

# Biomechanical Evaluation of the Zimmer Biomet Sports Medicine JuggerKnotless<sup>®</sup> Soft Anchor

Zimmer Biomet Sports Medicine Research and Development

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## Introduction

Zimmer Biomet Sports Medicine has recently expanded the JuggerKnot<sup>®</sup> Soft Anchor platform by developing a novel all-suture soft anchor that, when appropriately deployed, eliminates the need to tie a surgical knot. The JuggerKnotless Soft Anchor utilizes a bone conserving drill hole diameter of 2.1 millimeters, which is significantly smaller than anchors commonly used in such repairs. The purpose of this study is to compare the JuggerKnotless Soft Anchor to the Arthrex PEEK<sup>®</sup> PushLock<sup>®</sup> Anchor in terms of cyclic durability and ultimate strength.\*

\*Reached during static testing after completion of cyclic loading. Bench testing not necessarily indicative of clinical results.

## Materials and Methods

Six JuggerKnotless 2.1 mm anchors (Figure 1) and six Arthrex 2.9 mm PEEK PushLock (Figure 2) anchors were inserted into a 15pcf solid rigid polyurethane foam block laminated with 2 mm short fiber filled epoxy per the manufacturers technique.<sup>1,3</sup> The anchors were tensioned over 4.7 mm Polished Steel S-Hooks. A 10 Newton preload was applied to establish the initial position from which to measure displacement. The anchors were then cycled from 10 to 60 Newtons at 1 Hertz for 500 cycles while measuring displacement. The anchors that did not fail were then statically pulled at a rate of 30 mm/min until failure, while measuring the load at 3 mm of displacement (clinical failure), the ultimate load at failure and the mode of failure.<sup>2</sup>



**Figure 1**  
Zimmer Biomet JuggerKnotless Soft Anchor



**Figure 2**  
Arthrex PEEK PushLock Anchor

## Results

Table 1 shows the averages of the cyclic and static testing conducted. As can be seen in the table, the average cyclic displacement of the PushLock anchor was higher than the displacement of the JuggerKnotless anchor. During cyclic testing three of the PushLock anchors reached a displacement of 3 mm, whereas zero specimens from the JuggerKnotless group reached this displacement. No specimens failed during cycling, and therefore all were tested to failure after cycling. After conclusion of the cyclic testing, the static pull to failure resulted in a higher load at 3 mm displacement and higher-ultimate load for the JuggerKnotless anchor compared to the PushLock anchor.

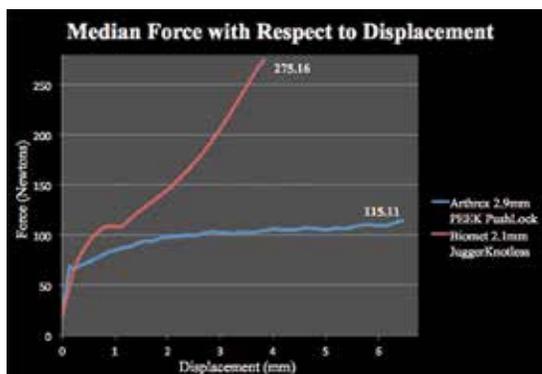
Product	JuggerKnotless Anchor	PushLock Anchor	P Value (TTest)
Average Cyclic Displacement	1.3 mm	3.8 mm	0.0636
Average Load at 3 mm Displacement	209 N* (47 lbs)	89 N (20 lbs)	0.0003
Average Ultimate Load	252 N (57 lbs)	110 N (25 lbs)	0.0003

**Table 1**  
Average Displacement, Loads, and P Values

The median Force vs. Displacement curves are shown in Figure 3. The mode of failure for each 2.9 mm PushLock was suture slipping past the anchor while the mode of failure for each 2.1 mm JuggerKnotless was suture breaking. No anchors from either group pulled out.

## Conclusion

This comparison of the Zimmer Biomet JuggerKnotless anchor and the Arthrex PushLock anchor using cyclic loading and load to failure testing demonstrates that the all-suture anchor possesses greater strength characteristics when compared to the solid Arthrex PEEK anchor in bone block. Both ultimate load and load at 3 mm of displacement were shown to be statistically greater with a 95% confidence interval and the average cyclic displacement value was lower for the JuggerKnotless Soft Anchor. The JuggerKnotless Soft Anchor provides fixation strength properties greater and statistically more resistant to displacement than the Arthrex PushLock anchor.



**Figure 3**  
Post-Cyclic Median Ultimate Loads

## References

1. PushLock Knotless Instability Repair Surgical Technique. Web. Retrieved March 15, 2013. <http://www.arthrex.com/shoulder/pushlock>
2. Data on file at Zimmer Biomet Sports Medicine, 457BMT1124. Testing was performed by Knight Mechanical Testing. Bench testing not necessarily indicative of clinical results.
3. Hartzell, J., MD; Borden, P., MD; Schneider, D., MD. JuggerKnotless Soft Anchor for Labral Repair Surgical Technique. BMET0747.0-ENG

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Bench testing not necessarily indicative of clinical performance.

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