A Comparison between Submucosal Connective Tissue Palatal Flap and Conventional Pedicle Palatal Flap for the Closure of Oroantral Fistulae

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Citation

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Abstract

Background and Aim: Oroantral communication and subsequent formation of oroantral fistula is a common complication of dental extraction and/or other oro-facial surgeries. Many surgical procedures have been used for the treatment of oroantral fistula, and it is believed that long term successful closure of oroantral fistula depends on the technique used, the size and the location of the defect. The aim of this study is to evaluate the success of the submucosal connective tissue palatal flap technique compared to the conventional pedicled palatal flap technique in the closure of oroantral fistula.Materials and Methods: Ten patients suffering from oroantral fistula were recruited in the study, and they were divided into two groups. The first group was treated with the conventional pedicled palatal flap technique, and the second group was treated with the submucosal connective tissue flap technique. Suitable post-operative care and observation in both groups were achieved.Results: It has been shown that all fistulae were closed successfully in both groups. There was no discomfort and no burning sensation in the second group. They all showed relatively fast healing. Interestingly, patients in the second group needed fewer amounts of post-operative analgesics than in the first group.Conclusion: Both types of flap techniques provided sufficient and successful closure of oroantral fistula. However, submucosal connective tissue palatal flap seems to be preferable for fistula closure because it overcomes the disadvantages of the full thickness palatal flap. Compared with the conventional palatal flap, submucosal connective tissue palatal flap technique may appear to be more difficult in terms of flap manipulation. The surgical experience plays an important role at this level.

INTRODUCTION

Oroantral fistula (OAF) is the communication between the maxillary sinus cavity and the oral cavity through a perforation in the sinus wall.

The term oroantral communication comprises two pathological conditions; the acute oroantral perforation and the chronic communication ‘‘fistula’‘ (1).

Oroantral communication and subsequent formation of OAF is a common complication of dental extraction. Owing to its anatomical location and intimate relationship with the teeth, the maxillary sinus occupies an important place in oral surgery. From a small cavity at birth, the maxillary sinus starts to enlarge during the third month of fetal life and usually reaches maximum development around the eighteenth year. Its volume is approximately 20-25ml in a normal adult. The removal of the first upper molar is the most common etiological factor which may lead to OAF (2).

Some pathological conditions that might also cause oroantral communication are: removal of tumors or cysts of the palate, cases of noma, syphilitic gumma, leprosy, and lishmaniasis (3). An OAF usually needs 7 days to epithelize and become a chronic fistulous tract (4).

Long term successful closure of OAF depends on the technique used, the size and the location of the defect (2).

Many surgical procedures have been used for the treatment of OAF (3) such as:

- Buccal flaps
- Pedicle tongue flap
- Combined buccal and reverse palatal flap
- Pedicle buccal fat pad graft
- Palatal pedicle flaps

Several materials can also be used to enhance a successful closure under the flap like bone or cartilaginous grafts, gold foil, and biodegradable ceramic (5).

The optimal operative procedure to accomplish closure of OAF ought to fulfill the following requirements:

1. Be applicable in most cases
2. Have minimal incidence of failure
3. Be relatively simple
4. Does not require removal of additional teeth or bone tissues

The most common flaps used in the closure of OAF are the buccal flaps and the palatal flap with its modifications.

Buccal flaps are successfully used in the closure of OAF. Care must be taken to avoid injury to the parotid papilla or duct. Although the buccal flap is technically a simple procedure, yet it has the following disadvantages: 1) it is thin, 2) there is tendency to obliterate the muco-buccal fold, and 3) it is unstable due to cheek movements (5).

The palatal flap with its modifications results in successful closure of the fistula. The palatal mucosa is much thicker and firmer than the buccal mucosa or cheek, and a flap can be designed that is well nourished by the blood vessels emerging from the anterior palatine foramen (greater palatine artery) (4).

Pedicled palatal flap closes the OAF without reduction in the depth of the buccal vestibule. However, rotation of the palatal mucoperiosteum flap leaves a raw area on the palate until secondary epithelization occurs and a bulge of soft tissue is created at the axis of rotation (6). In trials to overcome these problems, submucosal connective tissue palatal flap technique was used successfully and provided mucosal flap to cover the raw area (7).

The aim of this study is to evaluate the success of the submucosal connective tissue palatal flap compared to the conventional pedicled palatal flap in the closure of OAF.

