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Original Article

The comparison of the efficacy of Alveogyl, 0.8% Hyaluronic acid, and 0.2% Chlorhexidine Digluconate in alveolar osteitis

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Abstract

Aim: The aim of this study was to compare the efficacy of Alveogyl, 0.8% hyaluronic acid (HA), and 0.2% chlorhexidine digluconate (CHX) gel in reducing pain and improving clinical signs and symptoms of alveolar osteitis.

Methodology: The clinical data of patients treated for alveolar osteitis between 01/01/2015 and 01/01/2019 were retrieved for this study. All patients were initially treated by curettage and physiological saline irrigation. Patients were then divided into 4 groups. Group 1 was considered the control group; no other biomaterials were administered after curettage and physiological saline irrigation. All other groups were administered an additional treatment in the socket after curettage and physiological saline irrigation (Group 1 – Alveogyl; Group 2 - 0.8% HA; Group 3 - 0.2% CHX). Patients were evaluated before surgery as well as days 3 and 7 after surgery. The postoperative evaluations included: Visual analog scale (VAS) pain scores, the presence of clinical signs and symptoms of exposed alveolar bone, disorganized blood clots, inflammation around the socket, and bad odor and taste.

Results: Sixty-seven patients were included in the study. There was no statistically significant difference between groups in all control evaluations ($p>0.05$). There was significantly reduced inflammation around the extraction socket on postoperative day 7 in the CHX group compared to that in the control group ($p<0.05$). No other significant changes in clinical signs and symptoms were observed among groups.

Conclusion: There was no significant difference between curettage with physiological saline irrigation alone and the addition of Alveogyl, 0.8% HA, or 0.2% CHX in the reduction of pain in alveolar osteitis. Nonetheless, CHX may reduce inflammation around the extraction sockets.

Keywords: Alveolar osteitis, Chlorhexidine Digluconate, dry socket, Hyaluronic acid

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Introduction

Alveolar osteitis is an inflammatory process characterized by disorganized or lack of fibrin clot in the tooth extraction socket. Contributing symptoms include irradiating pain on the ipsilateral face region, bad breath, inflammatory changes around the alveolus, and regional lymphadenopathy (1,2). It is more frequently seen after surgical dental extractions

(rather than regular non-surgical extractions) and mostly following mandibular third molar extractions (2-4). The diagnosis of alveolar osteitis is made by the presence of severe pain at the site of extraction, which generally occurs 1 to 3 days after tooth extraction. To date, the etiopathogenesis has not been fully defined.

The suggested treatment of alveolar osteitis is surgical curettage of the disorganized blood clot and removal of debris accumulated in the socket under local anesthesia (2). Almost half of the patients with alveolar osteitis visit outpatient clinics several times for necessary intervention, which is time-consuming and cost-intensive (1,5). Several local medications and biomaterials such as Alveogyl, SaliCept, topical antibiotics and anesthetics, CHX, and platelet-rich plasma have been used to accelerate tissue healing in post-extraction sockets (6-10). These biomaterials were successful in varying degrees, but further research is required to fully understand the potential benefits of biomaterials in the treatment of alveolar osteitis.

Our study investigated the efficacy of biomaterials in the treatment of alveolar osteitis. The null hypothesis was no difference in pain and clinical signs and symptoms between patients that did not receive biomaterial treatment (Group 1, control) and those treated with Alveogyl (Group 2), 0.8% HA gel (Group 3), and 0.2% CHX (Group 4).

Materials and Methods

The study was approved by the local clinical ethics committee with submission number 2019-115 and performed in accordance with the Helsinki declaration and its amendments. Data from patients with a diagnosis of alveolar osteitis and subsequently treated between 01/01/2015 and 01/01/2019 were included in this study. The inclusion criteria were: 1) availability of clinical data, complete with follow-up records including pain scale and intraoral examination data on preoperative day 1 and postoperative days 3 and 7 after diagnosis of alveolar osteitis, 2) patients older than 18 years without any systemic diseases, 3) patients initially treated with surgical curettage and physiological saline followed by either no biomaterial treatment, Alveogyl, 0.8% HA gel, or 0.2% CHX gel. Exclusion criteria for the study were: 1) patients who had metabolic diseases or are under chemotherapeutic or other medication for any systemic diseases and 2) patients who used any kind of therapeutic systemic antimicrobials for alveolar osteitis treatment.

