

Compression and Push-Out Force Comparison of Arthrex to Competitor Compression Screws

Arthrex Research and Development

Objective

Compression Testing – To determine the maximum compression force when screws were inserted flush with the test block surface using two pieces of 20 lb/ft³ (PCF) foam block.

Screw Push-Out Testing – To determine the force required to push screws out of 20 PCF foam block with all threads fully engaged.

Methods and Materials

Compression Testing – A load cell was placed between the two test blocks that had been prepared with the appropriate sized pre-drill according to manufacturer recommendations. Please refer to Figure 1 for the complete test setup.

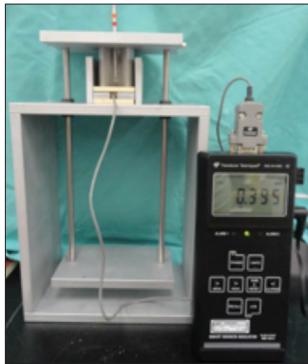


Figure 1: Compression Test Setup

The appropriate driver was selected according to each respective manufacturer and used to insert the screw. For all samples, the compressive force was continuously recorded as the screw was inserted until flush with the top of the test block, then as the screw was inserted further until loss of compression occurred. The maximum compression force during the insertion process was recorded.

Screw Push-Out – Foam block samples were prepared with a through hole according to manufacturer recommendations. The screws were inserted into respective test blocks until flush. A dowel pin was then used to push the screw out of the foam block. For each sample, the maximum load was recorded.

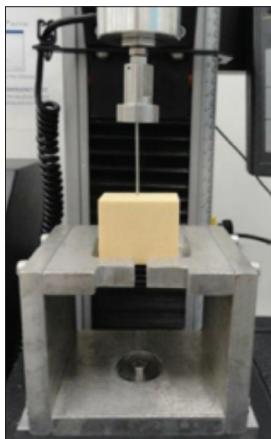


Figure 2: Screw Push-Out Test Setup

Results

The average values and standard deviations for compression and screw push-out testing are shown below in Figure 3, Figure 4, and Table 1.

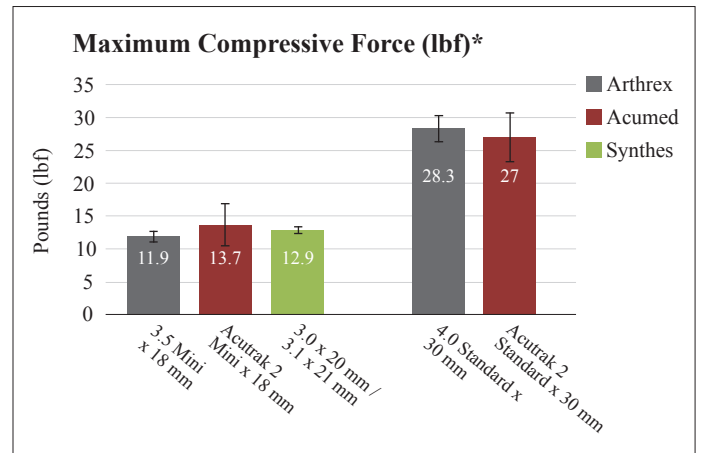


Figure 3: Compression Force Results

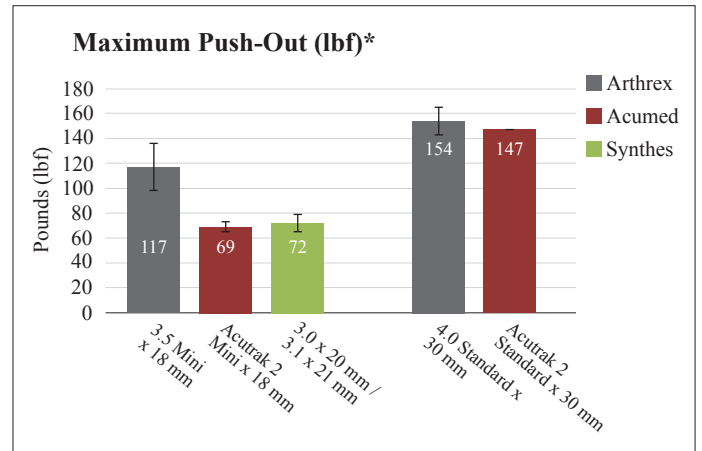


Figure 4: Screw Push-Out Results

*data on file

	Comparison	p-value	Statistically Different (Yes/No)
Maximum Compression Force	Arthrex 3.5 Mini x 18 mm vs. Acutrak 2 Mini x 18 mm	0.01	Yes
	Arthrex 3.5 Mini x 18 mm vs. Synthes 3.0 x 20 mm / 3.0 x 21 mm	0.002	Yes
	Synthes 3.0 x 20 mm / 3.0 x 21 mm vs. Acutrak 2 Mini x 18 mm	0.8	No
	Arthrex 4.0 Standard x 30 mm vs. Acutrak 2 Standard x 30 mm	0.353	No
Maximum Push-Out Force	Arthrex 3.5 Mini x 18 mm vs. Acutrak 2 Mini x 18 mm	0.005	Yes
	Arthrex 3.5 Mini x 18 mm vs. Synthes 3.0 x 20 mm / 3.0 x 21 mm	0.388	No
	Synthes 3.0 x 20 mm / 3.0 x 21 mm vs. Acutrak 2 Mini x 18 mm	0.006	Yes
	Arthrex 4.0 Standard x 30 mm vs. Acutrak 2 Standard x 30 mm	0.454	No

Table 1: Statistical Comparison of Compressive Forces

Conclusion

Arthrex compression FT screws provide a similar compressive load to competitors (fully threaded-Acutrak 2 and Herbert-Synthes) with statistically greater push-out force that may lead to better long term stability and less likely screw back out.