Flexural Strength of the Arthrex Apollo$^{RF®}$ H50 and Smith & Nephew HipVac® 50 Ablation Probes

Arthrex Research and Development

Purpose

Arthroscopic hip procedures require instrumentation of sufficient length to enable access to the relevant anatomy.[1] RF probes need to have lengthened shafts to be of utility for these procedures; however, the longer shaft creates a larger moment arm from the junction of the shaft to the probe handle, which creates more stress when load is applied to the tip of the probe.[2] Thus it is important that the probes are designed to withstand the forces of hip surgery. The purpose of this testing was to compare the maximum failure load when force is applied to the Arthrex Apollo^{RF} H50 and Smith & Nephew HipVac 50 ablation probes.

Methods and Materials

A material testing machine (ALGOL Instrument Co, Ltd, Model MAX-1KN-B-1) was used to determine the maximum failure load for each hip probe. The probe handle was fixated in a vice oriented horizontally to the plunger that was being used to apply the load. The handle was positioned so that the plunger was directly over the tip of the probe. When securing the handle, care was taken to not compromise the handle by over-clamping in the vice. Force was applied to the tip of the plunger by downward movement of the cross-head of the material testing machine at a displacement rate of 200 mm/min. The maximum failure load was measured and recorded by the load sensor of the material testing machine. Figure 1 shows the test during loading.

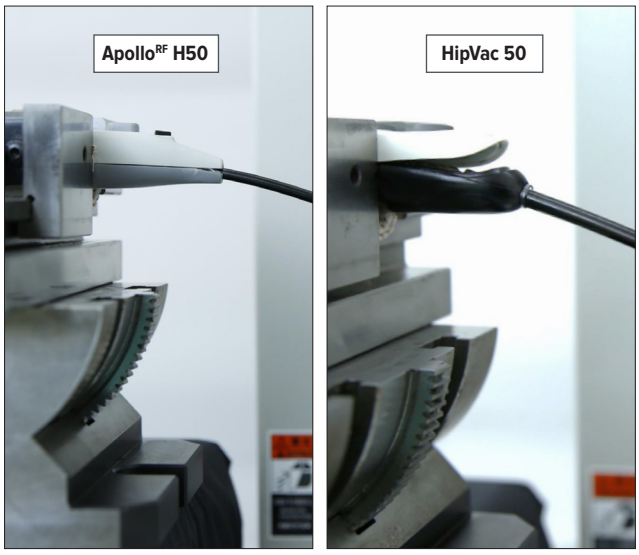
Figure 1. Test setup.

We tested 15 samples of the Arthrex Apollo^{RF} H50 probes and 14 of the Smith & Nephew HipVac 50 probes.

Results

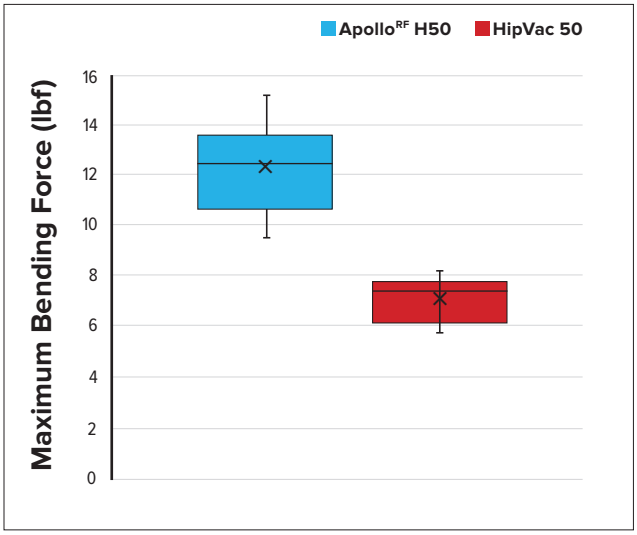
All test samples failed at the handle (Figure 2).

Figure 2. Test samples at maximum bending force.



The maximum failure load applied was 12.20 ± 1.78 lbf (standard deviation) for the Arthrex Apollo^{RF} H50 test samples and 6.89 ± 0.84 lbf for the Smith & Nephew HipVac 50 test samples. Figure 3 graphically displays the distribution of data. Data was normally distributed and a 2-sample *t* test was conducted to compare the results. The greater maximum failure load of the Apollo^{RF} H50 device was statistically significantly stronger than that of the HipVac 50. ($P < .001$).

Figure 3. Force at failure.



Conclusions

It is imperative that RF probes designed with longer shafts for arthroscopic hip indications can withstand the forces generated during the surgical procedure. The results of this testing show that that Arthrex Apollo[RF®] H50 ablation probe can withstand 1.77 times more force than the Smith & Nephew HipVac® 50 ablation probe.

References

1. Froimson MI, Krebs VE. Specialized equipment. In: McCarthy JC, ed. *Early Hip Disorders*. New York: Springer; 2003:95-102.
2. Bedford A, Fowler W. *Engineering Mechanics: Statics*. 1st ed. Menlo Park, CA: Addison-Wesley; 1999.

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