

# CLOSURE OF OROANTRAL COMMUNICATION WITH PLATELET-RICH FIBRIN

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## ABSTRACT:

**Objective:** to evaluate the effectiveness of platelet-rich fibrin (PRF) for closure of oroantral communication (OAC) that occurs after teeth extraction during two months of clinical and radiographical follow-up.

**Methods:** Sixteen patients of both sexes included in this study who had (OAC) after dental extraction. The closure was done by using platelet-rich fibrin clot which was plugged into the site of the extraction site that contains the communication, and then we sutured the (PRF) membrane to the gingival borders above it. Data collected includes patient age and gender, location of perforation, and immediate and late complications and Follow-up evaluations

**Results:** All 16 cases of the oroantral communication were successfully treated with this technique. Immediate postoperative complications were pain (31.25%), edema (25%) and trismus (12.5%). No late complications occurred, and all patients were free of pain or any limitations after the 2-month follow-up period.

**Conclusion:** The use of platelet-rich fibrin is an acceptable and reliable procedure in closing an oroantral communication.

**Keywords:** Platelet-rich fibrin, centrifuge, perforation, maxillary sinus.



## INTRODUCTION

An oroantral communication (OAC) is an open connection between the oral cavity and maxillary sinus. The maxillary sinus takes up a large part of the body of the maxilla, generally extending into the alveolar process bordering the apices of the posterior teeth. OACs are usually caused by extraction of maxillary posterior teeth.<sup>[1]</sup>

Basically, any communication between oral cavity and antrum should be closed immediately in order to prevent infection and fistula formation.<sup>[2]</sup> An oroantral communication which is less than 2 mm in diameter will usually close

spontaneously after the formation of a blood clot and secondary healing, but when there is more than 2 mm defect, or there is inflammation in the antrum, the opening often persists.<sup>[3]</sup>

There are several alternative techniques to close oroantral communications, such as soft tissue flaps, bone grafts, alloplastic material and some other techniques.<sup>[4]</sup>

Platelet-rich fibrin is a second generation platelet concentrate and is defined as an autologous leukocyte and platelet-rich fibrin biomaterial. It was first developed by Choukroun *et al.* in

Fracce.<sup>[5]</sup> It has been used extensively in combination with bone graft materials for periodontal regeneration, ridge augmentation, sinus lift procedures for implant placement and for coverage of recession defects in the form of a membrane.<sup>[6]</sup> This membrane consists of a fibrin 3-D polymerized matrix in a specific structure, with the incorporation of platelets, leukocytes, growth factors and presence of circulating stem cells.<sup>[7]</sup> The PRF clot forms a strong natural fibrin matrix, which concentrates almost all the platelets and leucocytes of the blood harvest, and creates a complex architecture as a healing matrix, including mechanical properties no other platelet concentrate offers. It is an autologous biomaterial, not an improved fibrin glue.<sup>[8]</sup>

Recently, we reported that PRF could stimulate cell proliferation of osteoblasts,<sup>[9]</sup> gingival fibroblasts,<sup>[10]</sup> pulp cells,<sup>[11]</sup> and periodontal ligament cells, but suppress oral epithelial cell growth.<sup>[10]</sup> These cell-type-specific actions of PRF may be beneficial for tissue regeneration. Some clinical applications in socket preservation,<sup>[12]</sup> sinus augmentation,<sup>[13]</sup> and periodontal regeneration surgery.<sup>[14]</sup>

However, no data are available on the use of PRF in the closure of oroantral communication by itself as a clot and a membrane together individually, with the exception of Gulsen *et al.* in Turkey who used PRF as a clot only without a membrane to close oroantral

communications and they published their results in 2016.<sup>[15]</sup>

The present study was conducted to evaluate the use of the platelet-rich fibrin as a clot and a membrane for the closure of oroantral communication.

## MATERIALS AND METHODS

During the years 2014 - 2016, in the department of oral and maxillofacial surgery, college of dentistry, Tishreen university, Syria, the platelet-rich fibrin was used for the closure of oroantral communications that results of extraction and all the perforations treated in 48 hours after the extraction in 16 patients (7 males and 9 females) ranging in age from 31 to 53 years, all the patients were free of systemic diseases, and all the defects were in posterior part of maxilla with the diameter of 3-7mm. (the diameter of the perforations were measured using a small ruler between the largest margins of the defect). Periapical radiographs and Water's view was taken for each patient to demonstrate the defect in the bony floor of the antrum and ensure its presence, also to show the condition of the maxillary sinus.

