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The clinical results of buccal advanced flap for the closure of oroantral perforations

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Abstract

Aim of this study was to evaluate the success of buccal sliding flap used in the reconstruction of oroantral defects, and clarify its indications and size limitations. In this prospective clinical study, buccal Sliding flap was used for closure of oroantral defect in 23 patients with different indications which included; 4 defects resulting from maxillary cysts (radicular and residual cyst) ,12 newly created medium size oro-antral communications, 7 cases with chronic oroantral fistula. The defect diameter range between 3-8 mm. Patients were evaluated for signs of flap epithelialization, infection, and fistulae recurrence.

The epithelialization process was completed in 19 patients after 2 weeks without any complication. However, partial dehiscence of the flap occurred in 4 patients with chronic oroantral fistula.

The results of this series support the view that the use of buccal sliding flap is a simple, convenient, and reliable method for the reconstruction of small to medium-sized oroantral defects with minimum complications.

Key words: oro-antral communication, buccal sliding flap, and maxillary sinus

Introduction

Oroantral communication is not an uncommon sequel of maxillary posterior teeth extraction (0.31% to 4.7%) [1], because there is a close relationship between the root apices of these teeth and the antrum, and it may occur after surgical enucleation of the cyst related to the maxillary bone as a result of expansion of the cyst inside the alveolar bone and perforation of the antrum. Basically, any communication between oral cavity and antrum should be closed immediately in order to prevent infection and fistula formation[1-3]. 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[4,5]. During expiry the air current which passes from the sinus through the alveoli into the oral cavity facilitates the formation of a fistula canal, which connects the sinus with the oral cavity. The fistula may spontaneously close by swelling of the gingiva, although the chances of this occurring are not great. With the presence of a fistula the sinus is permanently open, which enables the passage of micro flora from the oral cavity into the maxillary sinus and the occurrence of inflammation with all possible consequences[2,4].

The occurrence of chronic sinusitis and antral polyp is frequently a

consequence of oroantral fistula. If during tooth extraction the sinus is open, but no inflammation is present, its spontaneous closure frequently occurs. When a clinical diagnosis of chronic sinusitis is made radiographic follow-up of the sinal inflammation is necessary [5,6]. The floor of the sinus is often uneven and deepened, which can be determined by determining the position of the lowest part of the sinus to the floor of the nasal cavity. The floor of the sinus can have three basic positions: beneath the level of the floor of the nasal cavity, on its level or above its level. The relation is particularly important, in which the floor of the maxillary sinus is beneath the level of the floor of the nasal cavity, because its floor can extend to the tops of the dental roots, or go even deeper between them. Such roots are separated from the sinus by a thin bony lamella and its mucous membrane, or very rarely only by the mucous membrane of the sinus. The thickness of the bone wall varies and is on average 0.2 - 16 mm .The symptoms which occur during the occurrence of an oroantral fistula are similar to the symptoms of oroantral communication[2,4] . A purulent discharge may drip through the fistula, which cannot always be seen. Also, when the patient drinks he feels as though part of the liquid enters the nose from that side of the jaw and occasionally runs out of the nostril on the same side. When the nostrils are closed with the fingers and the patient is asked to blow through the nose, air hisses from the fistula into the mouth. A similar occurrence happens when the patient blows out his cheeks, only then the air passes from the mouth into the sinal and nasal cavity [3,4]. In some cases the test of blowing through the nose or mouth does not necessarily give a positive answer, e.g. when the fistular canal is filled with inflammatorily changed sinal mucous membrane. However, the test with a blunt probe will confirm the existence of a fistular canal[5,6].

