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Case Report

Use of Cyanoacrylate-based Domestic Glue in Emergency Treatment of Cutaneous Laceration due to Trauma to the Forehead: Case Report

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Abstract

Usually, the conventional method for wound synthesis is simple sutures with synthetic threads. However, there is an increased susceptibility to scar formation. Consequently, the development and use of non-invasive wound synthesis biomaterials has increased. Cyanoacrylate-based tissue adhesives are one of them, acting as a hemostatic agent, being also biodegradable and antibacterial. The purpose of this article is to present the case of a patient with cutaneous laceration due to trauma to the forehead, treated emergently in a dental office. The traumatic incision was synthesized with ethyl cyanoacrylate. No intercurrences were reported. The repair occurred with satisfactory clinical and aesthetic results.

Keywords: *Cyanoacrylate; Skin; Wound Healing; Tissue Adhesive; Surgical Incisions; Lacerations*

Introduction

The adequate synthesis of surgical incisions or traumatic injuries, aims to promote the repair of the laceration and closure of the incision by reapproximating the edges of the injured tissue. Therefore, it is of fundamental importance for healing and surgical success. Usually, the conventional method for wound synthesis is simple sutures with synthetic threads. However, there is a greater susceptibility to scar formation, risk of infection, suture loss, and re-opening of incisions. Consequently, the development and employment of non-invasive wound synthesis biomaterials have increased [1,2].

Cryanoacrylates were first synthesized by Ardis in 1949. However, only in 1959, its use was possible as a surgical adhesive, described by Coover. They belong to the family of polymers whose monomer is formed by reversible condensation of formaldehyde with a cyanoacrylate ester. Depending on chain length and complexity, cyanoacrylates come in many different forms; they include methyl, ethyl, butyl, isobutyl, isoamyl, and octyl cyanoacrylate. Their general formula is CNCH 2 = COO-R, where R is the side chain. Polymerization occurs in the presence of hydroxyl ions, so when it comes into contact with water or moisture in the fabric, it will form a strong bond and exothermic polymerization will occur. The

number of alkyl groups on the side chain of cyanoacrylate can be increased from one (methyl cyanoacrylate) to two (ethyl), to four (butyl) and five (isoamyl), but generally not more than eight (octyl cyanoacrylate). The cytotoxicity of these adhesives is related to their speed of degradation, and the size of the chain. This means that the larger the side chain, the lower the speed of degradation, resulting in lower histotoxicity [1-4].

Purpose of the Study

The purpose of this article is to present the case of a patient with cutaneous laceration due to trauma to the forehead, treated emergently in a dental office. The traumatic incision was synthesized with ethyl cyanoacrylate.

Case Report

A Caucasian male patient, 76-years-old, presented emergencially to the dental office complaining of profuse bleeding and cutaneous laceration due to trauma of the forehead.

Clinically, a vertical linear incision (upper-inferior), slightly more than 20 mm long, was observed, with abundant bleeding on the left eyebrow and edema in the region (Figure 1). The patient reported hitting his head against the door frame after becoming unbalanced.

Figure 1: *Vertical linear incision, with slightly more than 20mm long, and bleeding on the left eyebrow and edema in the region.*

Regarding systemic conditions, the patient reported taking Rivaroxaban 20 mg 6 months ago, indicated due to a diagnosis of pulmonary thrombosis after administration of the Astra-Zeneca™ coronavirus vaccine.

Light compression of the wound for hemostatic control was performed. The wound was then cleaned with gauze and 10 volume hydrogen peroxide. After drying the region with sterile gauze, domestic cyanocrylate-based glue (SuperBonder™, Henkel, São Paulo, Brazil) was applied (Figure 2) and the glue was dried with an air jet. The patient was instructed not to manipulate the region and, in any sign of bleeding, to seek emergency hospital treatment.

Figure 2: *Application of domestic cyanocrylate-based glue on the incision (A); SuperBonder™, Henkel, São Paulo, Brazil (B).*

The patient was carefully followed up. After 2 days, a slight erythematous halo resulting from the inflammatory process of the trauma, with the appearance of glue crust, was observed over the wound (Figure 3). There were no reports of bleeding or complications. After 7 days, retraction of the wound scar was observed (Figure 4). Discrete scarring was observed 15 days after the trauma (Figure 5). Two months after the trauma, an imperceptible scar was observed, even though it was perpendicular to the frontal muscle, which could cause greater scar marking by muscle contraction (Figure 6). No other complaints or complications were reported, as well as sequelae resulting from the trauma. The patient reported the suspension of treatment with Rivaroxaban by the vascular physician, as well as did not report other traumas.