All of the operations were performed under local anesthesia with 2% lidocaine and 1:80,000 adrenaline. Then blood samples were taken from the patient without using an anticoagulant, in 12ml glass-coated plastic tubes, and immediately centrifuged at 3000 rpm for 12 minutes (Nuve 200 centrifuge, Beckman Coulter). A fibrin clot is formed

in the middle part of the tube, while the upper part contained a cellular plasma, and the bottom part contained red corpuscles. The fibrin clot was separated easily from the lower part of the centrifuged blood, then The clot has been cut into one third and put into the extraction socket after the irrigation with a sterile physiological solution to eliminate any residue in the form of a foreign body, The remaining two-thirds of PRF clot was pressed gently with sterile dry gauze and then the membrane had been created and sutured with silk thread 3/0 above the extraction site with two sutures buccally and palatly. Postoperative mouth rinse (isotonic saline) were prescribed 2-3 times daily. Antibiotics, analgesic and nasal decongestants were not used. Patients were recommended to eat a soft diet and not to blow the nose during the first week, and sutures were removed 10 days later.

Our success criterion in the present study was the complete epithelialization of the extraction site (complete closure of the perforation) without symptoms or signs of leakage. Follow-up evaluations were performed at 10 days, 15 days, first month, and second month after treatment.

### **Case 1**

A 31-year-old man with an OAC in the right maxilla after the extraction of his first right upper molar, and he was treated with platelet-rich fibrin, Figures from 1 to 6.

### **Case 2**

A 53-year-old woman with an OAC in the right maxilla after the extraction of her first right upper molar, and she was treated with same technique, Figures from 7 to 10.

### **RESULTS:**

Out of the 16 patients, 43.75% (7/16) were men and 56.25% (9/16) were women. Their age range was 31 to 53 years. The etiology of the perforation was tooth extraction in all patients. The greatest incidence of the perforations was found after extraction of the first molar, followed by extraction of the second molar. Of the 16 perforations, nine were in the left side and seven in the right side of the maxilla. The size of the communication was less than 7 mm in all cases. All cases had successful healing after two months follow up period, and at the end of a week the platelet-rich fibrin had been transformed into healthy granulation tissue. Three weeks postoperatively healing and epithelisation of oral mucosa was apparent. The most relevant immediate postoperative complications were pain (31.25%), edema (25%) and trismus (12.5%). After the two months follow-up period all cases were healed without any complications (Table 1).

### **DISCUSSION :**

PRF prepared using Choukroun's technique, is prepared naturally without the addition of thrombin. It is hypothesized that the PRF has a natural

fibrin framework that can protect growth factors from proteolysis.<sup>[16]</sup> It is organized as a dense fibrin scaffold,<sup>[17]</sup> with a specific slow release of growth factors.<sup>[16]</sup> PRF can be considered as a natural fibrin based biomaterial to guide cell migration into the wound. In addition, growth factors are active for a relatively longer period and are effective in stimulating tissue regeneration.<sup>[18]</sup> This leads to the idea of using PRF as a biomaterial for closure of oroantral communication.

To the best of our knowledge, this is the first report of the use of PRF as it self Individually as a clot and a membrane together for closure of oroantral communications .Recall examinations of the patients who received the procedures showed complete closure and absence of maxillary sinus pathosis We had no need to raise a flap and the vestibular depth was protected. The reason PRF can improve the OAC healing can be explained as follows; This fibrin matrix can guide the healing processes. Recently, we found that PRF can upregulate phosphorylated extracellular signal-regulated protein kinase expression and suppress osteoclastogenesis by promoting the secretion of osteoprotegerin (OPG) in osteoblasts cultures.<sup>[9]</sup> PRF also was demonstrated to stimulate osteogenic differentiation of human dental pulp cells<sup>[11]</sup> and periodontal ligament cells by upregulating (OPG) and alkaline phosphatase expression.<sup>[14]</sup>

Many growth factors, such as platelet-derived growth factor and transforming growth factor, are released from the PRF. <sup>[16]</sup> In addition, PRF may play an important role in the revascularization of the graft by supporting angiogenesis.<sup>[7]</sup>

