Biomechanical Comparison of JuggerKnot and 2.4 mm BioComposite SutureTak

Arthrex Research and Development

Objective

The purpose of this study was to compare the biomechanical loading characteristics of the Biomet JuggerKnot suture anchor to the Arthrex 2.4 mm BioComposite SutureTak Suture Anchor.

Methods and Materials

Two matched pair shoulders were used in this study. The glenoid and scapula were dissected, and potted in fiberglass resin. Anchor positions were randomized to account for variations in bone density around the glenoid. The anchors were inserted according to manufacturer's recommendations (including deployment of the JuggerKnot anchor). Post insertion, the sutures were tied around a 3/8" (9.5 mm) dowel rod using a six-throw static surgeon's knot. Six anchors per group were tested.

Mechanical testing was performed using an Instron 8871 Axial Tabletop Servohydraulic Testing System with a 1 kN load cell attached. The pull-to-failure was conducted in-line with anchor insertion to simulate a worst-case loading scenario The tied suture loops were preloaded to 5 N, cycled from 5 N to 25 N for 100 cycles, and then pulled to failure at a rate of 15 mm/min. Load and displacement data were collected at a rate of 500 Hz. A paired t-test ($\alpha = 0.05$) was used to compare the two groups.

Results

The results (mean ± standard deviation) along with p-values from the statistical analysis can be seen in Table 1. Statistical differences existed in every category except ultimate load.

The JuggerKnot anchor experienced low resistance to displacement, despite manually "deploying" the anchor as described in the surgical technique. In addition, the cycling regime may have helped "deploy" the anchor; however, the load displacement curve seen in Figure 1 shows a lack of resistance to displacement despite the manual "deploying" and cycling regime. To illustrate the lack of resistance to displacement, the load at 2 mm of displacement immediately after cycling was measured for each anchor. The load at 2 mm of displacement after cycling for the JuggerKnot anchor was 53 ± 12 N compared to 126 ±16 N for the 2.4 mm BioComposite SutureTak.

Figure 1: Load Displacement Curve

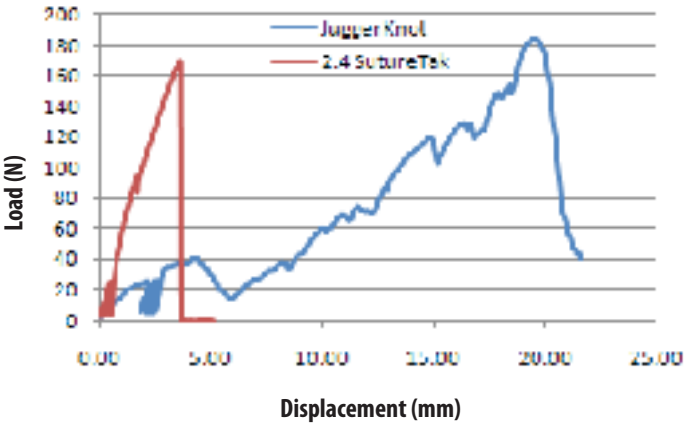

Table 1: Results

	JuggerKnot	2.4 mm BioComposite SuturetTak	p-value
Ultimate Load (N)	172 ± 48	167 ± 14	0.937
Displacement at Ultimate Load (mm)	16.6 ± 5.8	3.8 ± 0.7	0.009
Cyclic Displacement (mm)	2.0 ± 1.2	0.6 ± 0.3	0.002
Load at 2 mm Displacement (N) †	34 ± 12	101 ± 28	< 0.001
Load at 2 mm Displacement after Cycling (N)	53 ± 12	126 ± 16	< 0.001
† Included the displacement that occurred during cycling			

Conclusion

The 2.4 mm BioComposite SutureTak provides fixation properties superior to the JuggerKnot across a range of several benchmark fixation qualities. The loading profile also demonstrates that the 2.4 mm BioComposite SutureTak is statistically more resistant to displacement than the JuggerKnot anchor.

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