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The use of dermis-fat graft in oro-nasal fistula repair

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ABSTRACT

Aim of the study:

To evaluate the use of dermis-fat graft as autogenous tissue to achieve three layers closure of the palatal fistula.

One of the most devastating complication that follows cleft palate surgery is oro- nasal fistula. It can lead to many problems like fluid and food regurgitation, poor oral hygiene and retropharyngeal incompetence. The repair of palatal fistula had long presented a remarkable challenge to the plastic surgeon. Repair of these fistulae required the use of more than the usual two-layered closure procedures; demanding the introduction of a ‘Third layer’ of tissue to enhance smooth healing, and thereby reduce the chance of closure failure which predispose to fistulization. In this study we used an autogenous graft of ‘‘ dermis and fat (dermis-fat) graft ‘‘ to serve as the third protective, supportive and enhance layer.

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Introduction:

Cleft lip and/or cleft palate is the second most common congenital anomaly after clubfoot, with overall incidence 1 in 750 live births. The two main goals in cleft palate surgical treatment are; 1/ anatomic separation of nasal and oral cavities. 2/ soft palate muscles repair. The most important requirement to achieve the goals of cleft palate repair is a tension free watertight repair of the palate to reduce subsequent scarring and formation of fistula. 1, 2, 3

Cleft palate repair may be complicated by many post-operative complications, including fistula formation. The incidence of the oro-nasal fistula varies from less than 2% to over 40%. Fistula may occur immediately after cleft palate repair or several months to years later during the course of management like during orthodontic treatment. Any part of the palatal repair may breakdown resulting in fistula formation. However, the most common site is the junction of anterior hard palate and soft palate. Oro-nasal fistula can lead to many complaints such as food and liquids

regurgitation, hyper- nasal speech and articulation problems. Halitosis caused by trapped particles of food is another complication of fistula. 4, 5, 6, 7

One of the most daunting tasks is; closure of palatal fistula, and it traditionally carries a 37% or more recurrence rate. Fistula repair is more difficult than primary repair because of ; excessive scarring, fibrosis and impaired vascularity which at the end leads to subsequent limitation of palatal tissue motion. There are many techniques for fistula closure. The cornerstone of any repair is *two-layered watertight closure*. This two-layer creation (nasal lining and oral lining) pose the opportunity for augmentation of each layer by many reconstructive methods. This two-layer closure is enhanced by adding a new "middle" layer with adjunct material. There are many reports that showed that closure of oro-nasal fistula was effective in three layers. The intermediate layer could be either bone, cartilage, a cellular matrix or dermo-fat graft. 8, 9, 10, 11

In this study, dermo-fat graft is evaluated for treatment of post cleft

palate repair oro-nasal fistula.

upon using dermo-fat graft. Patient's ages were ranging from 2 to 40 years (13 males versus 9 females). The fistula size varies from 4 mm to 25 mm in diameter.

Patient and method:

In this study twenty-two patients, with thirty oro-nasal fistulae were operated

%	No. of cases	Age group
27.3	6	< 3 years
31.8	7	3-6 years
40.9	9	7-40 years

Table 1: Age groups of patients.

The patients were divided into three groups according to the location of the fistula as the following:

Group I : Labio-nasal anterior to alveolus (6 fistulae).

Group II : Anterior palatal fistula located in the hard palate (including junctionarea) , (22 fistulae).

Group III : Posterior palatal fistula (soft palate) , (2 fistulae).

Timing of fistula repair ranged between 6 months up to more than 4 years.

Majority of cases are selected to have long time intervals between primary and secondary procedure as shown in table 2 below ;

Table 2 : Time interval and number of previous failed fistula repair.

Failure of previous fistula repair	%	No. of patients	Range of time
3	36.4	8	6 month – 2 years
No	31.8	7	3-4 years
No	31.8	7	>4 years

Fistula size were divided into small, medium, large, and very large as shown in (table 3) below;

%	No. of fistulae	Size in mm	Fistula type
16.6	5	0-4	Small
53.4	16	5-14	medium
23.4	7	15-19	Large
6.8	2	20-25	Very large

Table 3 : Distribution of fistula according to their size.

