Surgical Indications and Considerations

Anatomical Considerations: Patellar stability is dependent upon two components: bony (trochlear groove) and soft tissue structures. There are multiple soft tissue layers that surround the patellofemoral joint. Medially, the superficial layer is consists of the fascia over the sartorius muscle, the second layer contains the medial patellofemoral ligament (MPFL) and the retinaculum, and the third layer contains the medial collateral ligament and joint capsule. The MPFL provides 50-80% of total restraining force medially. Fascial interconnections between fibers of the iliotibial band, lateral hamstrings, lateral collateral ligament, and lateral quadriceps comprise the lateral retinaculum.

Pathogenesis: Patellar instability can be correlated with one or more of the following anatomical risk factors: tightness of lateral structures, patella alta, patella or femoral dysplasia, increased Q-angle, increased sulcus angle, generalized laxity, increased femoral anteversion, increased external tibial torsion, lateral position of the tibial tuberosity, abnormal foot pronation, and a vertical vastus medialis oblique (VMO) insertion. Patella dislocation can occur from indirect, twisting or rapid change of direction with the foot planted, or direct trauma to patella.

Epidemiology: A higher incidence of patellar dislocations occur in females ages 10 to 17 years of age and the athletically active, with less incidence over age 30. Lateral dislocations are very common and will be the topic of discussion in this guideline. Medially dislocations are typically rare and result from direct trauma, an excessive lateral release or overcorrection of a realignment procedure. Redislocations occur more frequently in patients younger than 20 and tend to decrease with advancing age.

Diagnosis
- History of dislocation with giving way
- Effusion
- Positive apprehension test (Fairbank sign)
- Medial retinacular tenderness
- Other clinical findings may include:
  Patellar mobility (Sage test for lateral retinacular tightness - positive if medial patellar excursion is less than ¼ of greatest patellar width)
  Patellar maltracking
Abnormal Q angle (normal = males - 8-10 degrees, females - 10-20 degrees)
Abnormal sulcus angle (normal = <150 degrees)
• Imaging studies help confirm the diagnosis

Surgical Procedure: Many different procedures are performed to correct patellar instability. Proximal realignment procedures include lateral release, medial reefing, advancement of the vastus medialis oblique (VMO), and Galleazzi’s procedure. Lateral release involves an incision of the lateral retinaculum. Medial reefing involves tightening the medial structures and is often done in conjunction with a lateral release. VMO realignment involves reattaching the VMO insertion more distally and laterally on the patella. The Galeazzi procedure is seldom performed however involves attaching the semitendinosus tendon to the medial side of the patella. Distal realignment consists of transferring the patellar tendon and tibial tubercle medially. Soft tissue distal realignment involves transferring the medial 1/3 of the patellar tendon to the tibial collateral ligament. Evidence has shown that lateral release is more effective when combined with another procedure (i.e. proximal or distal realignment) and for many investigators would only be used if there was a residual patellar tilt after repair/reconstruction of the medial retinacular structures.

CONSERVATIVE REHABILITATION (Acute)

Phase I
Goals: Decrease pain and swelling
Limit range of motion and weight-bearing to protect healing tissues
Return muscle function
Avoid overaggressive therapy that may lead the patient into a patellofemoral pain syndrome
Intervention:
• Bracing: set at 0 degrees initially with ambulation, lateral buttress pad in brace
• Ice
• McConnell taping; light compressive bandage
• Instruction in partial weight-bearing with crutches
• Electrical stimulation for activation of the VMO
• Supine straight leg raise (SLR) with minimal to no pain
• Ankle pumps if edema is present
• Isometric hamstrings

Phase II

Criteria: no significant joint effusion, no quadriceps extension lag, minimal to no pain with activities of daily living

Goals: Full ROM - pain-free

Improve quadriceps strength

Low-level functional activities

Initiate conditioning

Avoid patellofemoral symptoms or instability

Intervention:
• Continue patellar bracing or taping
• Weight-bearing as tolerated; discard crutches when extension lag is no longer present
• Continue electrical stimulation and modalities as needed
• Continue supine SLR and add adduction and abduction SLRs
• Toe raises with equal weight bearing
• Closed kinetic chain exercises
• Low-level endurance and pool exercises

