Patella Fractures and Extensor Mechanism Injuries

Applied Anatomy of the Patella

Inverted Triangle
Apex Distal
Larger Lateral Facet
Increases Extensor Power
“pulley”

Mechanism of Injury

- Direct anterior blow
- Indirect mechanism
  - Quad mech over powers patella tendon
  - 2 part transverse fracture
Diagnosis

• H & P
• X-ray (lateral view most helpful)

Treatment

• Goals
  – Maintain biomechanical/functional integrity
  – Restoration of articular congruity
• Treatment options
  – Non operative
  – ORIF
  – Partial/complete patellectomy

Non-operative Treatment

• Minimal articular displacement
• Intact extensor retinaculum
• Long leg / cylinder cast in extension???
  • Maybe in the non compliant
  • Hinged Knee Brace
  • Extension (0-15) 4 weeks
  • Advance in increments
    15 degrees weekly
Operative Treatment

ORIF

- Anterior tension band wiring
- Lag screw fixation
- Combination of lag screws and tension band wiring
  - Fiber wire/tape
  - Steel wire
  +/− circumferential suture wiring

Operative Treatment

Plate Fixation

NEW?

Surgical Approach

- BONE FOAM or knee roll
- Expose and repair torn retinaculum
- Dissect periosteum from edge of fracture
- Reduction is judged based on anterior cortex
  - May not be reliable if there is comminution or coronal injury of subchondral surface
Extensile medial parapatellar approach

• Indicated for comminuted fractures
• Evert patella
• Allows direct visualization of articular surface

Tension Band
Biomechanical Principle

• Distractive forces of quadriceps contracture produces compression along articular surface

Biomechanical Evaluation
Anterior tension band vs 2 Lag screws vs Cannulated screws and steel wire

Cannulated lag screw with tension band wiring stronger

Treatment

Partial Patelllectomy
- One large fragment
- Other fragments comminuted

Partial Patelllectomy
- Quad strength 85% of unaffected side
- ROM 94% of unaffected side
- 78% good or excellent
- No threshold size for remaining patellar fragment


Complete Patelllectomy
- Avoid if possible
  - Only in cases of unsalvageable fractures/failed ORIF that can not be salvaged
  - Low patient satisfaction (6 – 25%)
  - Extensor strength reduced by 80 %
  - Loss of motion average 18 degrees
Surgical Setup
- Bump under ipsilateral hip
- Roll/Bone Foam
- Radiolucent table
- +/- Tourniquet
- Implants
- Large Weber tenaculum for reduction X 2

Post-op Management
- Early motion is preferred
- increase knee motion in a controlled fashion
  • ROM Brace in extension for 2 weeks (0-15)
  • Adv 15 degrees weekly after
- Weight bearing with knee in extension

Outcomes
- Most patients score worse on patient related outcome tools when compared to population norms.
  - SF-36: Differences in physical component score only
  - KOOS: Differences exist for all subscales

Extensor Mechanism Injuries

• Anatomy
  – Extensor Mechanism comprises the quadriceps tendon, patella and patellar tendons
  – Retinaculum and IT band
  • Secondary Extensors

• Mechanism of Injury
  – Forceful quadriceps contraction/load with knee in flexed position
  – Fall from height, motor vehicle accident
  – Be aware that lower energy mechanism may exist with elderly/medical co-morbidities.

• Physical Exam
  – Tenderness over quadriceps/patellar tendon
  – Palpable defects
  – Inability to actively extend knee or maintain extension.
  • May still be possible with intact retinaculum
Extensor Mechanism Injuries

- Radiographic
  - Insall ratio
  - Patellar tendon: Patella
  - ≥ 1.2 is abnormal
- Inferior pole of patella typically projects to Blumensaat’s line

Extensor Mechanism Injuries

- Other Modalities
  - Ultrasound
  - MRI useful for
    - Neglected tears: Degree of retraction/Status of tissue available for repair
    - Partial Injuries: Determine amount of extensor mechanism remaining in continuity.

Extensor Mechanism Injuries

- Treatment
  - Goals: Restore active knee extension
- Treatment Options
  - Non operative
  - Operative
    - Repair
    - Reconstruction
Extensor Mechanism Injuries

- Non Operative Management
  - Unacceptable medical risk
  - Functionally intact extensor mechanism
    - i.e. Partial disruptions

Extensor Mechanism Injuries

- Operative Treatment
  - Indications
    - Loss of extensor mechanism function in patient with acceptable medical risk
  - Options-Acute
    - Primary Repair
      - Multiple techniques described

Extensor Mechanism Injuries

- Techniques
  - End to end suture
  - Suture/Drill holes
  - Suture Anchor
  - Suture with turndown flap
Surgery

- Suture-Transosseous tunnel technique
  - Position: Supine
  - Implants/Instruments: 2.0 mm drill, Suture passer, Heavy nonabsorbable suture
  - Full thickness flaps to allow visualization of medial/lateral retinaculum.
  - krackow or other locking type suture configuration.
  - Three transosseous tunnels drilled in either antegrade or retrograde fashion through patella.

Chronic Extensor Mechanism Injuries

- Autograft/allograft reconstruction or augmentation
  - Poor tissue/>3 cm gap present
- V-Y turndown Flap
  - Helpful when <3 cm gap is present

Extensor Mechanism Injuries

- Outcomes
  - Acute Quadriceps tendon
    - Generally 80-100% good to excellent results (10-18)
  - Acute Patellar Tendon Repair
    - 70-100% Good to Excellent results

Extensor Mechanism Injuries

• Post Operative Management
  – Immobilize in extension during initial post operative period
    • Longer for chronic/tenuous repairs
  – Weight bearing with knee in extension
    • Brace/Cast
  – Systematically increase knee motion

Summary

• Operative treatment indicated for most patients with loss of extensor mechanism and acceptable medical risk
• Goal is congruent articular surface with stable fixation to permit early range of motion
• Allow early weight bearing with knee braced in extension