

Management Of Oroantral Communication: A Comparison Between Closure With Buccal Advancement Flap And Closure With Platelet-Rich Fibrin Membrane

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Abstract:

Aim: to evaluate and compare the results of management of acute oroantral communication (oac) with buccal advancement flap (baf) and with platelet-rich fibrin (prf) membrane. In all patients postoperative pain, swelling, number of analgesics taken, loss of depth of vestibule and presence/absence of nasal regurgitation were evaluated. Materials and methods: a total of 523 patients requiring extractions of non-salvageable maxillary posterior teeth and radiographically having close proximity to the maxillary sinus were included. Out of that, 10 patients developed acute oac after extraction. Of which, 5 were treated by baf (group-1) and other 5 by prf membrane (group-2). Observations and results: in group-1, the mean value of vas score on post-operative day-1 and after 1 month was 7.40 and 0 respectively, whereas in group-2, it was 4.40 and 0 respectively. The mean post-operative swelling score in group-1 on post-operative day 1 and after 1 month was 12.8 and 11.26 cm respectively, whereas in group-2 same was 11.36 cm throughout all follow up. The mean number of analgesics taken by patients of group-1 on post-operative day 1 and after 1 month were 4 and 0 respectively, whereas in group- 2 they were 2 and 0 respectively. The mean depth of vestibule in group-1 pre-operatively was 2.8 cm and post-operatively after 1 month was 1.32 cm. Whereas in group-2 it was same pre and post-operatively. Conclusion: patients treated with prf membrane for closure of oac shows decreased post-operative pain and swelling with no alteration in depth of vestibule as compared to baf.

Objective: to evaluate and compare the results of management of acute oroantral communication (oac) with buccal advancement flap (baf) and with platelet-rich fibrin (prf) membrane. In all patients postoperative pain, swelling, number of analgesics taken, loss of depth of vestibule and presence/absence of nasal regurgitation were evaluated.

Keywords: *oro-antral communication, acute, buccal advancement flap, platelet-rich fibrin.*

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I. Introduction:

Oro-antral communication (OAC) is described as a pathologic communication between the maxillary sinus and the oral cavity. There are many causes of OAC, including extraction of posterior maxillary teeth,

removal of maxillary cysts/tumours, trauma, implant surgery etc. The extraction of maxillary posterior teeth is the most common cause of OAC, because of the anatomically close relationship between the root apices of the premolar and molar teeth and the maxillary antrum, and the thinness of the antral floor in that region.^[1]

A normal blood clot formed within the socket can close acute OAC spontaneously without any surgery, if the sinus is uninfected and the perforation is upto 3mm. Whereas those larger than 3mm require surgical intervention. Immediate approach to an OAC, within 24 to 48 hours, is recommended to prevent the development of oroantral fistulas (OAFs) and the risk of chronic sinusitis.^[2]

Over the years, most commonly performed surgical treatment is buccal advancement flap (BAF). However, it has certain disadvantages such as postoperative pain, swelling and decrease in the depth of the buccal sulcus due to which adaptation of the dental prosthesis is impaired.^[2]

Recent researches showed usefulness of PRF for the management of acute oroantral perforations. PRF can be easily and quickly prepared, highly biocompatible, and does not have any infection risk, as it is not obtained from other living organisms. PRF suppresses inflammation and infection, decreases the bleeding in the operation site with the vascular haemostasis, and stimulates the recovery of the soft and hard tissues.^[2] This study was undertaken to compare the results of closure of oroantral communication with buccal advancement flap and closure with PRF membrane.

II. Materials And Methods:

A total of 523 patients requiring extraction of non-salvageable maxillary posterior teeth, radiographically having close proximity to the maxillary sinus (according to Shahbazian criteria), who reported to the Department of Oral and Maxillofacial Surgery, College of Dental Sciences and Research Centre, Ahmedabad from 2019-2021 were studied. Out of that, 10 patients had developed OAC after extraction, (confirmed with positive water test and modified ball burnisher test) were included in the study. Out of these 5 were treated by BAF (Group-1) and other 5 by PRF membrane (Group-2). This study was undertaken after clearance from the ethical committee. (INSTITUTIONAL ETHICS COMMITTEE Ref no:- CDSRC/IEC/20190301/08)

Inclusion Criteria:

- Patients requiring extraction of maxillary posterior teeth (1st, 2nd and 3rd molars) showing close proximity to the sinus floor as seen on radiograph (Shahbazian criteria³).
- Size of OAC >3mm.

Exclusion Criteria:

- Size of OAC <3mm.
- Patients with:
 - Uncontrolled systemic diseases.
 - Platelet disorders or blood dyscrasias.
 - Pre-existing sinusitis or previous sinus related surgeries.
 - Habit of smoking.
 - Oral submucous fibrosis (OSMF).