When all of this is considered, PRF can be recognized as an autologous biomaterial. PRF as a membrane and grafting material offers an improved space-making effect on the barrier, which is conducive to cell events leading to bone tissue regeneration and facilitation of mineralized tissue formation due to osteoconductive and/or osteoinductive properties possibly inherent in PRF.<sup>[19]</sup> Recently Gülsen *et al.* found that PRF as a clot only can close OAC successfully,<sup>[15]</sup> and Kapustecki *et al.* found that using autogenous bone graft and PRF membrane can improve normal bone regeneration in the site of oroantral communication.<sup>[20]</sup>

## CONCLUSIONS:

In conclusion, platelet-rich fibrin via Choukroun's technique is simple and inexpensive, and the systematic use of this biomaterial for the closure of oroantral communications seems to be a very promising option.

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**TABLES:**

| No | Gender | Age/Year | Region                      | Etiology   | Immediate complications | Delayed complications |
|----|--------|----------|-----------------------------|------------|-------------------------|-----------------------|
| 1  | Male   | 40       | Left 1 <sup>st</sup> molar  | Extraction | None                    | None                  |
| 2  | Female | 53       | Right 1 <sup>st</sup> molar | Extraction | None                    | None                  |
| 3  | Female | 59       | Left 2 <sup>nd</sup> molar  | Extraction | Pain+Trismus            | None                  |
| 4  | Male   | 31       | Right 1 <sup>st</sup> molar | Extraction | None                    | None                  |
| 5  | Female | 36       | Left 2 <sup>nd</sup> molar  | Extraction | Edema                   | None                  |
| 6  | Female | 44       | Left 1 <sup>st</sup> molar  | Extraction | Pain                    | None                  |
| 7  | Male   | 50       | Right 2 <sup>nd</sup> molar | Extraction | None                    | None                  |
| 8  | Female | 37       | Left 1 <sup>st</sup> molar  | Extraction | None                    | None                  |
| 9  | Male   | 51       | Right 1 <sup>st</sup> molar | Extraction | Edema                   | None                  |
| 10 | Male   | 42       | Right 2 <sup>nd</sup> molar | Extraction | Edema+pain              | None                  |
| 11 | Female | 46       | Left 1 <sup>st</sup> molar  | Extraction | None                    | None                  |
| 12 | Female | 39       | Right 2 <sup>nd</sup> molar | Extraction | None                    | None                  |
| 13 | Female | 48       | Left 1 <sup>st</sup> molar  | Extraction | Trismus+Pain            | None                  |

|    |        |    |                             |            |       |      |
|----|--------|----|-----------------------------|------------|-------|------|
| 14 | Male   | 37 | Right 1 <sup>st</sup> molar | Extraction | Edema | None |
| 15 | Female | 41 | Left 1 <sup>st</sup> molar  | Extraction | None  | None |
| 16 | Male   | 49 | Left 2 <sup>nd</sup> molar  | Extraction | Pain  | None |

Table 1. Sample population details

**FIGURES:**



Figure 1 (A) clinical diagnosis of OAC with gutta percha point (B) radiographic view

