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Does Subperiosteal Scoring Contribute to Enhanced Success of Rehrmann Flap for Closure of Oro-Antral Fistula?

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Abstract

Objective: The Rehrmann flap is a type of buccal flap for closure of small oro-antral fistula (OAF). The aim of the study was to investigate whether the subperiosteal scoring contributes to enhanced success of Rehrmann flap for closure of OAF.

Methods: The prospective randomized study was undertaken on 40 patients who had previously undergone extraction of maxillary first molars with an established diagnosis of OAF. The patients were divided into 2 groups of 20 cases each with OAF following extractions and surgical closure based on "with subperiosteal scoring" for group A and "without subperiosteal scoring" for patients included for group B intervention arm.

Results: It was observed that for patients in group A, there was adequate tissue for OAF closure without flap tension in 20 patients (100%), whereas for patients in group B, flap closure without tissue tension could be achieved in 10 of the 20 patients (50%). The incidence of postoperative flap dehiscence was n = 1 (5%) in group A and n = 7 (35%) in group B.

Conclusion: Subperiosteal scoring was found effective and had a better and uneventful healing of oro-antral communication or fistula.

Keywords: Surgery, oral, maxillary sinus, oroantral fistula, mouth mucosa

INTRODUCTION

Any perforation caused in the maxillary sinus and its conversion into oro-antral fistula (OAF) is an uncommon condition, yet commonly encountered complication following exodontia. It may result as the complication of surgery including dental extractions, trauma, infection, irradiation, neoplasm, or cyst.[1] The most common cause for its formation is traumatic extractions of the maxillary posterior teeth. Considering anatomical location of the sinus and its close proximity with teeth, maxillary antrum occupies a vital place for maxillofacial surgical procedures.[2]

Development of the maxillary sinus starts from a small empty cavity at birth, which usually starts to enlarge in size during the third month of fetal life and reaches to its maximum size at around the 18th year of life. The volume of maxillary sinus is approximately 20 ml to 25 ml in a normal human adult. Anatomically, alveolar process and hard palate forms the floor of the sinus.[3]

The roots of maxillary premolars and molars are in intimate proximity to the antrum, with those of second premolars and first molars appearing to bewithin the sinus at most instances. Thus, OAF is a result of abnormal oro-antral communication (OAC), which may be caused by upper (maxillary) posterior teeth extractions.[4-6]

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This surgical closure of OAF is a challenging and intricate surgical procedure. The literature describes various surgical techniques from simple to complex procedures with varying degree of difficulty in its execution. The selection of the technique from various available procedures entirely depends upon the size and location of the defect, the amount and condition of existing tissue left for repair, and the ease in performing the surgery in order to provide favorable postoperative outcome. It is completely agreed upon that in spite of good surgical technique used, successful closure is dependent on complete removal and elimination of sinus fistulous tract and pathology.[7-9]

Where indicated, most common techniques proposed for closure of OAF, are buccal or palatal alveolar flaps and their modifications (with or without periosteal scoring). The Rehrmann flap is a type of buccal advancement flap for closure of small OAF with broad base and adequate blood supply.[10]

This study investigated whether the subperiosteal scoring contributes to enhanced success of Rehrmann flap for closure of OAF.

METHODS

The randomized clinical study was prospectively performed on 40 patients who had previously undergone extraction of maxillary first molars and reported to the outpatient department of the Oral and Maxillofacial Surgery unit with an established diagnosis of OAF following exodontia. All the patients included in this study were advised antibiotics (amoxicillin + clavulanic 625 mg BD) and a combination of levocetirizine and montelukast along with xylometazoline nasal drops at the time of reporting to limit sinus disease before OAF closure. These patients were randomized into 2 groups of 20 cases each with OAF following maxillary dental extraction(s), and the intervention included surgical closure of the flap with or without subperiosteal scoring; interventional arm labeled group A had 20 patients with OAF and proposed closure using Rehrmann flap with subperiosteal scoring, and interventional arm labeled group B had 20 patients with OAF and closure by Rehrmann flap without subperiosteal scoring. The inclusion criteria for the study were as follows: patients having OAFs (acute to within 4 weeks after extraction), site of fistula near maxillary first molar extracted region, and size of fistula as seen on oral end (greatest dimension of approximately 8-10 mm). The patients excluded from the study were pediatric patients below 13 years of age, older (>75 years) patients

with comorbidities, patients with mental and psychological disorders who may not cooperate for the surgical procedure, and patients with a record of allergy to local anesthetics. A randomized prospective clinical study was undertaken after obtaining the due approvals from the institutional ethical committee (IRB: TMJC/OMFS/19-21/1028).

