

Investigation of the influence of high tibial osteotomy on medial meniscus extrusion : A cadaveric biomechanical study.

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Disclosures: No disclosures.

Introduction: Medial meniscus extrusion (MME) leads to increase joint surface contact pressure and rapidly progress to osteoarthritis. Theoretically, improvement of the MME requires alignment correction and repair of the hoop mechanics. However, it is controversial whether high tibial osteotomy (HTO) with meniscus repair improves the MME in clinical. The purpose of this study was to evaluate how the effect of extra-articular alignment correction by high tibial osteotomy (HTO) affects the MME with fresh-frozen human cadaveric knees and six degrees of freedom (DOF) robotic testing system.

Method: This study was approved by the ethics committee of our institution (approval number 1-2-68). We performed using six fresh-frozen human cadaveric knee specimens (n = 4 male, n = 2 female, mean age at death, 87.3 years; range, 79–94 years), a six DOF robotic testing system, and ultrasound evaluation to measure the amount of MME[Figure.1,2]. Ultrasound evaluation under 250 N of compression load was performed on the knee at 0°, 30° and 90° flexion. Each specimen was tested under 5 conditions (1. Intact, 2. Medial meniscus posterior root tear (MMPRT), 3. Medial Meniscus repair (MMR) alone, 4. Medial open-wedge HTO+MMR, and 5. HTO alone). Statistical analysis was performed using a two-factor repeated-measures analysis of variance (ANOVA) with Bonferroni correction ($p < .05$).

Results: Figure3 showed the amount of MME by each conditions. Statistical differences were observed between the MMPRT group and the intact group, the MMR group excluding the 90 degrees of the knee flexion, and the HTO+MMR group. There was a statistically significant difference between the MMR group and the HTO+MMR group at 30 and 90 degrees of the knee flexion ($p = .002$, $p = .004$, respectively).

Discussion: The MME would not improve with HTO alone, if the hoop mechanism was broken. HTO + MMR decreased MME compared to MMR alone. There were several limitations. First, the each specimens were elderly. Second, The 250 N compression load was a little small.

Clinical relevance: Results of our study showed that MME could be improved by alignment correction with HTO if the hoop mechanism was effective.

Figure.1 6-DOF robotic testing system and ultrasound probe

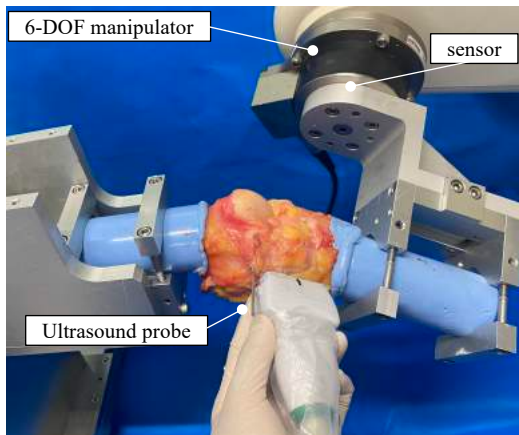


Figure.2 Ultrasound image

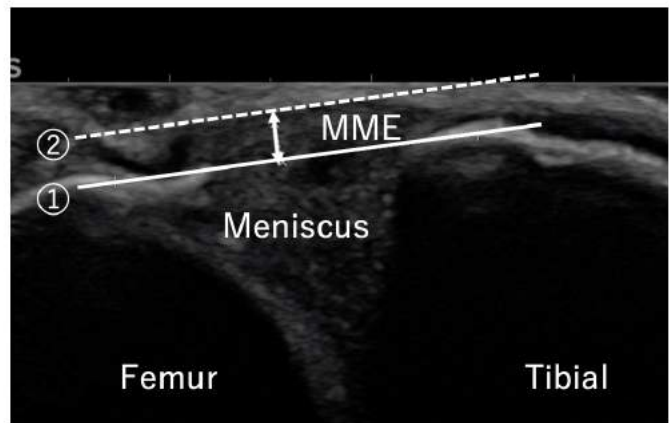


Figure.3 The amount of the MME by 250N compression load
— Statistically significant

