



Wound Edge Approximation

October 4, 2019

Client: Dr. Charlton

Advisor: Dr. Suarez-Gonzalez

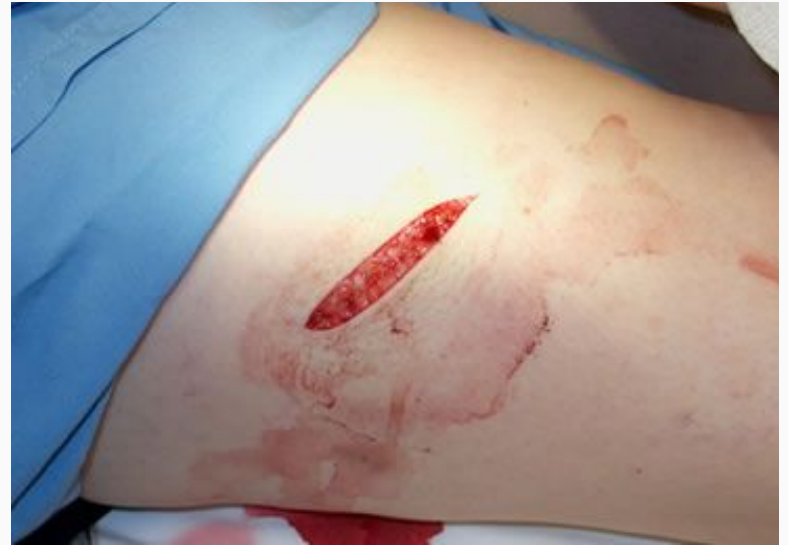
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Overview

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Problem Statement

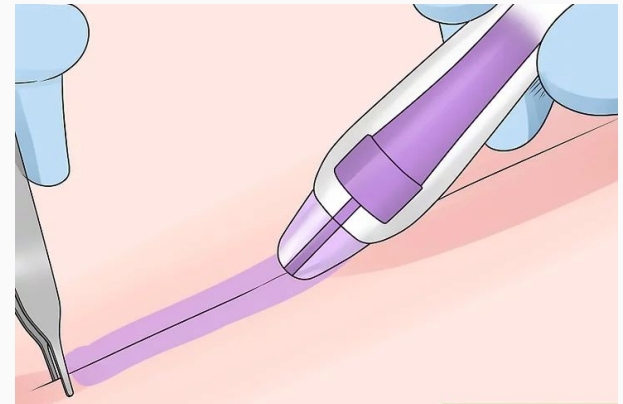
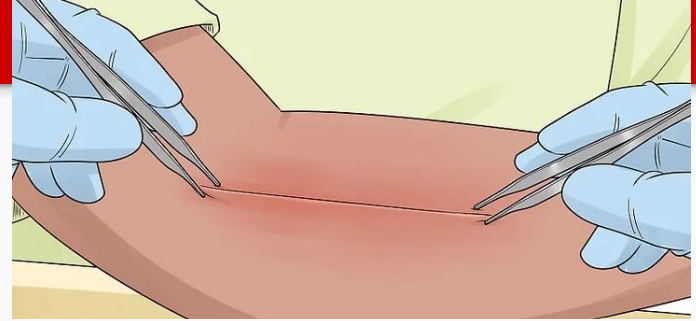
- 6 million laceration cases treated each year [1]
- Skin tension pulls edges of the wound apart
- Repair is difficult
 - Suturing or gluing
- Device to hold wound edges together while the wound is closed by clinician



https://www.med.uottawa.ca/procedures/wc/e_treatment.htm

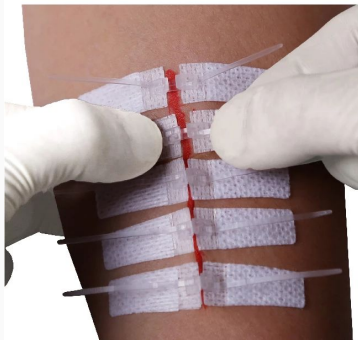
Background

- Wound approximation - two margins of a cut are drawn together without gaps between the edges
- Wounds over 1-2 cm in size begin to splay
- Imperfect approx. can lead to scarring and poor healing
- Device to be used with Dermabond [2]