The control group (Group 1) consisted of patients treated with a standard procedure of gentle curettage of the infected alveolar socket under local anesthesia (40 mg articaine hydrochloride + 0.012 mg epinephrine hydrochloride) followed by physiologic saline irrigation. Group 2 consisted of patients treated with curettage followed by saline irrigation with an additional Alveogyl (Septodent Inc, Wilmington, USA) placed in the post-extraction socket. Group 3 consisted of patients treated with curettage followed by saline irrigation with an additional 0.8% HA gel (Gengigel®, Ricerfarma s.r.l., London, UK) placed in the post-extraction socket. Group 4 consisted of patients treated with curettage followed by saline irrigation with an additional 0.2% CHX gel (Plak gel®, Polifarma Benessere s.r.l., Rome, Italy) placed in the post-extraction socket. Alveogyl was inserted in the sockets as one or two pieces of tiny strings. In groups 3 and 4 respectively, 0.3 mL of the gel form of hyaluronic acid and CHX were applied into the socket with a dental injector with a disposable delivery tip (Fig. 1). In all study groups, patients were instructed to be careful when eating and avoid chewing on the affected region of the jaw.

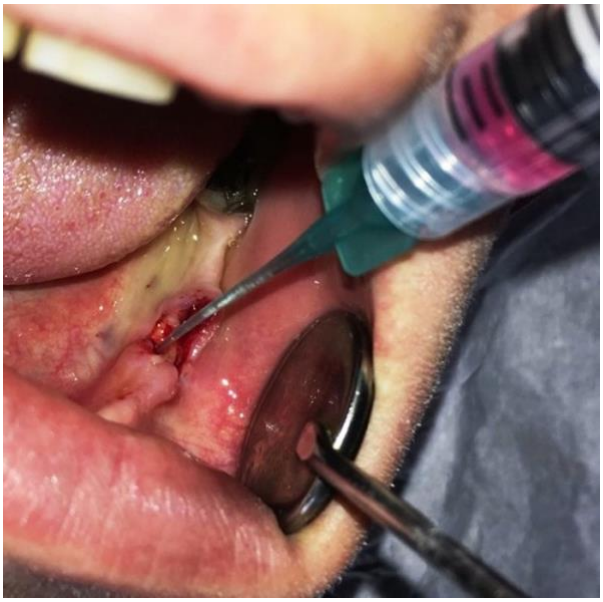


Figure 1. Gel form of hyaluronic acid and chlorhexidine digluconate was applied into the infected socket with a dental injector with a disposable delivery tip.

A pain score ranging from 1 to 10 on a VAS was taken from patients. Clinical signs and symptoms, including exposed alveolar bone at the site of the alveolar osteitis, disorganized discolored blood clot in the post-extraction socket, inflammation around the post-extraction socket, and bad odor and unpleasant taste were recorded in the intraoral examination at the preoperative day 1 and postoperative days 3 and 7.

Exposed bone observed in or around the socket was determined as exposed alveolar bone. A disorganized blood clot was defined as an inadequate blood clot that looks discolored and grimy in appearance in the post-extraction socket. Sockets that did not have any blood clots (dry socket) were also classified as a disorganized blood clots. Inflammation around the socket was determined by the presence of redness, sensitivity to palpation, and increase in heat during visual inspection and bidigital palpation of the gingival and the mucosal tissue around the extraction socket. The presence of a bad odor and an unpleasant taste was subjectively established by asking the patient whether he or she had bad breath or taste issues during the treatment process. The adverse effects of the biomaterials used were also recorded.