MATERIALS AND METHODS

Ten patients suffering from OAF were recruited in the study. They were collected from the private clinic of Oral surgery and were divided into two groups; G1 and G2. Each group contained five patients. The first group was treated with the conventional pedicled palatal flap technique, and the second group was treated with the submucosal connective tissue flap technique.

A comprehensive history was collected from the patients considering the cause and onset of OAF, and about the duration of the condition.

The clinical examination of the patients included the observation of remarkable features such as: regurgitation of liquids from the mouth into the nose, which is the most common complaint, unilateral epistaxis, alteration in the resonance of the voice, inability to blow-out the cheek, difficulty in smoking, and/or foul or salty unpleasant taste.

X-ray examinations revealed the presence of a fistulous tract connecting the oral cavity with the maxillary sinus.

After suitable anesthesia, in both groups of patients, the OAF was prepared by excising the epithelium from its margins and by undermining the mucoperiosteum on its buccal aspect, followed by removal of diseased bone if present, so that the flap would rest on healthy bone tissue and thus enhance successful closure.

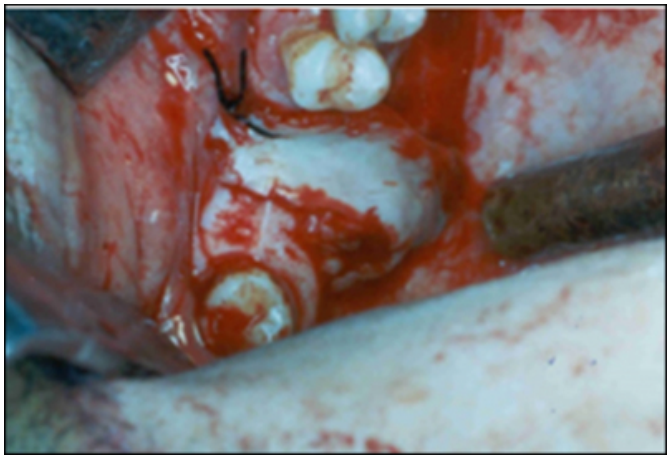
The first group (G1) was treated by conventional pedicled palatal flap (also known as palatal rotation advancement flap). Briefly, the flap was extending anterior and large enough with the base of the pedicle over the greater palatine foramen. The flap started approximately in the middle between the gingival margin and the median palatine raphe. This flap is rotated across the fistula so that its anterior suture line rests on sound bone on the buccal side of the fistula (Figures 1 and 2).

Figure 1

Fig. 1: Preoperative photograph of fistula with 1 month duration

Figure 2

Fig. 2: Rotation of the palatal flap to cover the defect



The second group (G2) was treated by palatal submucosal flap. This technique is considered as a modification of the previous procedure and was achieved by separating the full thickness palatal flap into a mucosal layer and an underlying connective tissue layer.

The submucosal connective tissue flap was used to close the fistula, and the mucosal part of this flap is then returned to its original position and sutured in place to obtain primary closure (Figures 3 and 4).

Figure 3

Fig. 3: Preoperative photograph of fistula with 2 year-duration

Figure 4

Fig. 4: Preparation of the Palatal Submucosal flap and dissection into two layers

The patients were post-operatively instructed to avoid any actions which may cause negative or positive pressure inside the sinus (e.g. drinking tubes, blowing the nose, sneezing with opened mouth, etc…). Antibiotics were also prescribed to avoid infection for 5-7 days, and analgesics to relieve pain. Decongestant nasal drops and inhalants to shrink the nasal mucosa and promote healing were advised, as well as normal saline mouth washes after 24 hour post-operatively. Sutures were removed after 10-12 days post-operatively.

Immediate evaluation of the surgical procedure and consequences was done at the day of the operation after complete recovery and then one day after the operation through clinical objective findings including: 1) Bleeding (ranging from no bleeding to active bleeding), and 2) Pain; could be evaluated by the amount of analgesics consumed

per day.

Late post-operative evaluation was conducted in the follow-up once a week up to 4 weeks. The evaluation included: healing, the color of the flap, texture of the tissue, integrity of the suture line, signs of flap epithelialization, infection, pain, headache, numbness of the operated area, fistulae recurrence (if recurrence occurred, it would appear at the time of suture removal and not later), posterior nasal discharge and/or maxillary sinusitis, chewing and swallowing difficulties, and speech problems.