Radiographic investigation carried out prior to this procedure was conventional intra-oral periapical radiograph (IOPA).

Proximity between the roots of maxillary posterior teeth and sinus floor (according to Shahbazian criteria)^[3]

Score	Criteria
0	When there is a distinct space between the root tip and the sinus floor
1	When the roots are in close contact with the floor of the maxillary sinus (<0.5 mm away)
2	When the roots are projected onto the sinus but are actually lateral or medial to it
3	When the roots are protruded into the maxillary sinus cavity

Technique of closure of OAC by using buccal advancement flap (Von Rehrmann flap)^[4] (Group-1): After confirming the presence of OAC, two divergent incisions were made in the buccal vestibule on either side of the extracted tooth socket. Full thickness trapezoidal mucoperiosteal flap was reflected. Periosteum on the undersurface of flap was incised horizontally to release and advance the flap to make the flap tension free at closure site. The advanced flap was then sutured with the palatal flap using 3-0 silk suture by horizontal mattress sutures. (Fig-1)

Technique of closure of OAC by using PRF membrane (Choukron's method)^[4] (Group-2): After the presence of an OAC was confirmed, for obtaining blood sample, venepuncture was done using 26 gauge needle and 10 cc of blood was withdrawn, which was transferred to a sterile test tube. Another test tube was taken

containing saline as a balancing solution. Both the test tubes were then placed in a centrifugation machine at the speed of 2500 rpm for 12 minutes. The blood containing test tube now contained 3 compartments: the upper layer consisted of acellular plasma, the middle layer was the PRF clot and the lower layer consisted of red corpuscles. The PRF membrane was gently separated and removed carefully. One membrane was inserted at the site of communication in the socket and the other was sutured with the flap of the extraction site with the help of 3-0 silk suture using a horizontal mattress and an interrupted suture. (Fig-2)

Clinical evaluation included assessment of pain, swelling, number of analgesics taken, depth of vestibule and nasal regurgitation noted on post-operative day 1, 3, 7, and after 1 month. Pain was assessed using VAS. Facial measurements were made based on the method described by Gabka and Matsumara. The depth of vestibule was measured from the distance between a point on the coronal margin of attached gingiva and the point on the greatest concavity of the mucobuccal fold in all patients on the operated site. Nasal regurgitation was evaluated in patients by performing water test. Post-operative radiograph (IOPA) was taken in all the patients after 1 month to confirm the closure of OAC. Statistical analysis was performed using paired t test for individual groups and unpaired t test for inter-group comparisons (of mean values) at post-operative days 1,3,7, and 1 month by using SPSS software (version 20). Statistical significance was defined at $p < 0.05$.

III. Observations And Results:

In Group-1, the mean value of VAS score on post-operative day -1,3,7, and 1 month was 7.40, 5.20, 2.40, and 0 respectively, whereas in Group-2, it was 4.40, 2.20, 0, and 0 respectively. These values showed that patients of Group-1 showed significantly higher amount of VAS than patients of Group-2 (Table-1).

The mean post-operative swelling score in Group-1 on post-operative day 1,3,7, and after 1 month was 12.8, 11.6, 11.4, and 11.26 cm respectively, whereas in Group-2 same was 11.36 cm throughout all follow-ups indicating that there was no swelling observed in Group-2 patients (Table-2).

The mean number of analgesics taken by patients of Group-1 on post-operative day 1,3,7, and after 1 month were 3.8~4, 2.4~3, 0, and 0 respectively, whereas in Group-2 they were, 2,0,0, and 0 respectively. These results showed that the numbers of analgesics taken by patients in Group 2 were significantly lesser as compared to Group-1 (Table-3).

The mean depth of vestibule in Group-1 pre-operatively was 2.8 cm and post-operatively after 1 month was 1.32 cm. Whereas in Group-2 the same was 2.72 cm pre-operatively and post-operatively. These results suggested that there was significant reduction in depth of vestibule in Group-1 whereas there was no alteration in depth of vestibule in Group-2 (Table-4).

IV. Discussion:

Sequelae of undiagnosed OAC includes nasal regurgitation, pain, purulent discharge and epithelization of the tract leading to OAF.^[5]

The age of selected patients in our study ranged from 20 to 60 years and the mean age was 38.7 years. Out of 10 patients, 7 patients were female and 3 patients were male. The most commonly affected region in our study was maxillary left posterior region (70%) followed by maxillary right posterior region (30%). The most commonly affected tooth in our study was maxillary left 1st molar (50%) followed by maxillary right 1st molar (40%) followed by maxillary left 3rd molar (10%).