Fistula shape in this study had variable appearance ranging from slit like, oval, round, or irregular shaped as shown in (table 4) below;

%	No. of cases	Fistula shape
10	3	Slit-like
50	15	Oval
30	9	Round
10	3	Irregular

Table 4 : Fistula shape.

All patients were subjected to preoperative general condition assessment seeking for any associated anomalies. Fistula assessment was done focusing on size, site, number and shape. Then assessment of surrounding tissue viability and pliability was done (any local scar). Soft palate length and movement was also evaluated subjectively by physical examination. Oral cavity examination also included any dental caries, any abnormal positioned teeth, and any possible

tonsillar enlargement or infection. Speech was assessed to delineate whether speech anomalies is related to fistula itself or due to other causes related to the cleft palate repair.

Preoperative routine investigation were done including Hb level, bleeding profile, virology screen, blood group and RH, and finally chest X-Ray and echo study for selected patients. Preoperative consent was taking from patients and/or their parents.

Operative technique:

All operations were done under general anesthesia with the use of mouth gag and patient in supine position. Then sterilization is done of both of the oral cavity and site from which the dermo-fat graft is taken (which is usually taken from groin crease). Methylene blue is used for marking of the fistula. After marking, 2 ml xylocaine with 1:100,000 adrenaline is injected in the palate and in the donor site. Then by using number 15 scalpel, circumscribing incision is made around the fistula for breaking the continuity between oral and nasal epithelium. Careful and meticulous dissection then proceed between oral and nasal layer to ensure adequate thickening nasal layer that freely dissected from surrounded tissue and closed using inverted 4/0 polyglactin suture (vicryl). After established nasal layer lining of the fistula, single or double mucoperiosteal flap is elevated by using bilateral or unilateral relaxing incision and dissection then proceed medially toward

the fistula beneath the elevated mucoperiosteal flap, insuring adequate release. In some cases, where the area surrounding the fistula is fibrosed and difficult to elevate, buccal flap was used in form of local rotation or transposition flap that carried to the anterior palatal region through the alveolar cleft in order to obtain oral coverage, and when the fistula is located in soft palate (Figure1), same principle is applied with undermining in the area that occur between soft palate muscle in order to separate between oral and nasal layers, this combined also with bilateral relaxing incision at the lateral edges of the soft palate to ensure tension free closure. After finishing the dissection, meticulous hemostasis is done using bipolar cautery. After that, marking of the donor area (groin creases) by using methylene blue. The ellipse of marked skin is located parallel to the groin crease. The ellipse of the skin and fat is harvested slightly larger than the fistula defect. The skin is then de-epithelized with adjustment of the graft be about 4-6 mm in thickness or slightly less in

most of the fistulae (23), and in (7) fistulae the thickness used was 7-8mm. Then donor site closed by using 3/0 polyglactin subcuticular sutures.

The dermis-fat graft then inserted into the fistula, the fatty layer facing the nasal layer, while the dermal layer on the oral layer (Figure 2). The graft then fixed in to position between oral and

nasal layer using 3/0 interrupted polyglactin (vicryl) suture. After that mucoperiosteal or buccal flap (i.e. oral layer) is sutured above the graft using 3/0 interrupted polyglactin (vicryl) suture. Tongue stich then applied which help to prevent airway obstruction and to avoid mechanical disruption of repair site.

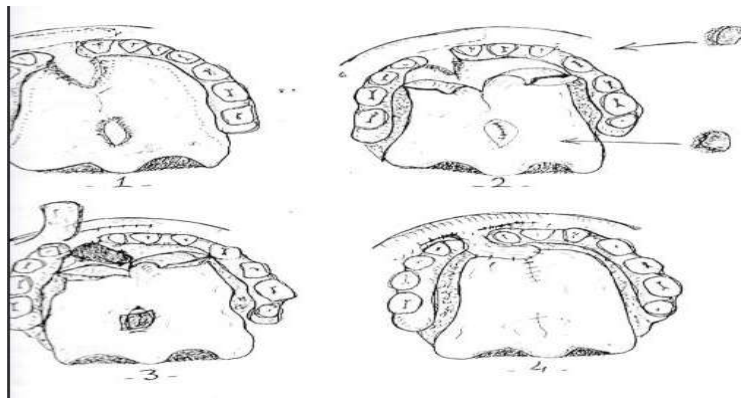


Figure 1: Using the dermo-fat graft in anterior fistula, with oral covering by buccal flap across the alveolus.

