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Severity of Patellofemoral Dysplasia is Associated with Movement and Landing Mechanics Following Operative Treatment for Patellar Instability

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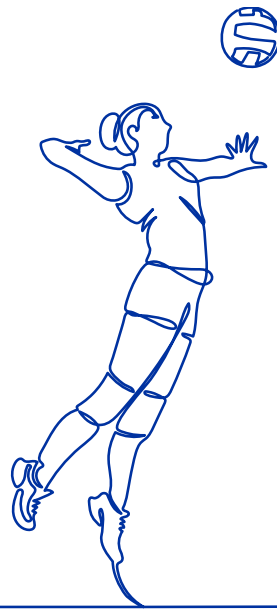

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UT Southwestern Medical Center

Disclosures

- **Henry B. Ellis, M.D.**
  - Paid Speaker- OrthoPediatrics
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Introduction

- Patellofemoral instability (PFI) is highly correlated with patello-trochlear dysplasia (1)

- Biomechanical testing can reveal alignment issues in PFI patients, including increased valgus and quadriceps avoidance.

- The relationship between these dysplastic features and biomechanics during sport-related tasks like the drop vertical jump (DVJ) has not been investigated.

Introduction

Purpose

To identify correlations between preoperative anatomic characteristics and lower-extremity kinematics at sports clearance in adolescents following medial patellofemoral ligament (MPFL) reconstruction.

Hypothesis

We hypothesized that PFI-associated dysplasia would correlate strongly with pelvis, hip and knee kinematics during dynamic movements.

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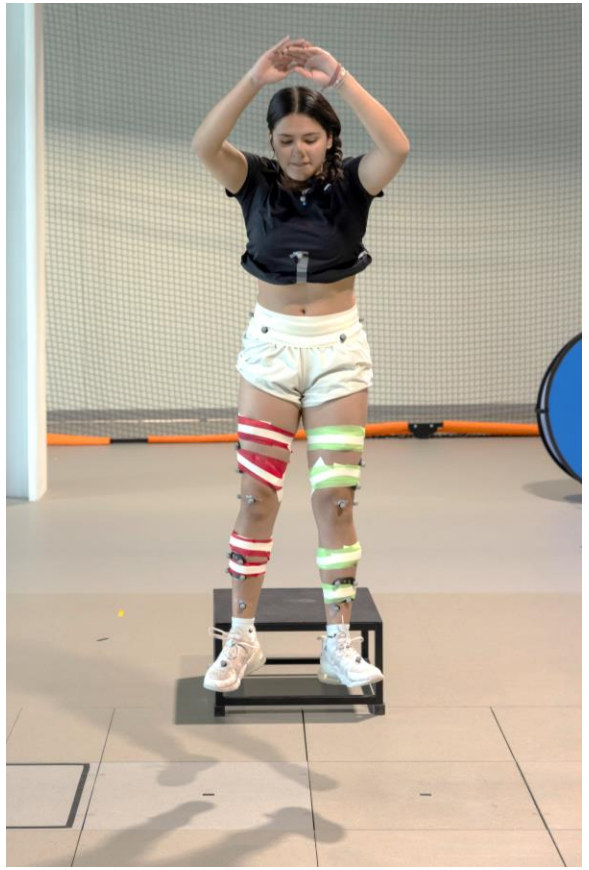
Methods

- **Prospective cohort study.**
- **Adolescent patients aged 10-18 who underwent MPFL reconstruction for PFI between 2019 and 2023.**
- **Motion capture testing within 2 weeks of sports clearance.**
  - Protocol included landing from a 31 centimeters plyo-box, with subsequent maximal vertical jump.
  - Pelvis, hip, and knee were assessed during descent phase of the DVJ.



Drop Vertical Jump (DVJ)

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Methods (continued)

- **Preoperative radiographs and MRI**
  - **Tibial tubercle to trochlear groove distance (TT-TG)**
  - **Tibial tubercle-posterior cruciate ligament (TT-PCL)**
  - **Trochlear width (TW)**
  - **Trochlear sulcus depth (TSD)**
  - **Lateral inclination angle (LIA)**
  - **Patellar tilt angle (PTA)**
  - **Femorotibial angle (FTA)**

- **Data analysis**
  - Spearman correlations were used to explore relationships between preoperative anatomy and DVJ kinematics.

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Results

- **N = 17**
  - **8 Male**
  - **15.5 ± 1.4 years old**
  - **15 unilateral**
  - **TT-PCL, TT-TG, and TSD did not significantly correlate with any kinematic variable.**

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Results

- **Positive correlation**
  - Greater pelvic obliquity (r=0.672, *p=0.004) with FTA*
  - Hip internal rotation (r=0.508, *p=0.044*) with FTA.
  - Greater knee valgus with TW (r=-0.486, *p=0.048*)
  - Greater internal rotation with LIA (r=0.513, p=0.035).
  - TW with Internal hip rotation (r=0.483, p=0.049)

- **Negative correlation**
  - Greater flexion during landing with PTA (r=-0.547, *p=0.023*)

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Results

- **Greater severity of patella-trochlear dysplasia**
  (decreased TW (r=-0.486, *p=0.048*)

- **And increased PTA (r=0.689, *p=0.002*)**

Were both associated with the knee joint moving further away from the midline.

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Discussion

- **These results highlighted that more severe patella-trochlear dysplasia was significantly linked to distinct biomechanical patterns during DVJ.**

  *** measured by factors such as TW, LIA, and PTA**

- **Greater trochlear dysplasia correlated with knee valgus and decreased flexion at landing, as well as increased pelvic obliquity and hip internal rotation.**

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Discussion

- **The finding of persistent knee extension, valgus and internal rotation at landing after patellar stabilization may assist in patient counseling regarding expectation of outcomes regarding knee performance upon return to sport.**

- **The findings emphasize the importance of assessing these anatomical risk factors across various dynamic tasks rather than solely gait.**

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Thank You!

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Reference

1. Kim, H. K., et al. (2016). "Patellofemoral Instability in Children: Correlation Between Risk Factors, Injury Patterns, and Severity of Cartilage Damage." American Journal of Roentgenology **206(6): 1321-1328.**

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