

# CYANOACRYLATE TISSUE ADHESIVES: A PRACTICAL ALTERNATIVE TO SUTURES?

## ABSTRACT

Cyanoacrylate is a tissue adhesive, which has been widely used in the area of medicine and dentistry for wound closure and for improving healing. It is used in areas free of tension and in superficial wounds. It is widely used in gingivectomy, flap surgery and for closure of wounds in the soft tissue graft donor site in the palate. The material can be spread easily, readily wets the surface to which it is applied and produces very little heat. It will stick virtually to any biological or synthetic material. Although it has more tensile strength compared to sutures, it cannot adhere to tissues under tension. The aim of the present review is to discuss the role of cyanoacrylate as an alternative to silk sutures.

**Keywords:** Cyanoacrylate tissue adhesive, silk suture, flap surgeries.

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## INTRODUCTION

Proper closure of the surgical wounds is necessary for attainment of healing by primary intention. Surgical sutures are the most commonly used methods of wound closure in periodontal surgery. They function primarily to approximate the flaps and to promote wound healing when wound is most vulnerable. Materials like silk, nylon, steel, catgut and polyglycolic-polylactic acid derivatives are being used for post-operative closure of the flaps. Suturing is technique sensitive, time consuming procedure and can cause tissue damage if not handled properly. Braided silk suture has a phenomenon of wicking, which make it a site for secondary infection. It also has the maximum amount of inflammatory tissue response. Hence, a need for an alternative is felt.<sup>1</sup>

Surgical tissue adhesives are increasingly used in place of sutures to close wounds. Tissue adhesives prevent needle stick injuries, promote healing and avoid additional appointment for suture removal.

## CYANOACRYLATE TISSUE ADHESIVE

Over the entire range of surgical adhesives, cyanoacrylates have unique combination of chemical and physical properties that set them apart from others. They have been exploited for topical tissue repair and closure.

Cyanoacrylate adhesives were originally developed in the late 1940s, and their potential as a medical adhesive became evident during the Vietnam War as a hemostat for soldiers wounded in field combat. The chemical formula is  $\text{CH}_2=\text{C}(\text{CN})-\text{COOR}$  where R can be substituted for any alkyl group, making different kinds of cyanoacrylate adhesives. By changing the type of alkyl chains in the compound to one with longer molecular chain can reduce tissue toxicity.<sup>2</sup> Cyanoacrylate provides faster healing and the patient experience less postoperative pain.<sup>3</sup>

Two types of cyanoacrylates are commonly used:

1. N-butyl-2-cyanoacrylate (Histoacryl, B. Bruan, Tuttlingen, Germany; Glubran 2, GEM

S.r.l., Viareggio, Italy; Trufi ll, Cordis Neurovascular, Inc., Bridgewater, NJ, USA, and others)

2. 2-Octyl-cyanoacrylate (Dermabond, Ethicon, Raleigh, NC, USA, and others)

The N-Butyl-2-cyanoacrylate has become the most popular and common adhesive. It has been widely used in endoscopic therapy for more than 10 years. Cyanoacrylate provides immediate hemostasis, rapid adhesion to soft and hard tissues, and it also has bacteriostatic properties, good tissue compatibility and gradual resorption without foreign-body response.

The cyanoacrylate is mostly used in areas of superficial wounds and that free of tension. It is used in gingivectomy, periodontal flap surgeries. The use of cyanoacrylate tissue adhesives can overcome the inherent limitations of silk sutures and can provide a closed environment for undisturbed healing during the early post-operative period.

For connective tissue graft procedure, graft is mostly harvested from palatal donor site. This surgery often leaves an open wound which is painful. Recently using cyanoacrylate for closure of donor sites have shown to reduce patient discomfort.<sup>4</sup>

Cyanoacrylate helps to stabilize collagen membrane in an extraction socket thereby delaying alveolar ridge resorption.<sup>5</sup>

Cyanoacrylate can be used as periodontal dressing after gingivectomy procedure to cover the exposed surgical area.

In 2014 Gümüs, reported the use of cyanoacrylate tissue adhesive to stabilize free gingival grafts and they found less graft shrinkage in sites stabilized with cyanoacrylate. This study suggests that cyanoacrylate may be considered as an alternative for stabilization of free gingival grafts.<sup>6</sup>

## Application of cyanoacrylate

Cyanoacrylate is placed in a dropwise manner on the flap margins, which are then held in place. The application is done until a thin film

of set cyanoacrylate is formed. It sets within 5–10 seconds by polymerization in the presence of moisture and even blood, with release of heat.<sup>7</sup>

### Advantages of cyanoacrylate

1. Cyanoacrylates are single-component, catalyst-free adhesives capable of bonding at room temperature within just a few seconds.
2. Cyanoacrylate require no external initiation, relying only on the small amount of adsorbed water and chemicals on the tissue surface for cure.



Figure 1:  
Application of cyanoacrylate



Figure 2:  
Cyanoacrylate-immediate post application

3. Unlike sutures, which leave small openings in the wound, cyanoacrylates form a continuous seal which efficiently distributes the load and leads to decreased scarring.
4. These adhesives can also act as a liquid bandage to protect the wound and even act as a reservoir for antibacterial medication.

### Disadvantages of cyanoacrylate

1. Significant reactivity of cyanoacrylate results in short shelf-life.

2. Due to reactivity, precautions are needed for their application and delivery.
3. Heat produced from the curing reaction can cause inflammation.
4. Toxic byproducts (e.g., formaldehyde) are formed on degradation causing inflammation (additive scavengers can reduce this risk).

### CONCLUSION

Cyanoacrylate is found to be better as compared to sutures because it provides additional benefits like immediate hemostasis, easy application, patient acceptance, esthetically more pleasing, noninvasive, less time consuming, absence of postsurgical pain or infection, easy postoperative maintenance, and no food lodgment.

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