Existing Designs

DermaClip



<https://www.dermaclipus.com/>

Steri-strip



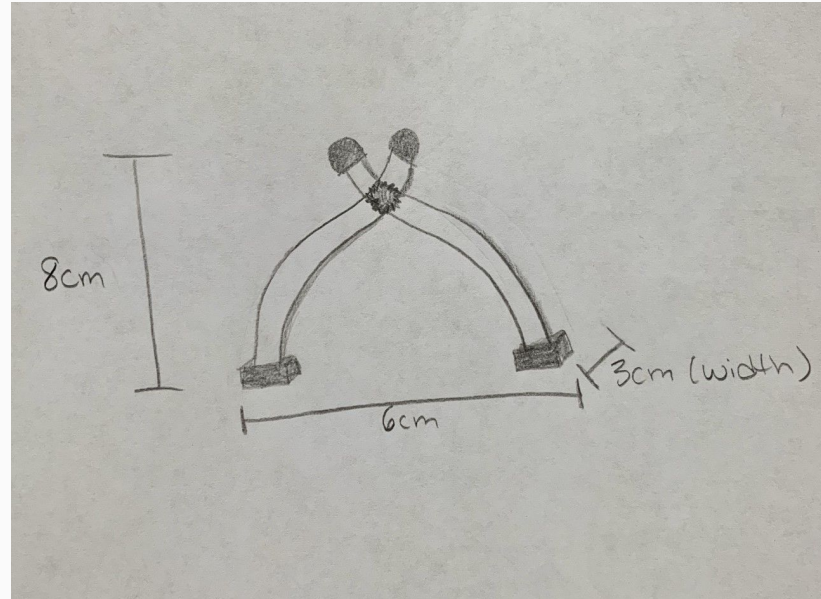
<https://www.americanscreeningcorp.com/medical-supplies/strip-steri-strip-closure-tan.asp>

Product Design Specifications

- Should hold wound edges together while gluing
- Must not harm skin or cause pain
- Should withstand autoclave sterilization: 30 minutes at 121°C [3]
- Have a simple, clean, non-threatening look
- Maintain functionality for at least 350 uses
- Must function for wounds 1-5 cm
- Weigh less than 0.5 lbs
- Fabrication should be within a budget of \$300

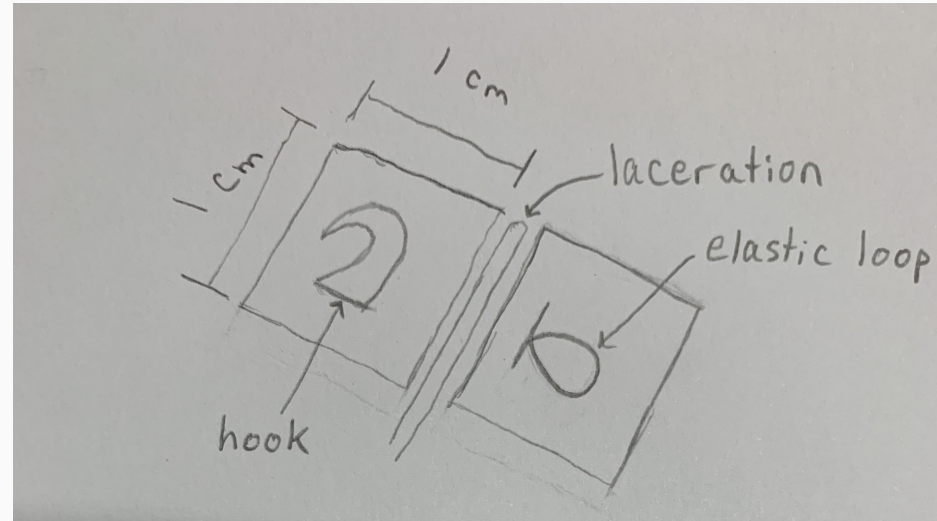
Bow-Shaped Design

- Locking hinge mechanism
- Arms opened to desired width, placed on opposing sides of wound, and closed
- Silicone tips
 - Grip skin, pull wound edges together
- Stainless Steel body



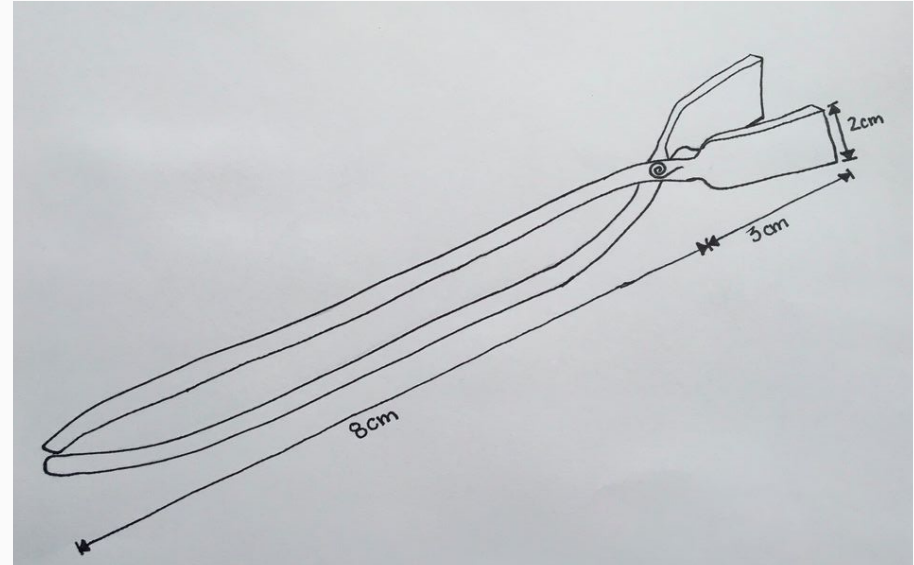
Hook and Loop Design

- Two adhesive patches on opposing sides of wound
- Elastic loop pulled across wound, secured around plastic hook
- Multiple used for wounds >1 cm
- One-time use