Rehrmann in 1936 introduced BAF technique, which has several disadvantages, such as the need for surgical expertise, postoperative pain, swelling, scar formation, alveolar ridge resorption and reduction in buccal vestibular depth which may impede implant placement and prosthetic treatments.^[1]

Alloplastic materials have the disadvantages like time consuming, high expense, and increase incidence of infection being a foreign material. Hence, we chose PRF prepared from patient's own blood for closure of OAC.

The fibrin matrix of PRF acts as a 3-dimensional scaffold allowing for delayed release of contents of leukocytes and platelets so that the beneficial wound-healing effects are present for a longer time period. The matrix is also thought to trap more leukocytes within its network. Therefore, it can simultaneously support the epithelial coverage, immunity, and development of angiogenesis. Consequently, it can speed revascularization and enhance tissue/wound healing.^[6]

Elshourbagy MH et al described oroantral communication repair using bone substitute and PRF.^[7]

Agarwal B et al described a technique for closure of OAF using PRF and concluded that PRF is a superior healing biomaterial which also preserves the depth of the vestibule.^[8] Comparison of both the methods is described in Table -5.

Results of clinical assessment

Pain

The results showed that patients of Group-1 showed significantly higher amount of VAS scores than patients of Group-2. The reason may be attributed to the fact that in Group 1 the closure was done by advancing the buccal flap, hence excessive tension of the flap might result in more pain. Whereas in Group-2 a flapless, less invasive procedure in which capillaries and nerves are protected without raising a flap might contribute to less post-operative pain.^[4]

Bilginaylar et al. (2018) reported that 21 acute OAC were treated with the application of 2 PRF clots where the perforation was more than 3 mm in diameter. He showed statistically significant reduction of pain in PRF group as compared to BAF group.^[9]

The simple fact of sealing the entrance of the socket with a membrane prevents the entry of food and debris, which can naturally decrease painful stimuli compared with an open socket. Other possible explanations include a supportive effect on the immune system due to stimulation of defence mechanisms which is inherent property of PRF.^[10]

In a study by Gacic et al, patients with buccal flaps reported the highest pain, and pain was lower in the groups treated with hemostatic gauze or -TCP.^[11] Thoma et al in his study reported that postoperative pain and swelling were markedly reduced if OACs were closed with bioabsorbable root analogue compared with buccal sliding flaps.^[12]

Del Fabbro et al., on comparing use versus no use of platelet concentrate rich in growth factors as an adjunct in endodontic surgery, found that the patients in the test group had significantly lower pain perception during the first 3 days.^[13]

In a study by Reeshma et al. comparing PRF with zinc oxide eugenol in the relief of pain in alveolar osteitis, it was found that pain was lower in the PRF group than in the ZOE group. He suggested that the fibrin matrix in PRF promotes angiogenesis and enhances natural immunity, thus reducing inflammatory processes and pain.^[14]

Swelling

Pre-operative facial measurements were noted in both the groups and were taken as baseline for evaluation of post-operative swelling.

The results indicate that there was no swelling observed in Group-2 patients which might be attributed to the fact in Group-1 flap mobilization and tension and periosteal slitting may be the reason for increased post-operative swelling.

Some of the most important growth factors of PRF, include transforming growth factor β (TGF- β), platelet-derived growth factor (PDGF), insulin-like growth factor 1 (IGF1), vascular endothelial growth factor (VEGF), and epidermal growth factor (EGF). Moreover, among the growth factors released from platelets, the PRF contains immune cytokines such as interleukin (IL)-1 β , IL-6, IL-4, and tumor necrosis factor (TNF)- α . The anti-inflammatory property could be explained both by the suppression of proinflammatory chemokines as IL-1 and by the observed antimicrobial effect.^[15] In the study by Nasirzade et al., it was established that the beneficial action of PRF might involve macrophage polarization from proinflammatory M1 toward pro-resolving M2 phenotypes resulting in an anti-inflammatory property.^[16]

Similar results were obtained in the study carried out by Bilginaylar et al. (2018), in which there was negligible swelling in patients treated with PRF as compared to BAF for closure of OAC.^[10] In another study carried out by Ahmed et al, pain and postoperative edema were significantly less in PRF group than BAF group.^[17] A study carried out by Awal et al. comparing the efficacy of PRF membrane with BAF in closure of OAC showed that, PRF procedure showed decreased pain, less inflammatory response and better healing compared to BAF.^[18]