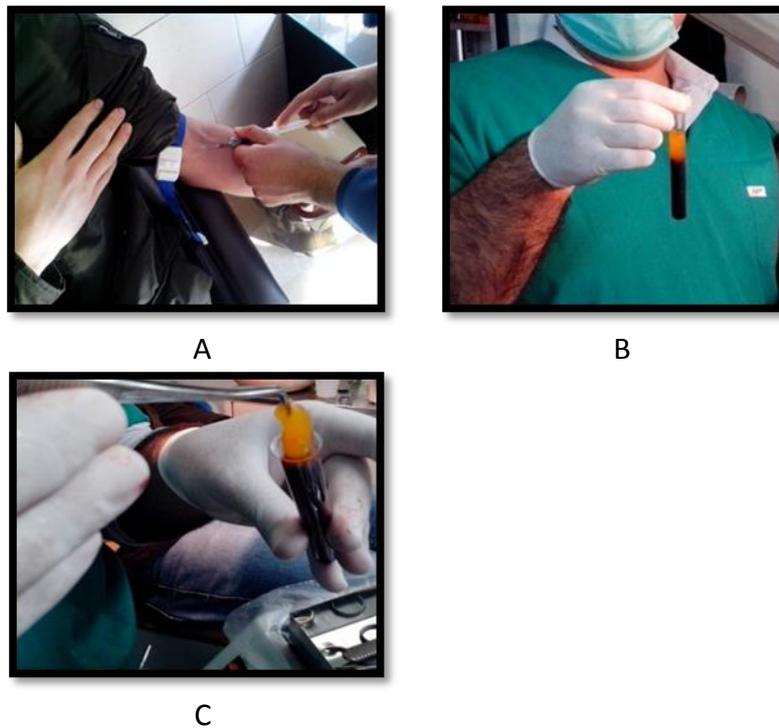
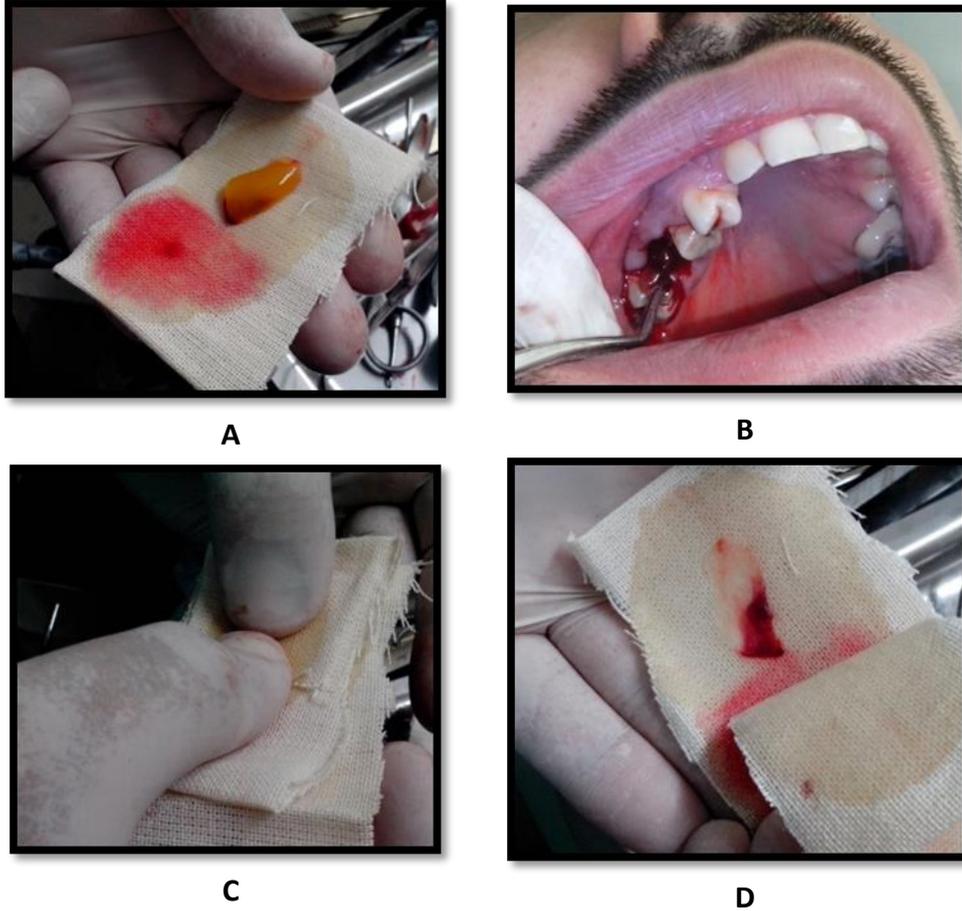
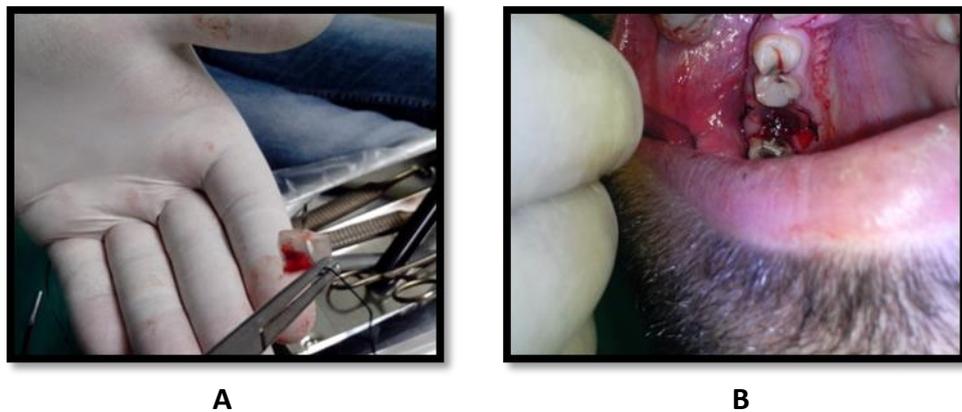