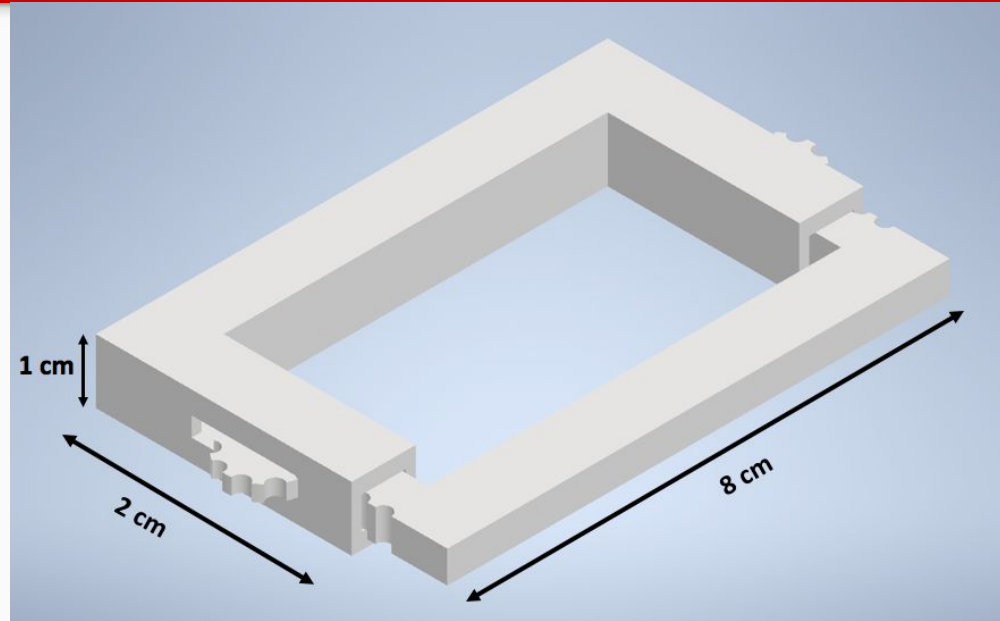
Barrette Design

- Spring-loaded hinge
 - Simple opening/closing of arms
- Arms lie flush with skin
 - Allow for easy gluing
- Stainless Steel body



Rectangle Design

- Wound is centered on rectangular opening
- Gears on short sides are rotated manually to retract long side
- Short sides - Stainless Steel
- Long sides - Silicone
- Unimpeded access to wound



Design Criteria	Bow-shaped Design		Hook & Loop Design		Barrette Design		Rectangle Design	
Effectiveness (25)	(4/5)	20	(4/5)	20	(3/5)	15	(5/5)	25
Patient Comfort (20)	(4/5)	16	(5/5)	20	(3/5)	12	(4/5)	16
Safety (20)	(3/5)	12	(3/5)	12	(3/5)	12	(4/5)	16
Practicality (15)	(4/5)	12	(3/5)	9	(4/5)	12	(5/5)	15
Novelty (10)	(5/5)	10	(3/5)	6	(5/5)	10	(5/5)	10
Cost (5)	(4/5)	4	(3/5)	3	(4/5)	4	(4/5)	4
Ease of Fabrication (5)	(3/5)	3	(3/5)	3	(4/5)	4	(3/5)	3
Total (100)	77		73		69		89	

Future Work

- Prototype Fabrication
 - TEAM Lab & Makerspace
- Testing
 - SolidWorks
 - Laceration models (suture practice kits)
 - Skin tension measurements

Acknowledgements

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References

- [1] Quinn, J., Polevoi, S. and Kohn, M. (2013). Traumatic lacerations: what are the risks for infection and has the 'golden period' of laceration care disappeared?. *Emergency Medicine Journal*, 31(2), pp.96-100.
- [2] Jnjmedicaldevices.com. (2019). *DERMABOND® Mini Topical Skin Adhesive* | J&J Medical Devices. [online] Available at: <https://www.jnjmedicaldevices.com/en-US/product/dermabond-mini-topical-skin-adhesive> [Accessed 18 Sep. 2019].
- [3] CDC.gov. (2008). *Steam Sterilization: Guideline for Disinfection and Sterilization in Healthcare Facilities*. [online] Available at: <https://www.cdc.gov/infectioncontrol/guidelines/disinfection/sterilization/steam.html>.