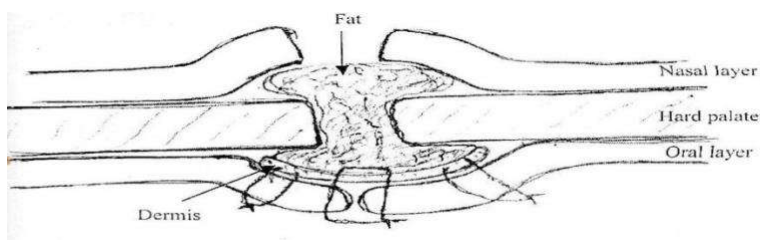


Figure 2 : the dermo-fat graft in place, with the fat layer on the nasal side, while the dermal layer on the oral side.

Closure of the oral layer was done by using unilateral mucoperiosteal layer in six cases, and bilateral mucoperiosteal layer in fifteen cases. In nine fistulae, buccal flaps were used when there is shortage of local tissue. Buccal flap was used in anterior hard palate fistula (three cases) and in naso-labial fistula (nine fistulae).

Patients and/or parents were instructed to have fluid diet at least 2 weeks after operation and to take water immediately after feeding patient were kept for injectable third generation cephalosporin (according to body weight) for at least 3 day after operation, and then continue for oral antibiotic for one week. Patients were discharged in the next day after removing tongue stich. First visit at 5th postoperative day with examination is done for any possibilities of wound dehiscence, infection, or hematoma formation. At 2 weeks after operation, donor site stiches are removed and then patient scheduled on regular follow up at least 6 month after

operation.

Results:

The study included 22 patients (13 males, 9 females), ranging in the ages between 2 to 40 years, operated upon, having 30 oro-nasal fistulae of variable sizes from a few millimeters to 25 mm. In all the cases the fistulae occurred following cleft repair surgery, except for one was post-traumatic. The pre-operative assessment of the size of the fistulae did not reflect the actual size which was found during operation to be larger. In most of the fistulae (27) the tune over flap was used to repair the nasal layer, while the gingival flap used in 3 fistulae. Whereas the oral layer repaired using unilateral mucoperiosteal flap in 6 fistulae, and bilateral flaps in 15 fistulae. *Burian* buccal flap used to repair 3 fistulae in the anterior hard palate, and 6 in the nasolabial area, all of these 9 cases the buccal flap was transposition type.(table 5).

Failure	%	No. of fistulae	Type of repair	Layer of repair
1	90	27	Turn-over f.	Nasal layer
2	10	3	Gingival f.	
0	20	6	Unilateral M-P f.	Oral layer
2	50	15	Bilateral M-P f.	
1	30	9	Buccal f.	

Table 5 : Oral and Nasal flaps.

We used minimal thickness of the graft (4-6 mm) in 23 fistulae, and 7-8 mm thick graft in 7 ones.

Regarding complications (table 6) ; in 2 fistulae partial wound dehiscence occurred. In another 2 fistulae there was obliteration of the buccal sulcus. While partial graft exposure in 2 other fistulae. We experienced no hematoma, or infection or airway obstruction.

%	No. of fistulae	Type of complication
6.6	2	Partial wound dehiscence
6.6	2	Obliteration in Buccal sulcus
6.6	2	Partial graft exposure

Table 6 : Complications.

During follow up period only three of our patients had fistula recurrence, fortunately in those patients the fistula size had been reduced in comparison with its preoperative size as shown in (table 7) below;

Postoperative size	Preoperative size	Cases of fistula recurrence
3 mm	12 mm	Case 1
5 mm	10 mm	Case 2
15 mm	20 mm	Case 3

Table 7 : Size of recurrent fistulae.

