

Biomechanical Evaluation of Various Suture Configurations in Side-to-Side Tenorrhaphy.

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Abstract

BACKGROUND:

Side-to-side tenorrhaphy is increasingly used, but its mechanical performance has not been studied.

METHODS:

Two porcine flexor digitorum tendon segments of equal length (8 cm) and thickness (1 cm) were placed side by side. Eight tenorrhaphies (involving sixteen tendons) were performed with each of four suture techniques (running locked, simple eight, vertical mattress, and pulley suture). The resulting constructs underwent cyclic loading on a tensile testing machine, followed by monotonically increasing tensile load if failure during cyclic loading did not occur. Clamps secured the tendons on each side of the repair, and specimens were mounted vertically. Cyclic loading varied between 15 N and 35 N, with a distension rate of 1 mm/sec. Cyclic loading strength was determined by applying a force of 70 N. The cause of failure and tendon distension during loading were recorded.

RESULTS:

All failures occurred in the monotonic loading phase and resulted from tendon stripping. No suture or knot failure was observed. The mean loads resisted by the configurations ranged from 138 to 398 N. The mean load to failure, maximum load resisted prior to 1 cm of distension, and load resisted at 1 cm of distension were significantly lower for the vertical mattress suture group than for any of the other three groups ($p < 0.031$).

CONCLUSIONS:

All four groups sustained loads well above the physiologic loads expected to occur in tendons in the foot and ankle (e.g., in tendon transfer for tibialis posterior tendon insufficiency). None of the four side-to-side configurations distended appreciably during the cyclic loading phase. The vertical mattress suture configuration appeared to be weaker than the other configurations.

CLINICAL RELEVANCE:

For surgeons who advocate immediate loading or motion of a side-to-side tendon repair, a pulley, running locked, or simple eight suture technique appears to provide a larger safety margin compared with a vertical mattress suture technique.