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### Surgical glue- a promising technology for wound healing

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#### ABSTRACT

Wound closure is one of the important steps of surgical dressing and suturing is the most commonly used method of wound closure. The process of suturing takes very long time for surgery and increases the patient's risk of anesthesia awareness. Skin glues are a safe and effective method to close selected wounds. They are also cost-effective and help prevent infection. Ideally, wounds should be less than 4 cm, not contaminated or infected and have skin edges that are not under tension. Wounds should be closed within 12 hours. Novel methods of wound closure have been introduced to address these issues, most notably cyanoacrylate tissue glues. The evidence would suggest that the use of cyanoacrylate tissue glue is associated with a reduction in closure time and costs. On a daily basis, dermasurgeons are facing different kinds of wounds that have to be closed. With a plethora of skin closure materials currently available, choosing a solution that combines excellent and rapid cosmetic results with practicality and cost-effectiveness is preferred.

**Keywords:** Surgical Glue; Cyanoacrylates; derma bond; polymerization.

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Review Article

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#### INTRODUCTION

Tissue glues have been used in surgery on an experimental basis since the mid-1960s; they were formally approved by the U.S. Food and Drug Administration (FDA) for surgical use in 1998. As early as 1964, Eastman Kodak submitted an application to the FDA for the use of cyanoacrylate glues in surgery; the formula was used by Dr. Harry Coover during the Vietnam War to seal chest wounds

or other open wounds until the patient could be taken to a military hospital<sup>[1]</sup>.

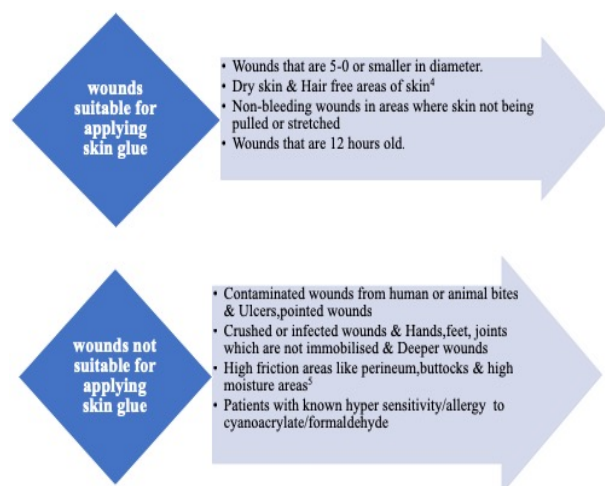


Figure 1: surgical glue and its repair

Surgical adhesives are a very interesting and a promising area for development in the market. A glue with strong adhesive properties in surgical conditions can be very useful. Some glues, such as Dermabond®, are used for skin suture<sup>[2]</sup>. Wound closure often promotes wound healing and also produces an acceptable cosmetic report. Traditionally sutures and also adhesive strips have been used. Skin glues are safe and effective but wound selection is important. Skin glues are cyanoacrylates. Derivatives with long chains are less reactive and stronger. They are available in liquid

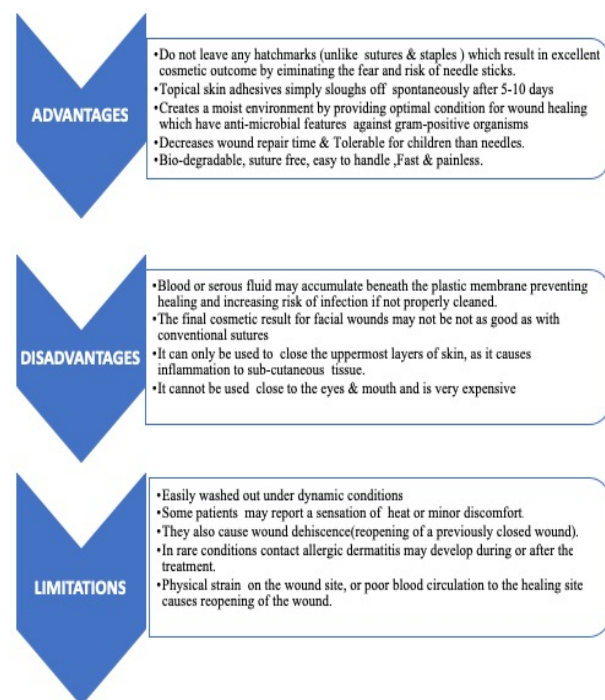
monomer formulations which react with formaldehyde on contact with skin or other surfaces. This polymerization produces an exothermic reaction to create a bridge while becoming adherent to the skin. Today's products are all effective and non-toxic and produce stronger bonds. One study has shown that the current adhesive properties have a bursting strength equivalent to 4/0 nylon in an intracuticular wound closure<sup>3</sup>.