Many techniques have been proposed to seal the perforation from the oral environment. Different flap designs that cover these defects have been reported however, they each have some disadvantages. Palatal flaps produce a denuded area that requires secondary healing. The use of filler materials in combination with guided bone regeneration (GBR)and guided tissue regeneration (GTR) techniques is no real alternative, because primary closure to cover membranes is still challenging, on the other hand, graft material may easily be dislocated into the sinus and is therefore produce bad sequel [7]. A pedicle graft of the buccal fat pad (BFP) which also used in the reconstruction of oroantral defects may associate with some complications like haematoma, partial necrosis, excessive scarring, infection or facial nerve injury[6-8]. The use of nonporous hydroxyapatite blocks (which are carved and tapered with diamonds under water cooling until friction is achieved) to close fistulas has been reported[9]. Transplanted natural third molars have also been used to close perforations[10].

Suhonen and coworkers introduced the idea of applying chair side custom-made bioabsorbable root analogs into extraction sockets as immediate implants to preserve the alveolar process; all these mentioned procedures have their disadvantages and technical complexity and complications [11, 12].

This present study was done to assess the suitability of buccal sliding flap (buccal advanced flap) to close oroantral communications or chronic fistula(chronic fistula become established if the creation of oroantral communication is unrecognized ,untreated or spontaneous closure does

not occur[2-5])also to evaluate this type of flap to close oroantral defects resulting from surgical treatment of radicular cyst (periapical cyst which occur in relation to the none vital tooth) or residual cyst(the cyst that remain within the bone after extraction of the related non vital tooth), and to show the results related to the use of this technique in the repair of oroantral defects in 23 patients.

Materials & methods

During the years 2005 - 2009, in the college of dentistry Hawler medical university, the buccal advanced flaps was used for the reconstruction of oroantral defects in 23 patients (14males and 9 females) ranging in age from 17 to 57 years, all the patients were free of systemic diseases. The indications for the use of the buccal sliding flaps and the location of the reconstructed region are presented in table (1). Our success criterion in the present study was the complete epithelialization of the flap (complete closure of the perforation).

All the defects were in posterior part of maxilla with the diameter of 3-8mm.(the diameter of the perforations were measured using a small ruler between the largest margins of the defect). 12 patients were of newly created oro-antral communications during dental extraction, 7patients with chronic oroantral fistula, 4 patients with perforation during surgical removal of maxillary radicular and residual cysts.

The surgical technique of buccal advanced flap[13]:

Periapical, oblique occlusal, orthopantomograph radiographs and Waters view was taken for each patient to demonstrate the defect in the bony floor of the antrum and to show the condition of the sinus.

After giving local anesthesia to the area to be operated on; initially, the wound edges around the defect were excised with no.11 scalpel blade for refreshment and to obtain raw surfaces. The palatal margin of the opening was undermined for 2-3mm to ease later suturing; two short releaving incisions opposite the buccal ones was done to permit eversion of the palatal wound margin.Two divergent buccal incisions were then made up towards the buccal sulcus. The buccal mucoperiosteal flap then reflected, the end of this flap was grasped gently with toothed dissecting forceps. This tense lining layer of the flap (periosteum) was then lightly incised from distal to mesial; Care was taken to examine the periosteal surface of the flap before the incision so that the cut is placed to avoid any obvious vessels.

Following this, the flap was easily advanced over the defect. The corners of the distal end of the flap were trimmed a little with a sharp blade to fit the defect.

The flap was sutured into position. Two plain sutures (black silk suture 4.0) are placed bisecting the mesial and distal angles of the flap and holding these two points in position against the palatal gingiva. Next, a horizontal mattress suture then inserted between them to evert the wound margin. It then tied without undue tension or the ischemic margin that necrosis and fails to heal. Further sutures were placed to close the buccal limbs of the incision.

The sutures were removed two weeks postoperatively as it takes this time for a firm and strong attachment to develop.

During the initial healing period, the patients were advised to avoid movements which stretch the cheek or activities such as nose- blowing or forceful mouth-rinsing which produce a pressure difference between the two sides of the wound.

Amoxicillin 500 mg 8-hourly for 5days, was prescribed .those that had allergy to pencillin, then Erythromycin 500mg was given.

