

Use of Chlorhexidine Bioadhesive Gel to Reduce Infection and Discomfort in Alveolar Bone Graft Wound: A Randomized Pilot Study

Uso de Gel Bioadhesivo de Clorhexidina para Reducir la Infección y el Malestar en la Herida del Injerto Óseo Alveolar: Un Estudio Piloto Aleatorizado

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ABSTRACT: The objective of this study was to analyze the inflammation index, edema, bacterial plaque presence and postoperative discomfort, with the use of chlorhexidine gel. This is a randomized double-blinded pilot study, with 21 unilateral cleft lip and palate individuals, randomized into 2 groups: Test Group (TG), with 7 individuals who used 0.2 % chlorhexidine bioadhesive gel in the surgical wound after the bone graft; and Control Group (CG) with 14 individuals who used a placebo gel as the same way. The gel was applied on the surgical wound suture after alveolar bone graft. The evaluation criteria of the gel application effectiveness were the visual analogue scale (VAS) for pain control and/or discomfort and clinical evaluation of inflammatory condition and/or wound infection. The study showed promising results for postoperatively use of the chlorhexidine gel, although there was no statistically significant difference between the groups.

KEY WORDS: chlorhexidine, dental plaque, bone transplantation.

INTRODUCTION

The surgical wound delayed healing may compromise bone formation in the alveolar bone graft. Thus, some ways of minimizing this effect have been proposed, such as the use of different types of flaps and sutures, use of laser, piezoelectric instruments, and antibiotics both systemic and topical (Corsi *et al.*, 1994; Sortino *et al.*, 2008; Gerbault *et al.*, 2016; Noba *et al.*, 2018).

Among oral antiseptics, 0.2 % chlorhexidine has been shown to be effective in reducing mutans streptococci and has proved to be particularly active against some of the pathogenic periodontal microorganisms (Nimbulkar *et al.*, 2020). In addition, it significantly reduces gingival bleeding rates, as well as dental plaque accumulation (Fonseca *et al.*, 2015). It was also observed the reduction of edema in the

postoperative period of exodontia, when the 0.2 % chlorhexidine bioadhesive gel, applied on the surgical wound, was used in comparison with the control group. The gel allows a greater release of local chlorhexidine and for a longer period of time than the rinse, since it remains in contact with the surgical site (Muñoz-Cámara *et al.*, 2021).

The bactericidal effect of chlorhexidine is due to the binding of its cationic molecule to the microbial wall thus altering the osmotic equilibrium. Also, it is suggested that chlorhexidine inhibited bacterial plaque formation by binding to the anionic acid groups in the salivary glycoproteins, in addition to binding to the salivary bacteria interfering with their adsorption to the tooth (Gunsolley, 2010; Santos *et al.*, 2017; Coelho *et al.*, 2020). Its action is effective against gram-positive

and gram-negative organisms and yeast and its main characteristic is the slow action promoting a prolonged effect (McClure *et al.*, 2007; Madrazo-Jiménez *et al.*, 2016).

The present study aimed to compare the effect of the chlorhexidine gel with a placebo gel on the postoperative alveolar bone graft sutures in patients with cleft lip and palate.

MATERIAL AND METHOD

This is a randomized pilot study conducted at the Hospital for Rehabilitation of Craniofacial Anomalies (HRAC-USP) and was conducted in accordance with the principles of the Declaration of Helsinki and ethical standards on human experimentation with the approval of the Human Research Ethics Committee (CAAE - 20750213.4.0000.5441). The sample included 21 individuals with unilateral transforame fissure, and inclusion criteria were the indication for secondary or tertiary alveolar bone graft, absence of gingival inflammation, keratinized mucosal band of at least 3.0mm in the bone graft region, over 18 years of age and absence of disorders and/or syndromes.

The convenience sample to individuals were randomized by the Excel system (Microsoft Windows®) and divided into 2 groups: test group (TG, 7 individuals), using 0.2 % chlorhexidine gel (Peroxidin Gel Bioadhesive, LACER laboratory), and control group (CG, 14 individuals), who used a gel with the same characteristics of texture, smell and taste, but without chlorhexidine. Both gels were colorless and translucent, the only difference being the presence of chlorhexidine in TG. All patients signed an informed consent form before performing the procedures. All surgeries were performed under general anesthesia and with the classic technique of Boyne and Sands (1972), and the alveolar defect filling was performed with RhBMP (INFUSE® Bone Graft) and all sutures were performed with monocryl 5-0 (Ethicon®). The surgeries in the maxilla were performed by a single professional, with the same surgical technique for cleft median palate closure. In the 24-hour postoperative period, all subjects received analgesic, anti-inflammatory and antibiotic medication.