RESULTS

CLINICAL RESULTS IN G1

During the immediate post operative period, all patients were complaining of pain and burning sensation with discomfort during chewing and swallowing. The early postoperative period started directly after the end of the operation till the end of the first week. All patients showed slight bleeding in the early post operative few hours.

The late observation period extended for three months. By the end of the second month the flap was healed and the raw area was covered and there was no complaint from the patient.

CLINICAL RESULTS IN G2

During the immediate post operative period there was no bleeding at all, no discomfort during eating, which might be presented due to the absence of bulky palatal soft tissue mass, no raw area, and no burning sensation.

The late observation period showed that the fistula was completely closed in all the patients at the time of suture removal. The edges of the flap were healed, and the granulation tissue changed into a firmer granulation tissue during the second week and it became completely epithelialized, with slight contraction and shrinkage. By the end of the third week the submucosal layer became completely healed and its color started to return to the normal color of the mucosa.

FINAL GENERAL RESULTS

It has been shown that all fistulae were closed successfully in both groups. There was no discomfort and no burning sensation in G2. They all showed relatively fast healing. Interestingly, patients in G2 needed fewer amounts of analgesics than in G1 (Figures 5 and 6).

Figure 5

Fig. 5: Six weeks postoperatively shows complete healing of the palatal flap in G1 with successful closure of the fistula

Figure 6

Fig. 6: postoperative view shows complete healing of the palatal submucosal flap in G2 with successful closure of the fistula

DISCUSSION

The oroantral communication is a rather frequent complication of oral surgery in the maxilla. Most of these complications can be treated adequately at the time of occurrence. However, some of them become chronic and may cause considerable problems to the patient and to the surgeon (8). Such fistulae usually occur in association with an extraction of premolars or molars in the upper jaw (9).

Oroantral fistula in the alveolar ridge of the molar region can also occur after enucleation of cysts, or surgery for treatment of maxillary sinus. Such openings are difficult to be closed surgically (10).

In our study, cases of oroantral communication had

developed as complications after teeth extraction with a percentage of 80 % of the communications resulted after removal of the upper first molar; four cases due to extraction of upper right first molars, four cases due to extraction of upper left first molars, one case due to extraction of upper right third molar, and one case due to extraction of upper right second premolar.

Killey and Kay (1967) analyzed 250 cases of OAF. They found that 50 % of the cases occurred after the removal of the upper first molar (11).

Hirata et al. (2001) mentioned that the perforation rate occurred most often after extraction of upper first molar, and that it was significantly higher in males who were in the third decade of life (12).

In our study, male to female ratio was 1:1, and the age range of the patients was between 25 and 59 years with an average of 40 years.

It seems to be that the incidence of OAF is more frequent in elder patients. Punwutikorn et al. (1994) noted that the elder the patient, the higher the chance of having OAF after simple tooth extraction (4). They have also shown that removal of the first molars is the most etiological factor in OAF.

An oroantral defect larger than 5 mm or present for three or four weeks rarely heals spontaneously, and the subsequent OAF that develops usually requires surgical closure. The problem of adequate, tension-free tissue coverage becomes significant as the size of the defect increases (13). If the patients are suffering from acute sinusitis, this must be first controlled by pre-surgical treatment, but its presence should not affect the ultimate choice of surgical procedures. The most significant factors influencing the choice of the technique are the size of the fistula and the amount of edentulous space available for surgery. In cases where the fistula is extremely large and/or located in the third molar region, the palatal pedicle flap is preferable (14-15).

Patients who present with a chronic OAF not only require closure of the fistula but they also require management of the inflammatory sinus disease that co-exists with the fistula before its closure (16). All the patients in our study were instructed to take antibiotics and sinus irrigation three days before operation to control the sinus infection and to be sure about the cleanliness of the sinus.

Numerous techniques have been described for closure of OAF. Most of them share an equal degree of success and failure (13, 17).

A modified palatal flap technique has been introduced and successfully used in eight patients for closure of OAF (18).

Successful closure of OAF is dependent upon the following principles:

-Control of maxillary sinus infection.

-Removal of as much of the epithelial lining of the fistula as possible, making sure that there is a raw surface throughout the periphery of the wound.

-Maintenance of adequate blood supply to palatal pedicle flap with minimum tension on the flap.

-Causation of minimal trauma to the pedicle flap, and the tissue around the OAF.

