

Medial Meniscal Root Avulsion: A Biomechanical Comparison of Four Different Repair Constructs.

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Summary:

A locking loop stitch used to repair medial meniscal root avulsions proved significantly stronger in time-zero pullout strength than three other suture constructs.

Abstract:

PURPOSE:

Medial meniscal root avulsion may lead to a deleterious alteration of medial compartment loading and increased risk of cartilage degeneration. Repair of this injury has been proposed to restore normal biomechanics of the knee. The purpose of this study was to evaluate the time-zero pullout strength of four different constructs used to repair medial meniscal root avulsions.

HYPOTHESIS:

(1) No meniscal root repair technique will be as biomechanically strong as the intact meniscus. (2) A looped suture construct will resist greater loads than simple sutures.

METHODS:

Sixty fresh-frozen cadaveric knees with a mean age of 74 years were used for this study. Each knee was dissected to isolate the attachment of the posterior root of the medial meniscus to the tibial plateau. An Instron machine with custom-designed clamp was used to avulse the intact posterior meniscal root in 12 Control specimens. An additional 48 specimens were tested after transection of the native meniscal root to evaluate the pullout strength of four different repair constructs using #0 FiberWire suture secured to a screw through a trans-tibial tunnel: a Single Suture (n=12), Double Suture (n=12), Loop Stitch (n=12), and a novel Locking Loop Stitch (n=12). Analysis of variance was used to compare pullout strength of all groups with pairwise between-group differences assessed using Tukey's-adjustment for multiple testing.

RESULTS:

Repair failure occurred most commonly by suture pullout in 94% of the specimens in the repair groups. For the Controls, failure occurred most commonly at the meniscus-clamp interface. Failure strength was highest for the Control group (mean: 359.5 N + 168 N), followed in descending order by the Locking Loop Stitch (191.4 N + 45.1 N), Loop Stitch (119.6 + 55.0 N), Double Suture (96.2 N + 51.4 N), and Single Suture (58.2 N + 29.6). The Control group was significantly stronger ($p < 0.0001$) than three of the experimental groups (Single Suture, Double Suture, and Loop Stitch) but not the Locking Loop Stitch ($p = 0.056$). The Locking Loop Stitch was significantly stronger than the Single Suture ($p < 0.0001$) and Double Suture ($p = 0.002$) and trended toward significance compared to the Loop Stitch ($p = 0.06$). Age and gender had no effect on pullout strength.

DISCUSSION:

The results of this study showed that the novel Locking Loop Stitch provided pullout strength that most closely approximated the strength of the native meniscal root in addition to being significantly stronger than commonly

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used repair methods. The Locking Loop may be the preferred method for repair of medial meniscal root avulsions.