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COMPARING THE CLINICAL RESULTS OF APPLYING PLATELET-RICH FIBRIN VS. BUCCAL ADVANCEMENTFLAPFOR THE PROMPT CLOSURE OF ACUTE OROANTRAL COMMUNICATIONS

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Abstract:

This study compared the clinical results of platelet-rich fibrin (PRF) treatment and buccal advancement flap surgery for the closure of acute oroantral communications (AOACs). After the posterior maxillary teeth were extracted from 36 individuals, AOACs greater than 3 mm in diameter were found. Twenty-one patients in group A received PRF clotting, while fifteen patients in group B received the traditional buccal advancement flap. Baseline variables such as pain, the analgesic doses are taken, and swelling was assessed preoperatively. These were also examined on postoperative days 1, 2, 3, and 7, and patients were seen again in the 3rd week. In group A, statistically significant reduction was examined ($P < 0.05$) in pain and the analgesic doses are taken (sum of 1st, 2nd, 3rd, and 7th days on days 1 and 2) (PRF).The swelling was also significantly less in group A ($P < 0.05$). The mean duration did not differ between the groups ($P > 0.05$). In conclusion, both methods were successful for the immediate closure of AOACs. However, a lesser amount of pain and no swelling observed with the use of PRF clots for the immediate closure of AOACs compared to buccal advancement flap surgery.

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Key words: Acute oroantral communication, buccal flap surgery, pain, platelet-rich fibrin, swelling

INTRODUCTION

Oroantral communication (OAC) is described as a pathologic communication between the maxillary sinus and the oral cavity. There are many causes of OAC, such as removal of maxillary cysts/tumors, trauma, implant surgery, orthognathic surgeries, pathologic entities, and mainly the extraction of posterior maxillary teeth, because of the close anatomical relation between the sinus floor and the root apices of posterior teeth in that region.[1–3] If the perforation is up to 3 mm and there is no sinus infection,acute oroantral communications (AOACs) can close spontaneously without any surgery, whereas those larger than 3 mm require surgical intervention.[3,4] It is not simple to establish the size of the OAC. For this reason, it is hard to estimate whether the defect will heal uneventfully without any surgical procedure. 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.[4,5] In addition, literature revealed high success ratio for the immediate closure of AOACs, approaching 95%, whereas the proportion of success for the secondary closure of oroantral fistulas has been shown to be as low as 67%.[3,6]

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Various flap designs and techniques have been reported in the literature to close large OACs. These techniques can be defined as buccal fad pad, the palatal flap, distant soft tissue flaps (tongue and temporalis flaps), double layer techniques, suture, dental transplan- tation, titanium mesh, biodegradable polyurethane foam, and most frequently the buccal advancement flap.[1–9] In addition, recent researches showed that platelet-rich fibrin (PRF) is also a useful approach for the management of acute oroantral perforations.[10–13] The present study aimed to compare the clinical outcomes (pain, analgesics, swelling, and duration) of the buccal advancement flap surgery versus the use of PRF for the closure of AOAC following extraction of posterior maxillary teeth.

METHODS-

The AOACs of larger than 3 mm detected following the extraction of maxillary molar teeth in 36 patients at the Rama dental college hospital and research centre mandana kanpur between November 2023 and November 2024. The volunteers had neither systemic diseases nor signs of sinus disease. Furthermore, patients had

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no smoking or drinking habits. Teeth were extracted under the buccal and palatal local infiltration anesthesia, which contained 0.012 mg/mL epinephrine HCl and 40 mg/mL articaine HCl.. Following tooth extraction, Valsalva's maneuver test was used for the diagnosis of AOAC (pressing of nostrils and exhalation of the air from the nose). After the observation of air leak, to decide whether the size of perforation was >3 mm, modification of ball burnisher instrument (Fig. 1) which was 3 mm in diameter was used. For this aim, the tool was used to define if it could pass into the sinus cavity through the bottom of the extraction socket. The highest size of the AOAC could not be specified because of the clinical measurement difficulty. However, the highest size of the defect was measured about 8 × 4 mm with the help of periodontal probe (after checking which roots caused perforation, diameter of roots was measured mesio- distally