The gel was packed in 3ml tubes and identified with numbers that corresponded to the individual randomization. Each individual submitted to bone graft

surgery received a tube and was guided and supervised by a sole investigator to apply the gel 3 times a day for 2 consecutive days in the surgical wound on the suture. Both subjects, undergoing surgery and the investigator evaluator, were not aware of the gel being used. The evaluation of the surgical wound was performed in the immediate postoperative period and after two days of surgery, because they are discharged from the hospital, and return to the municipalities where they live, which are usually located far from the hospital, which did not allow the postoperative follow-up for a longer time.

The evaluation criteria used were the visual analogue scale (VAS), with scale in cardboard paper without gradations, only with indication of minimum and maximum pain, for pain and/or discomfort control (Kelly, 2001). The clinical evaluation was performed by a single calibrated professional (Kappa test), for the condition of inflammation and/or infection of the surgical wound. For the clinical evaluation, the following data were considered: local temperature, fluid presence, mucosal staining, dental plaque presence, tensile strength of the thread and wound resistance (Tatarunas *et al.*, 1998). For the results statistical evaluations, the chi-square test was used through the Sigma Stat 10 software (Systat Software 2011).

RESULTS

Among the individuals that participated in the research, it was found that 3/21 (14.28 %) presented fluids in the surgical wound and 4/21 (19.04 %) presented crust, all of them being CG. Regarding healing, 6/7 (85.71 %) TG individuals and 11/14 (78.57 %) CG individuals had good healing. There was presence of inflammation in 3/21 (14.28 %) cases, being 1/7 (14.28 %) of the TG and 2/14 (14.28 %) of the CG. The red color of the mucosa was present in 2/7 (28.57 %) individuals of the TG and 4/14 (28.57 %) of the CG (Table I).

There was no reported pain by any individual in both groups during the use of the bioadhesive gel, possibly due to the use of postoperative analgesics. No pus or wound dehiscence has been reported in any individual.

There was no statistically significant difference in relation to all the parameters evaluated through the Fisher exact test at a significance level of 5 % (p=NS).

Table I. Table of the prevalence of the clinical and subjective parameters evaluated by group.

Groups	Fluids	Crust	Healing	Inflammation	Mucosal Redness	Pus	Pain (VAS)
Control Group (n=14)	3 (21,42 %)	4 (28,57 %)	11 (78,57 %)	2 (14,28 %)	4 (28,57 %)	0 (0 %)	0 (0 %)
Test Group (n=7)	0 (0 %)	0(0 %)	6 (85,71 %)	1 (14,28 %)	2 (28,57 %)	0(0 %)	0(0 %)

VAS= Visual Analogic Scale.

DISCUSSION

The results presented in this pilot study, with respect to the 0.2 % chlorhexidine bioadhesive gel, had no statistical association to prove the efficacy of chlorhexidine when used as a bioadhesive gel. Despite this, and the fact that CG had a sample size twice that of the TG, the results obtained were in favor of the test group, suggesting that the 0.2 % chlorhexidine bioadhesive gel, if used with a larger sample and for a longer time, will have chances of success in the postoperative use, especially when related to the clinical sensation of the researcher involved in this research.

It is believed that these results ($p = NS$) were due to the small sample size and the time of 0.2 % chlorhexidine bioadhesive gel action on the surgical wound, of only 2 days, since in other study, the treatment took place for 7 days (Sáez-Alcaide *et al.*, 2020). This study observed that with the use of chlorhexidine bioadhesive gel in the surgical wound after remove third molars, significant reduction of postoperative pain, trismus and inflammation. The 2-day period was used by limiting the individual's profile, which moves to distant places after the second postoperative day at the Institution where the study was performed.

The beneficial effect of chlorhexidine is recognized in many scientific articles that also prove its efficacy in the oral cavity. As for the bioadhesive form of therapeutic gels was found the prove that the bioadhesive form is more efficient therapy than the mouthwashes solutions for the treatment and prevention of local infections, mainly related to the residence time of the drug in contact with the operative wound, even in a humid environment such as the mouth mucosa (Rubio-Palau *et al.*, 2015).

