Intra-alveolar chlorhexidine gel for the prevention of dry socket in mandibular third molar surgery. A pilot study

Daniel Torres Lagares [1], Pedro Infante Cossio [2], Jose Luis Gutierrez Perez [3], Manuel Maria Romero Ruiz [4], Manuel Garcia Calderon [2], Maria Angeles Serrera Figallo [5]

(1) Assistant Professor. Oral Surgery
(2) Associated Professor. Oral Surgery
(3) Titular Professor. Oral Surgery
(4) Professor of Master of Oral Surgery
(5) Associated Professor of Oral Medicine. Faculty of Odontology. University of Seville

Correspondence:
Dr. Daniel Torres Lagares
Facultad de Odontología de Sevilla
C/ Avicena s/n 41008 - Sevilla (España)
E-mail: danieltl@us.es

Received: 4-06-2005
Accepted: 2-11-2005

Torres-Lagares D, Infante-Cossio P, Gutierrez-Perez JL, Romero-Ruiz MM, Garcia-Calderon M, Serrera-Figallo MA. Intra-alveolar Chlorhexidine gel for the prevention of dry socket in mandibular third molar surgery. A pilot study. Med Oral Patol Oral Cir Bucal 2006;11: E179-84.

Indexed in:
-Index Medicus / MEDLINE / PubMed
-EMBASE, Excerpta Medica
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ABSTRACT

Purpose: Chlorhexidine is a good prophylactic agent for post-extraction dry socket alveolitis. The bio-adhesive 0.2% chlorhexidine gel could improve this action since its intra-alveolar positioning would allow a more direct action on the alveolus and more prolonged action of the medication.
Materials and Method: We present a single blind, randomised study on 30 patients to evaluate the efficacy of the bio-adhesive 0.2% chlorhexidine gel, placed only once within the alveolus, on the reduction of the incidence of impacted third molar post-extraction dry socket alveolitis and its post-operative effects on patients.
Results. A reduction of 42.65% in the occurrence of alveolitis and a more favourable post-operative period in the experimental group was observed. In the control group, the appearance of alveolitis was 30.76% opposite to 17.64 % in the experimental group.
Conclusions: The bio-adhesive 0.2% chlorhexidine gel, applied only once after the extraction of impacted third molars, seems to be an appropriate option for the reduction of alveolitis. It improves the buccal aperture and oedema in the post-operative period, although further double blind studies with larger samples are necessary.

***Key words**: Alveolar osteitis, dry socket, third molar extraction, chlorhexidine, pilot project.*

RESUMEN

Introducción: La clorhexidina es un buen agente profiláctico de la alveolitis post-extracción. La aparición del gel bioadhesivo conteniendo clorhexidina al 0,2% podría mejorar esta acción. Su colocación intraalveolar permitiría una actuación más directa sobre el alveolo y una actuación más prolongada del fármaco.
Pacientes y método: Presentamos un estudio a simple ciego, randomizado, sobre 30 pacientes, valorando la influencia de la colocación en una sola vez y de forma intraalveolar gel bioadhesivo conteniendo clorhexidina al 0,2% tras la extracción de terceros molares incluidos, en la aparición de alveolitis y en el postoperatorio de los pacientes.
Resultados: Encontramos una reducción del 42,65% en la tasa de alveolitis y un postoperatorio más favorable en el grupo experimental. En el grupo control, la alveolitis apareció en un 30,76% frente a un 17,64 % en el grupo experimental.
Discusión y conclusiones: Tras comparar nuestros datos con otros estudio, pensamos que el gel bioadhesivo de clorhexidina al 0,2%, aplicado en una sola vez de forma intraalveolar parece ser una opción adecuada para la prevención de la alveolitis. Esta actuación mejora la apertura bucal y el edema en el postoperatorio, aunque son necesarios nuevos estudios realizados a doble ciego y con muestras más amplias para confirmar nuestros datos.

***Palabras clave:** Osteitis alveolar, alveolitis seca, extracción de tercer molar, clorhexidina, estudio piloto.*

INTRODUCTION

Dry socket alveolitis is a post-extraction complication which can be defined as a postoperative pain in and around the extraction site, which increases in severity at any time between 1 and 3 days after the extraction accompanied by a partially or totally disintegrated blood clot within the alveolar socket with or without halitosis (1). Its frequency varies from 1% to 70%. The incidence of alveolitis after the extraction of impacted third molars is high, between 20-30% of extractions (2-6).