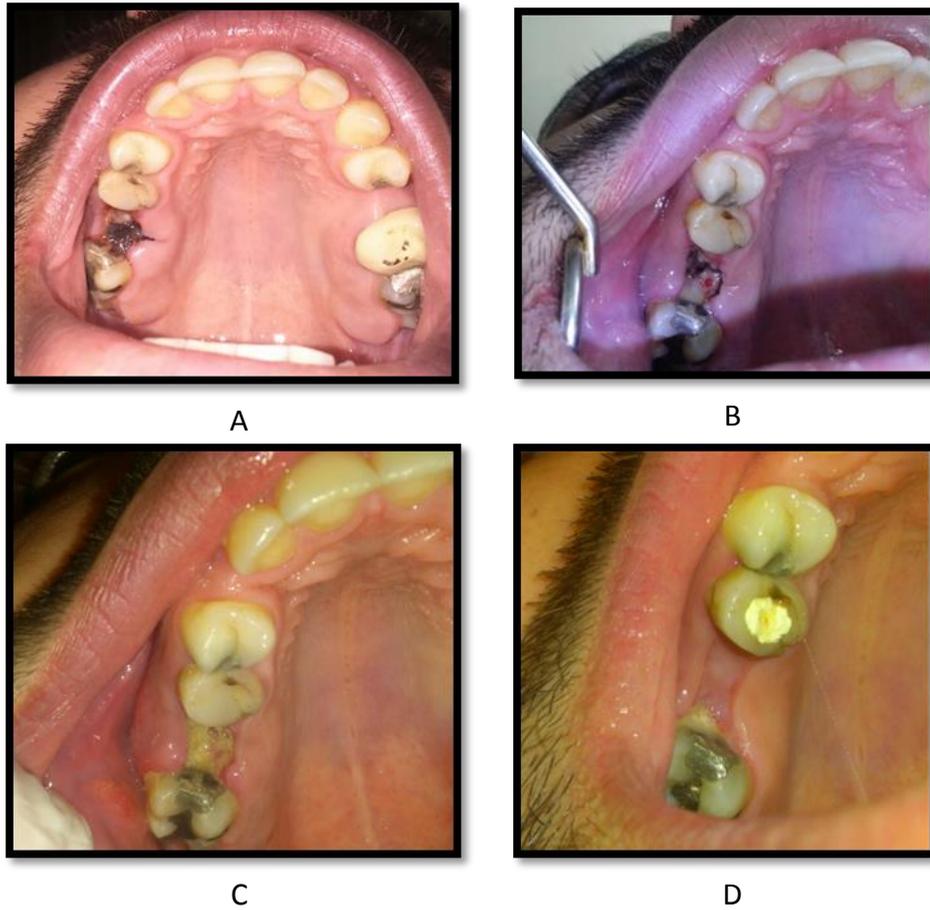
Figure 2 (A) Taking a sample of patient blood (B) the blood after centrifuging (C) The fibrin clot separated easily from the lower part of the centrifuged blood.



