Fracture
Butterfly fragment

6 mos

Hip Dislocations

+ Size differential
+ High Energy
+ Mostly in Football

Acute Reduction

Surgery for Fractures or Entrapped Fragments
High risk of Avascular Necrosis

ACL

Pivot shift bone bruise pattern

Oblique images
Cruciates in plane
ACL Reconstructions

- Physeal Sparing
- IT band
- All - Epiphyseal
- Physeal Respecting
- Mixed
- Vertical Tunnels
- Skeletally Mature

ACL Physeal Sparing

IT Band

All-Epiphyseal

ACL All-Epiphyseal

Bone age - all physes open
Age 11 correlate
Drills contained within epiphyses
Proximal Tibia
- Tibial Spine/Eminence
- ACL attachment
- Tibial Tubercle Apophysis

Tibial Eminence - Screw
Screw contained within epiphysis

Tibial Eminence - Suture
Injury Fragment
Small Fragment or Commination - Suture Fixation
Tibial Tubercle

- Respect the physis
- Metaphyseal cancellous screw
- Lag screw - compression

Tibia Shaft

- Proximal physis open
- Cannot violate

Distal Tibia

- Tillaux
- Triplane
Distal Tibia Physis Closure

FIGURE 26.37: Closure of the distal tibial physis begins centrally (A) and extends medially (B) and then distally (C) before final closure (D).

Triplane Fracture

3-D imaging offers opportunities to plan length and select implants.

Triplane Fracture
Sports Injuries

+ Total increasing with more participation
+ Overuse continues to be a problem
+ Injury prevention important
+ Fracture types and complications differ in the growing skeleton

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