FIGURE 1. The instrument (3 mm in diameter) which was used to determine whether the size of perforation is >3 mm.

and buccopalatinally). Likewise, preoperative panoramic radiographs revealed a close relationship between the apices of tooth and floor of the sinus in all cases before extractions (Figs. 2A- 3A). After completing an informed consent agreement, the patients randomly separated into 2 groups. In group A (n = 21), PRF clots were used for the treatment of acute OACs. Blood samples of each patient were taken directly into 2 × 10 mL glass-coated plastic tubes (excluding

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anticoagulant, Fig. 4A) and immediately centrifuged at 3000 rpm for 10 minutes (Elektro-mag, M415P, Istanbul, Turkey; Fig. 4B). For each tube, the platelet-poor plasma was separated from middle part (PRF) that accumulated at the top of the tube (Fig. 4C)

and PRF clot was separated 2 mm below from its' contact point with the red corpuscles (Fig. 4D). Two PRF clots were gently placed into the extraction cavity and sutured to avoid them from escaping to the sinus and for stabilization (Fig. 2B-C). In group B (n = 15), buccal advancement flap was used to close acute OACs.

FIGURE 2. (A) One of the pre-extraction panoramic view from group A (maxillary left first molar). (B) View of perforation. (C) View of sutured platelet-rich fibrin clots. (D) View of healthy granulation tissue on the 7th day of follow-up. (E) View of epithelialized oral mucosa on the 3rd week of monitoring.

The extraction socket was closed by sliding the buccal flap over the socket and suturing the flap to the undermined palatal mucosa (Fig. 3B). In all cases, before

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any intervention, the sterile physiologic saline solution was used to clean the postextraction socket of the tooth. The 3-0 silk sutures were used and removed after 7 days. In group A, healthy granulation tissue (Fig. 2D) and in group B, primary closure was observed on the 7th day of follow-up (Fig. 3C). Additionally, the epithelialized oral mucosa was detected in all cases on the 3rd week of monitoring (Figs. 2E-3D). Postoperative care was the same in both groups, and all the patients were instructed not to eat hard foods and not to blow from the nose during for 1 week. Acetaminophen (paracetamol 500 mg, advised to take as required) and mouthwash (isotonic saline, 2–3 times daily 24 hours after the intervention) were prescribed. Antibiotics and decongestants were not used. Pain, the number of analgesic doses taken, and swelling were evaluated preoperatively and postoperatively on days 1, 2, 3, and 7.

A visual analog scale (VAS) (0 mm: no pain to 100 mm: severe pain) was used to assess pain and the number of analgesics taken were recorded.[14] The swelling evaluated by using the modified method by Gabka and Matsamura.[15] Three preoperative measure- ments taken with soft tape measure between 5 reference points: tragus to the outer corner of the nose, tragus to the outer corner of the mouth, and lateral corner of the eye to the angle of the mandible were repeated on the 1st, 2nd, 3rd, and 7th postoperative days. The sum of the 3 preoperative measurements was taken as the baseline for that side. The difference between the maximum

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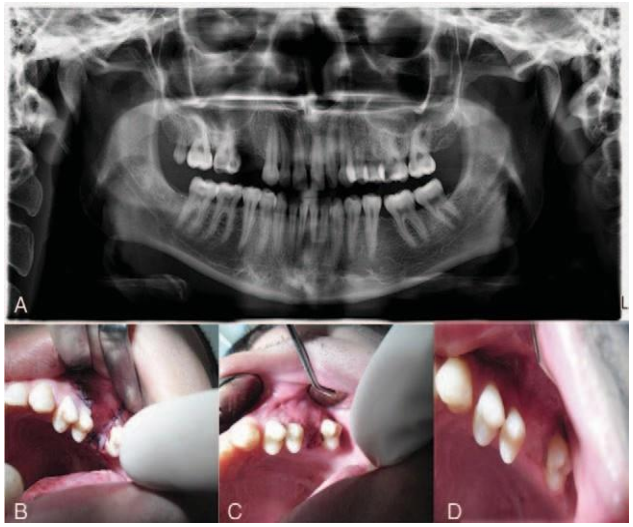
postoperative measurement and the baseline gave the value of facial swelling for each patient. The swelling values of each patient recorded as a percentage by using the following formula: ([Maximum postopera-tive value – Preoperative



