



EVALUATION OF CHLORHEXIDINE GEL COMBINED WITH PLATELET-RICH FIBRIN “PRF” IN REDUCING ALVEOLAR OSTEITIS AFTER REMOVAL OF IMPACTED MANDIBULAR THIRD MOLAR

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ABSTRACT

Objectives: To evaluate the effect of chlorhexidine gel combined with platelet-rich fibrin “PRF” in reducing alveolar osteitis after removal of impacted mandibular third molar. **Subjects and methods:** Forty two patients were divided randomly into three groups: Group A: the socket received 0.2% CHX gel and PRF. Group B: the sockets received PRF only. Group C (control): the sockets did not receive any treatment. Follow up: 2, 7 and 15 days post-operative for evaluating alveolar osteitis, pain, facial swelling, mouth opening and wound healing. **Results:** At the present study, reduction of alveolar osteitis incidence in group A in comparison to group B (7.6%) and group C (30.7%). There were significant reduction in pain between groups in 2 days and 7 days. There was no difference in facial swelling, maximum mouth opening. Follow up: after 3 months for evaluating bone density at the site of extraction and the result were increase in bone density in group A and group B in comparison to group C. **Conclusion:** Chlorhexidine gel combined with platelet-rich fibrin “PRF” reduce pain and decrease the incidence of AO.

KEYWORDS: Impacted mandibular third molar, alveolar osteitis, PRF, chlorhexidine.

INTRODUCTION

Alveolar osteitis (AO) or dry socket is one of the most common postoperative complications following surgical tooth extractions and its prevention is more effective than its treatment ⁽¹⁾. It is a painful condition occur when the blood clot at the site of the tooth extraction fails to develop, the incidence of AO was reported to be 3–4% and its value may be extended to 45% especially during the extraction of an impacted mandibular tooth due to a more restrictive blood supply compared to maxillary ⁽²⁾.

AO starts usually at first to third day after surgery with severe as well as progressive pain, regional lymphadenitis, halitosis, and foul taste. AO usually associated with significant morbidity for patients, as well as cost implications for patients and dentists ^(3,4).

AO is characterized by severe throbbing pain that will intensify between the second and fourth post-surgical days ^(5,6).

Various risk factors have been identified in the development of AO including smoking, age,

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gender, oral contraceptives⁽⁷⁻¹¹⁾, preoperative infection, amount of trauma during surgery, difficulty of surgery, surgeon experience, and amount of socket irrigation⁽¹²⁻¹⁶⁾.

Different protocols have been developed to inhibit the development of AO including anti-fibrinolytic agents, clot support agents, local antibiotics, steroidal anti-inflammatory drugs, systemic antibiotic prescription, chlorhexidine (CHX) mouthwash, CHX gel, and platelet rich fibrin (PRF) application with different positive results⁽¹⁷⁻²⁰⁾. PRF is considered as the second generation of platelet concentrates. While PRF contains various immune cells and cytokines, its structural strength provides its possibility to use as a membrane and a wound cover as well as to improve the healing process⁽²⁰⁾. PRF has been successfully used in management of periodontal diseases, bone augmentation, angiogenesis, and plastic surgeries^(21, 22).

CHX is an antiseptic agent used intra-orally in the form of mouthwash and bioadhesive gel. The gel has the additional benefit of releasing the active agent for a longer duration and also enhancing the bioavailability of active agent inside the extraction socket⁽²³⁾.

The present study is designed to evaluate the effectiveness of chlorhexidine (CHX) gel and platelet-rich fibrin (PRF) in reducing the development of alveolar osteitis (AO) after extraction of impacted mandibular third molar.

SUBJECTS AND METHODS

Forty-two patients attended to remove impacted mandibular third molar from outpatient clinics of oral and maxillofacial surgery department at faculty of Dental Medicine, Cairo, Boys, Al-Azhar University.

Inclusion criteria include patients who have impacted mandibular third molar indicated for extraction, minimally to moderate difficulty according to

Pederson classification, patients (17-35 years) with no sex predilection.

Exclusion criteria included patients on chemotherapy, radiotherapy or finished the therapy from less than six months, pregnant and nursing female, patients who have periapical infection or pathosis, and heavy smokers.