Two of those patients with recurrent fistulae were scheduled for later fistula repair. The third patient had no complaints that demands further

operation.

No other complications were seen in all of our patients like wound dehiscence, partial graft exposure, hematoma,

infection or obliteration of buccal sulcus.

Discussion:

One of the factors, that can judged the success of the palatoplasty operation is the frequency of the postoperative fistula formation. Many factors had being attributed to formation of oro-nasal fistula post cleft palate repair including; increase cleft severity, tension, infection, poor surgical technique and absent of multilayer closure. Presence of many surgical procedures for closure of fistula reflects the fact that there is no single consistence procedure. Most of the procedures, which are adapted for closure of fistula, depend on two-layer closure (nasal layer lining by turn over flap and oral layer closure by mucoperiosteal flap). However, when there is dead space between the layers of closure this is associated with high degree of failure and fistula recurrence which make subsequent operation more difficult. Thus using a 'third' interposition layer between the layers of fistula closure (i.e. oral and nasal layer),

had markedly reduced the incidence of fistula recurrence. 12, 13, 14, 15

Various interposition material had being utilized to fill the defect of the fistula such as cancellous bone graft, fat graft, Conchal cartilage and synthetic material like hydroxyapatite. 16 In this study application of autogenous dermis-fat graft was found to be effective in reducing the hematoma formation inside the fistula because it serve to obliterated the dead space, also dermal fat graft gave rigid stability to the layered closure of the repair and this is related to the flexibility of the graft which made it amenable to fit the fistula of variable size and location. In addition, dermis-fat graft will prevent interposition of two suture lines between oral and nasal layer, which lead to fistula recurrence. Dermal fat graft is easy to harvest with minimal or no donor site morbidity.

In our study we had noticed association between the fistula size and recurrence rate, of recurrent fistulae had occur when the fistula size is large (15-19 mm) or very large (20-25 mm) also we

noticed that oval and slit like fistulae are easier to close than round shape fistula. This might attributed to the fact that slit like or oval fistula lies parallel to the old cleft direction and it just needed sliding of lateral mucoperiosteal flap. While round fistula required elevation of the layered flaps and more mobilization (advancement and rotation) to achieve closure.

In our study, 30% of fistulae were round, formed two of the three recurrences after closure.

All the fistulae that are located in naso-labial region were closed successfully, although the size of these fistulae exceeded 1 cm, this is probably related to the availability of well vascularized tissue from adjacent labial surface for complete closure. We used finger flap (*Burian flap*) as buccal flap since it simple, easy, and in closed vicinity to the repair site.

For fistulae that are located in the hard palate, in (22 fistulae) we encountered high complication rete (13.6%), we thought this is due to scary area which

makes mobilization of the flap more different.

Fistulae located in the soft palate, we found that the use of dermis-fat graft had excellent result. The flexibility of the dermis-fat graft simplified positioning the graft in the defect and since it is soft tissue it should not interfere with soft palate mobility during speech. Unfortunately, we lack the long follow up for those cases in regarding the alteration of the soft palate mobility after application of dermis-fat graft.

According to Ian Jackson 17 large soft palate fistula in association with short soft palate, necessitate concomitant posterior pharyngeal flap and as stated by Ach Watson, this flap, surprisingly can reach to the incisive foramen. 18

We followed the policy that all patients with dental caries were referred to pediatric dentist prior to surgery to accomplish proper dental care to decrease risk of infection. However, Vig et al 19 had found that it more convenient to extract abnormal teeth during the time of the surgery. Stoeling

20 had suggested the extraction of abnormal teeth should be done 3 months before surgery to improve the quality of keratinized mucosa.

The dermis-fat graft was harvested in this study from groin region while Vandeput and others used the gluteal fold as a source of the graft. The advantage of using of groin region is that easy to excess and need no change in patient position during operation.