value]/Preoperative value) × 100 = % of facial swelling. In group A, the operating time was recorded from taking blood samples to the last stitch. However, in group B, operating time was the period between the beginnings of incision to the final suture. Patients were examined on each of the 4 postoperative days, at approximately the same time of day and again on the 3rd week to check wound healing. Another doctor recorded all measurements.

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Statistical analyses were performed using independent samples *t*-test (*t*), to compare the mean values of 2 independent groups. Whenever the data were not normally distributed, Mann-Whitney test (*z*) applied. Besides, the Chi-squared test (x^2) was used to compare categorical variables. *R* statistical software package was used to perform statistical analysis (ver 2.14.0). Statistical signifi- cance was defined at $P < 0.05$.Ethical approval obtained for the study by the Near East Univer-sity IRB, Nicosia, Cyprus, and all participants signed an informed consent agreement. The project number was YDU/41-340.

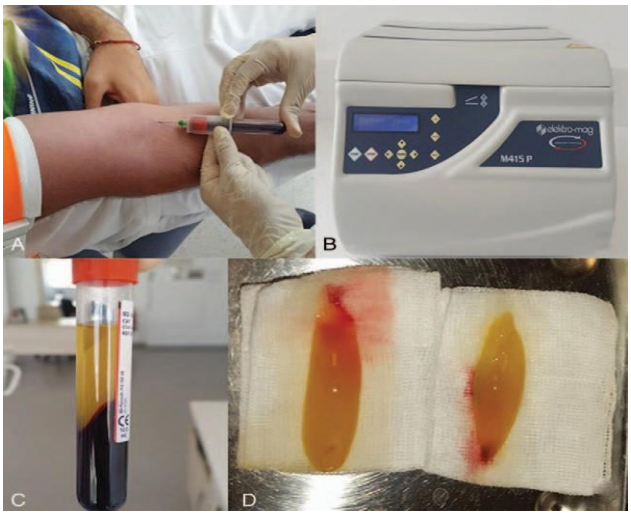

FIGURE 4. (A) Drawing the blood samples into 2 × 10 mL glass-coated plastic tubes. (B) Centrifuge device which was set to 3000 rpm for 10 minutes. (C) The composition of a structured fibrin clot in the middle of the tube, just between the red corpuscles at the bottom and acellular plasma at the top. (D) The view of 2 platelet-rich fibrin clots which were ready to use

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RESULT:

In group A (PRF), 11 males and 10 females and in group B (buccal flap), 9 males and 6 females were treated uneventfully without any serious complications, such as alveolitis, infection, side effects, or formation of OAF. Both groups had similar gender distributions ($x^2 = 0.206$, $P = 0.650$, df = 1). The mean ages between the groups were insignificant among the groups ($z = 0.562$, $P = 0.590$) ($P > 0.5$).In group A, OAC detected after the extractions of 11 right maxillary first molar, 7 left maxillary first molar, 1 right maxillary second molar, and 2 left maxillary second molar. In group B, OAC observed after the 8 right maxillary first molar, 3 left maxillary first molar, 2 right maxillary second molar, and 2 left maxillary second molar extractions. Statistical analysis revealed that similar number of sides were operated ($x^2 = 1.447$, $P = 0.695$, df = 3) ($P > 0.05$).

The mean duration of PRF application was 17.31 1.36 minutes in the group A, which was not significantly different from the mean duration (17.02 1.51 minutes) in the group B ($t = 0.598$, $P = 0.554$) ($P > 0.05$).