These patients were informed before the surgery about advantages and disadvantages of the procedure, and only those who agreed to sign the written informed consent were included for this study. The following parameters were assessed: sufficient/insufficient intra-operative flap advancement for closure (assessed clinically by the operating surgeon) and presence/absence of postoperative flap dehiscence. Statistical analysis was done using paired *t* tests. Data were assessed using College of Saint Benedict and Saint John's University statistical calculators.

Pre-operative evaluation of the patients included general systemic examination and medical history, along with history of systemic diseases/hemorrhagic disorders. Thorough local clinical examination was done with particular reference to size, location, and width of extracted socket and OAF. Routine blood investigations were done before the proposed surgical intervention. OPG (orthopantomogram) and CBCT (cone beam computed tomography) were done to assess maxillary sinusitis, associated sinus pathology and the fistula.

Procedure
To eliminate the operator bias for the study, all the surgical interventions in both the study arms were performed by a single qualified maxillofacial surgeon (DB) with a peer-endorsed adequate experience in intra-oral procedures. In the operating room, under aseptic protocols, standard painting (using 5% povidone iodine solution) and draping were done. The patients included in the study were instructed to rinse their mouth with a 0.2% chlorhexidine mouth rinse before the surgery. All the patients were administered a standard 1-gram amoxicillin-clavulanic and a pre-emptive 50-mg diclofenac oral tablets 1 hour before the procedure. Local anesthesia with adrenaline (2% lignocaine with 1:200,000 epinephrine; Lox, Neon, India) was administered at the surgical site employing supra-periosteal injection for local hemostasis and anesthesia, posterior superior alveolar nerve block, and greater palatine nerve block using standard techniques (Figure 1, 2). De-epithelization of the fistulous tract was meticulously done, and fistula was cleaned and irrigated thoroughly with povidone iodine solution and 0.9% saline to avoid infection and further flap rejection (Figure 3). This was followed by placement of collagen membrane (of bovine origin) over the fistula orifice before flap closure. Rehrmann flap (buccal trapezoidal mucoperiosteal flap) was elevated in both the groups: in group A, subperiosteal scoring of flaps was done with great care to avoid damage to flaps (Figure 4), and in group B, flaps were devoid of subperiosteal scoring (Figure 5). The flaps were advanced palatally using an Adson's tissue holding forceps in order to close the defect with

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Main Points

- Rehrmann flap is a versatile local buccal advancement flap for the closure of oro–antral fistula.
- Subperiosteal scoring decreases flap failure rate post-surgery.
- Subperiosteal scoring enhances flap mobilization and length, facilitating closure without tension.

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Figure 1. Pre-operative image of OAF

Figure 4. Periosteal scoring

Figure 2. De-epithelization of the fistula tract

Figure 5. Flap with periosteal scoring

Figure 3. Fistula was cleaned and irrigated adequately

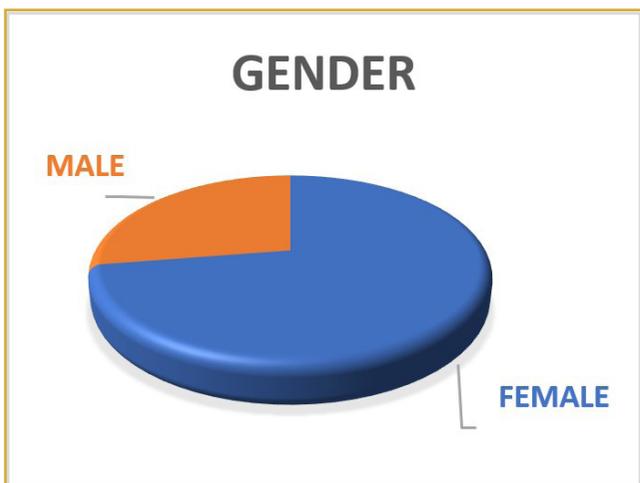Figure 6. Flap advancement with periosteal scoring

