

Case report

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Comparative assessment of cyanoacrylate adhesive and sutures for closing donor sites of the hard palate mucosa during a single surgical procedure: a clinical case

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ABSTRACT

INTRODUCTION: Suturing is still the most common wound closure method in dentistry. However, this approach has a number of drawbacks, including the risk of inflammation, delayed healing, and inconveniences for patients, necessitating the research of alternative techniques. Because of their quick polymerization in a moist environment and good biocompatibility, cyanoacrylate adhesives are considered a promising alternative option.

CASE DESCRIPTION: Two donor sites of the hard palate mucosa were closed during a single surgical procedure: one using "Sulfacrylate" cyanoacrylate adhesive and the other by suturing. Clinical assessment and photo documentation were performed, and the patient's subjective perception was analyzed 7 days and 1.5 years after surgery to compare the healing of the hard palate mucosa with different wound closure approaches.

The site where the adhesive was applied showed faster healing, minimal inflammation, and excellent esthetic results without scarring. The procedure time for the adhesive was significantly shorter than for suturing. The patient reported less discomfort on the side where the adhesive was applied.

CONCLUSION: "Sulfacrylate" cyanoacrylate adhesive is an effective and safe alternative to conventional suturing, with improved healing and comfort for patients. Further real-world studies of this approach are recommended.

Keywords: cyanoacrylate adhesive; surgical wounds; clinical case; dental surgery; mucosa.

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Клинический случай

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Сравнительный анализ применения цианакрилатного клея и швов при закрытии донорских участков слизистой оболочки твёрдого нёба в рамках одной операции (клинический случай)

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АННОТАЦИЯ

Актуальность. В стоматологической практике наложение швов остаётся наиболее распространённым методом закрытия ран. Однако наличие ряда недостатков: риск воспалительных реакций, замедленное заживление и неудобство для пациентов — стимулирует исследование альтернативных методов. Цианакрилатные клеи, обладающие такими свойствами, как быстрая полимеризация во влажной среде и биосовместимость, рассматриваются в качестве перспективной альтернативы.

Описание клинического случая. В рамках одной хирургической процедуры были обработаны два донорских участка слизистой оболочки твёрдого нёба: один — с использованием цианакрилатного клея «Сульфакрилат», второй — с наложением швов. Выполнены клиническая оценка, фотодокументация и проанализированы субъективные ощущения пациентки на 7-й день и через 1,5 года после операции для сравнительного анализа заживления тканей слизистой оболочки твёрдого нёба после применения различных методов обработки.

Участок, обработанный клеем, продемонстрировал более быстрое заживление, минимальную воспалительную реакцию и превосходный косметический результат без рубцов. Время обработки клеем оказалось существенно короче, чем при наложении швов. Пациентка отметила меньший дискомфорт на стороне с клеем.

Заключение. Использование цианакрилатного клея «Сульфакрилат» является эффективной и безопасной альтернативой традиционным швам, обеспечивая лучшие результаты заживления и комфорта для пациента. Рекомендуется дальнейшее изучение данного метода в клинической практике.

Ключевые слова: цианакрилатный клей; хирургические раны; клинический случай; стоматологическая хирургия; слизистая оболочка.

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INTRODUCTION

Currently, suturing remains the most common method of wound closure in the oral cavity; however, its well-documented drawbacks have stimulated the search for new techniques and materials. Oral wounds have a high risk of secondary infection during healing—often observed in the oral environment—due to biofilm formation and food accumulation, which are further aggravated by the presence of sutures [1]. Suturing requires anesthesia and needles, takes considerably more time, and necessitates a follow-up visit for suture removal, all of which increase patient discomfort. There is also a potential risk of accidental errors by clinicians and auxiliary personnel [1–4]. Issues related to the incompatibility of suture materials with tissues—such as their recognition as foreign bodies that promote chronic inflammation and delay tissue regeneration—remain relevant. Furthermore, early biodegradation of resorbable sutures may lead to wound dehiscence and the formation of suture-related fistulas. Ischemia of wound margins caused by tissue compression from the suture often results in tissue deformation, “suture marks,” and postoperative scarring, which is particularly critical in exposed areas. These problems still require practical solutions [5].

In recent years, tissue adhesives have been considered a promising alternative to conventional sutures, provided they demonstrate adequate adhesive strength, polymerization in a moist environment, biocompatibility, stability, and reduced procedure time [6]. Currently, medicine uses both synthetic compounds—such as polyurethane- and cyanoacrylate-based adhesives—and biologically derived adhesives with natural adhesive properties, such as fibrin and collagen. Both in Russia and abroad, the most widely used materials are chemically engineered “super glues” based on alkyl esters of α -cyanoacrylic acid.

In dental practice, cyanoacrylate tissue adhesives have been used for more than 20 years because of their unique characteristics: the ability to bond living tissues rapidly in a moist environment, inherent sterility, antibacterial activity, and lack of toxicity. They do not cause local irritation, possess anti-inflammatory and hemostatic effects, and exhibit a high degree of biocompatibility. The adhesive film provides reliable fixation, isolates the wound surface, and promotes healing of periodontal tissues without compromising their blood supply. Moreover, it does not cause pain, does not interfere with mastication or speech, and allows the use of prosthetic appliances. Consequently, periodontal

tissue regeneration proceeds more rapidly, while the thin and flexible film that forms on the surface requires no removal—unlike traditional dressings [7, 8].

The application of cyanoacrylate tissue adhesive is painless, which allows its use when the effect of anesthesia subsides [9, 10], as well as in patients with dental anxiety or elevated stress levels, including children [11]. Moreover, studies demonstrate a minimal inflammatory response at the application site and no risk of tissue necrosis. High esthetic outcomes, absence of allergic reactions, and stability of the adhesive layer have also been reported [1, 12].

To date, a considerable number of studies have compared the effectiveness of cyanoacrylate tissue adhesives and sutures in various oral surgical procedures, including tooth extraction and closure of mucosal wounds. Several *in vivo* studies comparing sutures and different types of cyanoacrylate adhesives in both animals and humans concluded that cyanoacrylates outperform sutures [2, 13]. In particular, biological adhesive demonstrated superior effectiveness compared with traditional sutures in post-extraction healing, as evidenced by reduced pain, edema, and inflammation [14, 15]. A 2021 study showed that cyanoacrylate tissue adhesive used for closure of donor and recipient sites in gingival grafting exhibited pronounced hemostatic, analgesic, and wound-healing properties. Patients reported less pain, reduced need for analgesics, and faster healing at the donor site. In addition, cyanoacrylate demonstrated a substantial hemostatic effect, reducing bleeding time and lowering the risk of late postoperative hemorrhage. These findings confirm its effectiveness as a promising agent for closure of surgical wounds in dentistry [16].

However, most of the above studies compared results among different patients, introducing variability in surgical conditions and individual healing characteristics. At the same time, clinical studies comparing cyanoacrylate adhesive and sutures within a single surgical procedure in the same patient remain scarce. This approach eliminates the influence of individual differences in metabolism, tissue regeneration, and postoperative inflammation, thereby ensuring a more objective assessment of each method's effectiveness.

To address this gap, comparison of the two methods for closing donor sites of the hard palate mucosa should be performed under identical surgical and healing conditions. Such a design provides more reliable data on the effects of cyanoacrylate adhesive and sutures on epithelialization rate, degree of inflammation, pain intensity, and esthetic outcomes.

The following case report makes a meaningful contribution to clinical dentistry by providing deeper insight into the advantages and potential limitations of each method under real-world clinical conditions.

CASE DESCRIPTION

The study was conducted as a clinical case with elements of comparative analysis.

To correct gingival recession in the maxilla using the tunnel technique, a gingival graft was harvested during a single surgical procedure performed on a 43-year-old female patient. The donor sites of the hard palate mucosa were subsequently examined. During the procedure, two areas of the hard palate mucosa were treated: one with cyanoacrylate tissue adhesive and the other with sutures. Photographs were taken on the day of examination and 1.5 years after surgery. The patient completed a questionnaire assessing subjective sensations.

The procedure was performed under local anesthesia (4% articaine with epinephrine 1:100,000) using standard dental instruments. Donor sites of the hard palate mucosa were prepared symmetrically to ensure comparable conditions.

On one donor site, a medical cyanoacrylate tissue adhesive, Sulfacrylate (MedIn, Russia), was applied according to the manufacturer's instructions. The wound was preliminarily dried with a gauze pad. Since complete drying was not possible, two ligature sutures were placed in the distal region prior to adhesive application. The adhesive, applied dropwise, spread evenly to form a thin layer, providing hemostasis of the wound surface. Excess adhesive was removed, and the surface was rinsed with an antiseptic solution. The time required for adhesive application was 25 seconds.

The other donor site was closed with nonabsorbable sutures using Supramid 5/0 (Resorba, Germany), a pseudo-monofilament surgical suture material made of coated polyamide 6/6. This material combines the properties of monofilament and braided sutures, ensuring minimal tissue trauma and ease of handling. Black-colored sutures were used to improve intraoral visibility. A continuous suture technique was used, with uniform tissue tension and a reverse-cutting triangular needle to ensure atraumatic penetration of the mucosa. This material was chosen for its high resistance to oral microflora, shape stability in a moist environment, reliable knot security from the second throw, and minimal "sawing effect" during removal. The material ensures stable wound margin approximation and promotes favorable healing. A dental sponge (Stimul-Oss, Belkozin, Russia) was additionally placed over the sutured area to protect

the wound surface and enhance tissue regeneration. The total time required for suturing was 3 minutes and 10 seconds, which was substantially longer than the time for managing the corresponding site with cyanoacrylate adhesive.

Clinical evaluation of the healing process was performed by visual inspection of the donor sites on the hard palate mucosa. The primary assessment parameters included:

- Degree of epithelialization of the wound surface;
- Inflammatory changes (hyperemia, edema);
- Severity of bleeding or exudation;
- Signs of wound margin dehiscence or formation of suture-related fistulas;
- Overall tissue condition at 7 days and 1.5 years after surgery.

To analyze the patient's subjective perception of the two donor site closure methods, a questionnaire was used. The patient evaluated the following parameters:

- Level of pain and discomfort in the early postoperative period (on a 1–10 scale);
- Perceived comfort in wound closure and postoperative care (difficulties during speech, eating, or sensation of tightness);
- Wound bleeding during eating or tooth brushing;
- Overall satisfaction with the outcome (including esthetic aspects).

For objective comparison, photographic documentation was obtained: images of the wound surfaces were taken on the day of surgery, on postoperative day 7, and 1.5 years after the procedure. The tissue condition was compared using the photographs to assess esthetic results and long-term outcomes.

The time required for each procedure—adhesive application and suturing—was recorded for objective comparison.

RESULTS AND DISCUSSION

Clinical Evaluation of the Healing Process

Tissue recovery during surgical wound healing is largely determined by multiple factors, including the condition of the sutured tissues, volume deficiency, reduced elasticity, and anatomic and architectural characteristics of the adjacent areas. The process is also affected by factors that create additional tissue deficiency (for example, the use of volume-augmenting implantable materials), as well as the size of the surgical defect, incision location, and other aspects related to the nature of the surgical procedure [17]. Cyanoacrylate tissue adhesive promotes complete hermetic closure of wound

margins by acting as a surface protective barrier that prevents the ingress of biological fluids and foreign elements (saliva, food debris, biofilm) into the wound area, thereby enhancing healing and reducing tissue contraction [18]. This effect plays a crucial role in preventing secondary infection and scar tissue formation.

On the side treated with cyanoacrylate adhesive, initial epithelialization of the wound surface was observed on postoperative day 7. Tissue edema and hyperemia were minimal, with no signs of inflammation or exudation. Wound margins were completely approximated without signs of dehiscence. At 1.5 years, the palatal mucosa appeared anatomically intact, without scarring, and the tissue texture remained natural.

On the sutured side, moderate inflammatory changes were observed on day 7, including pronounced hyperemia, edema, and irritation of the tissues surrounding the suture material. Complete epithelialization on this side was not achieved, indicating delayed healing; the wound surface was covered with a fibrinous coating. At 1.5 years, postoperative scars were noted at the suture site, adversely affecting the esthetic outcome.

Patient's Subjective Assessment

The patient reported that pain on the adhesive-treated side was easier to tolerate. During the first postoperative days, the pain level was lower on the adhesive side (2 points vs 5 points on the sutured side). On the sutured side, brief episodes of bleeding were observed within the first 5 postoperative days, particularly following mechanical irritation during

eating or tooth brushing. In contrast, no such episodes occurred on the side treated with cyanoacrylate adhesive, indicating a more pronounced hemostatic effect of the adhesive.

Despite the evident clinical advantages, the mechanism underlying the hemostatic action of cyanoacrylates has not been fully elucidated. One hypothesis suggests that cyanoacrylate ester forms a macroscopic film that acts as a mechanical barrier, slowing blood flow and serving as a surface for activation of the coagulation cascade. Additional evidence indicates that the film formed by cyanoacrylate is a porous structure that becomes impregnated with blood, promoting coagulation within the pores of the adhesive layer [19].

During speaking and eating, the patient experienced less discomfort on the adhesive-treated side due to formation of a protective film over the wound surface, although the adhesive layer caused slight tongue discomfort. On the sutured side, the patient noted a sensation of tightness, followed by relief after suture removal. The patient rated the esthetic outcome of the adhesive-treated side highly, noting no visible differences between the donor site tissues and the surrounding hard palate mucosa. Sensitivity of the healed areas did not differ between the two sides.

Photographic Documentation

Photographs of the donor sites at different stages allowed visual comparison of the wound healing process.

On the day of surgery, the sutured side (see Fig. 1) showed an evenly distributed continuous suture

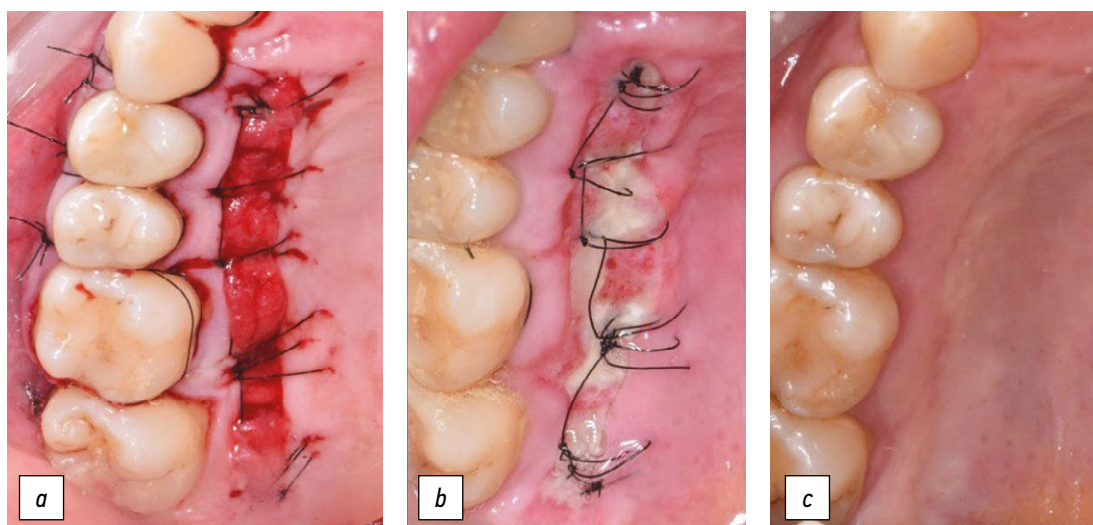


Fig. 1. Photographs of the sutured side: *a*, taken on the day of surgery; *b*, at 7 days postoperatively; *c*, at 1.5 years after surgery.

line. The wound margins were well approximated; however, marked tissue trauma was observed around the sutures, typical of needle and suture material use. The wound surface showed moderate bleeding, indicating the need for additional time to achieve complete hemostasis.

On the adhesive-treated side (see Fig. 2), the wound surface was covered with a thin adhesive layer that provided complete sealing. No signs of excessive trauma or tissue compression, typical of suturing, were observed. Hemostasis was achieved immediately after adhesive application.

At 7 days postoperatively, the adhesive-treated side exhibited a smooth surface with minimal inflammatory signs, whereas the sutured side showed edema and tissue irritation.

At 1.5 years, the adhesive-treated side demonstrated complete restoration without visible scarring, in contrast to the sutured side, where tissue thickening and a lighter coloration were clearly evident.

The adhesive-treated side required 25 seconds for material application, which was considerably faster than the 3 minutes and 10 seconds required for suturing. This advantage makes adhesive use more convenient for both clinician and patient. Reducing operative time is an important factor that promotes improved healing, as prolonged surgical procedures may increase the likelihood of secondary intention healing, which is associated with greater inflammation and an extended regeneration period [20].

Comparative Analysis

On postoperative day 7, the inflammatory response was more pronounced on the sutured side, with hyperemia,

edema, and irritation observed around the suture material. On the adhesive-treated side, these signs were absent or minimal, indicating the material's biocompatibility and its ability to reduce inflammation (see Table 1).

Thus, the cyanoacrylate tissue adhesive Sulfacrylate demonstrated the following substantial advantages over conventional suturing:

- faster wound healing and epithelialization
- minimal inflammatory response
- excellent esthetic outcomes without scarring
- reduced postoperative discomfort for the patient
- significant reduction in procedure time for the clinician.

Despite its widespread use, the suturing technique showed greater tissue trauma, delayed healing, and inferior esthetic outcomes.

CONCLUSION

Based on the analyzed clinical case, the cyanoacrylate tissue adhesive Sulfacrylate for closing donor sites of the hard palate mucosa demonstrated significant advantages compared with the traditional suturing method.

The key findings of this study indicate that adhesive accelerates the healing process: wound surfaces covered with adhesive showed faster epithelialization and absence of pronounced inflammatory response. Patient discomfort was minimal, with lower pain levels and greater postoperative comfort on the adhesive-treated side. The adhesive-treated site did not cause the tightness sensation typical of sutures. The use of adhesive produced excellent esthetic outcomes: at 1.5 years, the adhesive-treated wound surface appeared anatomically intact, without visible scars or "suture marks," which is particularly

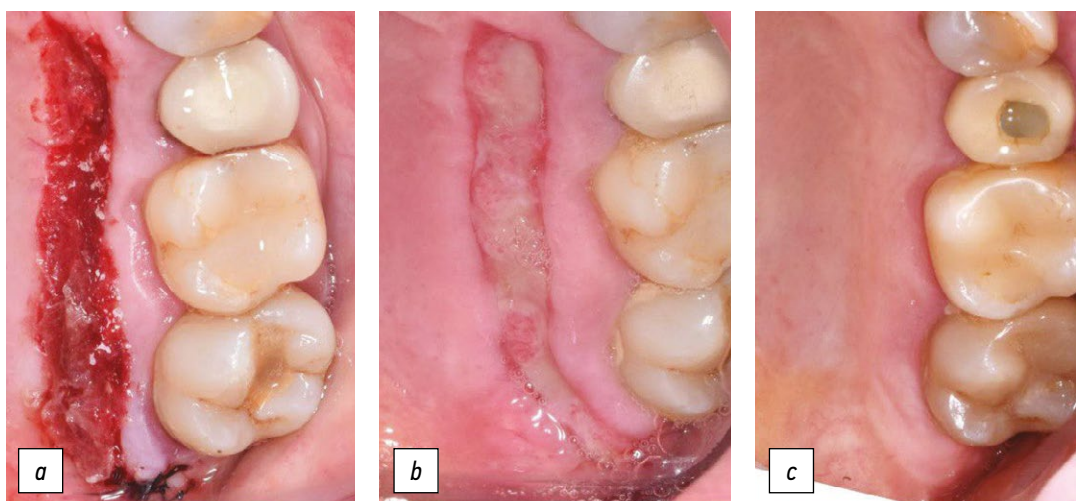


Fig. 2. Photographs of the adhesive-treated side: *a*, taken on the day of surgery; *b*, at 7 days postoperatively; *c*, at 1.5 years after surgery.

Table 1. Comparative analysis of the two wound closure methods

Parameter	Cyanoacrylate tissue adhesive	Supramid 5/0 sutures
Procedure time	25 s	3 min 10 s
Hemostasis	Excellent and nearly complete throughout the area; immediate as a result of effective wound sealing, although one additional suture was required distally	Good, but brief bleeding episodes occurred during the first 5 postoperative days
Pain level during the first 7 postoperative days (1–10 scale)	2 (minimal)	5 (moderate)
Inflammatory response (edema, hyperemia)	Minimal	Moderate (hyperemia, edema)
Risk of infection	Low (due to wound sealing)	Moderate (due to suture material and lack of a protective film)
Epithelialization at day 7	Nearly complete	Partial
Esthetic outcome at 1.5 years	Excellent, no scarring	Satisfactory, with possible scar formation
Risk of wound margin dehiscence	Moderate (due to superficial layer detachment)	Moderate (due to tissue tension)
Postoperative management	Not required	Antiseptic treatment required
Patient comfort	High (no pain, easy maintenance)	Moderate (tightness, discomfort, pain on mechanical irritation)
Clinician convenience	High (reduced procedure time)	Low (longer procedure duration)
Procedure cost	High	Low

important in esthetically sensitive areas. Adhesive is also advantageous for clinicians, as it significantly reduces procedure time, making the method more efficient in terms of treatment workflow.

Comparative analysis of the sutured side revealed that, despite its widespread use, the suturing technique was associated with more pronounced inflammatory reactions, delayed healing, greater patient discomfort, and less satisfactory esthetic outcomes.

The analysis of this clinical case supports the conclusion that the cyanoacrylate tissue adhesive Sulfacrylate can be recommended as an effective alternative to conventional sutures for managing donor site wounds of the oral mucosa in dental practice. Its application improves treatment quality, shortens procedure time, and enhances patient satisfaction.

ADDITIONAL INFORMATION

Author contributions: The author approved the final version of the manuscript for publication and agreed to be accountable for all aspects

of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Consent for publication: Written informed consent was obtained from the patient for the publication of personal data, including photographs (with faces obscured), in Russian Journal of Dentistry and its online version (signed on January 7, 2025). The scope of the published data was approved by the patient.

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Data availability statement: All data generated during this study are available in this article.

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