Statistical analysis

SPSS version 21.0 statistical software (IBM SPSS Inc., Armonk, NY, USA) was used for statistical analysis. Two-way repeated-measures ANOVA with one-factor repetition were used to compare the pain scores between groups and Pearson Exact Chi-Square analysis was used to compare the clinical signs and symptoms between groups. The Tukey-Kramer test was used for Post-Hoc analysis. $p<0.05$ was considered statistically significant.

Results

Sixty-seven patients were selected according to the abovementioned inclusion criteria. The mean age was 37.5±11.7 years. Sixteen patients were male, and fifty-one were female. There were 15, 17, 17, and 18 patients in groups 1, 2, 3, and 4, respectively. No side effects were caused by the biomaterials used in post-extraction sockets were observed.

There was no statistically significant difference in VAS scores between all groups ($p>0.05$). There were significant differences over time in all groups (Table 1) ($p<0.05$). The distribution of VAS scores between groups is shown in Graphic 1. There was significantly reduced inflammation around the socket on postoperative day 7 in the CHX group compared to that in the control group ($p<0.05$). No other significant changes in clinical signs and symptoms were observed among groups. All groups had a reduction in pain scores over time when compared to preoperative day 1 evaluation (Table 2).

Table 1. Mean values of pain scores acquired with VAS. P values on the column show the statistical significance of mean pain levels between follow-up controls. P values on the line demonstrate the statistical significance between groups

		Follow-up (Mean±SD)			
		a:1st day	b:3rd Day	c:7th day	p
Groups	1	7±1.6	5.73±1.94	2.40±3.15	a-b:<0.018* a-c:<0.001* b-c:<0.001 *
	2	7.06±1.85	4.41±2.23	1.35±1.7	a-b:<0.001* a-c:<0.001* b-c:<0.001*
	3	6.82±1.55	5.59±2.59	1.59±1.37	a-b:0.014* a-c:<0.001* b-c:<0.001*
	4	6.67±1.49	4±2.95	1.56±2	a-b:<0.001* a-c:<0.001 * b-c:<0.001*
	p	1-2:0.919 1-3:0.761 1-4:0.561 2-3:0.675 2-4:0.480 3-4:0.777	1-2:0.138 1-3:0.870 1-4:0.050 2-3:0.172 2-4:0.626 3-4:0.063	1-2:0.172 1-3:0.288 1-4:0.263 2-3: 0.749 2-4:0.780 3-4:0.964	

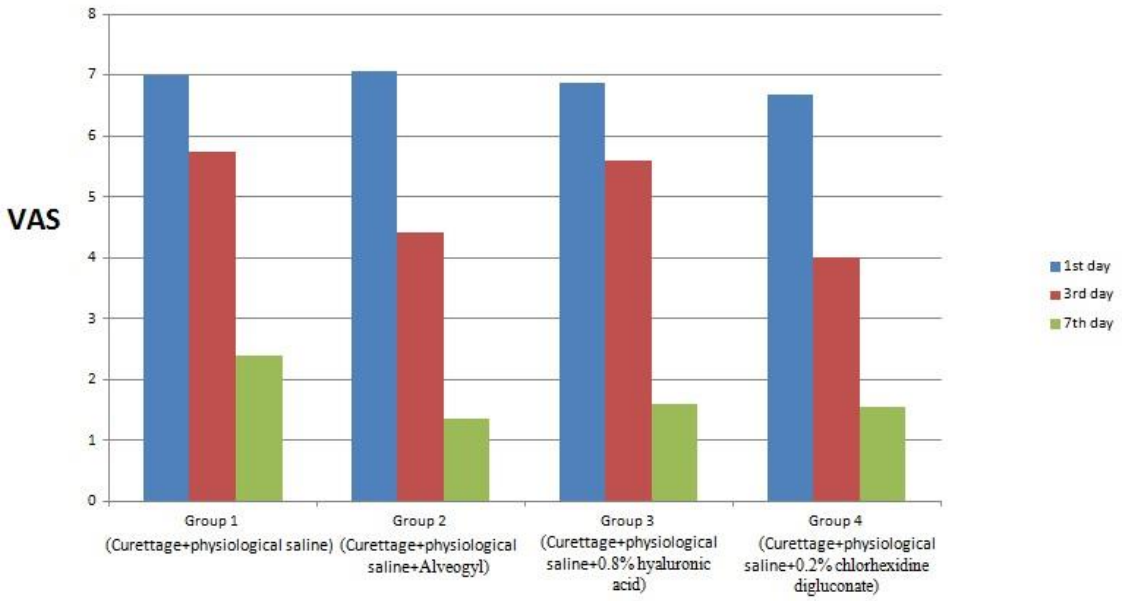
*p<0.05 was considered statistically significant