In some cases with chronic oroantral fistula or retained root in the sinus , extension of the anterior limb of the incision was done to explore the sinus itself through a Caldwell –Luc opening in the canine fossa, removing polypoid lining then cleaning and irrigation of the antrum with normal saline after that establishing an intranasal antrostomy was performed through which a drain (iodoform gauze) was inserted to prevent the accumulation of an antral haematoma which prejudices the success of the fistula closure procedure.

Intranasal antrostomy was done by passing heavy curved artery forceps into the nose along the floor and laterally into the antrum. Then the iodoform gauze inserted (from within the antrum) between the open tips of the forceps, grasped and then partially pulled back out through the nose. The drain was removed in twenty – four hours. Where the operation needs to be combined with an antrostomy through the canine fossa to remove a root from the antrum, the part of the mesial buccal incision which curves forwards up into the sulcus was extended to the lateral incisor region.

All patients were followed up for at least 4 weeks postoperatively and were recalled for final assessment at 3 months.

Results

All patients were followed up for one week two weeks and 4 weeks postoperatively and were recalled for final assessment at 3 months. The success criterion in this study was the complete epithelialization of the flap (complete closure of the perforation).

In 21 of the cases, signs of the BSF epithelialization started in the first week and terminated at 2nd weeks postoperatively (figure 6). One week following the operation, reopening of the flaps and failure of epithelialization was noticed in only 4 patients, who had large maxillary defects and chronic oroantral fistula table(1) and(5). In these cases, partial dehiscence of the flap was detected. None of the patients had esthetic disturbance, limited mouth opening or facial paralysis. No recurrence was seen and none of the patients needed an additional surgical intervention except those four cases of chronic oroantral fistula and large defect that considered as a two major factors of recurrences. Palatal transposition flap was performed as an alternative to close the defects of the failed cases successfully after thorough cleaning of the sinus with combination of antibiotic for the treatment of sinus infection.

From table 2-6 show statistical analysis taken from table (1)

Discussion

Numerous surgical methods have been described for treatment of oroantral defects, although only a few have been accepted in daily practice [14, 15].

When choosing the surgical method for treatment of an oroantral perforation its location and size should be taken into consideration, also its relation to neighboring teeth, the height of the alveolar ridge, duration, existence or otherwise of inflamed sinus and the general health status of the patient[6,7,15].

In the case of small perforations of the sinus, when there are no signs of sinusitis, spontaneous healing is possible, while in the case of larger perforations the chance of spontaneous healing is less[3,7].this is in agreement

with Hanazawe, reported that an oroantral fistula of less than 2 mm diameter has the possibility of spontaneous healing, while in the case of a larger diameter spontaneous healing is hampered because of the possibility of inflammation of the sinus or periodontal region [14].

The surgical technique which Guven most often used was the BAF-buccal advancement flap, because he considered it a simple method for closure of oroantral communication or fistula with less postoperative complication, less time consuming and less cost if compared with other methods used for this purpose[15]. Some authors, such as Killey and Kay In 1975 reported success with this method in 93% of cases[16]**.** Also in 1982 Von Wovern concluded a good success rate of the BSF and he mentioned some disadvantages related to it which was lowering of the vestibule and cheek oedema [17].

Intra-oral defects may be obturated with prosthesis or closed with local flaps such as palatal pedicle flap, or double layered closure flaps using buccal and palatal tissues [18, 19]. However, the aforementioned procedures produce large denuded area[18]. Commonly, the use of BSF has gained popularity in the closure of oro-antral communications and reconstruction of defects secondary to maxillary cyst [5, 7, 14,16]. There are not many reports dealing with these issues. Size limitations of BSF must be known in order to provide successful outcome. Some researchers have stated that in maxillary defects measuring more than 1 cm diameter, the possibility of partial dehiscence of the flap is high due to the impaired vascularity of the stretched ends of the flap, and they stated that the closure of larger defects cannot be guaranteed without producing flap necrosis or creating a new fistula[7,15,16,17]. These findings demonstrate that the size of the defect is an important factor for the success of BSF.

