

TECHNICAL REPORT

DRAWSTRING DURABILITY AND STRENGTH

Overview

Patients using the Quikdraw PRO™ (Pain Relief Orthosis) often wear the brace for an extended period of time. The brace is routinely used for a variety of conditions including work, physical therapy, leisure pursuits and activities of daily living (AOL). Because the brace may be applied or adjusted several times during a day, a key issue faced in the design process was developing a product that could hold up over time. The area determined to be the most vulnerable to stress or failure, over long periods, was the compression mechanism (drawstrings and SlickTrack™ tightening system) used to cinch up the device.

This report evaluated the durability and strength of the drawstrings, as well as the performance of the SlickTrack™ tightening system. The test results showed that even under extreme conditions the drawstrings and SlickTrack™ system held up fine and, in fact, showed no wear at all.

Materials & Methods

The drawstrings tested were made from commercially available 300 LB. test gel spun polyethylene fishing line (Izorline Inc.™). A standard Aspen Quikdraw PRO™ was taken out of stock and used for this trial. The brace was fastened to a stationary mannequin while the Form Fit™ Pull Tabs were anchored to wooden dowels that would mimic the anatomy of hands. The wooden dowels were fastened to a support strut driven by an electric motor. Each pull was conducted at 33 LBS. of pressure verified by a force gauge and cycled 10,000 times over a 2-day period. 10 pulls occurred over 20-second intervals



with a 10 second pause between intervals to avoid the possibility of frictional heat buildup on the cord. The draw strings were measured before and after the test was administered to determine if any stretching had occurred.

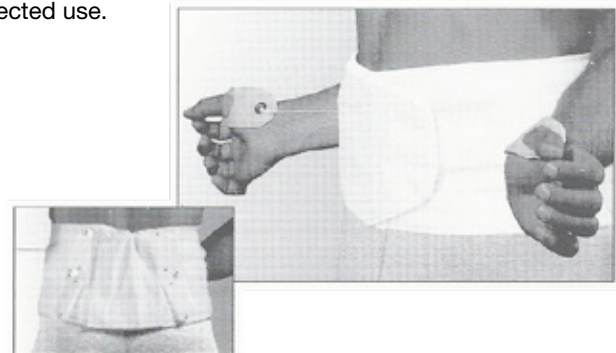
test fishing line is at least 150 LBS., the drawstrings in the Quikdraw PRO™ have essentially 5 times the needed strength. Over the course of a day, it is estimated that an individual may secure the brace around his/her body as many as 4 times. It was estimated that each application could include an additional 5 adjustments and manipulations of the drawstrings. Utilizing this data, the drawstrings could be pulled 20 times per day or 7300 times over the course of a year. Since it is not unusual for the brace to be worn for extended periods, 10,000 pulls was determined to be more than adequate for testing the durability of the drawstrings and brace.



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Conclusion

The Aspen Quikdraw PRO's™ drawstrings maintained their non-stretch qualities and showed no wear at the test's conclusion. The Form Fit™ Pull Tabs, and the Slick Track cord guides also withstood the 10,000 cycles with no noticeable wear. Based on this testing, the most vulnerable component of the device, the gel spun polyethylene cord and the slick track cord guides, proved to provide sufficient strength and reliability. This indicates that the overall design of the QuikDraw PRO™ is appropriate for the expected use.



Results

The drawstrings and Pull Tabs withstood in excess of 10,000 pulls with no sign of wear. It was also noted that there was no breakdown or wear on the Form Fit™ Pull Tabs, the Pull Tab Velcro, the Pull Tab and SlickTrack™ grommets, the SlickTrack™ drawstring guides, or the back pocket.

Discussion

Using a force gauge, an average pull to compress the brace was measured at 20 LBS. while the most aggressive pull measured 33 lbs. In order to simulate severe conditions, 33 LBS. of force was used in the test. Since the actual breaking strength of the 300 LB.

Acknowledgment

Experiments were performed and data was collected by Aspen Medical Products' research and development team in Long Beach, CA.