In most of the fistulae the thickness of the graft which was used was 4-6 mm (23 fistulae), which was less than the graft thickness which proposed by Vandeput (8 mm)¹⁶, we used it in (7 fistulae). We thought that graft with 8 mm thickness is bulky and prevent approximation of the palate flaps, also it need long time for revascularization. The size of the grafts were always larger than size of the defect by at least 2 mm, this overlapping found to be suitable for occupying the defect and provided more stable fixation.

As stated by Spira²¹, only large anterior palatal fistula of more than 5 mm might

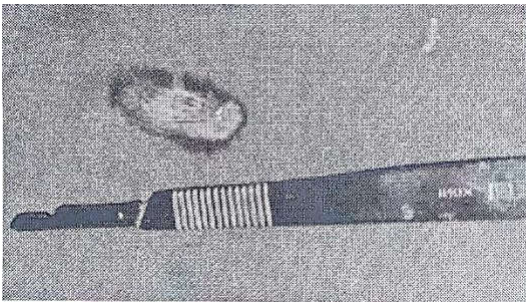
interfere with development of normal speech. According to Stark, there are great difficulties in differentiating between the causes of hyper-nasality, whether it is related to the retropharyngeal incompetence (short non-function soft palate) or from big fistula¹⁸.

According to our study, clinically we found there is improvement in hyper-nasality after closure of more than 1 cm-sized fistula, but we didn't agree with Ian Jackson who stated that all patients with palatal fistulae are noted to have an immediate speech improvement after repair because he thought that patients who had retropharyngeal incompetence together with palatal fistula will not improve because of persistence of the incompetence.

Fistula recurrence in our study occurred in 3 cases. One case showed partial recurrence because the size has greatly reduced from 12 mm to 3 mm and the fistula became nonfunctional (i.e. no symptoms). In the second case of recurrence, the size was reduced from 10mm to 5 mm. the cause of fistula closure failure in this case is due to necrosis of tip of buccal flap.

Conclusion and recommendation:

Using of interpositional dermis-fat graft had shown to have promising result in closure of oro-nasal fistula that followed cleft palate surgery. It provided durable, stable, and flexible coverage with minimal donor site morbidity. It can be used for fistula of less than 1.5 cm of various locations.

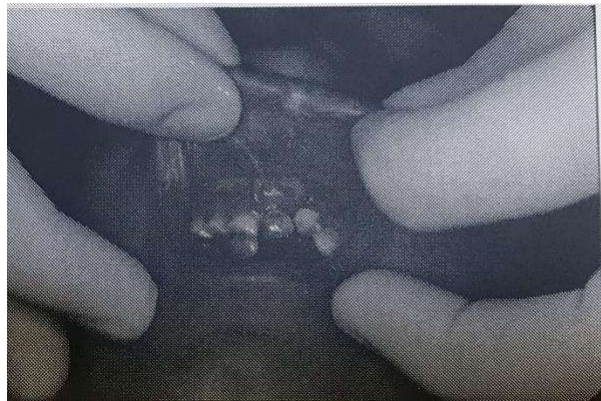
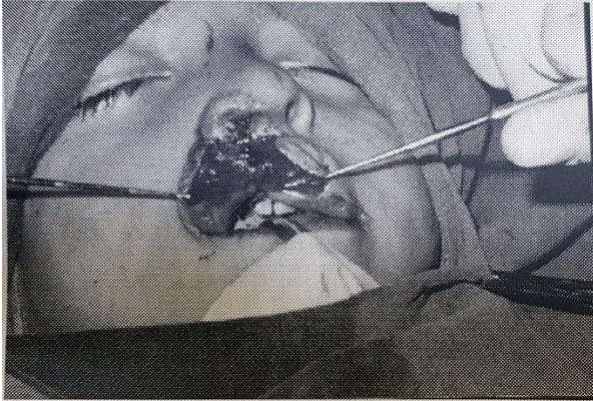


The harvested Dermis-fat graft



Case No. 1 :

a/ The site of the fistula . b/ Three months postoperative.



Case No. 2 :

a/ Intraoperative. b/ One year postoperative.

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