To date,buccal fat of pad technique(BFP) become popular for the closure of OAF but its not free from reported disadvantages such as haematoma, partial necrosis, infection , facial nerve injury and injury to stenson duct of parotid gland. The severe arterial bleeding also reported with this technique.other disadvantages of BFP is that the surgeon some time unable to expose the BFP adequately especially in patients with thin cheeks, also the defect could not be obliterated completely[18-23].

The success rate of BSF in the reconstruction of oral defects is quite high19 patient(82.6%) this is in agreement with all the previous articles [3, 5, 7, 16], failure of the procedure was actually seen in only 4 patients(17.4%) who had large defect with chronic infection of the sinus table(1)and table(5) illustrate that the most common cause of the surgical repair failure related to the presence of infection in the sinus this is in agreement with other studies that existence of infection in the sinus considered as a major factor in the failure of 0AF closure[7,16,17] . The epithelialization process was completed successfully in the rest of the cases at the last examination. However, factors such as careful manipulation of the flap, knowledge of its size limitations, and correct incision and sutures used must be taken into consideration. A clinical study by Guven in 1998 indicated that

oroantral fistula most frequently occurs after the third decade of life [4], which agrees with the results of other authors like Punwutikorn [24] , this is in agreement with my study that OAC most commonly occurs in the 4th and 5th decade of life as shown in table(1)and table(2)because the size of the

antrum increased with age, and although they reported that the maxillary sinus is more developed in women and that there is therefore greater possibility of the occurrence of oroantral communication and fistula in women. This is disagree with my research that it occurred more in male than female as shown in table (1) and table(4).

The use of BSF in small or medium intra-oral defects is a convenient, reliable and quick reconstructive method. The rich blood supply of the BSF, its easy mobilization, minimal donor site morbidity and fewer complications make it an ideal flap for the closure of OAF. Furthermore, the BSF is located closely to the defect to be covered diminishing the risk of infection [6, 16]. Because of these features of the BSF, it can also be considered as a reliable method for closure of defects also it can be used for more than one time and for different modalities of cases that results in complete success .while BFP can be used only for one time However, applied in selected cases [5, 8, 14]. We believe that the BSF should be used more often for this clinical application.

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Figure 1. OAC with probe in situ to demonstrate defect.

Figure 2.sinus tract excision and initial incision of mucoperiosteal flap

Figure 3. raised mucoperiosteal buccal advanced flap

Figure 4. increased mobility of the flap once periosteum incised.

Figure5. closure of the defect by the buccal advanced flap.

Figure6 completely healing of the flap and defect closure 2 weeks post operatively

Figure(1):Surgical closure of oroantral communication by buccal advanced flap.

Table(1) summary of clinical information in 23 patients

P	F/M	Age Yrs	Indications	Largest diameter of the defect(mm)	Site of the tooth related to the fistula	Anatomic Location (all of in maxilla)	Caldwell-Luc Procedure associated with BSF	Failure
1	M	57	Residual cyst	8	Right 1st and 2nd premolar	AC and lat. maxillary wall	-	-
2	M	30	Radicular cyst	7	Left 2n d molar	AC and lat. maxillary wall	-	-
3	M	28	Radicular cyst	8	Left 1st and 2nd molar	AC and lat. maxillary wall	-	-
4	F	17	COAF	7	Right 2nd premolar	AC and hard palate	+	+
5	M	32	OAC	3	Right 1st premolar	AC	-	-
6	M	22	OAC	4	Right 2nd molar	AC	-	-
7	F	19	Residual cyst	7	left 1st molar	AC and lat. maxillary wall	-	-
8	M	38	COAF	6	Right 2nd premolar	AC and lat. maxillary wall	-	-
9	M	35	COAF	8	Right 1st molar	AC and hard palate	+	+
10	M	49	OAC	5	Right 1st and 2nd premolar	AC	-	-
11	F	36	COAF	7	left 1st molar	AC and lat. maxillary wall	+	+
12	F	39	OAC	4	left 2nd molar	AC	-	-
13	F	22	OAC	3	Left 1st and 2nd premolar	AC	-	-
14	M	21	COAF	4	Right 1st premolar	AC and lat. maxillary wall	+	-
15	M	47	OAC	3	Right 2nd premolar	AC	-	-
16	F	41	COAF	5	Right 2nd premolar	AC and lat maxillary wall	+	-
17	M	51	OAC	3	left 1st premolar	AC	-	-
18	M	32	OAC	4	left 1st and 2nd premolar	AC	-	-
19	F	42	OAC	3	Right 1st molar	AC	-	-
20	M	38	COAF	8	left 2nd premolar and 1st molar	AC	+	+
21	F	53	OAC	4	left 2nd molar	AC	-	-
22	M	36	OAC	3	Right 1st premolar	AC	-	-
23	F	44	OAC	4	Right 2nd molar	AC	-	-

