ISAKOS Symposium on Patellofemoral Instability: Patella Alta (The Lyon Experience)

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I. Background
   a. Numerous factors contribute to patellar instability
      i. Alignment (TT-TG)
      ii. Status of medial restraints to dislocation (MPFL, capsule)
      iii. Amount of patellar tilt
      iv. Degree of trochlear dysplasia
      v. Patellar height (patella alta)
   b. Patella alta is frequently missed or ignored as most focus has been on alignment and the medial restraints, but the role of patella alta in instability may be more important that realized
      i. Patella also has been reported in 24% of patients with patellar instability versus 3% of patients with stable patellae[7]
      ii. It is important to note that patella alta rarely occurs in isolation – it is frequently associate with trochlear dysplasia[5, 6]
      iii. Patients who suffer a dislocation with minimal trauma are more likely to have patella alta than those with traumatic dislocations[8]
   c. Patella is associated with recurrent dislocation following both conservative treatment[10] and isolated MPFL reconstruction[18]
   d. May be more common in certain populations – for example in China[11]

II. Diagnosis
   a. Radiographic Ratios – Determined on lateral plain radiographs are traditionally used to define patellar height relative to the tibia - See Fig 1[14]
      i. Caton-Deschamps Index > 1.2
      ii. Blackburn-Peel Index > 1.2
      iii. Mod. Insall-Salvati Ratio > 1.2
   b. We prefer to use the Caton-Deschamps or Blackburn-Peel indices to assess patellar height because the Insall-Salvati ratio does not accurately reflect changes in patellar height following osteotomy
   c. Recent work ahs suggested that measuring patellar height relative to the femur such as with the patellotrochlear index (PT index) is more reliable and reproducible[3, 4, 9]
      i. Fig 2: PT Index = $BL_{(T)}/BL_{(P)}$[4]

Figure 1: Methods of Assessing Patellar Height

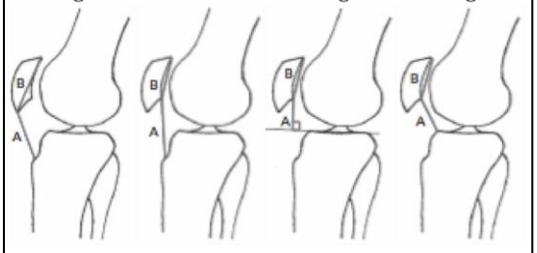
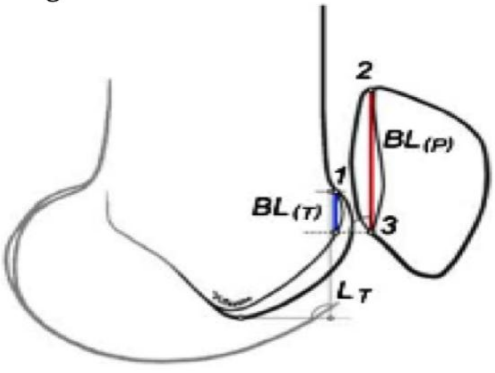


Figure 2: Patellotrochlear Index



ii. Ratio < 0.125 is patella alta

III. Pathoanatomy and Theory of Treatment
- a. Patella alta leads to decreased contact between the patella and trochlea
  - i. Results in increased patellofemoral pressure and potentially increased rates of patellofemoral OA[12, 17, 20]
  - ii. Also leads to decreased resistance to lateral translation[16, 21]
  - iii. We are aware of no biomechanical studies demonstrating that distal translation of the patella improves stability, nonetheless it is a logical treatment
  - iv. Clinical studies have shown isolated tibial tubercle transfer to be an effective treatment for patellar instability in patients with patella alta[15]
- b. Alternatively, it is possible that increased patellar tendon length is the culprit in patella alta rather than altered patellofemoral contact
  - i. Increased patellar tendon length rather than a "too proximal" position of the tibial tubercle has been noted in patients with patella alta and patellar instability[13]
  - ii. It may thus be more desirable to shorten the patellar tendon itself than to alter the insertion site with a distal transfer
    1. Isolated patellar tendon shortening is an especially attractive option in the skeletally immature population
    2. Medial tibial tubercle transfer has been shown to cause patellar tendon shortening, likely due to scar formation,[1] which may in fact be an advantage in controlling instability
    3. A biomechanical study has demonstrated that shortening of the patellar tendon by 10% increases patellofemoral contact area by 15 to 18% but does not alter patellofemoral stress[19]
  - iii. A patellar tendon tenodesis to the tibia just proximal to the tibial tubercle may be performed in association with a distal transfer to shorten the tendon

IV. Surgical Techniques
- a. Distal Tibial Tubercle Transfer
  - i. A paramedial skin incision allows to approach the patellar tendon and the tibial tubercle
  - ii. Then two perpendicular bone cuts of 6cm length allow to elevate a cortico-cancellous bone block including the patellar tendon insertion
  - iii. Then the bone block is shortened depending on the amount of the expected distal transfer
  - iv. The tubercle is then fixed with two 4.5mm diameter cortical screws. One can alternatively use three 3.5 mm diameter cortical screws
- b. Patellar tendon tenodesis
  - i. Following distalization of the tibial tubercle, two suture anchors loaded with absorbable sutures are placed in the proximal tibia at the level of the patellar tendon insertion prior to distalization
  - ii. The sutures are then passed through the tendon and tied, effectively shortening the tendon
  - iii. We do not recommend the use of nonabsorbable suture or more rigid fixation such as staples for this procedure
- c. Patellar tendon shortening

i. We prefer this technique described by the Cleveland Clinic group in childhood when growth plates are not fused[2]
ii. In this technique there is always a continuity of the posterior part of the patellar tendon - this is not a Z Plasty.
iii. The anterior half of the tendon is divided transversely near its distal insertion and dissected free from the posterior portion of the tendon
iv. This portion is then advance anteriorly and sutured into the intact tendon distally
v. The efficacy of this operation still needs to be proven – there are no clinical series published to date

V. Cases
   a. Example of standard distal transfer
      i. The influence of transfer of different indices (Insall-Salvati, Caton-Deschamps)
   b. Example of distal transfer with tenodesis
   c. Example of patellar tendon shortening

VI. References

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