It may be a self-limiting pain, but it does cause considerable problems in patients. Antibiotics are efficient in the prevention of alveolitis but they are expensive and generate resistances, thus justifying the research of new treatments which will give similar results with less cost and less undesirable effects (7-9). The introduction of 0.2% chlorhexidine in the form of a bio-adhesive gel has opened up new lines of investigation. The presentation of the bio-adhesive gel is such that it could be placed within the alveolus, making it possible to have a more direct action on the alveolus, and prolonging the time of the chlorhexidine treatment, in comparison to mouthwash which has been the pharmaceutical form used in other published clinical studies.

The intention of this paper is to present the data obtained in a pilot study carried out to evaluate the efficacy of the bio-adhesive 0.2% chlorhexidine gel, placed within the alveolus only once, on the reduction of the incidence of dry socket alveolitis after the extraction of impacted third molars and its post-operative influence on patients.

MATERIALS AND METHODS

The study was carried out at the Faculty of Odontology of the University of Seville (Spain). The design of the investigation work consisted of a pilot study on 30 patients carried out using methods for a prospective, parallel, single blind clinical trial. The medication and the doses studied were 10ml of gel containing 0.2% chlorhexidine digluconate and administered topically (intra-alveolar) versus a control treatment which consisted of not administrating any intra-alveolar medication. The principles of the Helsinki Declaration were followed and informed consent has been obtained.

The subjects studied were patients of both sexes, included consecutively, between 18 and 60 years, who presented with one or two lower impacted wisdom teeth with a difficulty index of between 4 and 7 on a scale of 0 to 10 according to Koerner (10), who had no symptoms ten days presurgery, and its extraction was indicated. The exclusion criteria for this study were the following: patients with contra-indications for intervention, patients with AIDS; smoking patients; immuno-depressed; pregnancy or women in the lactating period or using oral contraceptives; allergy to chlorhexidine, lidocaine or paracetamol; patients who required the extraction of two wisdom teeth at once, with any bone pathology or had ingested any medication 4 days before the operation.

The independent variable was the placing or not of the bio-adhesive gel containing 0.2% chlorhexidine in the alveolus after the extraction of the impacted wisdom tooth. The extraction was carried out following the same technique: anaesthesia with two cartridges of 2% lidocaine combined with epinephrine, in the lower alveolar nerve and lingual nerve at the level of the spine of Spyx and the buccal nerve, at the level of the bottom of the vestibule. A bayonet incision was performed, osteotomy of the bone and when it was necessary dental section was carried out before its extraction. After curettage of the alveolus, an envelope was opened, in which it indicated whether the patient should receive the bio-adhesive gel or not. The aforementioned allocation into one group or another was carried out by computer before the start of the study. The patients were not told whether they received the bio-adhesive gel or not (single blind).

All the patients took, as post-operative treatment, 14.05mg codeine phosphate and 500mg of paracetamol on demand, the number of pills taken each day during the first week were registered in the data collection notebook. Before the intervention, the buccal aperture and the pain with which the patient presented were registered on a verbal scale of 1 to 5. On the third and the seventh post-operative day the buccal aperture was measured again (with a gauge). Facial edema as well as the pain was evaluated daily on a visual analogue scale (VAS) of 0 to 100mm during the first week post-operative. We made a metric register of the edema, marking on the face of the patient the following points: mandibular angle, lateral cantus, base of the nasal wing, nasal commissures and pogonion on the side of the intervention. Taking the mandibular angle as a reference, we measured the distance between this point and the rest of the marks (11). The sum of all the measures was the facial size for that day. This measurement was carried out before the surgical procedure and the third and last day of follow up. The main variable was evaluated as, whether post-operative alveolitis appeared or not, using the diagnostic criteria specified by Blum (1): postoperative pain in and around the extraction site, which increases in severity at any time between 1 and 3 days after the extraction accompanied by a partially or totally disintegrated blood clot within the alveolar socket with or without halitosis. The tolerance to the treatment, on a verbal scale of one to five, was also evaluated.

The chi squared test was applied for the comparison of the proportions and the Student t test for the comparison of the means between the two groups.

