The Effect of Tibial Tubercle Distalization on Patellofemoral Contact Pressure and Tracking

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I (and/or my co-authors) have something to disclose.
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Patella alta

- Significantly associated with patella instability (Arendt et al, AJSM 2018; Christensen et al AJSM 2017; Jaquith and Parikh, JPO 2017; Sanders et al KSSTA 2018)

- Associated with patellofemoral osteoarthritis (Haj-Mirzaian et al, Osteoarthritis Cartilage 2018; Stefanik et al Arthr Care Res 2010)
Tibial tuberosity distalization

- Recommended for patients with instability and significant patella alta
- Concern for excessive increases in contact pressure, similar to that seen in patella infera
- Unknown effect of distalization on contact pressure in alta patients
- GOAL: evaluate contact pressures, location of contact, and tracking after distalization in alta patients
Material and methods

- 3T MRI of 8 instability pts (1 m, 7 f, mean age 17)
- Individual multibody dynamic simulation w alta (CD 1.3)
Dynamic knee squatting

- 3 conditions: alta; distalization (C:D 1.0); distalization + tenodesis
- Evaluation:
  - Lateral patella tracking – bisect offset index (% patella lateral to deepest part of trochlear groove)
  - Patellofemoral contact pressures + distribution
  - Repeated measures comparisons
Results: Distalization reduces maltracking

- Significant reduction in lateral bisect $10^\circ, 15^\circ, 25^\circ$
Distalization reduces mean contact pressure.
Distalization reduces peak contact pressure
Location of contact

- Centroid of pressure more proximal/superior, more medial at low flexion angles
- Max superior translation 6mm from $15^\circ$ - $45^\circ$
Discussion

• Dynamic simulation of distalization in alta
  • improved patella tracking
  • substantial ↓ in peak and mean contact pressure
  • Moves pressure proximal/superior and medial
• Other studies: ↑ pressure w alta (Watson et al Iowa OJ 2017)
  • ↓ pressure in 1 pt w static loading (Yin et al CORR 2016)
• Limitations: unable to assess >90° due to soft tissue wrapping; may have ↑ pressure
Conclusions

• Distalization in patella instability patients with alta can improve tracking and decrease contact pressures
• May decrease instability without risking excessive overload of cartilage through majority of ROM
• Study provides solid biomechanical rationale for use of distalization
Thank you!

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