

1 **Abstract**

2 **Background:**

3 Considering that implant backout is a recognized mode of failure, evaluating the pullout strength
4 is critical for assessing anchoring efficacy. The Sacrix[®] fully threaded titanium screw (TS) was
5 designed specifically for Less Exposure Spine Surgery (LESS) to reduce incision size, surgical
6 time, and blood loss, using two implants for sacroiliac joint (SIJ) fixation. This study compares
7 the Sacrix[®] design with the SI-Bone iFuse non-threaded triangular titanium implant (TTI)
8 design, which is widely regarded as the industry standard, and represents the first comparative
9 biomechanical pullout strength study of these implant designs currently used in SIJ fusions.

10 **Methods:**

11 We conducted mechanical static axial pullout tests on three 7.0 mm x 45 mm iFuse non-threaded
12 TTIs and six 8.0 mm x 40 mm Sacrix[®] fully TS embedded in polyurethane foam blocks. An
13 INSTRON 8874 Bi-Axial Tabletop Servohydraulic Dynamic Testing System was used to
14 perform the tests by applying a 2.5kN axial load.

15 **Results:**

16 The effective surface areas of the iFuse non-threaded TTI and Sacrix[®] fully threaded TS were
17 comparable, measuring 294.15 mm² and 289.81 mm², respectively. The TS exhibited a
18 significantly higher mean static axial pullout strength of 814.90N (SD ±99.428) compared to the
19 TTI 200.14N (SD ±14.428). Statistical analyses, including Welch's t-test and Mann-Whitney U
20 test, revealed significant differences in pullout strength between the two implants (P<0.05).
21 Variance analysis confirmed the differences in pullout strength variances between the implants
22 (P=0.040), suggesting that the variability in pullout strength was distinct for each implant.

23 **Conclusion:**

24 The Sacrix[®] fully threaded TS demonstrated a threefold increase in pullout strength compared

1 with the SI-Bone iFuse non-threaded TTI, suggesting that future sacroiliac joint fusion designs
2 should favor threaded over non-threaded implants for improved anchoring capability.

3

4 **Keywords**

5 Pullout Strength, Sacrix[®] Screw, SI-Bone, Sacroiliac Joint Fixation, Fully Threaded Screw