RESULTS

The control group consisted of 13 patients, with 17 in the experimental group. All completed the protocol. There were 30 impacted wisdom tooth extractions (14 left and 16 right) from September to December 2001. The mean age of the sample was 27.8 years (Standard Deviation, SD = 8.63 years), and 21 women and 9 men were treated. The mean difficulty was 5.23 (SD = 1.07) using the Koerner scale (10). There were no significant differences between the difficulty of the

extractions in the control and experimental group. The data as regards sex, mean age, right and left lower wisdom tooth and difficulty by group are shown in Table 1. No significant differences were found between the two groups, before treatment, as regards facial size, pain and buccal aperture.

In relation to the incidence of alveolitis –the primary aim of this study-, we detected the appearance of 4 cases of alveolitis (30.76%), whilst in the experimental group, 3 (17.64%) were found (no statistically significant difference, power of test of 13.57%).

The data referring to the pain suffered by the patients in the first week post-operative and the mean of the number of tablets taken each day did not produce any significant differences (Tables 1 and 2, Figure 1). The data regarding the buccal aperture and the facial size on the third and the eighth day post-operative are seen in Table 3. The data as regards the facial edema in the first week post-operative are shown in Table 2 and in Figure 1. No adverse effects were presented and the patients adequately tolerated the treatment carried out (Table 3).

	Sex		**Mean age**	**Tooth extracted**		**Difficulty**	**Facial size**	**Pain (0 to 100 mm)**	**Buccal aperture**
	Male	**Female**		**38**	**48**				
Experimental Group	5	12	29years (SD = 10,24 years)	6	11	5,17 (SD =1,18)	423,41 mm (SD = 36,55 mm)	1,18 mm (SD = 0,72 mm)	46,05 mm (SD =6,19 mm)
Control Group	4	9	26,3 years (SD= 5,96 years)	8	5	5,30 (SD =0,94)	428,85 mm (SD = 22,99 mm)	1,81 mm (SD = 1,31 mm)	47,07 mm (SD = 6,46 mm)

Table 1. Data relative to sex, mean age, tooth extracted, difficulty of extraction, facial size, pain (VAS) and buccal aperture before treatment, by groups. (SD=Standard Deviation)

	Pain (0 to 100 mm)							
	6 hours after extraction	**2º day after extraction**	**3º day after extraction**	**4º day after extraction**	**5º day after extraction**	**6º day after extraction**	**7º day after extraction**	**8º day after extraction**
Experimental group	58,08 mm (SD 34,6 mm)	38,63 mm (SD 24,77 mm)	38,77 mm (SD 22,03 mm)	30,41 mm (SD 26,30 mm)	23,53 mm (SD 28,03 mm)	16,98 mm (SD 27,27 mm)	8,82 mm (SD 14,01 mm)	2,14 mm (SD 3,70 mm)
Control group	46,15 mm (SD 38,42 mm)	29,02 mm (SD 20,07 mm)	31,64 mm (SD 24,79 mm)	23,08 mm (SD 18,4 mm)	25,96 mm (SD 22,4 mm)	26,05 mm (SD 30,23 mm)	22,29 mm (SD 29,25 mm)	11,98 mm (SD 18,34 mm)
	Edema (0 to 100 mm)							
	2º day after extraction	3º day after extraction	4º day after extraction	5º day after extraction	6º day after extraction	7º day after extraction *	8º day after extraction*	
Experimental group	56,35 mm (SD 30,67 mm)	49,46 mm (SD 31,58 mm)	37,97 mm (SD 29,17 mm)	24,13 mm (SD 25,58 mm)	14,37 mm (SD 23,44 mm)	3,81 mm (SD 4,82 mm)	1,14 mm (SD 1,55 mm)	
Control group	48,86 mm (SD 25,67 mm)	48,33 mm (SD 28,94 mm)	29,11 mm (SD 25,83 mm)	20,37 mm (SD 16,94 mm)	17,31 mm (SD 19,68 mm)	11,10 mm (SD 13,99 mm)	6,12 mm (SD 10,13 mm)	

Table 2. The pain and edema data in the first week post-operative (VAS scale). (SD=Standard Deviation) (*=statistically significant difference; $p < 0.05$; Student t).

