Knee: Extensor Mechanism

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Extensor Mechanism

- Quadriceps tendon
- Patella
- Patellar ligament/tendon
- Aponeurosis
- Med and lat restraints
Knee Extensor Mechanism

1. Extensor tendon / ligament injury
2. Patella dislocation
3. Fat pad syndromes
4. Anterior bursitis
5. Plicae
6. Patella miscellaneous
Extensor Tendon/Ligament Injury
Extensor Tendon/Ligament

- Quadriceps tendon
- Jumper’s knee
- Osgood-Schlatter
Quadriceps Tendinopathy

- Microscopic damage: “wear and tear”
- Streaks of intermediate signal = normal
Quadriceps Tear

- > 40, w/ acute trauma
- Also: diabetes, renal failure

- Partial tear: some ability to extend
- List torn components
Jumper’s Knee

• Proximal patella tendinopathy/itis--overuse
• Up to 20% athletes in jumping sports, running
• Most force occurs during landing
Jumper’s Knee

19♂ Basketball
Sinding-Larsen-Johannsson

- Similar symptoms to jumper’s knee
- 10-14 y.o.; tendon stronger than bone
- Traction apophysitis
- Swelling, edema
- Bone/cartilage fragmentation
  - Or heterotopic ossification
- 12-18 month self-limited course with “resolution”

Stanitski CL. Ped Ortho 1993; 483-495.
• Ossicle can persist in pts with repeated episodes
Patellar Sleeve Avulsion Fracture

- Pediatric
- Small bone fragment @ inf. patella
- Significant injury also to unossified patella

Patellar Sleeve Avulsion Fracture
Osgood-Schlatter Disease

- Traction apophysitis at attachment of patellar ligament to tibial tubercle
- Repetitive tensile forces on this immature junction create an avulsion
- 50% have ossicle in tendon
- Swelling, edema, hyperemia
- 12-18 month self-limited course with “resolution”

Stanitski CL. *Ped Ortho* 1993; 483-495.
Osgood-Schlatter Disease: OSD

- 25% bilateral
- Adolescent growth spurt
Patella Dislocation
Patella Dislocation

- Usually transient
- Clinically unsuspected 50%
  - Often 1st dx’d @ MR
- Risk factors: shallow trochlea, patella alta, flat dorsal patella
Patella Dislocation

Sulcus angle > “145°” abnormal

Colvin AC. JBJS 2008; 90:2751-62.
Transient Patellar Dislocation: TPD

- Peak age 14-18
- Most common acute knee disorder in adolescents—twist with planted foot or fall
- Almost always lateral
- MRI signs:
  - Contusions: LFC, med patella, **inf pole patella w/ impaction**
  - Osteochondral fracture of lateral femur, patellar avulsion medially
  - Torn medial stabilizers: retinac, **MPFL**, VMO
  - **Effusion** (hemarthrosis)
TPD: MRI

- Edema LFC 80%
- Edema med patella 60%

Elias DA. *Rad* 2002; 225:736-743
TPD: Patella Avulsion Fx
TPD: Patella Avulsion Fx
TPD: Patella Impaction Fx

• 45% of TPD

Elias DA. *Rad* 2002; 225:736-743
TPD: LFC Cartilage Injury
TPD: Patella Cartilage Injury
TPD: Osteochondral Injury
TPD: MRI

- Edema LFC 80%
- Edema med patella 60%
  - 45% impaction fx
- Medial PatelloFemoral Lig tear ~50% (MPFL)

Sanders TG. *JCAT* 2001; 25:957-962
Medial PatelloFemoral Ligament

1° medial restraint for the patella
-50-80% passive restraint

Sanders TG. JCAT 2001; 25:957-962

Elias DA. Rad 2002; 225:736-743
MPFL: Normal
MPFL Tear
TPD: MPFL

VMO lifted up
Likely partial tear MPFL
Patella Tracking

Tibial tubercle-to-trochlear groove distance (TT-TG): <15 nm >20 abnml
Patellar Tendon-Lateral Trochlear Ridge (PT-LTR):

- First slice below patella
- Measure a perpendicular from condyles to lateral ridge
- PT-LTR distance is the amount of patellar tendon lateral to the line
- > 5.5 mm → 73% sens, 89% spec for patella instability (better specificity than TT-TG)

Mistovich RJ et al: AJSM 2018;46:3400-3406
Fat Pad Syndromes
Fat Pad Syndromes

- Hoffa’s disease
- Quadriceps fat pad syndrome
Hoffa’s Disease

- Infrapatellar fat pad impingement syndrome
- Acute or repetitive trauma
Hoffa’s Disease
Hoffa’s Disease: HIV/AIDS

• Inflammatory?
• Drug-related (HAART)?
• Serous atrophy?

Courtesy of Larry White, MD

Torshizy H. Skel Rad 2007; 36:35-40
Superolateral Hoffa’s Disease

• Assoc. w/ patellar maltracking
Quadriceps Fat Pad Syndrome

• Suprapatellar fat pad
• May have mass effect on joint recess
Focal Nodular Synovitis/ PVNS

→ Tenosynovial Giant Cell Tumor
Anterior Bursitis
Anterior Bursitis

- Prepatellar bursitis
- Superficial infrapatellar bursitis (pre-tibial bursitis)
Prepatellar Bursitis

“Housemaid’s knee”
Superficial Infrapatellar Bursitis

“Preacher’s knee” (Pretibial bursitis)
Superficial Infrapatellar Bursitis

Landscaper, deck builder
Plica Syndrome
Plica Syndrome

- Suprapatellar
- Medial patellar
- Infrapatellar (ligamentum mucosum)
- Lateral patellar (rare)
- Suprapatellar
- Medial patellar
- Infrapatellar (ligamentum mucosum)
- Lateral patellar (rare)
Plica Syndrome

- Suprapatellar
- Medial patellar
- Infrapatellar (ligamentum mucosum)
- Lateral patellar (rare)
Plica Syndrome

- Suprapatellar
- Medial patellar
  - 20-25% have med. plica
  - Can be thickened
  - Most common symptomatic plica
    - Abrade cartilage
    - Inflamed & tender
Medial Plica Syndrome

- Abrade cartilage
- Tender if inflamed

Drapes over trochlear cartilage

Patella cartilage damage
Patella: Other

Osteochondritis Dissecans (OCD)

“Partial or total separation of a fragment of articular cartilage and subchondral bone from the articular surface.” -Choi
Patella OCD

- Much less common than OCD med fem condyle
- Lower ½ of patella
- Central / medial facet
- 20% Bilateral
- Probably shear injury
  - Patella alta 45%
  - Hypoplastic trochlea 35%

Choi et al. Skel Rad 2007
Patella OCD
Patella OCD
Patella OCD
Dorsal Defect of Patella

- Occur ~1% individuals
- Location: Superolateral
- Intact overlying cartilage
- Filled with fibrous tissue
- Generally asymptomatic
  - Local pain/tenderness may occur
Patella Cartilage Lesions

T2

3D SPGR
Symptomatic Bipartite Patella

• Bipartite 1%
• May be symptomatic in adolescents
Summary

• Extensor t./ lig. – can injure @ several sites
  – Findings relate to skeletal maturity
• Patella dislocation – transient
• Fat pad syndromes – anterior knee pain
• Bursitis – carpet installers