BTB TightRope Compared to Traditional Interference Screw Fixation

Arthrex Research and Development

Objective

The purpose of this testing is to determine the biomechanical fixation strength of the BTB TightRope, and compare the results to the traditional "gold-standard" repair using a titanium interference screw.

Methods and Materials

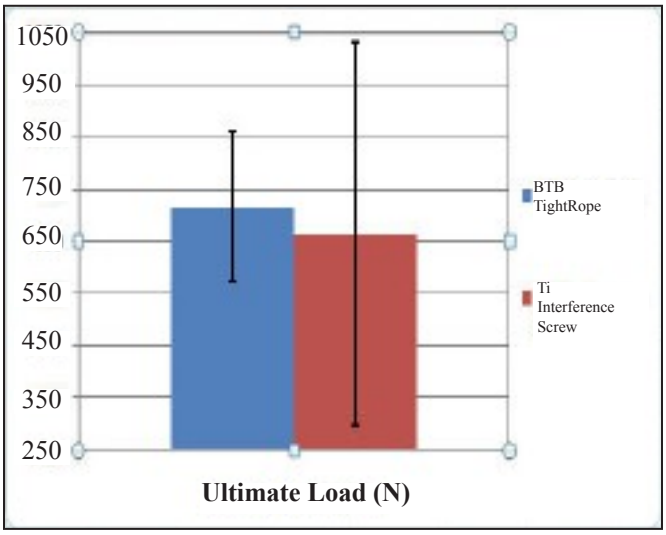
Matched pairs of grafts were prepared from allograft donor patellae. Each graft had a 25 mm long, 10 mm diameter bone block. A 2 mm hole was drilled into the bone block of each sample, 10 mm from the proximal end. For the BTB TightRope samples, the construct was created using the technique provided with the product. A #2 FiberWire was strung through the 2 mm holes of the contralateral samples to provide a passing suture. Porcine femurs were prepared with 10 mm diameter sockets, drilled 30 mm deep. The BTB TightRope samples were pulled into the sockets with the passing sutures and tightened with the cinching sutures. No knots were tied over the button. The contralateral samples were fixated in the sockets with an 8 x 20 mm titanium fully threaded interference screw inserted against the cancellous surface of the bone block.

Biomechanical testing was performed using an INSTRON 8871 Axial Table Top Servohydraulic Testing System (INSTRON, Canton, MA), with a 5kN load cell attached to the cross-head. The tendons were attached to a custom interdigitizing freeze clamp with dry ice. The porcine femurs were held to the testing surface such that the direction of pull was in line with the socket and bone block. Each sample was precycled from 10 to 50N at 1Hz for 10 cycles followed by cycling from 50 to 250N at 1Hz for 500 cycles. Post cycling, pull-to-failure was conducted at 20 mm/min. Load and displacement data were recorded at 500Hz. The ultimate load, yield load, stiffness, and the mode-of-failure were recorded for each sample. In addition, digital video tracking was used to determine the displacement of the graft relative to the femur.

Results

The ultimate load of the BTB TightRope samples was 717 ± 146 N, and the most common mode-of-failure (n = 3 of 6) was the bone block being broken at the 2 mm drill hole. The ultimate load of the interference screw samples was 664 ± 367 N, and the most common mode-of-failure (n = 4 of 6) was the bone block breaking or crumbling. The ultimate loads are shown in Figure 1.

Figure 1: Ultimate load comparison of the BTB TightRope and a titanium interference screw.



There was no significant difference found between the two groups in ultimate load ($p = 0.722$) or cyclic displacment ($p = 0.125$). However, an F-test showed a significantly greater variance for the interference screw ultimate load when compared to that of the BTB TightRope ($p = 0.032$).

Conclusion

The results of this testing suggest that the BTB TightRope has a substantially equivalent fixation strength as the "gold-standard" interference screw repair. Also, the ultimate load of the BTB TightRope may have a more predictable ultimate load than an interference screw.