



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

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Project Title
Overall Strength of Various Suture Techniques in Wound Closure

Abstract

Objectives/Goals
The purpose was to determine the overall strength of three suture techniques used in wound repair: the simple interrupted, horizontal mattress, and vertical mattress stitches.

Methods/Materials
1. Two strips were sewed together with suture material with one simple interrupted stitch 2. The strip was fastened to a fixed point on one side, the other side was attached to a rubber band attached to the K" Nex motor on the repetitive stress apparatus. 4. The motor was turned on and the stopwatch recorded time until failure & converted to cycles. Failure is defined as the suture breaking through the strip, or until the preset two minute time limit had passed. 5. The process was repeated 4 more times with the same stitch. 6. Steps 1-5 were repeated using the vertical mattress, then the horizontal mattress stitch. 7. Two strips were sewed together with suture material with one simple interrupted stitch. 8. The edges of a simple stitch strip were attached to a string fixed to a coat hanger bent into a hook by binder clips. 9. Incremental weights were added every 10 seconds until failure. 10. Steps 7-11 were repeated using the vertical mattress stitch then the horizontal mattress stitch. 11. Each stitch was tested in 5 trials in each test.

Results
In the repetitive stress test, the mean number of cycles to failure for the simple interrupted & vertical mattress stitch was 34.4 cycles and 9.34 cycles, respectively. The average cycles to failure for the horizontal mattress stitch was 98.4+ cycles, indicating that the horizontal mattress stitch did not tear through the strip within the two minute time limit. In the maximum tension test, the simple interrupted, vertical mattress, and horizontal mattress suture technique averaged 414 grams, 414 grams, and 501 grams, respectively.

Conclusions/Discussion
The hypothesis was partially correct. The horizontal mattress stitch had the highest averages in the maximum stress test & in the repetitive stress test. Results depended on the stitch#s the distribution of tension and location of suture#s insertion. Errors caused by elasticity in the suture material & imprecise measuring tools in the maximum tension test may have effected the results and would explain the large % deviations for some of the stitches in the repetitive stress test.

Summary Statement
The project evaluates the strength of three suture techniques based on a repetitive stress test and a maximum tension test.

Help Received
Dr. Suzuki made the stitches on the strips that were tested.