

Wound Closure Strength Comparisons of Topical Skin Adhesives

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BACKGROUND: Six topical skin adhesives are currently FDA-approved in the United States as Class II medical devices. Dermabond[®], Derma+Flex[®] QS[™] and SurgiSeal[®] are 2-octyl cyanoacrylates (OCA) and Histoacryl[®], Indermil[®], and LiquiBand[®] are n-butyl cyanoacrylates (BCA). Comparisons of all six products to measure wound closure strength have not previously been completed.

STUDY DESIGN: Six different brands of cyanoacrylate topical skin adhesive were compared with the following test:

Wound Closure Strength: Incisions made in pig skin were closed by each of the six products, according to each product's instructions. The incisions were then pulled apart to record the force required to separate the incision as the wound closure strength. Multiple data points were collected for each skin adhesive and averaged to achieve an average wound closure strength, which is measured in pounds.

RESULTS: In the wound closure strength test, SurgiSeal received the highest average score of 4.76 lbs., followed by Histoacryl (4.10 lbs.), Dermabond (3.64 lbs.), Indermil (2.70 lbs.), Derma+Flex QS (2.46 lbs.) and LiquiBand (1.56 lbs.).

CONCLUSIONS: Wound closure strength measures the capability of a topical skin adhesive to maintain approximation of a wound despite the pressure on the wound. Both SurgiSeal and Histoacryl earned high strength scores. While it was previously thought that OCA products have greater wound closure strength than those of BCA products¹, these tests demonstrate that Histoacryl, a BCA product, measures stronger than both Dermabond and Derma+Flex QS, both OCAs, in wound closure strength. In addition, the BCA product Indermil also performs better than Derma+Flex QS.

¹ Singer AJ, et al. Comparison of wound-bursting strengths and surface characteristics of FDA-approved tissue adhesive for skin closure. *J Adhes Sci Technol.* 2004;18:19-27.

WOUND CLOSURE STRENGTH

Objective: To evaluate the wound closure strength utilizing *in vitro* studies for the topical skin adhesives:

- Dermabond® Topical Skin Adhesive (OCA)
- Derma+Flex® QS™ High Viscosity Tissue Adhesive (OCA)
- Histoacryl® Topical Skin Adhesive (BCA)
- Indermil® Tissue Adhesive (BCA)
- LiquiBand® Topical Skin Adhesive (BCA)
- SurgiSeal® Topical Skin Adhesive (OCA)

Apparatus: Mark-10 Tensiometer – Tensile strength tester

Method: Incisions of one inch in length were made on the middle of the pig skin. The incisions were then closed by different wound closure products according to their specific instructions. The disrupting forces of the closed incisions were then measured by a Mark-10 tensiometer at 25 mm/min.

Procedure:

- 1) Prepare a pig skin (2 x 4 inch) by wiping the surfaces of the skin with sterile gauze saturated with isopropanol and make sure to remove all oily substances from the pig skin.
- 2) Then wipe the surface with sterile gauze to remove isopropanol.
- 3) An incision of one inch in length is made at the mid-section of the sample, as show in Figure 1.



Figure 1. Incisions made in the middle of the pig skin

- 4) After the incisions were closed by applying the adhesive, the pig skins were mounted onto a Mark-10 tensiometer to measure the wound closure strength of the different products. The disrupting forces were recorded when the incision was pulled apart, known as the wound closure strength. Figure 2 shows a picture of the incision closed by and adhesive and its opening by being pulled apart.

WOUND CLOSURE STRENGTH (CONT'D)

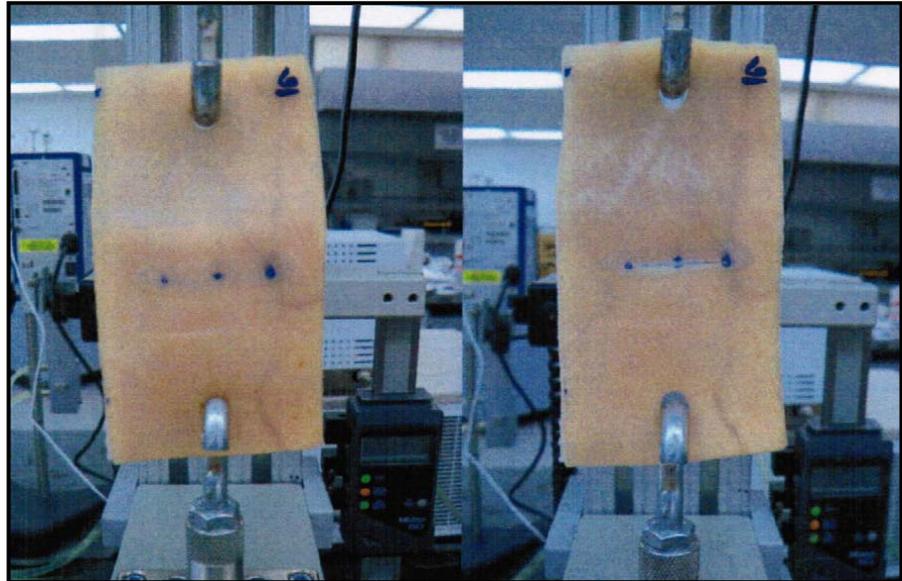


Figure 2. An incision closed by LiquiBand (left) and its opening by being pulled apart on the Mark-10 tensiometer.

- 5) The wound closure strength tests were repeated five or ten times for each product, and the results are summarized in the Results section.

Results:

Brand	Average Wound Closure Strength (lbs.)	Standard Deviation
Dermabond	3.64	0.83
Derma+Flex QS	2.46	0.36
Histoacryl	4.10	0.47
Indermil	2.70	0.62
LiquiBand	1.56	0.44
SurgiSeal	4.76	0.70