Total VAS pain scores (sum of values on days 1, 2, 3, and 7) were significantly higher ($P < 0.5$) in the group B (buccal flap) compared to group A (PRF) ($t = 4.698$, $P = 0.0001$) (Table 1). There was also significant difference between the groups on the postoperative day 1 ($t = 4.966$, $P = 0.0001$) and 2 ($t = 3.491$, $P =$

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0.001), but there was no significant difference ($P > 0.5$) on the days 3 and 7 ($z = 2.399$, $P = 0.058$) (Table 2).

TABLE 1. Comparison of VAS Pain Scores (Sum of 1st, 2nd, 3rd, and 7th Days) (mm)

VAS Groups (G)	n	Min–Max	Mean SD	t	P
PRF (A)	21	8.0–81.50	31.24 15.89		
Buccal flap (B)	15	25.0–90.0	59.0 19.53	4.698	0.0001*

PRF, platelet-rich fibrin; SD, standard deviation; VAS, visual analog scale.
*$P < 0.5$.

TABLE 2. Comparison of VAS Scores at 1st, 2nd, 3rd, and 7th Days (mm)

VAS	PRF (A)					Buccal Flap (B)		
Day	n	Mean	SD	n	Mean	SD	t	z	P
1st	20	24.33	9.30	15	42.33	12.47	4.966		0.0001*
2nd	20	6.31	7.01	15	14.20	6.19	3.491		0.001*
3rd	20	0.5	1.38	15	2.67	3.07		2.399	0.058
7th	20	0.00	0.00	15	0.00	0.00			

PRF, platelet-rich fibrin; SD, standard deviation; VAS, visual analog scale.
*$P < 0.5$.

TABLE 3. Total Number of Analgesic Doses for Groups (Sum of 1st, 2nd, 3rd, and 7th Days)

Analgesics Groups (G)	n	Min–Max	Mean SD	t	P
PRF (A)	21	1.0–8.0	3.67 1.80		
Buccal flap (B)	15	3.0–9.0	5.53 1.67	3.151	0.003*

PRF, platelet-rich fibrin; SD, standard deviation.
*$P < 0.5$.

Statistical analyses showed that in PRF group less pain was experienced compared to buccal flap group.The total number of analgesic doses taken from the 1st to 7th

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day was significantly lower ($P < 0.5$) in PRF group than buccal flap group ($t = 3.151$, $P = 0.003$) (Table 3). When the daily analgesic doses are taken were compared between the groups, on the 1st ($t = 2.424$, $P = 0.021$) and 2nd ($t = 3.300$, $P = 0.02$) days, there was a significant difference. However, there was no significant differ- ence ($P > 0.5$) on the days 3 and 7 ($z = 1.398$, $P = 0.058$) (Table 4). According to these results, the patients who treated with PRF (group A) used significantly fewer analgesics compared to the group B(buccal flap).In group A (PRF), There was no swelling in all cases, but in group B, mean% 0.94 0.26 swelling observed and the swelling difference between the groups was statistically significant ($z = 5.501$, $P = 0.0001$) ($P < 0.5$).

DISCUSSION

The primary factor for the treatment of acute OAC is closing thecommunication because it is essential to prevent food and saliva contamination that could cause bacterial infection, chronic sinusitis, and impaired healing. Management of acute OAC could be recom- mended within 24 to 48 hours, without any intervention large acute OAC (>3 mm) may turn into an OAF which is meant to indicate a canal lined by epithelium that may be filled by granulation tissue or by polyposis of the sinus membrane.[3,4,7,12,16]

According to the literature, the most common technique for the closure of an acute OAC is buccal flap which was first described by Rehrmann.[1,17,18] The present

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study also showed that buccal flap technique is still an effective technique for the treatment of acute OACs. However, there are some disadvantages when compared to PRF application. The results of present study displayed that the use of PRF in acute OACs statistically decreased the pain and the use of analgesics after the interventions when compared to buccal advancement flap procedure.

