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## CASE STUDIES

### A case study of using chlorhexidine gluconate for mouth ulcer care

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#### Abstract

The structure of the basement membrane of the labial mucosa is fragile and susceptible to injury and discomfort. Utilizing mouthwash and topical medications such as corticosteroids, anaesthetics, anti-inflammatories, and chlorhexidine gluconate are methods for alleviating the pain associated with ulcers. This research endeavours to assess the efficacy of 2% chlorhexidine gluconate gauze in treating pediatric oral ulcers. A 5-year-old girl accompanied her mother, who presented with complaints of pain, distended lips, and a disruptive child. Two days prior, it was determined through a clinical evaluation that the children had fallen and struck their heads on the floor. An objective examination of the superior and inferior labial mucosa unveiled numerous yellowish-brown ulcers that measured approximately 5 mm in diameter. These ulcers had brown, crusted margins and exhibited oedema. The children were administered twice daily moistened gauze containing 2% chlorhexidine gluconate. Following treatment, the lesion heals within seven days. With any luck, the research results can be applied to infants afflicted with oral ulcers.

**Keywords:** Mouth ulcers; nursing care; oral health; healthcare team; home treatment

#### Introduction

Traumatic injury is a condition that occurs due to mechanical trauma, such as being accidentally bitten, hit, or injured by an object, and can also occur as a result of falling while playing (Kilichevna & Idievna, 2021). Traumatic injuries can occur at all ages, especially in preschool-aged children. Preschool-age children tend to always want to move and play with their peers (Sari & Mahendra, 2022; Septiani et al., 2016), so the possibility of mechanical trauma increases. The prevalence of child trauma due to falls is around 31.7–64.2% (Goswami & Aggarwal, 2021). Traumatic injuries can occur in the oral mucosa, especially in the labial mucosa (Kilichevna & Idievna, 2021). The labial mucosa is the outermost soft tissue of the oral cavity, which consists of muscles, connective tissue, blood vessels, and nerves (Vodanović, 2016). The basement membrane of the labial mucosa in children has a thin and delicate structure. It is this structure that makes the labial mucosa vulnerable to trauma. Trauma to the labial mucosa can cause hyperemia, edema, epithelial desquamation, erosion, or ulceration, depending on the duration and intensity of the injury (Gafurovich & Kilichevna, 2020).

Ulcers are lesions that are shaped like craters on the skin or oral mucosa. An ulcer is used to describe an open sore on the skin or mucosal tissue that shows gradual disintegration and necrosis of the tissue. Ulcers are deeper than erosions, i.e., a complete loss of the epithelium extending to the basement membrane or into the connective tissue. Ulcers are usually accompanied by pain. The main treatment for ulcers caused by trauma is to remove the cause of the trauma and continue treatment to reduce pain and speed healing (Langlais et al., 2017). Treatments to reduce ulcer pain include using mouthwashes and topical medications. Types of mouthwash or topicals that are often used are corticosteroids, anesthetics, anti-inflammatories, and chlorhexidine gluconate (Langlais et al., 2017; Schemel-suárez et al., 2016). In addition to mouthwash and topical medication, chlorhexidine can be used as a wound or ulcer cleaner. The use of chlorhexidine gluconate for cleaning wounds or ulcers is usually at a concentration of 2%. Chlorhexidine gluconate 2% can be applied to ulcers using a cloth or gauze that has been proven to reduce bacteria (Derde et al., 2012). Each topical drug used for ulcer therapy has its advantages and disadvantages; therefore, it is necessary to

select a topical drug according to the case to get the desired treatment results. The purpose of this paper is to report the use of 2% chlorhexidine gluconate-impregnated gauze for the management of ulcers in children caused by traumatic injuries.

### Case report

A 5-year-old girl came with her mother with complaints of swollen lips, pain, and a fussy child. Based on the results of the alloanamnesis, it was known that two days ago the child fell and hit the floor while playing at school. The wound was cleaned and given corticosteroid topical by the doctor at the school clinic. At home, the child is fussy, doesn't want to eat, and cannot touch his lips. Complete immunization history and have had an anti-tetanus vaccine. The results of the objective examination showed the presence of multiple yellowish-brown white ulcers measuring approximately 5 mm on the superior and inferior labial mucosa with brown crusted edges accompanied by edema (**Figure 1**). At the first visit, case management was accomplished through subjective and objective examinations, as well as treatment. The treatment is to clean the wound using gauze soaked in a 2% chlorhexidine gluconate solution. Parents were instructed to clean the wound area twice a day using gauze soaked in a 2% chlorhexidine gluconate solution. After 7 days, parents are also instructed to maintain the child's oral hygiene and control.



**Figure 1.** Ulcer, edema, and crusta on the labial mucosa

### Results

At the second visit, after 7 days from the first visit, the subjective examination results showed that the child had no pain. Two days after routine cleaning, the lips are no longer swollen, and the child is not fussy and wants to eat. The results of the objective examination revealed that the ulcer was gone and the labial mucosa area had no scars (**Figure 2**). Parents were informed about the outcome of the treatment.



