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Tensile Testing of Sutures using the SVE | In a Temperature-Controlled Bath

Sutures are widely used in the biomedical industry. They are used in a variety of surgical procedures to allow for wound closure and aid in tissue healing. Sutures are manufactured from various different absorbable and nonabsorbable materials, and may be single filament or braided with or without a coating. There are some challenges in testing sutures. Loading the specimen alone can pose problems as some sutures are delicate and require a low amount of force to fracture. Also, some sutures are used inside wounds and are constantly in a hydrated environment.

The most common method for characterizing sutures is a basic tensile test to failure. Bluehill® 2 can easily preform this test method. This test method was used to evaluate maxium load, load at break as well as the strain at break for five suture specimens.

Test Configuration and Sample Preparation

A 5544 electromechanical test frame configured with a 10 N load cell (can vary depending on suture strength and composition) and 250 N submersible pneumatic grips with 25 x 25 mm surfalloy faces were used for this test. The Instron® BioPuls™ temperature-controlled bath was used in order to test the suture under physiological conditions. The Standard Video Extensometer (SVE) was also used in order to acquire accurate measurements of strain by tracking individually placed marks (adhesive putty is recommended) throughout specimen failure. In this test, a gauge length of 25 mm and a test speed of 25 mm/min were used. The complete test configuration is shown in Figures 1 and 2. Figure 2 shows a close up of the adhesive putty marks as they appear in the SVE software.

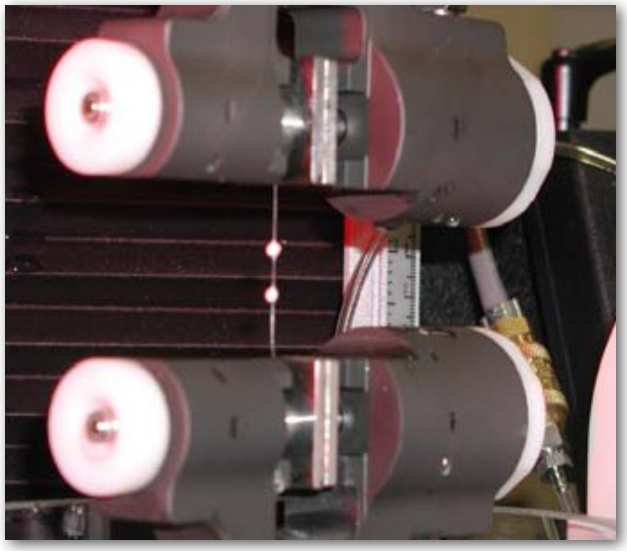

Figure 1

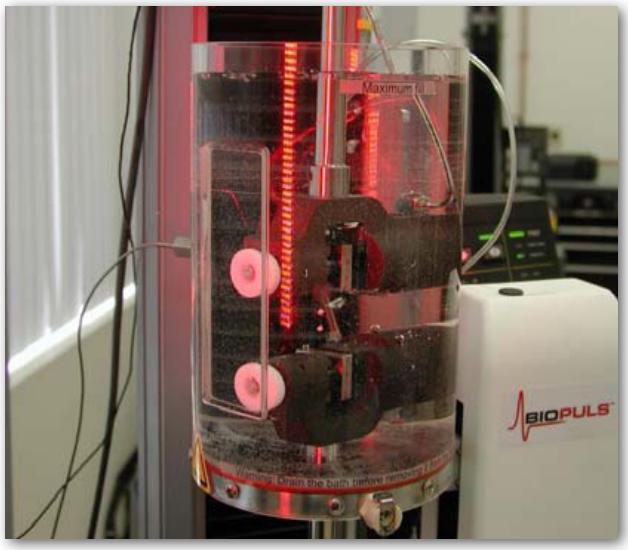

Figure 2

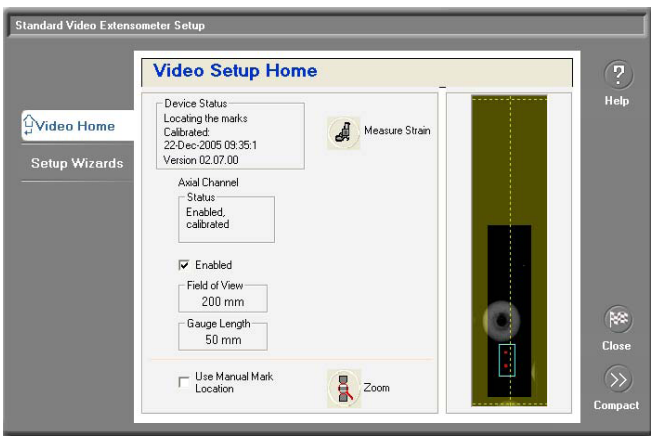

Figure 3 SVE software set-up window easily recognizes the white adhesive putty marks in

Results

These results show that the test configuration was successful in testing the sutures. The data was fairly consistent and is shown in Figure 4 and Table 1.

Configuration Table

Catalog Number	Configuration Options	Description
5544	Frame	Single column test frame
2530-428	Load Cell	10 N capacity
2752-005	Grips	250 N BioPuls™ submersible pneumatic grips
3130-100	Bath	BioPuls temperature-controlled bath
2410-270U1	Software	Bluehill® 2 software with tension application
2663-822	Extensometer	SVE
2663-822L1	-	200 mm FOV kit

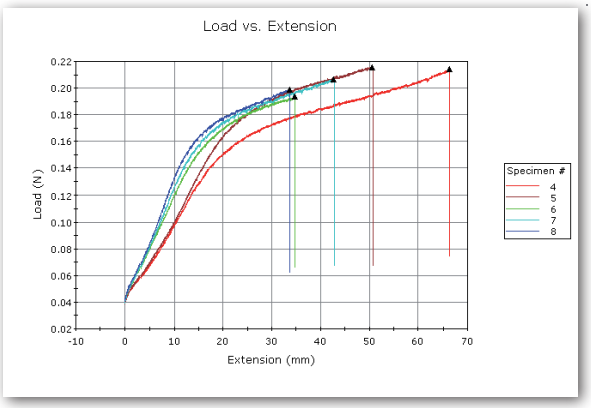

Figure 4: Load vs. Extension results for five suture specimens.

	Max Load	Load at Break	Ext at Break
	N	N	mm
4	0.214	0.214	66.350
5	0.216	0.215	50.783
6	0.193	0.193	34.800
7	0.207	0.207	42.765
8	0.199	0.199	33.748
Mean	0.206	0.206	45.689
SD	0.010	0.010	13.440

Conclusions and Recommendations

In conclusion, surgical sutures can easily be tested using the previously described configuration. It is recommended that the specimens are marked with white adhesive putty dots when using the SVE in order to obtain accurate strain measurements.

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