

# Differential pretensions of a flexor tendon graft for anterior cruciate ligament reconstruction: a biomechanical comparison in a porcine knee model

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摘要

## Abstract

Purpose: The best way to apply the pretension force to the soft tissue graft during anterior cruciate ligament (ACL) reconstruction remains controversial. We compared manual, intra-, and extra-articular pretension techniques and determined the magnitude of displacement of the femur-graft-tibia complex in response to repetitive loading. Type of Study: A biomechanical-controlled study. Methods: Fresh porcine knees and profundus digital flexor tendons of hind limbs were used. Specimens were divided into 3 groups. Group A (manual pretension, n = 9) consisted of grafts that were pretensioned only by a maximal manual pull before final fixation on the tibial side. Group B (extra-articular pretension, n = 9) consisted of grafts that were pretensioned using a commercial tensiometer at 89 N for 15 minutes on the tendon preparation board, followed by pulling using maximal manual force before final fixation. Group C (intra-articular pretension, n = 9) consisted of grafts that were fastened on the femoral side first and then underwent application of a pretension force at 89 N for 5 minutes before final fixation on the tibial side. These femur-graft-tibia complexes from the 3 groups were loaded from 0 to 150 N at a frequency of 1 Hz for 1,000 cycles and then underwent a tensile load-to-failure test at a rate of 150 mm/min. Results: The displacement of the femur-graft-tibial complex in response to cyclic loading for group C ( $5.4 \pm 0.3$  mm) was significantly lower than those for groups A ( $12.5 \pm 1.1$  mm) and B ( $8.8 \pm 0.8$  mm) ( $P < .001$ ). The fixation stiffness of group C ( $47.9 \pm 17.6$  N/mm) was significantly greater than that of group A ( $32.5 \pm 9.7$  N/mm) ( $P < .05$ ) but not significantly different from that of group B ( $53.1 \pm 9.1$  N/mm). The ultimate failure load in each group was not significantly different. Conclusion: Intra-articular pretension of the graft before final fixation can significantly minimize graft elongation at time 0 compared with manual and extra-articular pretension. Clinical Relevance: Intra-articular or in vivo

pretension of the graft using instruments may minimize the graft elongation in the early period of rehabilitation after ACL reconstruction