Biomechanical Evaluation of the Biomet Sports Medicine JuggerKnot™ Soft Anchor—2.9mm in Cadaver Bone

Mark E. Gittins, D.O, and Jeffrey E. Gittins, D.O.
OrthoNeuro, New Albany Surgical Hospital Foundation

Biomet Sports Medicine has recently developed a new anchor size for their JuggerKnot™ Soft Anchor product line anticipated to have strength comparable to anchors typically used in rotator cuff surgery. This suture anchor has a diameter of 2.9mm which is nearly half the size of many anchors commonly used in the humeral head. This new product, like the original, is made of a soft strand of braided polyester, combined with high strength MaxBraid™ suture. The purpose of this study is to determine whether the JuggerKnot™ Soft Anchor—2.9mm strength characteristics compare to a larger, competitive device of different material.

METHODS
While following the specific JuggerKnot™ Soft Anchor surgical technique, JuggerKnot™ Soft Anchor—2.9mm—double-loaded with size #2 MaxBraid™ suture—were implanted into the native cuff footprint of four cadaveric humeri, age range 44-59. Application of tension to the handle of the inserter causes the anchor to deploy, increasing its diameter. While following the specific Arthrex Ti Corkscrew® Anchor surgical technique, the Ti anchors (5 x 15.5mm) were placed in the same four cadaveric humeri specimens. The location of the anchors with respect to anterior/posterior, lateral and medial, were alternated. The sutures were tied to create loops to allow them to be pulled from the bone. Static load testing was then performed, at 1.18mm/sec until failure, on a Sintech S/1 Screw Machine (GPP-1257 - 3C, Serial #128907A).

RESULTS
The pullout data of the JuggerKnot™ Soft Anchor—2.9mm is compared with the Arthrex Ti Corkscrew® Anchor, in cadaveric bone, in Table 1.

As reported in Table 1, the average peak load of the smaller JuggerKnot™ Soft Anchor—2.9mm is greater than the Corkscrew® anchor, and contains 40% less material by volume.

Another noteworthy finding was the affect on the bone of each anchor. As can be seen in Figures 2 and 3, there are distinct residual bone surface differences between a standard screw-type anchor and an all-suture JuggerKnot™ Soft Anchor.

Table 1

<table>
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<tr>
<th>Implant</th>
<th>Average Peak Load (N)</th>
<th>Anchor Volume (mm³)</th>
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<tbody>
<tr>
<td>BSM JuggerKnot™ 2.9mm</td>
<td>343.58</td>
<td>44.4</td>
</tr>
<tr>
<td>Arthrex Ti Corkscrew® 5.0mm</td>
<td>299.68</td>
<td>77.5</td>
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The pull−out strength of the JuggerKnot™ Soft Anchor—2.9mm all-suture system has a higher pull−out strength than that of the Ti Corkscrew® Anchor.

Figure 1: Maximum load to failure of each anchor.
Figure 2: View of the relative size of a metal screw (left) relative to the JuggerKnot™ anchor–2.9mm (middle) and the commonly used 4.5mm punch used to prepare the bone for the placement of a screw (right).

Figure 2 shows the significant difference in the amount of footprint disrupted and occupied between various anchors in Sawbones® bone analogue.

Figure 3: A common occurrence seen while placing screw type anchor in bone. Shown in the foreground is a 5mm Arthrex Corkscrew® anchor placed, and the rim of bone that has been pried up during normal placement.

In addition to the size of the disrupted bone, the quality of the disruption can also be seen in the above figures. While the JuggerKnot™ anchor’s drilled hole creates a well defined edge rim where the anchor is placed, screws have a tendency to lift a thin rim of bone during placement that sometimes must be manually removed (Figure 3).

CONCLUSION
While providing fixation strength comparable to a solid, metallic screw anchor, the JuggerKnot™ Soft Anchor–2.9mm contains far less material. This smaller volume means less non-native material is introduced into the bone. More of the anatomic footprint is also cleanly maintained with this type of anchor.

Metallic screw systems can interfere with medical imaging devices creating indecipherable and unreadable images. Since the JuggerKnot™ all-suture system does not include any metal, it will not obstruct the imaging of the repaired area. The JuggerKnot™ Soft Anchor–2.9mm also has advantages in revisions because there is no solid hardware that needs to be removed or negotiated around during surgery. The JuggerKnot™ Soft Anchor is also a non-resorbing material, so varying resorption times and effects are not a factor with this system.

Because of the above mentioned benefits, and since its strength has been shown to be more than adequate in the humerus, the JuggerKnot™ Soft Anchor–2.9mm is a very attractive alternative to other anchor materials commercially available.

1. Data on file at Biomet Sports Medicine, Inc. Bench test results are not necessarily indicative of clinical results. This material is intended for the Biomet Sports Medicine Sales Force and surgeons only. It is not intended to be redistributed without the express written consent of Biomet Sports Medicine.