Group 1. Curettage with physiological saline, **Group 2.** Curettage with physiological saline and Alveogyl, **Group 3.** Curettage with physiological saline and 0.8% hyaluronic acid, **Group 4.** Curettage with physiological saline and 0.2% chlorhexidine digluconate.

Table 2. The clinical signs and symptoms were reduced for all individuals. Data were recorded at the time of intraoral examinations on preoperative 1st and postoperative 3rd and 7th-day follow-up controls.

Study Groups (N)	Follow-up	Exposed Bone (N)	Disorganized Clot (N)	Inflammation Around Socket (N)	Malodor and Unpleasant Taste (N)
Group 1 (15)	1st day	9	6	12	12
	3rd day	7	4	12	9
	7th day	-	1	7	5
Group 2 (17)	1st day	7	10	14	8
	3rd day	5	1	13	7
	7th day	2	-	4	3
Group 3 (17)	1st day	9	9	16	13
	3rd day	5	5	13	10
	7th day	2	1	3	3
Group 4 (18)	1st day	8	12	16	10
	3rd day	3	2	13	6
	7th day	-	0	1	3

Group 1. Curettage with physiological saline, **Group 2.** Curettage with physiological saline and Alveogyl, **Group 3.** Curettage with physiological saline and 0.8% hyaluronic acid, **Group 4.** Curettage with physiological saline and 0.2% Chlorhexidine Digluconate



Graphic 1. Pain scores obtained by VAS for all groups at preoperative day 1 and postoperative days 3 and 7

Discussion

Several contributing factors that impair the hosts' response to traumatic effects and bacterial elements and compromise the clinician's extraction skills were defined in the etiology of alveolar osteitis (3). It is characterized by severe, excruciating pain and is the most common complication seen after tooth extraction. For this reason, fast treatment of alveolar osteitis is important to reduce patient agitation and pain.

CHX is a gold standard antiseptic molecule that is safely used to control bacterial plaque and the harmful bacterial milieu in oral and periodontal infections. Both rinse and gel forms of CHX have frequently been used in the treatment and prevention of alveolar osteitis (11). Generally, a prophylactic approach is accepted to prevent the occurrence of alveolar osteitis (3). It is reported that the use of the gel form is more advantageous than the rinse form because the gel form slowly releases CHX and provides easy handling and direct installation in the socket (12). In the prospective study of Hita-Iglesias et al. (11), gel and mouthwash forms of CHX were administered to patients after the third molar teeth were extracted under local anesthesia. The bioadhesive gel form of 0.2% CHX is more successful in decreasing the incidence of alveolar osteitis after third molar extraction. Torres-Lagares et al. (7) reported that 0.2% CHX bioadhesive gel may reduce the incidence of alveolar osteitis when applied in the extraction socket after third molar extraction. In the meta-analysis conducted by Daly et al. (1), it was suggested that there is moderate evidence of the beneficiary effect of CHX gel in the post-extraction sockets in the treatment of alveolar osteitis.