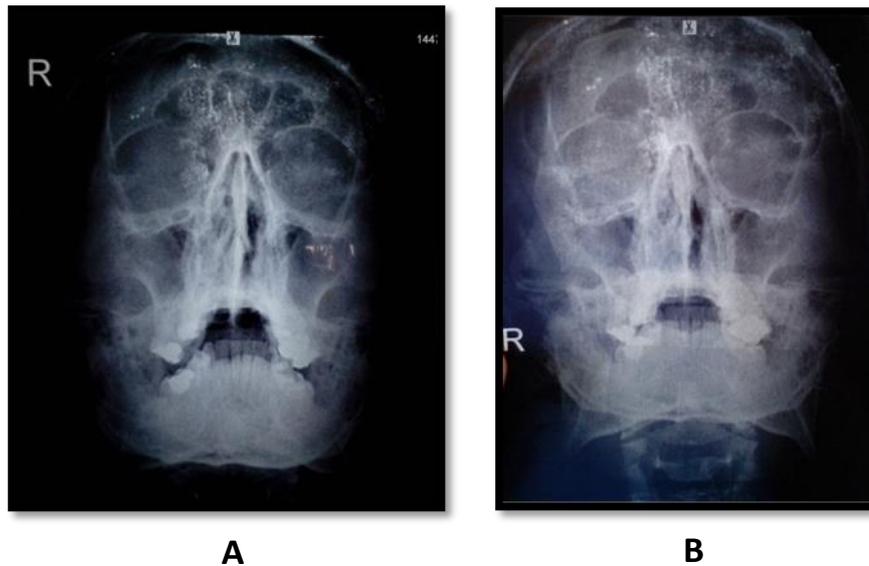
**Figure 3** (A) cutting the fibrin clot into two pieces (B) putting one third of the clot into the socket of extraction (C) The PRF clot was gently pressed between two layers of sterile dry gauze to form a membrane (D) PRF membrane.



**Figure 4** (A) suturing the membrane with silk thread 3/0 (B) suturing it above the socket that contains OAC.



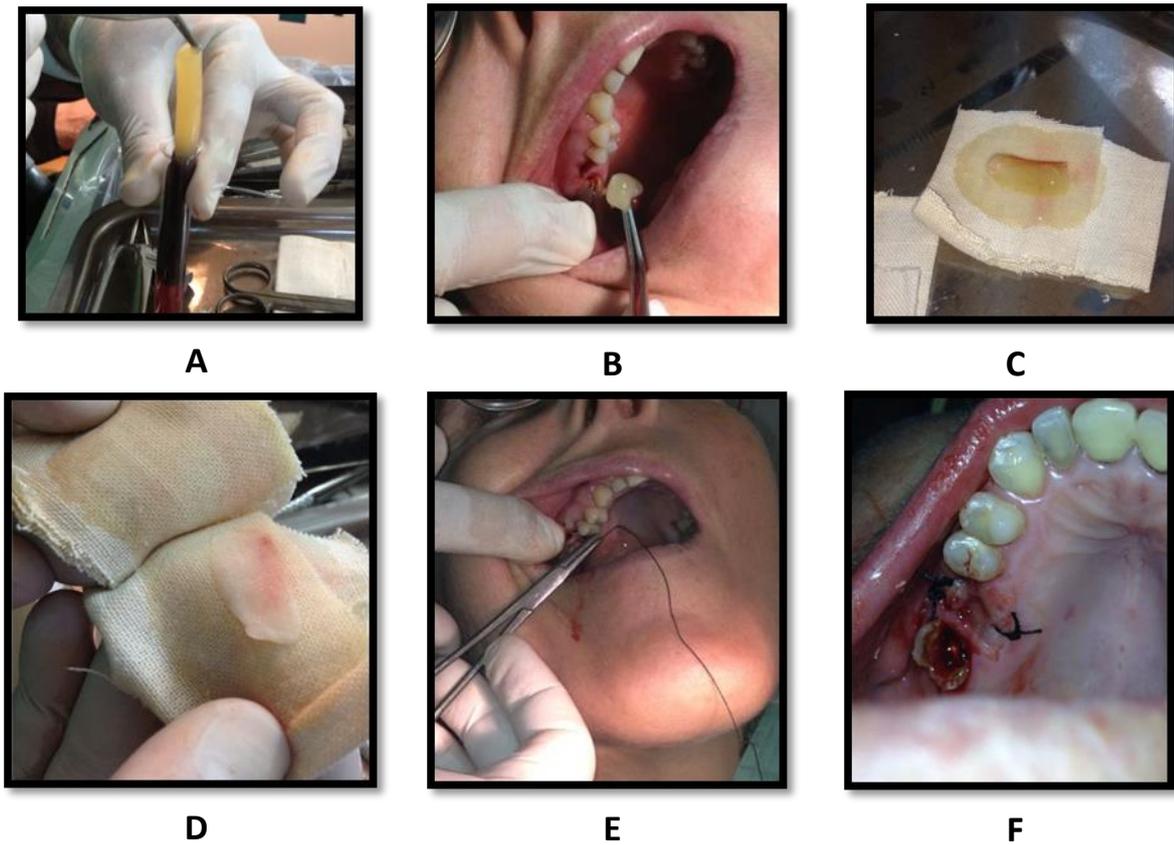
**Figure 5** (A) After 48 hours (B) after one week (C) after one month (D) after two months.



