Radiographic Evaluation of the Patellofemoral Joint

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Disclosures

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Patello-Femoral Disorders

Interlay of history, exam, and imaging studies to make a correct diagnosis
Radiographs

Full Series

- Bilateral AP weight-bearing
- Bilateral PA flexion weight-bearing
- Lateral at 30 deg flexion
- 30, 60, 90 axial views
Merchant View Radiographic Angles

Sulcus angle
- Abnl >140
- Measure of trochlear depth

Congruence angle
- Normal -8 to +14
- Measure of patellar subluxation
Normal congruence angle

Abnormal Congruence Angle

Opens Lateral Not Medial (+ rather than – degrees)
Merchant View Radiographic Angles

Lateral PF angle
- Normal opens lateral and > 8 deg
- Abnl parallel or open medial
- Measure of patellar tilt

Consider Laurin View
- Axial at 20 deg before engagement

More patellar tilt

**PF Index**: measure of thickness of joint space Medial/Lateral
- Normal value is 1.6 or less
- Abnl > 1.6

**Patellar tilt angle**
- Relationship of lateral facet to posterior condyles is more consistent
- Normal is always > 7 degrees and > 12 degrees @ 20-30 degrees of flexion

Tilt also evaluated via MRI

Normal is 10 degrees from posterior condylar line

87% sensitivity, 88% specificity, PPV 81%, NPV 92%

- This was matched to patients physical exam findings

Lateral Xray

- Possibly the most useful xray
- Always measure patellar height
- 30 degree flexed view assumes engagement into the trochlea and stabilization of the patella
- Measurement of Patella alta, lateral tilt, and trochlear dysplasia from this view
Patella Alta

Caton-Deschamps and Blackburne-Peele more accurate in determining height

Insall-Salvati and Grelsamer-Meadows also potential methods but may not be as accurate due to patella morphology
Normal radiographic anatomy
Trochlear Dysplasia: Mild

**Type A**
- Crossing sign
- Minimal trochlear depth

**Type B**
- Recentering beak with flat trochlea

**Dysplasia Type A**
- Abnl sulcus angle
- Shallow trochlea $>145^\circ$

**Dysplasia Type B**
- Supra trochlear spur
- Flat trochlea
Trochlear Dysplasia: Severe

**Type C:**
- Hypoplasia of medial trochlea
- Double contour

**Type D:**
- Most severe
- Recentering beak
- Double contour
Trochelar dysplasia

Abnormal – Crossing Sign

Abnormal – Double Contour Sign
Trochelar dysplasia

Normal

Abnormal
Patella Tilt

Normal – Lateral facet anterior to median ridge

Abnormal – Lateral facet superimposed on median ridge
MRI of Acute Injury

Verify dislocation

Detect osteochondral defects
  ◦ Up to 30-40% are missed on standard axial views
  ◦ Rate of osteochondral fracture in first time patellar dislocation is 24%

Locate possible loose bodies

Assess for concomitant injuries

Measure TT-TG distance
  ◦ Schoettle showed an 86% intermethod reliability of TT-TG measurement between CT and MRI

CT

Indicated in all patients undergoing patellar stabilization surgery??

Assess trochlear morphology

Assess congruence and tilt through a range of motion
  ◦ 10 degree increments: 0-60

Accurately measure TT-TG distance
**TT – TG distance: CT/MRI measurement of tubercle malalignment**

- Jones et al.
  - 2-9 mm normal
  - 10-19 abnormal
  - > 20 mm highly abnl.

- Schepsis et al.
  - Normal up to 12
  - Abnormal greater than 15
  - 15-20: mild
  - >20: significant

Pearls to accurate measurement of TT-TG

Reference line must be perpendicular to the posterior condylar line

Use the center of the trochlea in axial views closest to the notch (distal where patellar engagement starts)

Use the center of the distal tendon attachment on the tibial tuberosity

TT-TG = 26mm
Thank you!!

Questions??