**Wound Selection:**



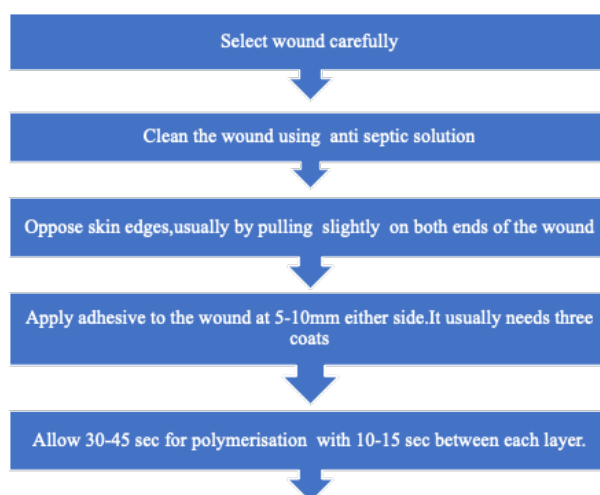
**Figure 2: Criteria for Wound Selection**

**Advantages, disadvantages, limitations of surgical glue:**

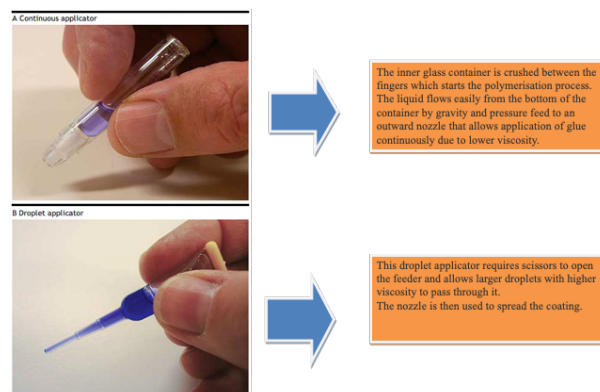


**Figure 3: Contraindications**

**Procedure for applying skin glue:**



**Figure 4: Schematic Representation for application of Surgical Glue**



**Figure 5: types of skin glue applicators**

**CYANOACRYLATES**

- A synthetic product used as a strong tissue adhesive for external use only.
- Chemical formula for cyanoacrylate in medical use is 2-octyl-cyanoacrylate. It is the only surgical glue that is approved by FDA for use on humans.

- These are liquid monomers, when they come in contact with basic or liquid substances become strong glue which is similar to sutures<sup>[7]</sup>.
- They have unique properties like bacteriostatic, bio-degradable and bio-compatible.
- Shelf life (Room temperature): 12 months (unopened), once opened- 1 month<sup>[8]</sup>.
- Every individual cyanoacrylate has varying viscosity for surgeon's choice.

**Table 1: DIFFERENCES BETWEEN SUPER GLUE & SURGICAL GLUE<sup>[10]</sup>**

Super Glue	Surgical Glue
Made of methyl -2 cyanoacrylate	Made of octyl cyanoacrylate
Solvents (methanol) if used in the non-medical super glue preparation causes burning sensation or irritation when applied on wound.	Surgical glue was formulated to prevent burning sensation as super glue causes.
Formaldehyde is liberated	No such toxic gases are liberated
Toxic	Minimal toxic effects
Short chain acrylic resins	Long chain acrylic resins
Weaker bonding across wound edges	Fast bonding across wound edges
Aches a little after applying.	No pain after applying

#### DERMABOND

- It is an occlusive dressing, which is non-toxic (protects from infection) that hardens in about 30 sec (decreases wound repair time), flexible after hardening (provides water-resistant coating).
- A sterile liquid tissue adhesive made of cyanoacrylate for forming a strong bond across apposed wound edges to close both major and minor wounds, like lacerations, incisions made during laproscopic surgery & wounds on face<sup>[9]</sup>.
- It is the "glue of choice" for surgeons to close the incisions after the surgery.

#### How long does glue last for?

The film will usually remain in place for 5 to 10 days and then naturally flake off your skin. Incisions are typically closed with absorbable sutures (which mean no stitches need to be removed). The incisions are covered with water-proof glue called Derma bond<sup>[11,12, 13]</sup>.

#### CONCLUSION

Fast post-operative recovery is essential for surgical procedures which should be cost-effective and the

role of surgical glue becomes increasingly more relevant in the current market. Presently, there are a myriad of surgical glues. However, they have limitations to their safety and usability. An ideal surgical glue must be safe, functional under dynamic or wet conditions, biodegradable, self-sufficient, flexible, fast drying, user-friendly, resist high pressures, and inexpensive. Polyamide sutures are more resistant and the glue should be used alone only in less tension. Cyanoacrylates are the resins that are used for the preparation of glues. Dermabond® is a commonly used tissue adhesive that demonstrates bactericidal properties against Gram-positive bacteria and other infections. It reduces post-operative procedure and easy for administration thus helping the healing of wounds earlier.

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