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## The use of cyanoacrylate in surgical procedure in periodontics: A literature review

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### Abstract

Cyanoacrylate is a tissue adhesive, which has been widely used in the area of medicine and dentistry with the aim of approaching wounds and improving healing. The cyanoacrylate in dentistry is mostly used in areas of superficial wounds and free of tension, for example in periodontics it is used in gingivectomies, closing flaps for pocket removal, in bone grafts and for the closing of wounds in donor areas as the grafts of the palate, which provides benefits to the patient as a faster healing and less postoperative pain. The objective of this paper is a literature review were all the newest information of the cyanoacrylate in periodontal therapy that is collected and described.

**Keywords:** Adhesive cyanoacrylate, periodontics, intraoral wounds

### Introduction

The cyanoacrylates were first synthesized in 1949 by a German chemistry, then was used by Coover in 1959 to wound closure [1]. The chemical formula is  $CH_2=C(CN)-COOR$  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 a longer molecular chain can reduce tissue toxicity [2]. This adhesive is maintained in a liquid state by an acidic stabilizer, is partially ionized molecules of water, and have the action of neutralizing the inhibitor. Once you applied the adhesive in the tissue starts a gradually polymerized to a solid state in 10 seconds for the contact with blood or saliva [3].

The N-Butyl-2-cyanoacrylate has become the most popular and common adhesive tissue that offers advantages as the immediate hemostasis, bacteriostatic properties, and rapid adhesion to soft and hard tissues, also has hemostatic action with a long half-life and good tissue compatibility and has a gradual resorption without foreign-body response<sup>4</sup>. It sets within 5-10 seconds by polymerization in the presence of moisture and even blood, with release of heat [5].

The use of cyanoacrylate adhesive (CA) is used in medicine for the same goal to achieve closing traumatic and surgical incisions, for example they used CA on abdominal organs, for repairing penetrating wounds on abdominal visceral, treatment of hepatic lesions [6]. They also used for vascular surgery due the rapid adhesive and hemostatic actions [7] and laparoscopic surgery for treatment for partial hernias and mesh fixation [8]. Also, literature reports the use of CA during procedure performed in other medicine fields as the gynecology, neurosurgery, orthopedics, plastic surgery, dermatology and urology [9].

The use of cyanoacrylate in periodontics surgery has being particularly used as an adhesive and a sealing glue, accomplishing the main concern among the clinics the process of the wound healing in the oral mucosa after an incision [10]. The main goal in surgery is the healing by primary intention because there is less scarring, more rapid healing, keeps the bacteria out if the system and reduced discomfort [5].

The objective of this paper is a literature review were all the newest information of the cyanoacrylate in periodontal therapy that is collected and described.

### Materials and methods

A literature review was conducted in Pubmed and Google academic databases searching for the words "cyanoacrylate", "tissue adhesives", "periodontics" and "periodontal surgery".

### **The use in periodontics surgery**

One of the main objectives of any surgical procedure is the wound closure, this has to be the repair if the incision by the approximation of the edges of the wound so it can heal following this concern over the years the use of suture materials has improve <sup>[11]</sup>. Nowadays cyanoacrylate bio-adhesive are the newest material, this material has the advantages of the rapid application, the resistance of infection, hemostatic proprieties and the patient comfort. By these advantages has being use in periodontics procedures as any intraoral wound as the closure of periodontal flap, paladar wounds, soft tissue biopsy fixation of autologous bone grafts and gingivectomy <sup>[12]</sup>.

### **Intraoral Wound Closure**

In every surgical procedure starts with an incision or wound and this laceration has to be repair using materials for a wound closure. Over the years new materials have been produced for example the use of adhesive tissues as a wound closure <sup>[13]</sup>.

In 2015 Sagar used "acrylate" as the adhesive tissue for wound closure in 10 patients. The cyanoacrylate was applied over the bone and inner surface of the mucoperiosteal flap and also applied over the incised margins and then approximated into the desired, it was held there under pressure for few seconds till the polymerization process was complete. The wound was observed on the 1<sup>st</sup>, 7<sup>th</sup> and 15<sup>th</sup> postoperative day for presence/absence of inflammation, edema, approximation or dehiscence. The results of using the adhesive tissue was equivalent to suture providing adequate wound healing after closure of surgical incisions. It showed advantages as the easy and painless application, no need to remove sutures and the hemostatic action in the area <sup>[6]</sup>.

In another study was evaluated in comparison the black 3-0 braided silk sutures and n-butyl-2-cyanoacrylate in 20 patients requiring alveoloplasty they use split-mouth in this study. Cyanoacrylate adhesive was applied over the surface of the wound and in the other place were the sutures. The patients were reviewed in the 1<sup>st</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, and 7<sup>th</sup> postoperative day and at the end of the 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> week. They evaluated the postoperative pain, bleeding, wound infection, wound dehiscence and the swelling of the wound, finding that the use of the cyanoacrylate were satisfactory, showed superior results in term of an uncomplicated healing, the healing was quick and less inflammatory <sup>[13]</sup>.