-Use of a nasal antrostomy, with or without a Caldwell-Luc procedure, to ensure adequate sinus drainage (18).

Gordon and Brown (1992) mentioned that the treatment of OAF was considered successful when primary healing had occurred at the time of suture removal (19).

In our study ten cases of OAF were treated with two different types of palatal flaps, all fistulas had successfully closed without recurrence, primary healing had occurred at the time of suture removal. In all of the cases, neither nasal antrostomy, nor Caldwell-Luc procedure was used.

Adequate sinus cleansing was performed by applying irrigation with antibiotics for at least five days, accompanied by vasoconstrictive nasal drops after complete excision of the epithelial lining of the fistula track through the bone defect toward the maxillary sinus, and removal of all pathologically-changed maxillary sinus mucosal tissues.

Further support to our technique was given by Car and Juretic (1998) who achieved successful closure in 38 cases of chronic OAF by treating them with antibiotics and without drainage of the maxillary sinus into the nose (20). They also mentioned that Caldwell-Luc drainage into the nose prolonged the procedure and made it more difficult. Moreover, postoperative oedema and hematoma were more pronounced.

Various palatal flap techniques based on the position of the

greater palatine vessels have been advocated. These can be divided into advancement flaps and rotation advancement flaps. Straight advancement flaps do not offer great mobility for lateral coverage (5, 16, 21-22).

Palatal rotation advancement flaps require mobilization of large amounts of palatal tissue because of the inelasticity of the tissue. This flap also has the disadvantage of tissue bunching at the base and causing a large area of palatal bone to be exposed (23).

This was further proven by results of our study, since all the patients of G1, who were treated with the palatal rotation advancement flap, had discomfort during swallowing and talking due to the presence of soft tissue bulge in the palate, and burning sensation from the raw bone area until complete epithelization. However, all of the patients in this group showed successful closure.

Herbert (1974) pointed out that for a large fistula, when local tissue is unavailable, palatal tissue-dependent flap is the method of choice. The palatal technique results in successful closure of the fistula with the maintenance of an adequate blood supply without reduction in the depth of the buccal maxillary vestibule.

Anavi et al. (2003) gave further support for the palatal rotation full thickness flap (24). They concluded that the palatal rotation advancement flap is recommended for the late repair of OAF owing to its good vascularization, excellent thickness and easy accessibility. It also allows the maintenance of the vestibular depth, and is particularly indicated in cases of unsuccessful buccal flap closure.

Gullane and Arena (1998) provided the main advantages of the palatal mucoperiosteal flap including a local tissue with good blood supply, excellent mobility, limited impairment of speech and a success rate of 96% (25). These advantages compensate for the relatively prolonged period required for epithelialization of the donor site over the hard palate.

This was supported by our clinical observation among the patients of G2, since all of them showed excellent closure of the fistula without any palatal soft tissue bulge. The connective tissue flap was extremely elastic, enabling it to be rotated without tension. Another advantage is that the epithelial layer of the flap was returned to its original place to cover the donor area. This technique offered the patients minimal discomfort and also provided early healing of the wound, as there was no raw area left behind for granulation. After healing, the palatal mucosa and the recipient site were smooth without a hole or bunching.

All our cases were observed periodically and didn't reveal sinusitis after the surgical closure.

CONCLUSION

According to the results of our observation, the following points could be concluded:

Both types of palatal flaps (conventional pedicle palatal flap and submucosal connective tissue palatal flap) provided enough well-nourished tissue for sufficient and successful closure of OAF (chronic or acute, large or small).

Nasoanterostomy is unnecessary in the closure of oroantral communications.

Preoperative preparation with antibiotics and good sinus irrigation is mandatory.

Submucosal connective tissue palatal flap seems to be preferable for fistula closure because it overcomes the disadvantages of the full thickness palatal flap (e.g. creation of soft tissue bulge and production of raw surface on the hard palate).

Connective tissue palatal flap offered the patients minimal discomfort, provided early healing of the wound, and did not create esthetic disturbance due to absence of the palatal raw area or any soft tissue bulge. Surgical splints or dressing were not necessary.

Due to the advantages of the connective tissue palatal flap, we believe that it is the safest procedure for the closure of OAF. However, compared with the conventional palatal flap, submucosal connective tissue palatal flap technique may appear to be more difficult in terms of flap manipulation. The surgical experience plays an important role at this level.

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