Abbreviations: AC: alveolar crest, F/M: female/male, lat: lateral, OAC: oro-antral communication, COAF: chronic oroantral fistula, P: patient, (+): Caldwell-Luc Procedure associated with BSF had performed at the same time with primary cyst enucleation.

Table(2) Distribution of oroantral communication according to age groups

agegroup

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< 20	2	8.7	8.7	8.7
	20-29	4	17.4	17.4	26.1
	30-39	9	39.1	39.1	65.2
	40-49	5	21.7	21.7	87.0
	50+	3	13.0	13.0	100.0
	Total	23	100.0	100.0	

Table (3) Age group- failure cross tabulation

agegroup * failure Crosstabulation

			failure		
			No	Failure	Total
agegroup	< 20	Count	1	1	2
		% within agegroup	50.0%	50.0%	100.0%
	20-29	Count	4	0	4
		% within agegroup	100.0%	.0%	100.0%
	30-39	Count	6	3	9
		% within agegroup	66.7%	33.3%	100.0%
	40-49	Count	5	0	5
		% within agegroup	100.0%	.0%	100.0%
	50+	Count	3	0	3
		% within agegroup	100.0%	.0%	100.0%
Total		Count	19	4	23
		% within agegroup	82.6%	17.4%	100.0%

Table (4) Sex failure cross tabulation

sex * failure Crosstabulation

			failure		
			No	Failure	Total
sex	male	Count	12	2	14
		% within sex	85.7%	14.3%	100.0%
	female	Count	7	2	9
		% within sex	77.8%	22.2%	100.0%
Total		Count	19	4	23
		% within sex	82.6%	17.4%	100.0%

Table(5) Indicatio- failure cross tabulation

indication * failure Crosstabulation

			failure		
			No	Failure	Total
indication	residual cyst	Count	2	0	2
		% within indication	100.0%	.0%	100.0%
	Radicular cyst	Count	2	0	2
		% within indication	100.0%	.0%	100.0%
	COAF	Count	4	4	8
		% within indication	50.0%	50.0%	100.0%
	OAC	Count	11	0	11
		% within indication	100.0%	.0%	100.0%
Total		Count	19	4	23
		% within indication	82.6%	17.4%	100.0%

Table(6) Age group –indication cross tabulation

agegroup * indication Crosstabulation

			indication				
			residual cyst	Radicular cyst	COAF	OAC	Total
agegroup	< 20	Count	1	0	1	0	2
		% within agegroup	50.0%	.0%	50.0%	.0%	100.0%
	20-29	Count	0	1	1	2	4
		% within agegroup	.0%	25.0%	25.0%	50.0%	100.0%
	30-39	Count	0	1	5	3	9
		% within agegroup	.0%	11.1%	55.6%	33.3%	100.0%
	40-49	Count	0	0	1	4	5
		% within agegroup	.0%	.0%	20.0%	80.0%	100.0%
	50+	Count	1	0	0	2	3
		% within agegroup	33.3%	.0%	.0%	66.7%	100.0%
Total		Count	2	2	8	11	23
		% within agegroup	8.7%	8.7%	34.8%	47.8%	100.0%