Patients were divided randomly into three groups: Fourteen patients in each group. Group A: the sockets received 0.2% CHX gel and PRF. Group B: the sockets received PRF only. Group C (control): the sockets did not receive any treatment.

The procedure was done with local anesthesia. A full thickness mucoperiosteal flap incision was made on the top of alveolar ridge and oblique release incision mesial to lower seven, removal of resistant bone, impacted tooth was removed.

Preparation of PRF by 10 ml of venous blood collected in vacuolated plain tube and centrifuged at 3000 rpm for 10 minutes after centrifugation, the PRF clot was removed from the tube using sterile tweezers. Then the PRF clot was separated from the attached RBC base using scissors, the clot was left 10 min in cup beside to release their serum then it was used in sockets after extraction in group A and group B.

The socket receive CHX gel plus PRF in group A, PRF only in group B or nothing in group C. Suturing the flap without tension (Figure 1).

Routine postoperative instructions were given to all patients: Bite firmly on gauze for at least 20 minutes, take soft and cold diet and avoid hard, hot and spicy food. Cold fomentation over the cheek at the first 24 hrs, replaced by hot fomentation the second day. Post-surgical medication includes 1 g amoxicillin / clavulanic twice daily, metronidazole 500 mg 3 times daily and analgesics: Ibuprofen 400 mg when needed. Follow up was: 2, 7 and 15 days post-operative for clinical evaluating AO, pain, facial swelling, mouth opening, suture looseness, and wound healing.

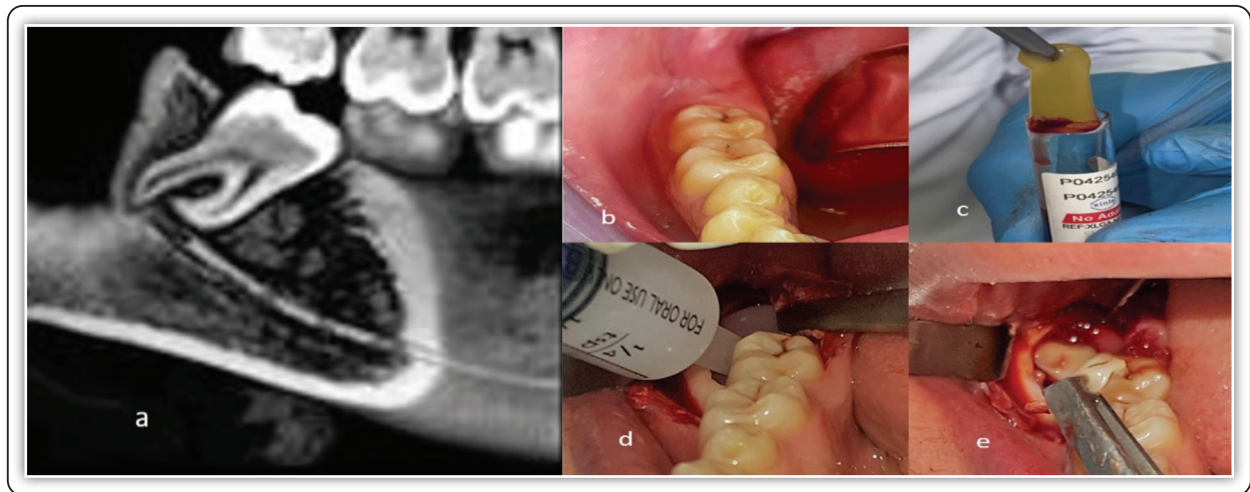


FIG (1) a, section of CBCT showing relationship between inferior alveolar nerve and the impacted tooth, b, pre-operative clinical photograph Showing completely impacted mandibular third molar, c, Platelet rich fibrin “PRF”, d, clinical photograph showing application of CHX gel, and e, clinical photograph showing application of PRF.

All patients followed after 3 months for radiographic evaluation, CBCT was done to measure bone density (Romexis planmeca 6 software) at the middle of the socket by Hounsfield Unit.

Statistical analysis of the data:

Quantitative data were expressed as mean \pm standard deviation (SD). Qualitative data were expressed as frequency and percentage. The following tests were done: A one-way analysis of variance (ANOVA) when comparing between more than two means. Post Hoc test. To assess individual differences after a significant ANOVA. Chi-square (χ^2) test of significance was used in order to compare proportions between qualitative parameters. The confidence interval was set to 95% and the margin of error accepted was set to 5%.

