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# Arthrex and Acumed Compression Screw Mechanical Testing

Arthrex Research and Development

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## Objective

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Determine the mechanical characteristics of the Arthrex 3.5 mm × 30 mm Mini Compression FT™ screw and the Acumed 3.5 mm × 30 mm Mini Acutrak 2® bone screw. The amount of compressive force generated during insertion and the torque required will be compared between the two screw types.

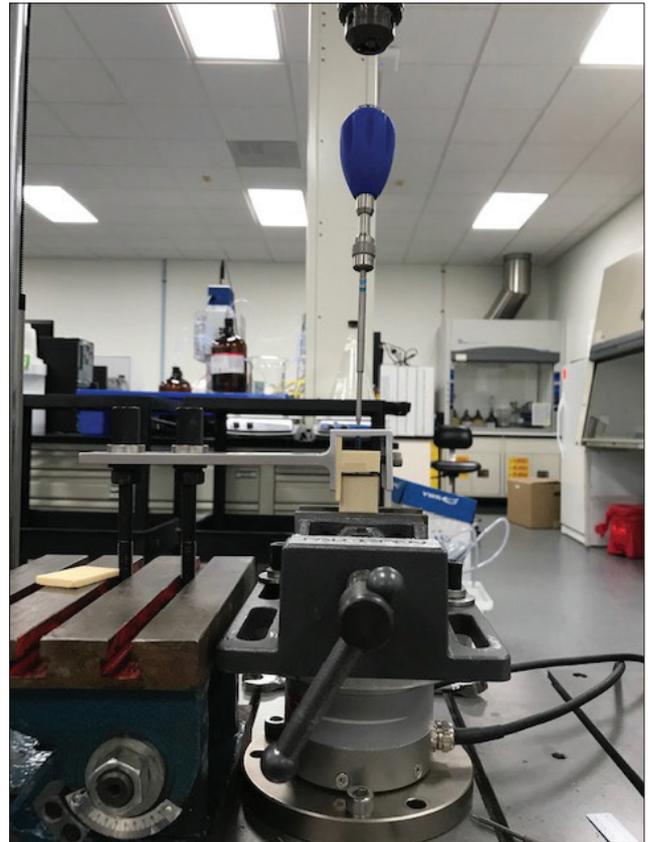
## Methods and Materials

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30 lbf/ft<sup>3</sup> foam blocks were prepared according to surgical technique guides for both devices. Two blocks were used for each test sample. The upper block was 14 × 40 × 24 mm and the bottom block was 40 × 28 × 24 mm, with the pilot holes parallel to the 14 and 40 mm dimensions, respectively. Mechanical testing was performed using an E3000 Instron ElectroPuls™ biaxial testing machine with a 5 kN/25 Nm combination load-torque cell secured to the testing surface. The top and bottom foam blocks were held 2 mm apart by independent fixtures, such that the compressive load and torque would be determined from the loading applied to the bottom block. Screw samples were manually inserted into the top block over a K-wire until the tip of the screw was visible in the 2 mm gap between the blocks. The test setup is shown in Figure 1.

The load-torque cell was activated to begin recording data at 1000 Hz, and the screw was inserted into the bottom block. A pause of several seconds occurred once the screw head appeared to be flush with the upper surface of the top block, and then insertion continued beyond full insertion, until the insertion torque was no longer increasing. Six samples of each screw type were tested. Student *t* tests were used to compare differences between the two sample groups.

**Figure 1.** Screws were inserted into two foam blocks with a 2 mm gap.



## Results

The results of the mechanical testing are listed in Table 1. There were similar results between the two groups for load at full insertion ( $P = .604$ ), max load ( $P = .743$ ), torque at full insertion ( $P = .180$ ), and max torque ( $P = .432$ ). Graphical representations of the compressive force and the insertion torque, relative to the screw insertion depth, are shown in Figures 2 and 3.

**Table 1. Mechanical Testing Results<sup>1</sup>**

	Load at Flush (N)	Maximum Load (N)	Torque at Flush (Nm)	Maximum Torque (Nm)
Arthrex	87.2 ± 44.2	111.3 ± 55.8	0.60 ± 0.37	0.85 ± 0.39
Acumed	75.4 ± 31.1	101.1 ± 48.5	0.37 ± 0.08	0.70 ± 0.21

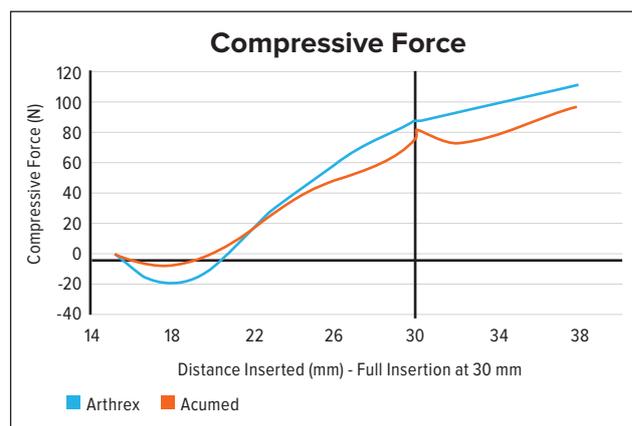
## Discussion and Conclusion

The compressive load and insertion torque profiles of the Arthrex Mini Compression FT™ screw and the Acumed Acutrak 2 appear similar, and no significant differences between the two devices could be found during this testing.

### Reference

1. Arthrex, Inc. Data on file (APT 04091). Naples, FL; 2019.

**Figure 2. Compressive force of the two screws through and beyond full insertion<sup>1</sup>**



**Figure 3. Insertion torque of the two screws through and beyond full insertion<sup>1</sup>**

