

10 mm × 30 mm FastThread™ BioComposite Interference Screw in ACL Reconstruction Using Soft-Tissue Grafts

Arthrex Research and Development

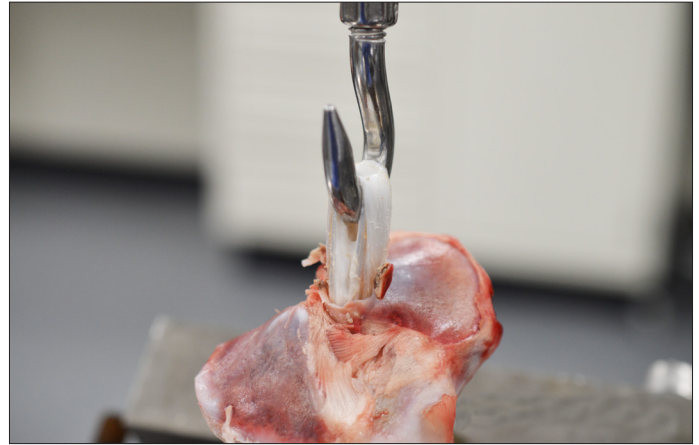
Objective

The objective of this study was to investigate the biomechanical properties or strength of ACL reconstruction using soft-tissue grafts in a porcine tibia model with 10 mm × 30 mm FastThread BioComposite interference screws for soft-tissue fixation. In addition, insertion torque and biomechanical properties of the subject screw were directly compared to that of 10 mm × 28 mm and 10 mm × 35 mm biocomposite interference screws for which testing was conducted in the past.

Methods and Materials

Eight (8) porcine tibias were potted in fiberglass. Bovine extensor tendon grafts were prepared by whipstitching 50 mm long #2 FiberLoop® suture and sizing each graft to 10 mm in diameter. A transtibial tunnel was drilled and each graft was pulled into the tunnel using the suture, leaving a 30 mm tendon loop above the tibial plateau (Figure 1). The subject screw was inserted into the tunnel while the graft was held in tension. Insertion torque was measured using a Mark-10 MGT-100 torque gauge. Cyclic and pull-to-failure tests were performed using an Instron E10000 mechanical testing system. Each construct was preconditioned by cycling between 10 N and 50 N at 1 Hz for 10 cycles followed by cyclic loading between 50 N and 250 N at 1 Hz for 500 cycles. Following cycling, a pull-to-failure test was conducted at a rate of 20 mm/min (Figure 1) into the implants.

Figure 1. Test Setup



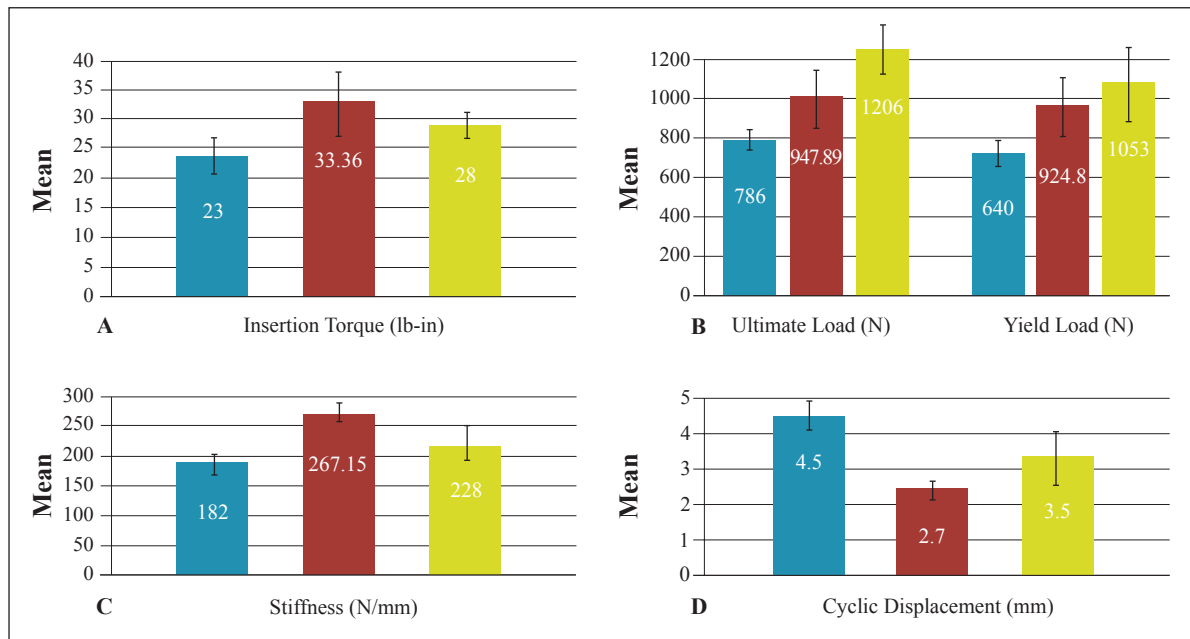
Results

Table 1 shows insertion torque and ACL reconstruction biomechanical properties for the subject screw as well as direct comparison of the same with 10 mm × 28 mm and 10 mm × 35 mm biocomposite screws for which data is obtained from previous reports.

Table 1. Insertion torque and ACL reconstruction mechanical properties for the subject screw and direct comparison of the same with other interference screws.

Parameters	10 mm × 28 mm Biocomposite Screw (Past Study) Mean ± SD ¹	10 mm × 30 mm FastThread BioComposite Screw (Subject Screw) Mean ± SD	10 mm × 35 mm Biocomposite Screw (Past Study) Mean ± SD ²
Insertion Torque (lb-in)	23 ± 5.3	33.36 ± 10.67	28 ± 4
Ultimate Load (N)	786 ± 101	947.89 ± 300.71	1206 ± 248
Yield Load (N)	640 ± 129	924.8 ± 302.15	1053 ± 378
Stiffness (N/mm)	182 ± 35	267.15 ± 31.4	228 ± 55
Cyclic Displacement (mm)	4.5 ± 0.7	2.7 ± 0.52	3.5 ± 1.5

Figure 2. (A, B, C, D) Graphical representation of data presented in Table 1



- 10 mm × 28 mm Biocomposite Screw (Past Study)¹
- 10 mm × 30 mm FastThread™ BioComposite Screw (Subject Screw)
- 10 mm × 35 mm Biocomposite Screw (Past Study)²

Conclusion

The direct comparison revealed that the 10 mm × 30 mm FastThread BioComposite interference screw performed better than 10 mm × 28 mm and 10 mm × 35 mm biocomposite interference screws as far as stiffness, insertion torque, and cyclic displacement are concerned. The 10 mm × 30 mm FastThread BioComposite screw performed better than 10 mm × 28 mm biocomposite screws as data indicates better mechanical properties and higher torque values; however, 10 mm × 35 mm biocomposite screws had higher values for ultimate and yield load as compared to 10 mm × 28 mm biocomposite screws and 10 mm × 30 mm FastThread BioComposite screws.

References

1. Arthrex, Inc. Data on file (APT 1197). Naples, FL; 2008.
2. Arthrex, Inc. Data on file (APT 1060). Naples, FL; 2008.