Other studies also show that the most studied antiseptic rinse for use in the postoperative period, which address the oral cavity is chlorhexidine, and report that its use reduces the rates of alveolar

osteitis from 24.5 % to 80.2 % (Haraji *et al.*, 2013; Rodriguez-Perez *et al.*, 2013). On the other hand, the effect of the 0.2 % chlorhexidine bioadhesive gel showed reductions of 60-70 % in the incidence of alveolar osteitis, which directed the accomplishment of this study with the surgeries of palatal bone grafts (Torres-Lagares *et al.*, 2006a,b; Torres-Lagares *et al.*, 2010; Haraji *et al.*, 2013; Canullo *et al.*, 2020).

Other advantages of bioadhesive gel in relation to rinses in terms of treatment duration involves the reduction of tooth stains and gustatory disorders, common conditions in individuals who use the 0.12 % chlorhexidine solution for a prolonged period (Rubio-Palau *et al.*, 2015).

In this study, the evaluation of pain was through the use of VAS, since studies indicate that it provides a simple and efficient measurement of the pain intensity and, for this reason, it has been widely used in clinical and research laboratories, when a rapid index of pain is required, to which a numerical value may be indicated (Fernandes & Pinho, 2015). In addition, VAS allows pain intensity to be assessed more reliably than the other one-dimensional scales (verbal scale, numerical scale) because it does not establish pre-established values between the extremities. It is also considered by many studies to be an easy method to administer and punctuate and that the patient easily understands by its conceptual simplicity considered that a major disadvantage of this method - VAS - is to consider pain as a one-dimensional experience, analyzing only the pain intensity, disregarding any other aspects of the pain (Kelly, 2001; Miner *et al.*, 2018). Another important fact about VAS is its limitation for patients who have difficulty communicating their pain, such as children, the hearing and visual impaired and patients with cognitive impairment (Holdgate *et al.*, 2003; Mohan *et al.*, 2010; Hawker *et al.*, 2011).

For the clinical evaluation of the inflammation and/or infection aspects, we chose to use the evaluation criteria in the animal model, being the one that most approached the evaluation of the condition that we analyzed in this study. The clinical criteria we found were suggestive that the presence of fluid from the surgical wound was more present in the CG group, indicating that the chlorhexidine bioadhesive gel may have a positive effect on the surgical wounds, but only with the continuity of this study design will be possible to establish this condition of inflammatory aspects reduction.

New researchs should be done using this gel with a large sample and longer exposure time so that it is possible to consolidate the effectiveness of chlorhexidine as a bioadhesive gel and thus be able to establish an accessible and functional protocol to reduce the possibilities of infection and discomfort in the postoperative period.

CONCLUSION

It was concluded that the effect of the 0.2 % chlorhexidine bioadhesive gel application after secondary alveolar bone graft suggested a promising one response and the research protocol could be applied without problems.

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CONFLICT OF INTEREST. Dr. Da Silva Santos reports grants and scholarships in CNPq process nº. 309525/2018-7 during the conduct of the study. The other authors claim there are no conflicts of interest.

ORCINA, B. F.; BATTISTETTI, M. M.; MELLO, M. A. B.; YAEDÚ, R. Y. F. & DA SILVA SANTOS, P. S. Uso de gel bioadhesivo de clorhexidina para reducir la infección y el malestar en la herida del injerto óseo alveolar: un estudio piloto aleatorizado. *Int. J. Odontostomat.*, 16(3):359-363, 2022.

RESUMEN: El objetivo de este estudio fue analizar el índice de inflamación, edema, presencia de placa bacteriana y molestias postoperatorias, con el uso del gel de clorhexidina. Se trata de un estudio piloto aleatorizado,

doble ciego, con 21 individuos con fisura labial y palatina unilateral, aleatorizados en 2 grupos: Grupo Test (GT), con 7 individuos que utilizaron gel bioadhesivo de clorhexidina al 0,2 % en la herida quirúrgica posterior al injerto óseo; y Grupo Control (GC) con 14 individuos que usaron un gel placebo de la misma forma. El gel se aplicó sobre la sutura de la herida quirúrgica después del injerto óseo alveolar. Los criterios de evaluación de la efectividad de la aplicación del gel fueron la escala analógica visual (EVA) para el control del dolor y/o malestar y la evaluación clínica del estado inflamatorio y/o infección de la herida. El estudio mostró resultados positivos para el uso posoperatorio del gel de clorhexidina, aunque no hubo diferencias estadísticamente significativas entre los grupos.

PALABRAS CLAVE: clorhexidina, placa dental, trasplante de huesos.

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