Figure 3: *Slight erythematous halo over the wound, resulting from the inflammatory process of the trauma, with the appearance of glue crust (after 2 days).*

Figure 4: *Retraction of the wound scar (after 7 days).*

Figure 5: *Discrete scarring (after 15 days).*

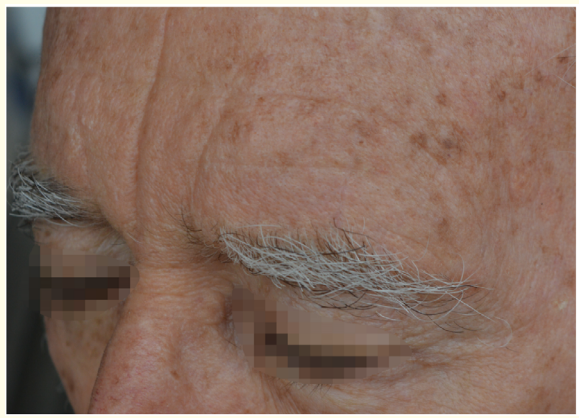

Figure 6: Imperceptible scar (after 2 months).

Discussion

The longer chain cyanoacrylate adhesives (butyl, octyl cyanoacrylates) are frequently applied in various areas of Medicine including, Gynecology, Gastroenterology, Neurosurgery, Orthopedics, Dermatology, Urology, Plastic, Vascular and Cardiac Surgery. Common indications used include esophageal fistula closure; myocardial surgery; bilateral mammoplasty; bone grafts; corneal surgery; variceal occlusion and embolization of arteriovenous malformations; and in skin wound closure [1,4,5], as presented by us.

In Dentistry, besides butyl and octyl cyanoacrylates, the literature reports the use of isoamyl cyanoacrylates, which has been considered the best adhesive for intraoral application compared to others, due to better adhesion in areas subjected to frequent humidity. These adhesives are used in several intraoral procedures, such as, for example, alternative to sutures for bonding mucoperiosteum to bone; periapical surgeries; cleft palate closure; synthesis of biopsy incisions; as a hemostatic agent in patients submitted to oral surgery; in the healing of recurrent aphthous ulcerations; closure of cleft lip; covering of intraoral bone graft site; in reimplantation of avulsed tooth; in supporting treatment of comminuted fractures of small maxillofacial bones; in synthesis of lacerations in children in order to avoid anesthetic procedures [1,6-9].

Another possibility proven through studies, is the cyanoacrylate for domestic use, popularly known as SuperBonder™ (ethyl cyanoacrylate), which presented biocompatibility similar to adhesives manufactured for medical use (octyl cyanoacrylates), not promot-

ing inflammatory and/or allergic reactions, tissue necrosis, and exhibiting aesthetically favorable healing, as it was presented by us. Several studies have used ethyl cyanoacrylate (SuperBonder-™) in lacerations, with objectives such as reducing surgical time, technique facilitation, and cost reduction. *In vitro* microbiological studies have evaluated the biocidal activity, and the results showed no contamination with these agents. Histologically, small giant cell granulomas were distributed around the junction, and there was no inflammatory neutrophil infiltration, indicating local bacterial or chemical injury. In *in vitro* studies with fibroblasts, besides demonstrating biocompatibility, progressive and continuous cell growth can also be observed, and cell behavior similar to that observed with Dermabond™ (octyl cyanoacrylates). Similar results were observed in osteoblast viability. Despite their off-label applications in health care, the low cost of these adhesives makes them an option for use in more humble social areas. However, there are controversial results regarding the toxicity of ethyl-cyanoacrylate adhesives in *in vitro* research [3,4].

Cyanoacrylate adhesives have numerous advantages, such as: fast application; reduced operative time; asymptomatic treatment since they do not require local anesthesia; have hemostatic and anti-inflammatory properties; favorable aesthetics; are biodegradable; are bacteriostatic; do not cause mucosal irritation or skin sensitivity; eliminate the need for a second visit for suture removal. The only disadvantage is the low tensile strength and high cost of octyl and isoamyl compounds. These adhesives are contraindicated in infected wounds [1-4]. It is worth noting that in the present case, the wound presented favorable characteristics for the use of the cyanocrylate adhesive, as well as being cleaned previously.

The satisfactory bacteriostatic properties exhibited in these adhesives, can be explained by the strong negative charge of the polymer and its ability to form a mechanical barrier to prevent the entry of any materials or microorganisms. Additionally, butyl cyanoacrylate adhesive has been reported to have an antibacterial effect on Gram-positive bacteria [4].