RESULTS

At the present study, reduction of AO incidence in group A in comparison to group B (7.6%) and group C (30.7%).

Maximum mouth opening (Inter incisal distance):

The distance between incisal edge of upper central incisors and lower central incisors when the patient opening his/her mouth maximally. There were no statistically significant difference in maximum mouth opening.

Facial swelling: Evaluation of edema was done by using flexible ruler by measuring the distance between fixed points in both vertical and horizontal plane. A: at the middle of tragus of the ear. B: At the corner of the mouth. C: at the outer canthus of the eye. D: at the angle of the mandible. The distance between A-B was measured and the distance between C-D was measured. There were no statistically significant difference in facial swelling.

Pain: Pain was evaluated through visual analogue scale (VAS). There were significant reduction in pain between groups in 2 days and 7 days.

After 3 months CBCT was done for evaluating the bone density at the site of extraction and the result were increase in bone density in group A and group B in comparison to group C without significant difference (Table 1).

TABLE (1): Comparison between groups according to Age (years), Inter incisal distance (cm), Facial measure A_B, Facial measure C_D, Pain and Bone density after 3 months

	Group A: CHX+ PRF	Group B: PRF only	Group C: Control	P
	Mean ± SD	Mean ± SD	Mean ± SD	
Age (years)	29.97±6.30	26.78±7.23	28.12±5.06	0.681
Inter incisal distance (cm)				
Pre-operative	4.17±0.35	4.16±0.42	4.16±0.42	0.789
Postop. 48hrs.	3.24±0.24	3.06±0.21	3.06±0.21	0.198
Postop. 7 days	3.88±0.27	3.64±0.34	3.64±0.34	0.116
Postop. 15 days	4.13±0.32	4.00±0.37	4.00±0.37	0.225
Facial measure A_B				
Pre-operative	10.59±0.39	10.46±0.35	10.46±0.41	0.497
Postop. 48hrs.	10.67±0.42	10.55±0.35	10.67±0.49	0.581
Postop. 7 days	10.59±0.39	10.47±0.35	10.51±0.42	0.574
Postop. 15 days	10.59±0.39	10.46±0.35	10.47±0.42	0.514
Facial measure C_D				
Pre-operative	10.68±0.43	10.49±0.33	10.55±0.52	0.497
Postop. 48hrs.	11.04±0.45	10.99±0.34	11.11±0.54	0.581
Postop. 7 days	10.82±0.43	10.74±0.34	10.78±0.53	0.574
Postop. 15 days	10.68±0.42	10.56±0.34	10.62±0.52	0.514
Pain				
After 48hrs.	2.83±0.72	3.69±1.44	5.23±2.05	<0.001**
After 72hrs.	1.75±0.75	2.69±1.18	4.23±1.48	<0.001**
After 7 days	0.00±0.00	0.38±1.12	1.23±1.92	0.035*
Bone density	141.29±10.06	142.81±8.66	111.46±6.19	0.285

p: *p* value for comparing between the studied groups.

*: Statistically significant at $p \leq 0.05$

DISCUSSION

Alveolar osteitis, is a common postoperative complication of dental extractions and is often extremely painful. It can be identified by postoperative pain in and around the extraction site, which increases in severity at any time between one and three days after the extraction, accompanied by a partially or totally disintegrated blood clot within

the alveolar socket, with or without halitosis. The severity of postoperative complication is affected by the difficulty of the surgery, the duration of the operation and the magnitude of the osteotomy.

Various studies have been developed to overcome AO. This present study was conducted on 42 patients in need for extraction of impacted mandibular third molar. The study group were

received CHX/PRF after extraction. They were selected from the Outpatient Clinic of the Oral and Maxillofacial Surgery Department, Faculty of Dentistry, Al-Azhar University. All patients in the current study were selected according to inclusion and exclusion criteria.

In the present study the application of CHX/PRF after surgical removal of impacted mandibular third molars reduced the risk of developing AO; the risk of AO development in group A (0%), group B (7.6%) and (30.7%) in group C.

