

ASSESSMENT OF ACUTE TENSILE STRENGTH IN WOUNDS CLOSED WITH FIBRIN TISSUE ADHESIVE. James W. Doyle Erin Wirth, Yaye Lo, and David Tuthill. American Red Cross, Holland Laboratory, Rockville, MD.

Fibrin sealants (FS), or fibrin tissue adhesives, are natural and biodegradable products that have hemostatic and tissue adhesive properties. Current fibrin sealant products are formulated primarily for hemostatic applications and may require modifications for optimal tissue adhesion. This study has examined the acute tensile strength of fibrin sealant with various concentrations of fibrinogen and using a quantitative *in vivo* technique.

Two full-thickness 2 cm incisional wounds were made on the dorsolateral surfaces of the thorax of male Sprague-Dawley rats (~350 g). FS for use as a fibrin tissue adhesive was prepared from solutions of human topical fibrinogen complex (TFC) and thrombin that were mixed during application to the wound in a two-syringe dispenser. A total of 100 μ l of FS was applied to each wound and the edges of the wound were held together for 5 minutes. The ultimate (bursting) pressure was measured using a BTC-2000 (SRLI, Nashville) at 1 or 2 hours following wound closure.

Initial studies examined the kinetics of acute tensile strength in wounds closed with FS. For these studies, a formulation containing a low concentration of thrombin (3 units/ml) was used because it was believed that fibrin polymerization, and hence wound strength, would require a longer time to develop than with formulations using higher thrombin concentrations. Surprisingly, it was found that the ultimate pressure decreased 34% ($P=0.0265$) between 1 and 2 hours following wound closure.

Subsequent studies examined the acute tensile strength of nine FS formulations at 1 hour after wound closure. These formulations contained TFC at 30, 60, or 120 mg/ml and thrombin at 3, 30, or 300 units/ml. FS formulations composed of 120 mg/ml TFC and 3 or 30 unit/ml thrombin had a significantly greater ultimate pressure than did formulations containing 30 mg/ml TFC or 300 units/ml thrombin.

The conclusion of this study is that FS with high thrombin concentrations (i.e., hemostatic formulations) or low fibrinogen concentrations (e.g., "homemade" from patient cryoprecipitate) have suboptimal acute tensile strength and thus may have limited utility as fibrin tissue adhesives. The results of this study also suggest that the acute tensile strength of wounds closed with FS rapidly decreases, perhaps by proteolytic degradation of fibrin-tissue crosslinks.