

Long-term Cycling of the TightRope Syndesmosis Repair Kit and 4.5 mm Synthes Cortex Screw

Arthrex Research and Development

Objective

A repaired syndesmosis injury experiences shear forces as the fibula moves relative to the tibia during gait¹. The purpose of this study is to compare the fatigue life of the Arthrex TightRope Syndesmosis Repair Kit and the 4.5 mm x 70 mm Synthes Cortex Self-tapping Screw, when tested in shear.

Methods and Materials

Syndesmosis repairs were simulated using two 30 lb/ft³ polyurethane blocks. The TightRope Syndesmosis Repair construct was tied off with a surgeon's knot with three alternating half-hitch knots; the Synthes screw was countersunk so the screw head was flush with the block. Mechanical testing was performed using an INSTRON 8871 Axial Table Top Servohydraulic Dynamic Testing System (INSTRON, Canton, MA) with a 5 kN load-cell secured to the cross head. One polyurethane block was bolted to the load-cell and the other polyurethane block was bolted to the base of the INSTRON (Figure 1). A 5 mm gap was left between the two fixtures. The constructs were cycled to failure from zero to 2.4 mm displacement in tension, the normal distal migration of the fibula secondary to contraction of the foot flexors during stance and push-off gait phases¹. A sample size of three was tested in each group.

Figure 1: Syndesmosis repairs were bolted to an INSTRON machine



Results

The Synthes Cortex Self-tapping Screw had a fatigue life of $11,844 \pm 1,273$ cycles. The Arthrex TightRope Syndesmosis Repair constructs were all stopped after at least 26,000 cycles without failure. The Synthes screws broke in all three constructs, while the Arthrex TightRope Syndesmosis Repair frayed slightly where the #5 FiberWire came into contact with the block (Figure 2).

Figure 2: Comparison of construct loads-of-failure between 4.5 mm Synthes Cortex Screw and Arthrex #5 FiberWire.



Broken Synthes screw



Slightly frayed #5 FiberWire

Reference

1. Scranton, P.E., Jr., J.G. McMaster, E. Kelly. Dynamic fibular function: A new concept. Clin Orthop Relat Res. 1976;(118):76-81.