Sockets with AO have higher fibrinolytic activity in comparison to normal extraction sockets. The result is reduced integrity of blood clot formed inside the extraction socket and the increased possibility of losing the clot and developing alveolar osteitis. The other mechanism contributed to the development of AO is bacterial infection and the release of their byproducts.⁽²⁴⁾

PRF acts as a reservoir of leucocytes, platelets, and different cytokines. Moreover, three-dimensional structure of PRF provides a matrix that reduces the risk of mechanical dislodgement of newly formed blood clot. PRF improves the migration of neutrophils and enhances the immune response at the site of extraction. Moreover, CHX is a strong antiseptic agent which is effective against a wide spectrum of both aerobic and anaerobic pathogens of oral cavity.⁽²³⁾

Hence, in the PRF/CHX sockets, both above mentioned mechanisms contributed to the development of AO were inhibited by the sealing, hemostatic, and immunity-related properties of PRF combined with antiseptic activity of CHX.

In accordance with the present study which reveal the significant effect of PRF and CHX in reducing AO. Al-Hamed et al.⁽²⁵⁾ Study the clinical effect of PRF following extraction of mandibular third molar and reported that PRF is a good biologic material that reduce postoperative pain, analgesic consumption and alveolar osteitis.

Cho H et al.⁽²⁶⁾ studied the effectiveness of irrigation with chlorhexidine after removal of mandibular third molars: the routine irrigation with chlorhexidine after the extraction of third molars helps to reduce pain and lowers the incidence of alveolar osteitis.

Hita-Iglesias et al.⁽²⁷⁾ studied the effectiveness of chlorhexidine gel versus chlorhexidine rinse in reducing alveolar osteitis in mandibular third molar surgery. The results of this clinical study showed that the application of bio-adhesive 0.2% CHX gel to the postoperative wound after the extraction of mandibular third molars decreases AO incidence compared with the application of 0.12% CHX mouthwash under similar circumstances.

In our current study, all patients in group A have no adverse reactions to CHX. As opposed to the study by Delilbasi et al.⁽²⁸⁾ who reported allergy, staining of teeth, mucosal irritation, alteration in taste, bad taste of the solution, and gastrointestinal complaints as adverse reactions of CHX. The reasons of not observing any of this adverse effect in the present patients could be that CHX gel was used as single application, while Delilbasi et al. used CHX solution before, during and after surgical procedure.

Several studies diagnosed AO between 2nd and 4th postoperative days when patients complained of a painful extraction socket, and by clinically examining extraction sockets which revealed empty socket or disintegrated clot with denuded bone and fetid smell.^(29,30)

In this study, AO was diagnosed in all the patients on 2nd postoperative day by history of painful extraction socket, and by clinical examination all cases had suture looseness, the socket having disintegrated blood clot with pain and halitosis as complained by patients.

Management of AO is aimed in controlling pain until normal healing occur and in all cases of AO

local measures are satisfactory. The method used to treat AO is to irrigate out food particles or bacterial material using saline and then fill the socket with zinc oxide eugenol on cotton which changed day after day until tissue healing occur.

In the current study, inter incisal distance and facial measurement have no significant difference at 48hrs, 7days and 15days as these measurement depend on the difficulty of surgery, time of operation, amount of bone removed and genital handling with soft and hard tissue.

According to pain: there were significant reduction of pain in group A compared to group B and C after 48hrs and 7days but there was no difference after 14 days. The application of intra-alveolar CHX gel could explain the reduction of pain.

In accordance with Singh et al.⁽³¹⁾ which reported that PRF promotes soft tissue healing, osseous regeneration, decrease pain and increase in bone density. In our current study bone density (measured by HU in CBCT) increased in group A and B compared to group C after 3 months. Kumar et al.⁽³²⁾ studied the benefits of PRF to evaluate healing of soft tissue and bone, respectively. They concluded that PRF improves healing of both soft and hard tissues.

So, the findings of the present study revealed that the efficacy of PRF could be enhanced significantly by application of CHX gel in reducing AO, pain and increase bone density.

CONCLUSION

The data presented indicated that 0.2% CHX gel applied only once in the alveolus combined with PRF, decrease the incidence of AO following removal of impacted mandibular third molars. Chlorhexidine gel might reduce post-operative pain (regardless of its effect on dry socket and infection). No clinically side effect (allergic reaction, staining) following application of CHX gel.

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