TABLE 4. Comparison of Number of Analgesics Taken at 1st, 2nd, 3rd, and 7th Days

Analgesics	PRF (A)			Buccal Flap (B)				
Day	n	Mean	SD	n	Mean	SD	*T*	*z*	*P*
1st	21	2.67	0.91	15	3.47	1.07	2.424		0.021*
2nd	21	0.86	0.85	15	1.67	0.49	3.300		0.02
3rd	21	0.14	0.36	15	0.4	0.63		1.398	0.058
7th	21	0.00	0.00	15	0.00	0.00			

PRF, platelet-rich fibrin; SD, standard deviation.
*$P < 0.5$.

Also, the depth of the sulcus was protected in PRF group, as the raising of the flap is not necessary (primary closure). As a result, no swelling and the lesser amount of pain were observed because capillaries and nerves protected in PRF group which was one of the leading advantages of this technique. Once getting the knowledge about the PRF application and materials, such as centrifuge device and disposables, it is easily applicable and inexpensive. Never- theless, the necessity to particular devices/disposables and the idea of giving blood samples for the treatment may create fear in patients, which are the primary limits of this method. Additionally,

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the success of this technique directly depends on the speed of blood collection and transfer to the centrifuge.[19] Patients also should not have any systemic diseases or signs of sinus disease because these situations may disrupt the behavior and structure of PRF.

Joseph Choukroun first defined PRF as a natural matrix which consists of different types of healing cells. Therefore, it can simultaneously support the epithelial coverage, immunity, and development of angiogenesis. Consequently, it can speed revascularization and enhance tissue/wound healing. Fibrin has been shown to act as the natural scaffold guiding angiogenesis that contains the creation of new blood vessels inside the wound. Thus, the requirement of an extracellular matrix scaffold which permits the migration, division, and phenotypic change of endothelial cells has been demonstrated to cause faster angiogenesis.[12,19,20]

In the literature, there are only a few articles that showed PRF application for the treatment of OACs. Agarwal et al indicated an alternative method for the management of OAFs with use of PRF clots. Four PRF clots obtained and squeezed to form a membrane: 3 of them rolled together to create cylinder-shaped fibrin plug to obturate the fistula and the last one was sutured below the buccal and palatal flap to seal the oral cavity from the underlying fistula and the fibrin plug.[10] Gu¨ ls¸en et al reported that 20 patients with acute OACs with perforations more than 5 mm in diameter received treatment with the use of PRF clots. Extraction cavity was filled

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with 6 PRF clots.[11] Bilginaylar reported that 21 acute OACs were treated with the application of 2 PRF clots which the perforation was more than 3 mm in diameter.[12] Assad et al also used PRF for the closure of OACs. According to their technique, one-third of a PRF clot was cutoff and inserted into the extraction socket, and the remaining two-third of the clot was pressed gently with sterile dry gauze forming the membrane. The extraction site was covered with the membrane and was sutured to the gingiva.[13] Although there are some differences between these approaches such as amount/number of PRF clots or material differences (the use of PRF either a clot or membrane or both together), briefly, all approaches revealed that PRF could be used as a useful treatment material of OACs.

In addition to all, clinically, there are also some uncountable advantageous for PRF application for the immediate closure of AOACs. Although there is no statistical difference in mean duration ($P > 0.5$) between the techniques, during the centrifugation process after taking the blood samples, the surgeon has free 10 minutes to

prepare and talk with the patient about the process. However, in buccal advancement flap surgery, surgeon raises a flap, slides, and sutures it to the palatal mucosa during that period.

CONCLUSION:

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The present study showed that buccal advancement flap and PRF techniques are both useful for the closure of acute OACs. Although both methods were successful for the immediate closure of acute OAC, PRF application decreased pain and swelling compared to buccal advancement flap surgery. Moreover, PRF procedure was less traumatic (bleeding was also lesser because of no need for raising a flap so that no necessity to aspiration), readily applicable and less stressfully when compared to buccal advancement flap surgery.

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