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## ***Other Risk Factors Not Accounted For***

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We read with interest the manuscript by Capin et al. comparing the knee mechanics and tibiofemoral joint loading after ACL reconstruction among patients without any concomitant meniscal surgery, those who underwent concomitant partial medial meniscectomy, and those who underwent medial meniscal repair. The authors found that patients with partial medial meniscectomy walked with higher pKAM (peak knee adduction moment) and shifted loading toward the medial compartment in the operated limb, whereas those with meniscal repair walked with lower pKAM and unloaded the medial compartment in the operated limb. The authors also explained the implications of the altered gait mechanics observed after meniscal surgery with respect to the well-documented increased risk of knee osteoarthritis (OA) in such patients (1, 2). This is an interesting and clinically relevant study regarding one of the most common knee injury patterns and associated concerns about development of knee OA.

However, the analysis would have been stronger if the other known risk factors for OA after ACL reconstruction were accounted and controlled for (3-5). For example, concomitant cartilage injury is regarded as one of the most important factors resulting in early development of knee OA. Although the authors excluded patients with an osteochondral defect >1 cm<sup>2</sup>, there was no mention of the status of articular cartilage observed during knee arthroscopy.

Moreover, as shown in Table 1, there was no difference in BMI between the meniscal repair and partial meniscectomy groups. However, BMI in the operated groups was higher than that in the non-operated group. Therefore, the association between altered gait mechanics and risk for knee OA in the operative groups cannot be drawn with certainty, as obesity is a strong independent risk factor for knee OA.

development after ACL reconstruction. Also, there is no information about whether the meniscal repairs were successful or not. A repeat arthroscopy or an imaging investigation (MRI or CT arthrogram) to evaluate the meniscal repairs would have added credibility to the comparisons between partial medial meniscectomy and meniscal repair groups (6).

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Conflict of Interest: None Declared

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## Article Author Response

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### *Article Author(s) to Letter Writer(s)*

We thank Dr. Tiwari and colleagues for commenting on our manuscript, and we appreciate the opportunity to reply.

The primary purpose of our study was to compare walking mechanics, including coronal-plane knee kinetics and tibiofemoral joint loading, after anterior cruciate ligament reconstruction (ACLR) among those without concomitant medial meniscus treatment, those with partial medial meniscectomy, and those with medial meniscus repair. While there is evidence in other cohorts linking meniscus involvement and treatment to osteoarthritis (OA) risk, there is a paucity of evidence that gait mechanics differ meaningfully after ACLR according to medial meniscus treatment. Moreover, there is growing evidence that evaluating gait mechanics early after ACLR may be critical in understanding future OA development (1-3) and in developing targeted rehabilitation interventions.

We acknowledge that there are limitations to our study and direct readers to the discussion section of our published manuscript, where we outlined several key limitations, including the lack of long-term follow-up. As Tiwari et al. suggest, future studies should include imaging to identify the presence and degree of joint degeneration or OA development. In those studies, controlling for other key OA risk factors—such as concomitant cartilage injury, body mass index (BMI), and success of meniscus repairs—would be necessary to determine the degree to which each risk factor versus gait mechanics contributed to OA development. However, in our study, performed early after surgery, it was critical to control for key variables known to affect gait mechanics, our primary outcome. We controlled well for these variables, most notably enrolling only those after primary ACLR (4,5) with high (i.e., >80%) quadriceps strength index (6,7). Quadriceps strength index, a strong predictor for altered walking mechanics after ACLR (6,7), was similar across all 3 groups, whose mean quadriceps strength indexes exceeded 90%. This indicates excellent and symmetric strength across groups. We also accounted for gait speed, which was controlled within participants across trials and was similar across groups. Our key findings were differences that occurred between the repair and partial meniscectomy groups.

While BMI differed statistically between the none group (mean, 24.9 kg/m<sup>2</sup>) and each of the two groups with treated medial menisci, there were no differences between those with partial medial meniscectomy (27.1 kg/m<sup>2</sup>) and those with medial meniscus repair (27.4 kg/m<sup>2</sup>). Additionally, BMI is a poor measure of obesity in young athletes, as the measure does not distinguish muscle weight from fat weight (8).

Other strengths of our study included controlling for sport level and using detailed biomechanical analyses, including patient-specific musculoskeletal modeling (9,10). While we again acknowledge that there are important limitations to consider, we hope our article investigating meniscal treatment on walking mechanics after ACLR will provide insight into one proposed mechanism for OA development and inspire future studies that include long-term diagnostic follow-up.

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