

Cyclic Displacement of the RetroButton and ToggleLoc with ZipLoop

Arthrex Research and Development

Objective

Both the RetroButton from Arthrex and the ToggleLoc from Biomet are suspensory devices that can be used to fixate ACL grafts. While both provide high ultimate loads, cyclic displacement must also be considered when evaluating the devices. The purpose of this testing was to determine the cyclic displacements of both products.

Methods and Materials

For both the RetroButton and the ToggleLoc, a gauge length of 50 mm was used during testing. Since the RetroButton is not adjustable, 50 mm samples were obtained. The ToggleLoc is adjustable, so calipers were used to change the loop length until it was 50 mm. Each suture loop was threaded through a steel plate with a 4.5 mm hole drilled in it. The plate was secured under the top plate of an aluminum fixture which was secured to the base of the Instron testing system (Instron, Canton, MA) as can be seen in Figures 1 and 2.

A 5 kN load cell was connected to the Instron and calibrated using BlueHill software. The loop of the suture was placed on a hook which was secured to a 5 kN load cell by means of a steel turnbuckle and an aluminum cross-head.

Loading profiles were created using Wavemaker software and data was recorded at 500 Hz. Each specimen was preloaded to 250 N and cycled from 50 N to 450 N at 1 Hz for 2000 cycles. Elastic displacement, permanent displacement, and total cyclic displacement were recorded.

Figure 1: A 50 mm RetroButton secured in an Instron materials testing machine



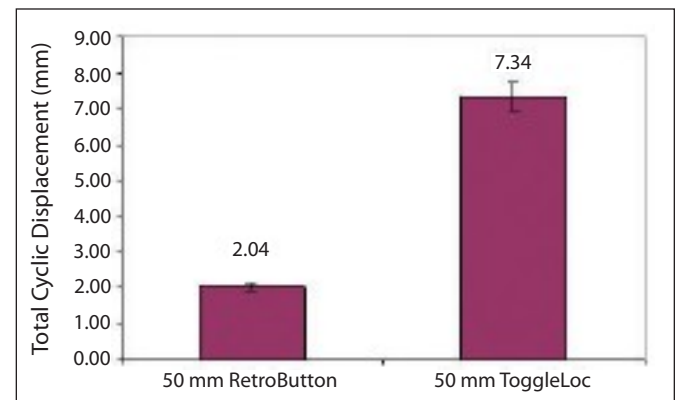
Figure 2: The suture loop is fed through a 4.5 mm diameter hole drilled through the steel plate



Results

The total cyclic displacements were 2.04 ± 0.01 mm for the RetroButton and 7.34 ± 0.39 mm for the ToggleLoc. Figure 3 shows the difference between the total cyclic displacements.

Figure 3: Total cyclic displacement of the 50 mm RetroButton and the ToggleLoc, adjusted to 50 mm



Conclusion

The total cyclic displacement of the ToggleLoc with a 50 mm gauge length was 7.34 ± 0.39 mm while the 50 mm RetroButton had a total cyclic displacement of 2.04 ± 0.01 mm which is approximately 3.5 times less than that of the ToggleLoc. The high cyclic displacement of the ToggleLoc is above the physiological displacement of the ACL as described by Jordan et al. (2007, AJSM).