Phase III

Criteria: full active ROM, good to normal quadriceps strength, full weight-bearing with normal gait pattern

Goals: Improve function

Gradual return to high-level activities

Intervention:
• Bracing: wean from bracing and taping as quadriceps function improves
• Four-way hip exercises
• Pool therapy - walking with progression to running
• Sport and skill-specific training
• Proprioceptive training
• Patient education

Criteria for Return to Full Activity (8-12 weeks)
Equal ROM between lower extremities

- No pain or edema
- 85% strength compared with uninvolved limb
- Satisfactory 1-minute single leg hop test, two-legged hop test
- Patellar stability with clinical tests

Preoperative Rehabilitation:

Acute Phase: PRICE - protection, rest, ice, compression, elevation (if acute)

Maintain quadriceps strength and flexibility of the hamstrings
Patellar bracing and taping to restore proper alignment

POSTOPERATIVE REHABILITATION

Distal and/or Proximal Realignment Procedures

Phase I for Immediate Postoperative - Weeks 1-6

Goals: Control inflammation
Protect fixation
Activation of quadriceps and VMO
Full knee extension and minimize adverse effects of immobilization

Intervention:

- ROM: 0-2 wks - 0-30 degrees of flexion, 2-4 wks - 0-60 degrees, 4-6 wks - 0-90 degrees
- Brace: 0-4 wks - locked in full extension 24 hours 7 days a week except for therapeutic exercises and continuous passive motion use, 4-6 wks - unlocked for sleeping, locked for ambulation
- Weight-bearing: Proximal realignment - as tolerated with two crutches, Distal realignment - 50% with two crutches
- Quadriceps sets and isometric adduction with electrical stimulation for VMO (* no electrical stimulation for 6 wks with proximal realignment procedure)
- Heel slides 0-60 degrees (proximal), 0-90 degrees (distal)
- Non-weight bearing gastrocnemius/soleus, hamstring stretches
- 4-way SLR with brace locked in full extension
- Resisted ankle ROM
- Patellar mobilization (when tolerable)
- Aquatic therapy at 3-4 wk - gait training
**Phase II - Weeks 6-8**

*Criteria for progression:* Good quadriceps set, ~90 degrees of flexion, no signs of active inflammation

*Goals:* Increase flexion

*Avoid overstretching fixation*

*Control of quadriceps and VMO for proper patellar tracking*

*Intervention:*

- **Brace:** discontinue use for sleeping, unlock for ambulation as per physician’s orders
- **Weight bearing:** As tolerated with crutches
- **Progress to weight-bearing gastrocnemius/soleus stretching, full flexion with heel slides**
- **Aquatic therapy**
- **Balance exercises**
- **Stationary bike - low-resistance, high seat**
- **Wall slides 0-45 degrees of flexion progress to mini squats**

**Phase III Week 8-4 months**

*Criteria for progression:* No quadriceps extensor lag with SLR, nonantalgic gait, no evidence of lateral patellar tracking or instability

*Intervention:*

- **Discontinue crutches when:** no extensor lag with SLR, full extension, nonantalgic gait pattern
- **Step-ups - 2 inches progress to 8 inches**
- **Stationary bike - moderate resistance**
- **Endurance - swimming, Stairmaster**
- **Gait training**
- **4-way hip exercise**
- **Leg press 0-45 degrees of flexion**
- **Toe raises, hamstring curls**
- **Continue balance activities**
  
*Hamstrings, gastrocnemius/soleus, add quadriceps and iliotibial band stretches*

**Phase IV 4-6 months**

*Criteria for progression:* Good to normal quadriceps strength, no soft tissue complaints,
no evidence of patellar instability, clearance from physician to progress closed-chain exercises and resume full or partial activity.

Intervention:
- Progression of closed-kinetic chain exercises
- Jogging/running in pool with resistance
- Functional progression, sport-specific training