Maawi et al presented a review and concluded that PRF was found to be effective in reducing post-operative pain, accelerating soft tissue healing and preventing three dimensional bone loss after extraction.^[19] Chenchev IV et al achieved a closure of the OAC with PRF while the postoperative period passed without complications and minimal complaints.^[20] According to Del Fabbro et al, reduction of post-surgical symptoms might be related with the absence of leukocytes in the PRGF fibrin membrane, thus reducing a leukocyte-induced exacerbated local inflammatory reaction.^[21]

Number of analgesics taken

Due to less invasiveness of the procedure and decreased post-operative pain and swelling, the number of analgesics taken in Group-2 was less than that of Group-1. These are attributed to the structure of PRF which consist of a fibrin matrix polymerized in a tetramolecular structure, the incorporation of platelets, leukocyte, and cytokines, and the presence of circulating stem cells.^[22] These results are in accordance with the results of the study by Bilginaylar et al.^[4]

In a study by Gupta et al, patients treated with PRF after removal of mandibular third molar showed less post-operative pain, swelling and number of analgesics taken as compared to the control group. This can be correlated to release kinetics of growth factors and mediator of inflammation by PRF which starts from day 1 continues till day 8–10.^[23]

Kapustecki M et al. presented an alternative method to treat OAC with autogenous bone graft and PRF and concluded that it can constitute an interesting alternative to traditional single and bilayer procedures.^[24]

Depth of vestibule

The results suggest that there was significant reduction in depth of vestibule in Group-1 whereas there was no alteration in depth of vestibule in Group-2 (p value-0.00).

Similar results were obtained in the study by Bilginaylar et al.^[4] In a study by Gacic et al., the patients treated with a buccal flap had a significantly reduced vestibular depth.^[11] Decrease of the depth of the sulcus can interfere with prosthetic rehabilitation and maintenance of oral hygiene.

Obradovic et al. reported a significant reduction in the buccal sulcus depth following repair of OAC by BAF method.^[25]

Another study by Hannaes and Pederson also concluded that there is a permanent decrease in vestibular depth after closure of OAC by BAF which might hamper prosthetic rehabilitation.^[1]

Gulsen U et al described the flap-free treatment of OAC with PRF. There was no need to raise a flap and the vestibular depth was protected.^[26]

Nasal regurgitation

Nasal regurgitation as confirmed by the water test was noted intra-operatively and after 7 days and 1 month post-operatively. The observations suggest that nasal regurgitation, which was present in both the groups intra-operatively, was absent after 7 days and 1 month post-operatively. This suggests that both the methods are equally effective in closing the OAC.

Assad M et al. presented a report of two cases of closure of OAC using PRF and concluded that it facilitates mineralized tissue formation due to its inherent osteoconductive and/or osteoinductive properties.^[27]

Al-Juboori MJ et al. described the treatment of chronic oroantral fistula with PRF clot and collagen membrane. The placement of resorbable collagen membrane was to prevent adhesion of the sinus membrane lining to the oral mucosa, which can lead to fusion of the oral mucosa and Schneiderian membrane.^[28]

Pandikanda R et al. reported flapless closure of OAC with composite of PRF and collagen which did not require any flap elevation thus preserving the vestibular depth and no secondary donor site thus less post-operative discomfort.^[29]

Lee C et al. discussed a novel technique using L-PRF matrix obtained from the patient's own venous blood that was clinician friendly, less traumatic compared to traditional methods of OAC closure with minimal postoperative recovery for the patient.^[30]

Khalfaoui M et al reported that closure of OAC using PRF membrane is a less invasive procedure than buccal sliding flap or buccal fat-pad techniques which keeps the vestibular sulcus depth.^[31]

Ramadan N stated that use of L-PRF for closing acute OAC does not require advanced surgical skill and experience with harvesting and rotating soft tissue flaps in the oral cavity as with other techniques.^[32]

Hunger S et al compared the results of closure of OAC with PRF and BAF and concluded that the use of PRF clots for defect filling is associated with lowered pain levels and less displacement of the mucogingival border.^[33]

Although the observations of our study suggest that closure of OAC with PRF membrane showed much better results in terms of post-operative pain, swelling, number of analgesics taken and preservation of depth of vestibule as compared to buccal advancement flap, a larger sample size study is recommended.

V. Conclusion:

From the results of the study, we have concluded that both BAF and PRF membrane are successful in treating acute OACs. Patients treated with PRF membrane for closure of OAC have decreased post-operative pain and swelling as compared to BAF. There is no reduction in the depth of vestibule in patients treated with PRF membrane, which is the main advantage of this technique over BAF, as reduction in depth of vestibule may interfere with future prosthetic rehabilitation of patients. Hence, efficacy of PRF membrane is sufficient for the treatment of acute OAC and it can be used as a preferred alternative treatment option for closure of the same. There are no sources of funding and no conflicts of interest.

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