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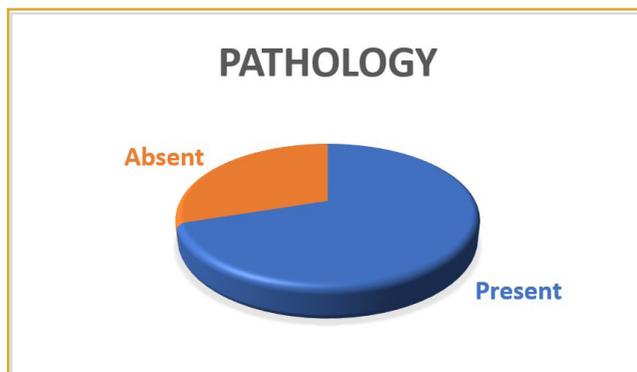Figure 7. Closure after flap advancement

Figure 10. Percentage of pathology detected in the maxillary sinus among study patients

Patients were also advised external ice fomentation in the immediate postoperative period. Suture removal was done on the seventh postoperative day.

Postoperative Care
Patients were instructed to follow a strict protocol for non-pressure activity, such as avoiding sneeze or cough forcefully, forceful rinsing or spitting, and sipping forcefully or using a straw. All patients were on antibiotics and analgesics for 7 days in the postoperative period and were regularly recalled for a follow-up and a review of the surgical site to rule out any postoperative complications on third and fifth postoperative days. Patients were also monitored using a once daily tele-call and were recalled on the seventh postoperative day for the removal of sutures. Postoperative evaluation was done for any dehiscence of the flap for up to 4 weeks postoperatively.

RESULTS

For this study, out of 40 patients who were treated, 11 patients (27.5%) were male, and 29 patients (72.5%) were female (Figure 8). Age distribution of the patients were 5 (12.5%) in the age group of 15- 24 years, 8 (20%) in 25-34, 15 (37.5%) in 35-44, 7 (17.5%) in 45-54, and 5 (12.5%) in 55-64. and most of the cases were in the age group of 35-44 years (Figure 9).

Presence of pathology (radiographic signs positive for sinusitis, polyps, and edematous orhypertrophic mucosa) within the sinus, wasevident in 28 cases (70%) on radiography (Figure 10). In all the cases, Rehrmann buccal advancement flap technique with or without subperiosteal scoring was used in order to completely close the defect and to assess the sufficiency of tissue for closure, the presence or absence of flap closure under tension during the procedure, and postoperative flap dehiscence, if any.

It was observed that for the patients in the group A, there was presence of sufficient tissue, i.e., in all the 20 patients (100%), whereas in group B, the closure could be achieved

Figure 8. Gender distribution of OAF in the study

Figure 9. Age distribution of OAF in the study

collagen membrane in place (Figure 6). Surgical site closure was done by placing simple interrupted sutures using 3-0 silk suture on a swaged needle followed by a pressure pack at the intra-oral surgical site for 45 minutes to 1 hour (Figure 7). An external buccal pressure was applied using a dynaplast stretchable adhesive bandage for 24 hours postoperatively.

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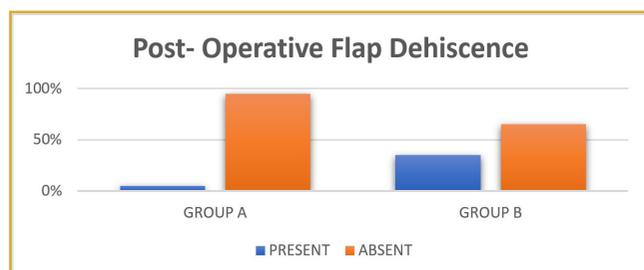**Figure 11.** Intra-operative flap advancement with sufficient/insufficient tissue for closure