	Tolerance (1 to 5)	Facial Size		Buccal aperture		Pills/Day
		3º day after extraction	8º day after extraction	3º day after extraction	8º day after extraction	
Experimental Group	1,41 (SD = 0,79)	463,17 mm (SD = 35,02 mm)	442,76 mm (SD = 38,73 mm)	34,00 mm (SD = 11,29 mm)	39,00 mm (SD = 8,69 mm)	1,89 pills / day (SD = 1,10)
Control Group	1,38 (SD = 0,50)	454,23 mm (SD = 23,95 mm)	457,46 mm (SD = 24,97 mm)	27,61 mm (SD = 11,26 mm)	36,00 mm (SD = 13,01 mm)	2,13 pills / day (SD = 1,14)

Table 3. Data of facial size and buccal aperture on the third and last day of follow up, as well as the number of analgesic pills taken per day and tolerance to the treatment carried out (verbal scale of 1 (totally tolerable) to 5 (totally intolerable). (SD=Standard Deviation)

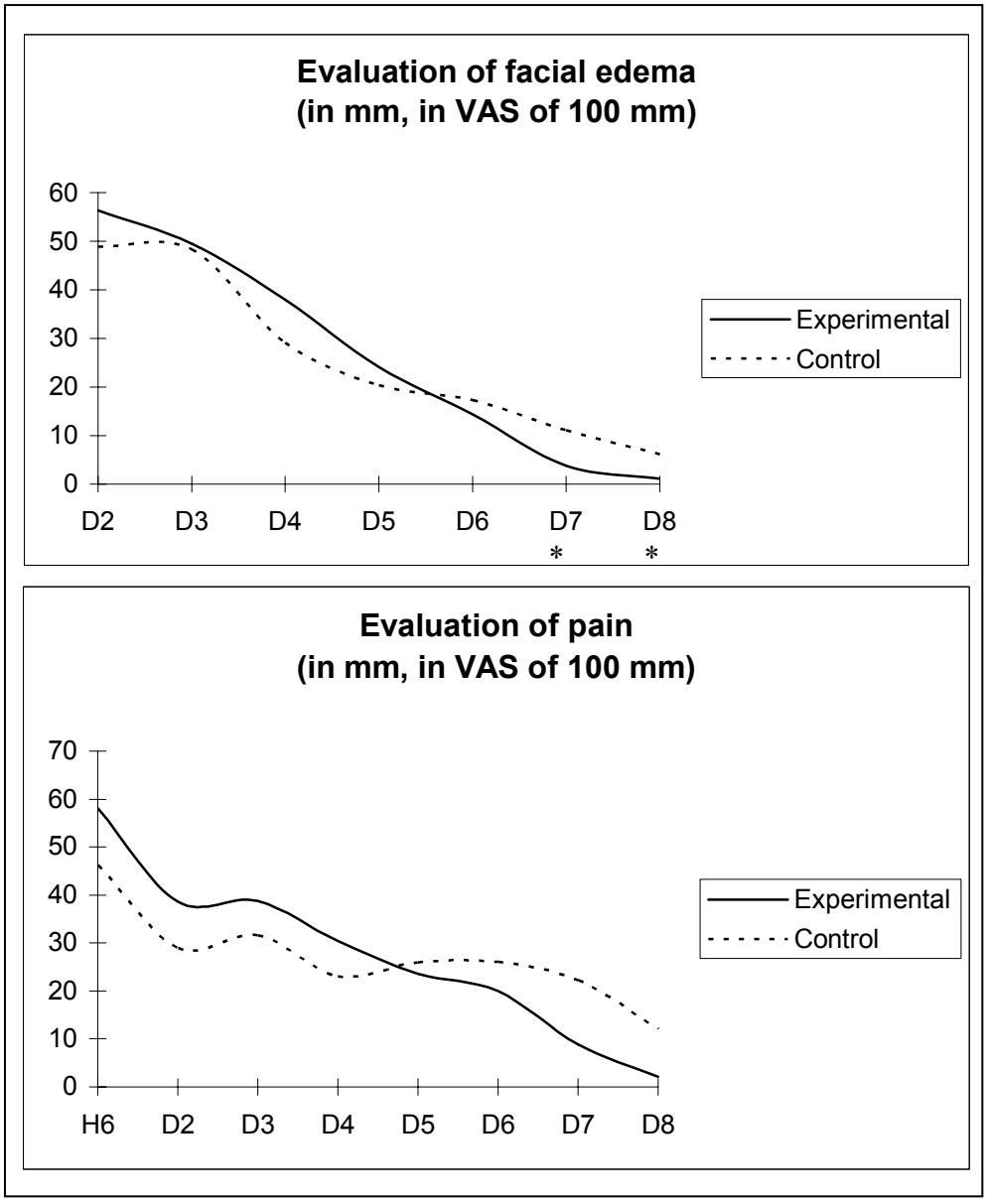

Fig. 1. Graph of the pain and oedema data in the first week post-operative. * = statistically significant difference ($p<0.05$).