**Figure 2.** The ulcer, edema, and crust have healed.

### Discussion

Traumatic injuries to the mouth and face are common in children. Most of the injuries will involve the teeth and/or supporting structures, which constitute a dental emergency (Sari & Mahendra, 2022). An extra-oral examination of patients with orofacial trauma is performed to check for lacerations, edema, and contusions of the face and lips. An intraoral examination was carried out to check the condition of the teeth and check for lacerations, edema, ulcers, erosion, and bleeding of the mucosa and gingiva. If there is a wound due to trauma, immediate cleaning of blood and

debris must be carried out using moistened gauze, irrigation, or suction (Derde et al., 2012; Gafurovich & Kilichevna, 2020; Langlais et al., 2017; Schemel-suárez et al., 2016; Zaleckiene et al., 2014). In this case, wound cleaning was done immediately after the trauma. The wound cleaning agent used is unknown because the trauma occurred at school and the treatment was carried out at the school clinic. The school clinic doctor gave topical corticosteroids, which were continued by the parents for two days. Topical corticosteroids are the drugs most commonly used for atrophic lesions of the oral mucosa. Topical corticosteroids have been used for more than 50 years to treat oral cavity lesions, but the use of topical corticosteroids still requires more attention (Rudralingam et al., 2017).

Topical corticosteroids mostly act by binding to glucocorticoid receptors, which are expressed on almost all cells. The binding leads to the regulation of genes that function to increase immunity. Topical corticosteroids are given to suppress inflammation and control symptoms, but not for healing (Rudralingam et al., 2017). Topical corticosteroids show increased effectiveness when used in the prodromal phase of ulceration or when lymphocyte activity is maximal (Coondoo et al., 2014). The success of topical corticosteroid administration depends on making an accurate diagnosis, selecting the right drug, selecting the appropriate dosage form, and applying it at the right frequency (Gabros et al., 2022). The use of topical corticosteroids in this case did not produce a maximum effect, as indicated by the child's condition not improving. Edema, ulcers, and crusts on the labial mucosa have not improved after 2 days of use, and the child does not want to eat because of pain. The lack of success in using topical corticosteroids in this case was probably because the ulcer was caused by a traumatic injury in a non-sterile location, so there was a bacterial infection in the ulcer.

Treatment for wounds caused by traumatic injuries is to clean the wound with irrigation or with gauze soaked in an antiseptic solution. A gauze covered with antiseptic fluid can clean debris in hard-to-reach areas. One of the antiseptic liquids that can be used to wet gauze is 2% chlorhexidine gluconate (Saidin et al., 2021). Chlorhexidine gluconate is the most commonly used oral preparation. Chlorhexidine gluconate is water-soluble at physiological pH, easily dissociates, and releases the positively charged chlorhexidine component. The interaction of positively charged molecules and negatively charged phosphate groups on the microbial cell wall will change the osmotic balance of the cell. This condition will increase the permeability of the cell wall, which allows chlorhexidine to penetrate the bacteria. Chlorhexidine gluconate at a concentration of 2% is bactericidal, and sedimentation of the cytoplasmic contents results in cell death (Alamgir, 2017; Saidin et al., 2021). The use of 2% chlorhexidine gluconate for wiping before surgery has been shown to reduce gram-positive bacteria compared to no wiping. Chlorhexidine gluconate (2% concentration) also produces a bactericidal effect on gram-negative bacteria. The application of 2% chlorhexidine gluconate in this case is to use gauze to clean the ulcer area twice a day.

In this case, after 2 days of applying gauze soaked in 2% chlorhexidine gluconate, the complaints were reduced, I was no longer sick, and I wanted to eat. Application of 2% chlorhexidine gluconate with gauze was continued until day 7 for wound healing. The use of 2% chlorhexidine gluconate for bathing in several studies was reported to be able to reduce the presence of infection in surgical wounds. The application of 2% chlorhexidine gluconate with a cloth can reduce wound infection (Derde et al., 2012; Frost et al., 2016; Safdar et al., 2014). Wound healing is a complex, dynamic process that the body undergoes to remove injuries or restore cellular and tissue structures. Wound healing is divided into three phases: inflammation, proliferation, and remodeling. Chlorhexidine gluconate has been shown to accelerate healing by reducing the inflammatory reaction in the first 48 hours. A prolonged inflammatory reaction may result from bacterial colonization and a lack of immunomodulation. Chlorhexidine gluconate enhances the immunomodulation response and acts as an antibacterial. Chlorhexidine gluconate stimulates plasma cell production, induces angiogenesis, and completes the remodeling process seven days after injury and application (Al-Mobeeriek, 2011; da Silveira Teixeira et al., 2019; Rosaline et al., 2020; Samanth & Varghese, 2017). In this case, after seven days of application of 2% chlorhexidine gluconate with gauze, the edema has disappeared, and the ulcers, erosions, and crusts have healed perfectly with no scars.

## **Conclusion**

Chlorhexidine gluconate 2% can be an alternative treatment for labial mucosal ulcers in traumatic children. Chlorhexidine gluconate 2% application is done using gauze. Healthcare professionals working in the hospital can use this treatment to treat ulcers as chlorhexidine gluconate has antibacterial properties. However, further studies are still needed to evaluate this chemical in other types of mouth ulcers.

## **Author's declaration**

The authors made substantial contributions to the conception and design of the study and took responsibility for data analysis, interpretation, and discussion of results. For manuscript preparation, all the authors read and approved the

final version of the paper.

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### **Availability of data and materials**

All data are available from the authors.

### **Competing interests**

The authors declare no competing interest.

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