Medial Meniscus Repair Only Partially Restores In-Vivo Knee Kinematics After ACL Reconstruction

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INTRODUCTION: The in-vivo and under weight-bearing biomechanical role of meniscal lesions and repair in combination with Anterior Cruciate Ligament (ACL) injury and reconstruction has not been extensively investigated yet. The aim of the study was to compare in vivo kinematics of ACL deficient knees with and without a medial meniscal tear; moreover, to investigate biomechanical differences between medial meniscus repair and healthy meniscus after ACL reconstruction. The hypothesis was that medial meniscus tear affects knee kinematic in ACL deficiency but meniscal repair in ACL reconstruction provides similar biomechanics to isolated ACL reconstruction.

METHODS: Nineteen patients with ACL injury were included: 10 had intact menisci (IM group) and 9 had medial meniscus injury (meniscus repair – MR group). Active knee kinematics under weight-bearing conditions was evaluated using a dynamic biplane radiographical system (roentgen stereophotogrammetric analysis – RSA) during a single-leg squat, performed preoperatively and 18 months after ACL reconstruction. The medial meniscus lesions were repaired with an all-inside technique. The General Linear Model was used to investigate the differences in terms of groups (IM vs MR) and time (preoperative vs follow-up) and their interactions ($p<0.05$).

RESULTS:

Tibial internal rotation was higher in the MR group with respect to the IM group both before and after surgery ($p<0.007$). Knee valgus was higher in the MR group preoperatively ($p<0.001$), while no differences were found at follow-up. Preoperatively, the IM group showed a more medial tibia compared to the MR group in the descendant phase ($p<0.006$).

DISCUSSION AND CONCLUSION: The presence of medial meniscus tear significantly altered knee kinematics in the context of ACL injury. The meniscal repair does not restore the tibial internal rotation of an isolated ACL reconstruction.

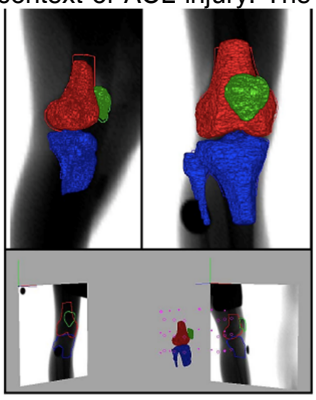

Figure 1. RSA data elaboration: 3D models of bones were obtained from MRI and were used in specific software to reproduce the joint movement through a validated tracking system that matched models and dynamic radiographs.

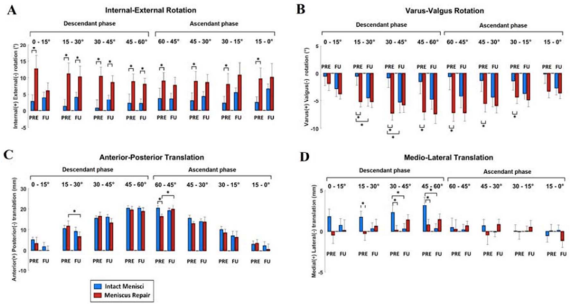

Figure 2A-D. Graphical representation of the kinematical parameters investigated; the black asterisks highlighted statistically significant differences ($p<0.05$). Note the pre-operative differences in internal-external rotation, varus-valgus, and medio-lateral translation between the two groups and the persistence of greater tibial internal rotation after surgical intervention (descendant phase). Pre: pre-operative; FU: follow up.