BIOMECHANICAL STUDY ON CADAVER KNEE FOR THE EVALUATION OF CRUCIATE KNEE LIGAMENT RECONSTRUCTIONS

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KEY WORDS: cruciate ligaments, reconstruction, kinematics, ligament deformation, three-dimensional analysis

INTRODUCTION: Ruptures of the anterior and posterior cruciate knee ligament (ACL and PCL), alone or combined, are among the most frequent joint injuries, especially in sports. The long-term unsatisfactory results and lack of systematic evaluation of surgical reconstructions have led us to make an evaluation on cadaver knees.

MATERIAL AND METHOD: A preliminary study was performed on one cadaver knee. The femur was fixed on a holder and magnetic sensors "Birds^{TM}" were attached to the tibia and the femur, which tracked the knee's movement. A three-dimensional knee analyzer GENI[(1)] was used to calculate kinematic parameters (tibial internal and external rotation and ab/adduction), as well as ligament combined deformation (elongation / bending / torsion) during knee flexion. This experiment was performed on an intact knee and a knee where the PCL has been cut and reconstructed using a synthetic Trevia ligament. Finally the knee was dissected to produce a combined postero-lateral instability and reconstructed with and without postero-lateral corner reconstruction. The effect of different reconstruction methods on kinematics and ligament deformation were compared.

RESULTS AND DISCUSSION: Kinematic parameters changed significantly when PCl and postero-lateral corner were dissected. The reconstruction of the PCL alone, using an "Over-the-Bottom" method described by Krudwig[(2)], shifted the curves back to the initial situation and decreased the variability of the movement. Ligament deformation was 3 mm elongation, 50^{o} femoral flexion and 90^{o} torsion. These values are in accordance with material properties and should lead to good long-term biofunctionnality.

CONCLUSION: This study proposes an *in vitro* protocol for a better understanding of the clinical success or failure of different procedures. Preliminary results showed that the system and the protocol setup are sensitive to changes in kinematics following posterior cruciate ligament dissection and reconstruction. Experiments are being performed at this time on several cadaver knees, in order to compare different reconstruction methods.

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