Cyanoacrylate adhesives also cause immediate hemostasis upon application. This characteristic is due to its ability to form a mechanical barrier at the wound site, which facilitates the coagulation process and allows bleeding control [2,4]. In the clinical case reported here, it was necessary that homeostasis was achieved effectively and immediately, due to the systemic condition of the patient, in which the drug Rivaroxaban was administered, an antithrombotic that inhibits the action of coagulation factor Xa, preventing blood clotting inside the blood vessel. The patient had recently been diagnosed with pulmonary thrombosis, quite possibly as a result of administration of the Astra-Zeneca™ vaccine, a recombinant adenovirus vector encoding the severe acute respiratory syndrome antigen Coronavirus 2 (SARS-CoV-2) [10].

Ideally, the method of laceration synthesis should be technically easy, quick, painless, aesthetically favorable, not require device removal, and cost-effective. Cyanoacrylates provide many of the characteristics of ideal surgical or traumatic wound synthesis. These adhesives represent an excellent alternative to conventional sutures. However, the use of these adhesives is limited to synthesis of lacerations and incisions in areas of low tension, as they provide lower tension resistance than sutures. However, in general, synthesis with suture thread has a great potential for reinfection during the healing process, a situation frequently observed in the oral cavity due to the formation of biofilm and accumulation of food residues, and the presence of suture thread will further aggravate this situation. The literature also reports, that syntheses with cyanoacrylate adhesives showed better hemostasis, better healing, good aesthetic appearance, minimal inflammation, optimization of the work time of the professional, less pain and edema, when compared to conventional sutures [1,2,4].

Conclusion

The synthesis of intraoral and extraoral traumatic or surgical incisions with cyanoacrylate-based adhesives is an advance and an opportunity to improve patient care. The properties of cyanoacrylate were favorable. Clinically, reduced closure time, promotion of immediate hemostasis and satisfactory healing, and improved patient comfort were observed. The literature shows convincing results in terms of safety, efficacy, ease of use, and feasibility of ethyl, butyl, isoamyl, and octyl cyanoacrylate adhesives in various fields of Dentistry.

Bibliography

1. Sagar P, Prasad K, Lalitha RM, Ranganath K. Cyanoacrylate for intraoral wound closure: A possibility? Int J Biomater. 2015;2015:165428.

2. Singh PK, Degala S, Shetty S, Rai VS, Das A. To evaluate the efficacy and effectiveness of N-butyl-2-cyanoacrylate glue (TRU SEAL) in closure of oral and maxillofacial laceration and surgical Incisions. J Maxillofac Oral Surg. 2019;18(1):131-138.

3. Damante CA, Cardoso MV, Hage Karam PSB, Haiter AC, Sant'ana ACP, Greghi SLA, Zangrando MSR, De Rezende MLR, Oliveira RC. Evaluation of regular market ethyl cyanoacrylate cytotoxicity for human gingival fibroblasts and osteoblasts. Surg Infect (Larchmt). 2020;21(1):29-34.

4. Borie E, Rosas E, Kuramochi G, Etcheberry S, Olate S, Weber B. Oral applications of cyanoacrylate adhesives: A Literature Review. Biomed Res Int. 2019;2019:8217602.

5. Kidokoro R, Nakajima K, Kobayashi F, Takeda Y, Matsuzaka K, Katakura A, Inoue T. A comparative study of the effects of 4-META/MMA-TBB resin and cyanoacrylate on wound healing of skin defects. J Biomed Mater Res B Appl Biomater. 2016;104(1):197-203.

6. Nevins M, Mendoza-Azpur G, De Angelis N, Kim DM. The biocompatibility of cyanoacrylate tissue adhesive in conjunction with a collagen membrane for providing soft and hard tissue regeneration in extraction socket preservation procedures. Int J Periodontics Restorative Dent. 2018;38(Suppl):s37-s42.

7. Sriwil M, Fakher MAA, Hasan K, Kasem T, Shwaiki T, Wassouf G. Comparison of free gingival graft and gingival unit graft for treatment of gingival recession: A randomized controlled trial. Int J Periodontics Restorative Dent. 2020;40(3):e103-e110.

8. Luther M, Gardiner FW, Bishop L. Management of traumatic tooth avulsion using 2-octyl cyanoacrylate tissue adhesive splint: A case report. J Emerg Nurs. 2020;46(5):693-697.

9. Foresta E, Torroni A, Gasparini G, Saponaro G, Longo G, Boniello R, Cervelli D, Marianetti TM, Pelo S, Moro A. Use of N-butyl-2-cyanoacrylate (Glubran2(®)) in fractures of orbital-maxillo-zygomatic complex. J Maxillofac Oral Surg. 2015;14(3):761-764.

10. Greinacher A, Thiele T, Warkentin TE, Weisser K, Kyrle PA, Eichinger S. Thrombotic thrombocytopenia after ChAdOx1 nCov-19 vaccination. N Engl J Med. 2021;384(22):2092-2101.

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