Relationship Between Graft Force And Tuberosity Position Following MPFL Reconstruction

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Disclosures

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MPFL Reconstruction

• Performed in patients with patellar instability
• Restores the soft tissue restraint
• Other considerations:
  – Malalignment
  – Patella alta
  – Trochlear dysplasia
Graft Isometry

- Biomechanical studies have evaluated graft isometry and PF kinematics following MPFL reconstruction:
  - Increased TTTG and patella alta lead to graft anisometry (Redler 2018)
  - MPFL reconstruction does not restore contact pressures and patellar kinematics when TTTG > 15mm (Stephen 2015)
Specific Aims

• The current study was performed to evaluate anatomical factors that contribute to MPFL graft loading using dynamic simulation of knee function.
Methods

- Dynamic simulation performed in 15 models of knees with patellar instability.
- Each model analyzed during squatting motion:
  - No MPFL graft
  - Graft fixation allowing 0.5 or 1 quadrant of patellar lateral translation
- Applied quadriceps forces ramped to 300 N at 90° of flexion.

MPFL graft
Methods

• Anatomic measurements and patellar tracking measurements quantified during squatting maneuver

Caton-Deschamps Index = A/B

Patello-trochlear index = C/B

Bisect Offset Index = B/(A+B)

Lateral TT-PCL Distance
Methods

- Patellar kinematics (bisect offset and lateral tilt) compared at 5° intervals
- Graft force compared between two tensioning protocols with Wilcoxon signed rank tests
- Regression analyses performed to relate anatomy to maximum graft force
  - Lateral TT-PCL distance
  - Lateral trochlear inclination
  - Caton-Deschamps index
  - Patellotrochlear index
Results

*significant difference compared to pre-operative condition
Results

- Graft forces were greatest at low flexion angles, approaching 0 N by 30° of flexion.
Results

- Maximum TT-PCL distance correlated with graft force
  - $p < 0.01$ for both graft tensioning protocols
Summary

- MPFL grafts carry minimal load beyond 30° of knee flexion during functional activities.
- The primary pre-operative anatomical parameter that determines the maximum MPFL graft is the most lateral position of the tibial tuberosity during function.
Conclusion

• These findings suggest that tibial tuberosity medialization should be considered in patients with an elevated lateral TT-PCL distance to decrease the risk of excessive MPFL graft tension.

• References: