

Jurnal Kesehatan Gigi

p-ISSN: [2407-0866](#)e-ISSN: [2621-3664](#)<http://ejournal.poltekkes-smg.ac.id/ojs/index.php/jkg/index>

Healing of Traumatic Ulcer Using Hyaluronic Acid Gel: A Case Report

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Received: July 16, 2025, 2025; Revised: March 27, 2026; Accepted: June 19, 2026

ABSTRACT

Traumatic ulcers are ulcerative lesions caused by mechanical, electrical, or chemical trauma. In children, the prevalence of oral ulcers reaches approximately 9%. Topical gel is commonly chosen as the first-line treatment for ulcers, due to their effectiveness in protecting the lesion and alleviating pain caused by friction with surrounding tissues. Topical gel formulations containing hyaluronic acid as the active ingredient have demonstrated significant therapeutic benefits in the management of oral ulcers. It contributes to the healing process by maintaining adequate moisture at the lesion, facilitating the initiation of the inflammatory and proliferative phases, and ultimately promoting faster tissue regeneration and wound closure. This article presents the management of a traumatic ulcer in a 3-year-old child resulting from an accident. The ulcer was located in the anterior maxillary region and was accompanied by the avulsion of teeth 51 and 61. The lesion was treated with topical hyaluronic acid gel. The treatment spanned over a period of two months, during which new gingival tissue developed, covering the exposed alveolar bone and socket following the trauma. In cases involving extensive traumatic ulcers, such as the present case, the application of hyaluronic acid gel has demonstrated efficacy in facilitating tissue regeneration. The selection of an appropriate topical therapeutic agent is particularly important in pediatric patients to ensure optimal healing outcomes, patient comfort, and adequate nutritional intake during recovery. Hyaluronic acid gel offers a cooling and tasteless upon application, rendering it a well-tolerated and effective option for the management of ulcerative lesions in children.

Keywords: hyaluronic acid; topical gel; traumatic ulcer

Introduction

This article discusses traumatic ulcers in children, which are ulcerative lesions caused by mechanical trauma. Oral ulcers often cause significant pain that interferes with eating, drinking, and overall quality of life. The authors highlight the use of hyaluronic acid gel as a topical therapeutic agent capable of accelerating wound healing while improving patient comfort.

Ulceration of the oral mucosa is a common condition affecting the oral cavity and may occur in

individuals of all ages, including children. The prevalence of oral ulcers in children is approximately 9% among all cases of oral ulceration [1]. The etiology of oral ulcers is diverse and may include physical trauma, electric burns, radiation exposure, autoimmune diseases, microbial infections, or, in some cases, idiopathic causes [2].

The primary complaint in oral ulcer cases is pain, due to the exposure of numerous nerve endings following the loss of the epithelial layer. The main goals of ulcer treatment are pain relief and acceleration of the healing process. Common pharmaceutical forms used in the treatment of oral

ulcers include topical gels, sprays, and mouth rinses [1]. Topical corticosteroids are frequently the first-line medication. However, the use of corticosteroids must be carefully considered in certain systemic conditions, as they may not be well-tolerated in some patients, such as infants and pregnant women [3].

Prolonged use of topical medications may lead to secondary effects, such as drug resistance or fungal infections [2]. Therefore, alternative topical medications that are both effective and reduce healing time should be considered. Compared to systemic therapy, topical medications are more efficient as they deliver high concentrations of active substances directly to the affected mucosa [4].

Hyaluronic acid is among the most frequently used active agents in current topical therapy for oral ulcers. It is a naturally occurring linear polysaccharide found in the extracellular matrix of connective tissue, skin, epithelium, nerve tissue, and musculoskeletal structures [5]. Hyaluronic acid is composed of a linear polymer of glucuronic acid and N-acetyl-glucosamine disaccharide [6].

In the healing process, hyaluronic acid gel functions by providing protection and hydration, promoting fibroblast stimulation, enhancing the production of growth factors, and supporting collagen biosynthesis [7]. Its use in topical gel formulations is often combined with other active agents to enhance efficacy. One such commonly used additive is xylitol [6]. This article explores the clinical efficacy of a topical gel containing hyaluronic acid and xylitol in the healing of post-traumatic oral wounds in pediatric patients.

Case Report

The study presents a case report of a 3-year-old girl who experienced a motorcycle accident resulting in the avulsion of teeth 51 and 61, accompanied by extensive gingival tissue loss in the anterior maxillary region (Figure 1). Initial treatment included wound irrigation, antibiotic and analgesic therapy, followed by the application of topical hyaluronic acid gel twice daily. The patient was monitored for two months through several follow-up visits.



Figure 1. Traumatic ulcer and avulsion of teeth 51 and 61

Initial wound management included saline irrigation to remove debris and cessation of bleeding by applying sterile gauze pressure. After hemostasis was achieved, a panoramic radiographic examination was conducted to evaluate the possibility of bone involvement (Figure 2).



Figure 2. Panoramic radiograph

The panoramic radiograph showed no signs of bone fracture either in the immediate area of the lesion or in adjacent regions such as the temporomandibular joint. The patient refused to eat or drink due to discomfort from the gingival injury. Although hospitalization was recommended to ensure adequate fluid and nutritional intake, the family declined and opted for outpatient monitoring. The patient was prescribed antibiotics and analgesics to prevent infection and relieve pain. Parents were instructed to clean the wound daily using sterile gauze and warm water and were advised to return for follow-up in one week.

At the first follow-up visit, one week post-trauma, healing of the upper lip laceration was evident. Intraoral examination revealed no active bleeding, although the sockets of teeth 51 and 61 remained uncovered by gingiva, with the exposed alveolar bone covered by a pseudomembranous layer (Figure 3).



Figure 3. First follow-up, 1 week post-trauma

The patient was prescribed a topical hyaluronic acid gel to be applied twice daily after meals. The parents were educated on maintaining wound hygiene and the importance of consistent gel application. A second follow-up was scheduled for two weeks post-trauma.

At the second follow-up visit, two weeks post-trauma, the upper lip laceration had fully healed (Figure 4). Labial gingival ulceration in the maxillary anterior region showed signs of recovery, indicated by the gradual coverage of the alveolar bone with gingival tissue. Mild erythema was still present in the area (Figure 5).



Figure 4. Healed upper lip laceration



Figure 5. Healing of the ulcer after 1 week of hyaluronic acid gel application

The ulcer was irrigated with saline, and the topical gel was prescribed again. The parents were advised to continue routine wound care and return for another follow-up in four weeks.

At the third follow-up visit, one month post-trauma, the child began to show improved cooperation and was willing to sit independently in the dental chair. However, during the initial intraoral examination, the patient became uncooperative again. Objective intraoral evaluation revealed significant healing of the ulcerative lesion,

with gingival tissue—matching the surrounding mucosa—covering the sockets of teeth 51 and 61 (Figure 6).



Figure 6. Healing of the ulcer after 3 weeks of hyaluronic acid gel application

The patient's parents also reported that the child was able to eat and drink without experiencing any pain. They were instructed to continue the application of the topical hyaluronic acid gel, maintain optimal oral hygiene, attend a follow-up visit no later than two months after the incident, and return immediately if any oral complaints arose.

At the fourth follow-up visit, two months post-trauma, the ulcerative lesion had completely healed, with no clinical signs of inflammation. The sockets and alveolar bone of teeth 51 and 61 were fully covered by healthy gingival tissue with a color consistent with surrounding structures (Figure 7). Parents were instructed to discontinue gel application, as wound healing was complete, and to maintain proper oral hygiene for their child.



Figure 7. Healed traumatic ulcer

Discussion

The treatment resulted in a gradual reduction of pain and inflammation. Gingival tissue progressively regenerated and covered the exposed alveolar bone and extraction sockets. The discussion emphasizes the biological role of hyaluronic acid in maintaining tissue hydration, modulating inflammation, promoting fibroblast activity, and facilitating wound closure.

Oral ulcers in children may result from various etiologies. Legeret and Furlano proposed a classification system for pediatric oral ulcers to facilitate accurate diagnosis and appropriate

treatment planning. In this classification, ulcers are categorized based on duration and number. Based on duration, ulcers are classified as acute, chronic, or recurrent; based on number, they are classified as single or multiple lesions [1].

Traumatic ulcers are categorized as acute ulcers, typically presenting as solitary lesions with erythematous borders, flat margins, and a clean base covered by a pseudomembrane [6]. These characteristic features were observed in the current patient (see Figure 2). The prevalence of traumatic ulcers in children ranges from 1.33% to 8.53%, with similar distribution among males and females [8].

Traumatic ulcers result from mucosal damage that extends through the basement membrane and into the underlying connective tissue, exposing nerve endings that produce significant pain upon contact [9]. Pain often leads to difficulty eating or drinking in the initial phase of trauma. In some cases, traumatic ulcers may also impact speech and school attendance, thereby affecting the child's quality of life [10].

The process of ulceration begins with tissue injury, followed by a transitional phase, and subsequently proceeds to healing [11]. The application of topical gel is considered the first-line treatment in cases of traumatic ulcers, as it provides soothing effects and accelerates the healing process. One of the active ingredients commonly used in topical gels is hyaluronic acid, a naturally occurring compound found in the body. Within the oral cavity, hyaluronic acid is naturally present in the gingiva, periodontal ligament, alveolar bone, and cementum [12]. In the present case report, the use of a topical gel containing 0.2% hyaluronic acid combined with 7.5% xylitol was shown to be effective in promoting healing and restoring the gingival structure.

Hyaluronic acid plays a crucial role in modulating the inflammatory response, maintaining tissue hydration, and preventing further mechanical injury. Its chemical structure exists in two forms, low-molecular-weight and high-molecular-weight hyaluronic acid. The low-molecular-weight form penetrates deeper tissue layers, whereas the high-molecular-weight form acts on superficial layers of the wound [13].

Wound healing generally occurs through four phases: hemostasis, phagocytosis, fibroblast migration, and tissue remodeling [7]. Hyaluronic acid actively contributes during the third and fourth phases by enhancing fibroblast migration, cellular proliferation, and keratinocyte re-epithelialization [5] [6].

The healing process initiated by hyaluronic acid begins with tissue nourishment, followed by stimulation of keratinocyte migration and proliferation [12]. The new tissue formed in this phase matures with the addition of proteoglycans, which aid hydration and reduce tissue swelling, leading to pain-free healing [14]. Hyaluronic acid does not possess direct antibacterial properties like chlorhexidine [2], but it compensates through its high viscoelasticity, creating a physical barrier that minimizes microbial penetration into the wound [15].

The topical gel used in this case also contained 7.5% xylitol, a five-carbon sugar alcohol known to inhibit bacterial growth [16]. Xylitol interferes with bacterial adhesion and biofilm formation, thereby increasing oral pH and creating an unfavorable environment for pathogenic bacteria [6]. Other effective topical combinations include hyaluronic acid with polynucleotides. Significant symptom relief by day three of treatment in cases of radiation-induced mucositis using such combinations [17].

The efficacy of topical agents in managing oral ulcers can be evaluated subjectively and objectively. Subjectively, pain severity can be measured using the Visual Analogue Scale (VAS), a horizontal scale from 0 (no pain) to 10 (severe pain). Objectively, assessment is based on the number of lesions, lesion area, and presence of inflammation. As this case involved a single traumatic ulcer, evaluation was based on lesion size, pain intensity, and clinical signs of inflammation, similar to the assessment method used by Kaur et al [6].

At the first visit, the lesion extended over 4 cm from teeth 51 to 61, with a VAS score of 10 and active bleeding. At the second visit, lesion size remained unchanged, but the VAS score decreased to 8, although inflammation had spread. After one week of topical hyaluronic acid application, the lesion persisted, but pain was reduced (VAS 5) with mild inflammation. Two weeks later, gingival tissue began covering the alveolar bone, and the VAS score dropped to 3, with minimal redness. By the fifth visit, two weeks after the previous one, the ulcer was fully covered by new gingival tissue, the VAS score was 0, and only minor erythema remained in isolated areas.

The clinical outcome in this case suggests that hyaluronic acid gel contributed to the healing of a large traumatic ulcer, while also providing comfort to the pediatric patient. No adverse effects or complications were noted during the treatment

period. This supports findings by Ge et al. [18] who confirmed the low cytotoxicity of hyaluronic acid, making it safe for use in pediatric patients. Furthermore, its cooling sensation and lack of flavor increase tolerability among children [19]. According to Yang et al. [10], topical hyaluronic acid does not pose an overdose risk, reinforcing its safety profile in pediatric care. Hyaluronic acid is also available in spray form, making it a suitable option for widespread lesions or patients with burning mouth syndrome [20].

Conclusion

The case demonstrates that topical hyaluronic acid gel is a safe, effective, and well-tolerated treatment for traumatic oral ulcers in children. Its ability to enhance tissue regeneration and improve patient comfort supports its use in pediatric dental practice.

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