### **Closure of Periodontal flap**

The use of flap surgery is one of the most use periodontal therapy, the closure of the flap is a necessity for a primary union between the flap margins and the establishment of a dentogingival junction <sup>[14]</sup>. In 2016 Khurana evaluated the healing of a periodontal flap surgery, they observed 20 patients who required this treatment they divided in two groups, one group the flap was secured with sutures and the group where flap was secured with cyanoacrylate and they evaluated redness, crater formation, materia alba and presence of sutures and the checkup were after 2, 6 weeks and 3 months. They demonstrate a significant reduction in plaque index, a reduction in early healing, reduction bleeding, absence of pain, itching and discomfort in the postoperative in the group, showing a superior result on the group of sutures <sup>[15]</sup>.

Another study made in 2016, Saquib report 3 cases of a closure of periodontal flap with N-Butyl cyanoacrylate, in which the 3 patients complete the non-surgical periodontal

therapy, then these patients were assigned for a flap surgery to remove the deep pocket, and at the end of the surgery the flap was closed by N-butyl cyanoacrylate and were evaluate for 1 week and 6 weeks for the prosses of healing, founding uneventful healing <sup>[16]</sup>.

### **Fixation of autologous bone grafts**

The most frequently used materials for the reconstruction of the hard tissue are the use of autograft, in order to the maintain the allograft to being osteogenic, osteoconductive and osteoinductive depends on the on the intimate contact between the graft and the bone bed <sup>[2]</sup>. The currently used graft fixation technique involves titanium screws. This method allows the position and dimensional stability of the bone grafts, but the use of the screws has some disadvantages as he difficult to access places and loosening of the screws and in some cases a second surgical procedure is necessary to remove the screws. But the use of the adhesive would give the advantages as the ease of application, graft stability <sup>[17]</sup>.

### **Palate Wound from a donor area**

The subepithelial connective tissue grafts require harvesting tissue from a donor area, and this is usually of the palate. In this area shows some complexity of the procedure, usually for the anatomical localization the suturing is challenging<sup>18</sup>. The donor area is an open wound where the healing is more painful, and bleeding is common this increases patient discomfort <sup>[19]</sup>.

The searching for new materials to improve the performance of the surgery, as the adhesive tissue have been used to accelerate healing, as we mention before the advantages as an easy application on the wound lead to apply the cyanoacrylate on the donor area.

Stavropoulou in 2018, use the cyanoacrylate on the palate area where was harvested tissue. The study compared the pain and discomfort of the patient and the healing of the area of two groups the suture and the cyanoacrylate. They concluded that the group of cyanoacrylates perform similar to sutures and the application was 3 times faster than placement of sutures <sup>[20]</sup>.

### **Preservation alveolar ridge**

Another use of the cyanoacrylate is the preservation alveolar ridge, as we mention before is known that adhesive tissue is biocompatible and non-toxic<sup>21</sup>. Using cyanoacrylate to stabilize a collagen membrane for providing soft and hard tissue in the preservation procedures in the extraction sockets. Has been another use of the cyanoacrylate is protecting the sites that are going secondary wound healing, resulting satisfactory results where the healing area was healthy <sup>[22, 23]</sup>.

### **Gingivectomy**

Periodontal dressings are used for postoperative to cover the wound, the objective is to control the pain and discomfort on the patient. The cyanoacrylate can be used in a gingivectomy procedure as a dressing to cover the area. Where the tissues can be found healthy, without any alteration of the color or texture <sup>[23]</sup>.

### **Membrane Fixation in Guided Tissue Regeneration**

Rezende in 2015, he studied a 47-year-old woman with a vertical bone defect it was treated by guided tissue regeneration using a particulate autogenous bone graft associated to a collagen membrane, the membrane was glued to the bone surrounding the defect and to the tooth surface

with CA. Were they found that the membrane glued with CA is viable and safe from both technical and biological standpoints and may be advantageous for clinical purposes [24].

### Mucogingival graft fixation

In 2014 Gümüs, used CA to stabilize free gingival grafts where they found less graft shrinkage in the cyanoacrylate group than the other groups, and patients felt less pain in the recipient site. This study suggest that CA may be considered as an alternative for stabilization of free gingival grafts [25].

### Conclusion

The use of the cyanoacrylate has proved to be multifactorial; it is similar to a suture to hold the tissues and to stabilized material, a dressing for cover any surgical area. Has showed the advantages in the multiple periodontal procedures.

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