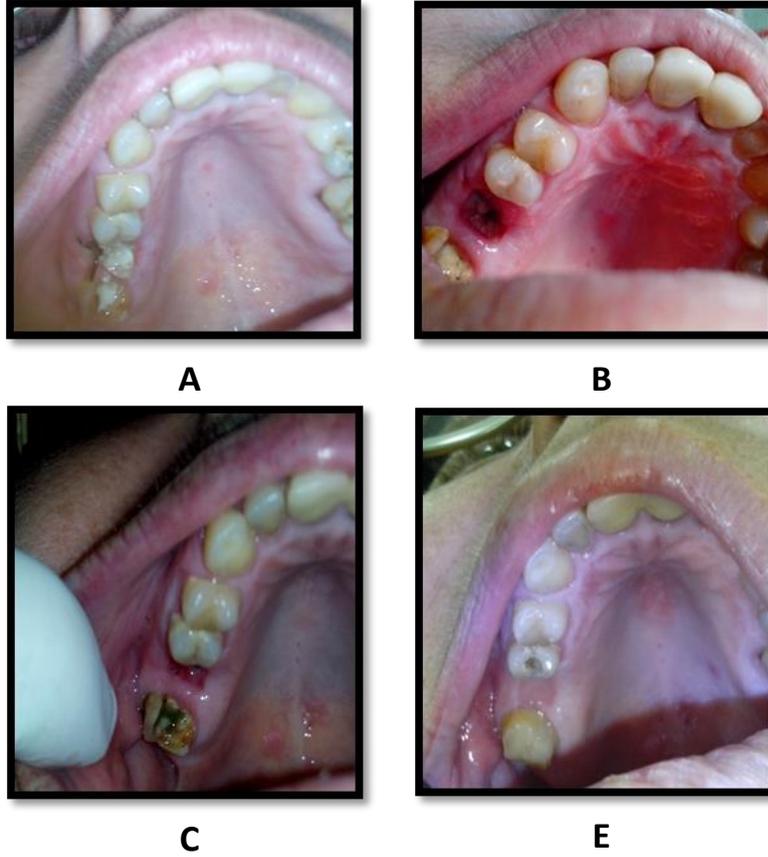
**Figure 6** Radiographic views shows the absence of any pathosis (A) before the surgery (B) after two months.



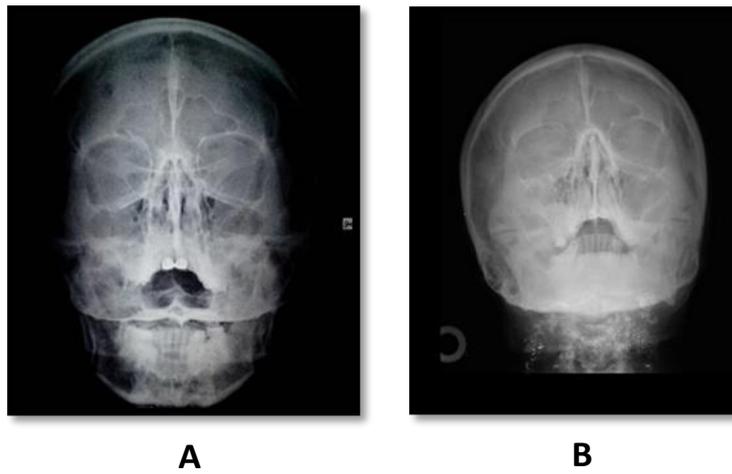
**Figure 7** Diagnosis of OAC (A) radially (B) clinically.



**Figure 8** (A) The fibrin clot separation (B) putting one third of the clot into the socket (C) (D) two thirds of the clot gently pressed between two layers of sterile dry gauze to form a membrane (E) suturing the membrane above the socket (F) two sutures applied buccally and palatelly.



**Figure 9** (A) After 48 hours (B) after one week (C) after one month (E) after two months



**Figure 10** Radiographic views shows the absence of any pathosis (A) before the surgery (B) after two months.