DISCUSSION

The etiology of alveolitis is not known, therefore its prevention is fundamental. Different etiopathological theories exist, the main ones being fibrinolytic and bacterial (2-6, 12). Numerous medications have been used in its prevention. Anti-fibrinolytic agents, saline mouthwashes (7,13), tranquiliser dressings (14) and polylactic acid (15), have been applied with some success. However, the most effective have been the antiseptics and antibiotics, especially tetracycline, both systemically and locally (8,9). Despite the fact that some antibiotics produce a decrease in the incidence of alveolitis, their high cost, their significant side effects and the possibility of generating resistances limit their use. Among the antiseptics, chlorhexidine has shown to be a good prophylactic agent of dry socket alveolitis. In a study carried out by Ragno and Szkutnik (4), 0.2% chlorhexidine digluconate mouthwash produced a reduction of alveolar osteitis after extraction of impacted third molars (17.5% as opposed to 36% in a control group).

In the literature there is no published clinical trial similar to ours which has used the chlorhexidine bio-adhesive gel placed in the alveolus as a study drug for the prevention of alveolitis after the extraction of impacted third molars. Therefore, we can only compare our study with other trials of other products and other presentations of chlorhexidine. Neither have we found articles with which to compare our buccal aperture, facial size and complexity of extraction data.

The number of patients studied, although very small to find statistically significant differences, is sufficient to draw conclusions, although only in a preliminary manner, pending studies with much larger series. In other published studies the numbers of patients included were between 20 and 67 per group, as opposed to 13 and 17 in this study (2-4,16,17). The mean age of our patients was 27.8 years. Other studies have a mean patient age of studied patients less than in our study (17-19). With respect to the proportion of males and females (30% men – 70% women), other studies also refer to a proportion of 1:2 in favour of women (17-19). Others were found were both sexes were balanced (3,16,20). We did not control tobacco nor oral contraceptives use in our patients, but these variables will have to be taken into account in next works.

The incidence of alveolitis was low in the experimental group, which was clinically significant in respect to the control group (reduction of 42.65%). Delibalsi *et al.* (16) found similar percentages of alveolitis using mouthwashes of saline and 0.2% chlorhexidine (20.9% versus 23.7%). The percentage found when a mouthwash of chlorhexidine with amoxicillin-clavulanate was 8.9%. In the study by Berwick and Lessin (2) they found no differences in the incidence of alveolitis in the groups under study (chlorhexidine 0.12% and cetylpyridium 0.05%).

Larsen (3) found 16% of alveolitis in the control group (placebo), whilst 8% was obtained in the experimental group (mouthwash with 0.12% chlorhexidine for one week post-extraction). Ragno and Szkutnik (4) obtained a reduction of 50 % using the same study groups. Bonine (18) and Hermesch *et al* (19), also found reductions in alveolitis of around 50% using 0.12% chlorhexidine mouthwashes. These reductions are slightly higher than those found in our study (42.65%).

We have found no significant differences in respect to facial size, although we did detect statistically significant differences in facial oedema in the last days of the follow up (Table 2). This concurred with other authors who referred to a better recovery in the experimental group (21-23), although in their studies this improvement was more significant. Perhaps the form of application or the fact that the medication was deposited more than once could be the explanation.

In respect to the buccal aperture and pain experienced, no significant differences were found. No secondary effects were seen that had been referred to in other similar studies (16). Nor was any adverse effect detected.

In summary, the data presented indicates that the bio-adhesive gel containing 0.2% chlorhexidine, applied only once, post-extraction in the alveolus, decreased alveolitis in a percentage similar to that achieved in other studies (2,16,18,20,24). The use of the experimental treatment produced a better patient recovery, especially with reference to the buccal aperture and post-extraction edema. Unfortunately, the sample size and the lack of statistical differences limit the conclusions that could reach this study. In this respect, this preliminary data should be corroborated by further studies applying a double blind protocol and a larger sample size.

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