The current study is not consistent with these literature findings. No significant change was found in pain scores among groups. Additionally, there were no significant changes in the clinical signs and symptoms between patients treated with CHX and other biomaterials, except the inflammatory changes around the extraction socket seven days after treatment compared to patients without any additional biomaterial used in surgery. This may be due to the antimicrobial effect of CHX, causing a reduction in the bacterial load of the post-extraction socket and subsequently suppressing inflammation in the adjacent mucosal and gingival tissue.

HA is a linear polysaccharide that plays an integral part in the human dermis and connective tissue. The function of HA is to facilitate the elastoviscous environment for the suspension of cells and tissue elements and aid tissue healing by promoting activation of inflammatory cells and basal keratinocytes (13,14). HA has frequently been used with relative success in clinical medicine. HA preparations are used as dermal fillers in dermatology (15), as tissue healing accelerators in radiodermatitis treatment (16), and in the treatment of oral inflammatory lesions (17). There are conflicting results of the healing effect of HA on alveolar osteitis. Dubovina et al. (18) reported that 0.8% HA gel significantly reduces the signs and symptoms of alveolar osteitis compared to Alveogyl. Afat et al. (19) reported that L-PRF combined with HA may be effective to prevent post-extraction infection and alveolar osteitis in mandibular third molars. On the other hand, in a randomized clinical trial by Bayoumi et al. (20), it was reported that HA administration after tooth extraction does not affect the occurrence of alveolar osteitis or alleviate postoperative pain effectively when compared to a control group. Similarly, Guazzo et al. (21) reported that usage of an amino acid and sodium hyaluronate gel after a third molar extraction shows no statistical difference in pain and alveolar osteitis when compared to a control group. Similarly, our current study showed no significant difference in pain scores and clinical signs and symptoms of alveolar osteitis between HA and other biomaterials and the control group

Alveogyl is an antiseptic material that is composed of iodoform, butyl para aminobenzoate, and eugenol. It is commonly used in the treatment of alveolar osteitis. Alveogyl dissolves slowly in the extraction socket and inhibits the sensory conduit of pain receptors by preventing the production of pain mediators (22). It also provides a barrier between the oral region and the exposed bone. There are conflicting results regarding the efficacy of Alveogyl in the treatment of alveolar osteitis. It has been suggested that Alveogyl is more effective in relieving pain when compared to zinc oxide eugenol and neocone (an antimicrobial pack) (23). Further, Dutt (24) reported that Alveogyl is more effective in controlling pain when compared to CHX gel. On the contrary, Chaurasia et al. (25) reported that zinc oxide eugenol paste provides more effective pain relief than Alveogyl in the management of alveolar osteitis. Kaya et al. (6) reported that low-level laser therapy (used with parameters of 808 nm wavelength, 100 mW power output, and 173.3 mW/cm^2 irradiance) is superior to Alveogyl and SaliCept patch in the treatment of alveolar osteitis. In the current study, Alveogyl showed no significant change in the pain and clinical signs and symptoms compared to 0.8% HA, 0.2% CHX, and even to the use of no biomaterial. This finding is interesting and may be a result of the relatively short follow-up period and small sample size due to the retrospective fashion of the study.

Conclusions

In conclusion, there was no superiority between curettage with physiological saline irrigation in isolation and the addition of Alveogyl, 0.8% HA, or 0.02% CHX in the reduction of pain in alveolar osteitis. CHX may improve the inflammatory changes around the socket after seven days. The results of our retrospective study show that the efficacy of curettage with physiological saline irrigation may not be enhanced with the use of biomaterials Alveogyl, 0.8% HA, and 0.02% CHX in the treatment of alveolar osteitis. Further prospective studies with larger sample sizes may better explain the efficacy of these biomaterials in the treatment of alveolar osteitis.

Ethical Approval: Ethics committee approval was received for this study from Eskişehir Osmangazi University local clinical ethics committee in accordance with the World Medical Association Declaration of Helsinki, with the approval number: 2019/115.

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

Peer-review: Externally peer-reviewed.

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Conflict of Interest: No conflict of interest was declared by the authors.

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