Figure 12. Postoperative presence/absence of flap dehiscence
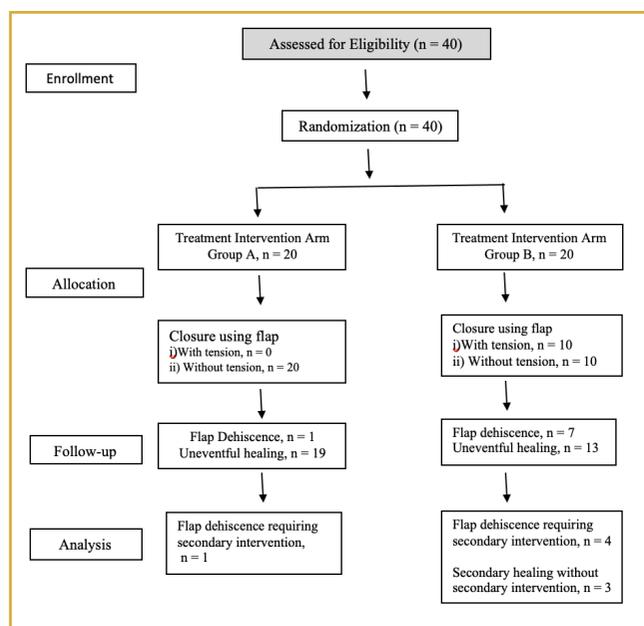

Figure 13. Flow diagram for prospective randomized study

satisfactorily without flap tension while closure in 50% of the study group patients, i.e., n = 10 (Figure 11). The rate of postoperative flap dehiscence was 1 (5%) in group A and 7 (35%) in group B (Figure 12). The patient in group A with postoperative flap dehiscence had known diabetes and was under medication with HbA1c value of 6.7; this patient was re-operated with buccal fat pad and Ashley's flap. In group B, out of 7 patients with postoperative flap dehiscence, 4 were re-operated with buccal fat pad and Ashley's flap, whereas 3 healed despite partial flap dehiscence (Figure 13).

DISCUSSION

The most common cause for the formation of OAF is traumatic extractions of upper posterior teeth due to the anatomical location of maxillary sinus and its close proximity with teeth.[2] Many authors also found a close relationship of maxillary second premolars with maxillary sinus.[3,4] Von Bonsdorff[5] reported that base of the sinus is in intimate relationship with the maxillary second premolars. Other authors also revealed that the most common etiological factor for OAF is the removal of maxillary first molars.[6-9]

Any OAF of diameter greater than 4-5 mm fails to close spontaneously and thus requires a surgical closure in order to heal completely. The surgical closure of OAF is challenging and poses difficulty for the surgeons.[10] Two important rules in surgical treatment of OAC/OAF are to 1) make the defect infection free, and 2) to achieve tension-free closure irrespective of any soft tissue flap used.[16]

Some common local flap techniques used by the surgeons worldwide for closure of OAF are buccal or palatal alveolar flaps with their modifications such as incorporation of subperiosteal scoring. Of these local flap techniques, the Rehrmann buccal advancement flap is the most common.[10] Visscher et al.[15] reported the ease of closure with buccal or palatal flaps and entrusting these flaps as the treatment of choice for OACs, where indicated.

In general, Rehrmann buccal advancement flap is simple, is less technique-sensitive, and requires short operating time. For the palatally located defects or defects with larger diameters, the flap may offer insufficient tissue for closure, and this may result in tension due to stretch during defect closure and suturing. With incorporation of periosteal scoring, the pliability and increase in length of the flap may be achieved with closures without tissue tension. The disadvantage of the buccal advancement flap is the reduction in the depth of buccal vestibule, which may pose difficulty for future prosthetic rehabilitation, as observed in the present study.[14,17,18]

Other techniques and materials used include alloplastic materials varying from autogenous bone grafts[11] to gold foil.[12] In addition, the use of dura mater and fascia have been advocated as allotransplants for OAF closure.[13] Lately, the use of pedicled buccal fat pad is also investigated and proposed for the closure of large defects.[14] Buccal fat pad is found to be safe and effective for the closure of OAFs as it fulfills criteria such as its wide applicability, low failure rate, simple implementation, no need of additional tooth or bone/autogenous tissue removal, with minimal discomfort to the patients postoperatively.[14,18]

Rehrmann buccal advancement flap with subperiosteal scoring for closure of OAC or OAF is a simple, conventional technique that aids in tension-free closure with successful and uneventful healing of the defect as compared with closure without subperiosteal scoring.

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