Original Article

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Evaluation of Using Dermis-Fat Graft in Oro-Nasal Fistula Repair

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ABSTRACT

Background

One of the most devastating complications that follow 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 plastic surgeons. 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 reducing the chance of closure failure which is predisposed 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 enhancive layer.

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

Patient And Method

In this study, 22 patients, with 30 oro-nasal fistulae were operated upon using dermo-fat graft. Patient's ages were ranging from 2–40 years (13 males and 9 females). The fistula size varied from 4 mm to 25 mm in diameter.

Results

There was 90% success rate of fistula closure by this technique only 3 cases of recurrence showen (10%) , that have dramatic reduction in the fistula size .

Conclusion

After using interpositional dermis-fat graft, there were promising results in the closure of oro-nasal fistula that followed the 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

Keywords cleft palate, palatal fistula, oronasal fistula, Dermal fat grafting, complication of cleft palate repair

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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 and 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.[1-3]

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, for example during orthodontic treatment. Any part of the palatal repair may break down, 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 liquid regurgitation, hyper-nasal speech, and articulation problems. Halitosis caused by trapped particles of food is another complication due to fistula. [4-7]

One of the most daunting tasks is the closure of palatal fistula, which traditionally carriesa 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 leadsto 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 an opportunity for augmentation of each layer by many reconstructive methods. This two-layer closure is enhanced by adding anew ‘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. [8-11]

In this study, dermo-fat graft is evaluated for treatment of post cleft palate repair oro-nasal fistula.

Table 1: Age groups of patients.

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

PATIENT AND METHOD

In this study, 22 patients, with 30 oro-nasal fistulae were operated upon using dermo-fat graft. Patient's ages were ranging from 2–40 years (13 males and 9 females). The fistula size varied from 4 mm to 25 mm in diameter.

The patients were divided into three groups according to the location of the fistula asthe 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. Majorityof 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.

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

Fistula size were divided into small, medium, large, and very large as shown in (Table 3).

Table 3: Distribution of fistula according to their size.

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

Fistula shape in this study had variable appearance ranging from slit like, oral, round,or irregular shaped as shown in (Table 4).

Table 4: Fistula shape.

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

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 were related to the fistula itself or due toother causes related to the cleft palate repair.

Preoperative routine investigation was 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—usually 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, with a number 15 scalpel, circumscribing incision is made around the fistula for breaking thecontinuity between oral and nasal epithelium. Carful 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 establishing the nasal layer lining of the fistula, the 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 inorder to obtain oral coverage, and when the fistula is located in soft palate (Figure 1), 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, the donor area (groin creases) is marked by using methylene blue. The ellipse of marked skin is located parallel to the groin crease. The ellipse of the skinand 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. Then donor site closed by using 3/0 polyglactin subcuticular sutures.

The dermis-fat graft is 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, the mucoperiosteal or buccal flap (i.e. oral layer) is sutured above the graft using 3/0 interrupted polyglactin (vicryl) suture. Then, the tongue stitch is then applied which helps prevent airway obstruction and to avoid mechanical disruption of repair site.

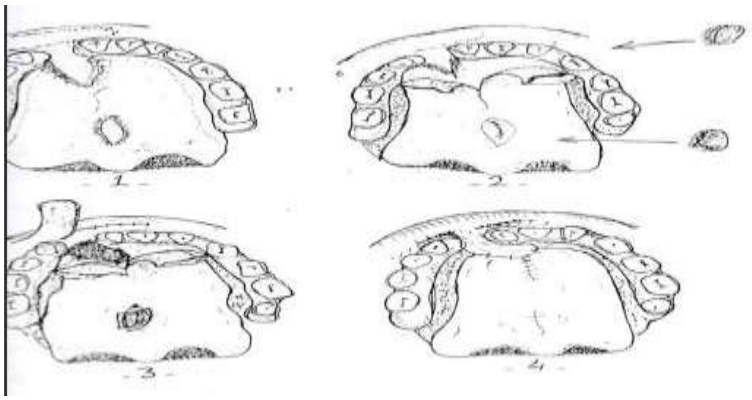


Figure 1: Using the dermo-fat graft in anterior fistula, with oral coveringby buccal flap across the alveolus.

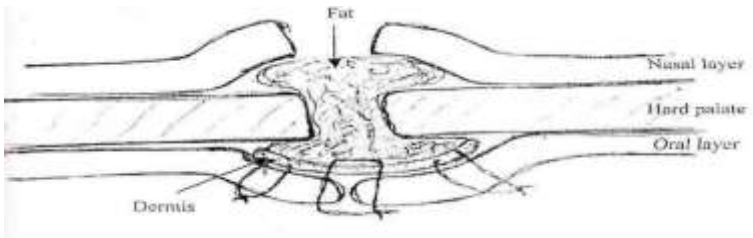


Figure 2 : The dermo-fat graft in place, with the fat layer on the nasal side, while the dermal layer on the oral side.

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

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 2to 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 ofthe 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, whilethe gingival flap used in 3 fistulae. The oral layer was repaired using unilateral muco-periosteal 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. In all of these 9 cases, the buccal flap was transposition type. (Table 5).

Table 5 : Oral and Nasal flaps.

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

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 the partial graft exposure in 2 other fistulae. We experienced no hematoma, infection, or airway obstruction.

Table 6 : Complications.

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

All of our patients had achieved watertight closure of their fistula with disappearanceof the preoperative symptoms related to the fistula. In the follow-up period, only threeof our patients had fistula recurrence. However, fortunately in those patients, the fistula size had been reduced in comparison with its preoperative size as shown in Table 7 below:

Table 7: Size of recurrent fistulae.

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

Two of those patients with recurrent fistulae were scheduled for later fistula repair.

The third patient had no complaints that demanded 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 be judged by the success of the palatoplasty operation is the frequency of the postoperative fistula formation. Many factors had been attributed to the formation of oro-nasal fistula post cleft palate repair including increase in 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 a 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- 15]

Various interposition material had been utilized to fill the defect of the fistula suchas cancellous bone graft, fat graft, Conchal cartilage, and synthetic material like hydroxyapatite.[16] In this study application of autogenous dermis-fat, graft was found tobe effective in reducing the hematoma formation inside the fistula because it serves to obliterate the dead space. Moreover, dermal fat graft gave rigid stability to the layered closureof the repair and this is related to the flexibility of the graft, which made it amenable tofit the fistula of variable size and location. In addition, dermis-fat graft will prevent interposition of two suture lines between the 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 noticed the 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). Moreover, we noticed that oval and slit like fistulae are easier to close than round fistula. This might be attributed to the fact that slit like or oval fistula lies parallel tothe old cleft direction and it just needed the 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 and formed two of the three recurrences after closure.

All the fistulae that were 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 completeclosure. We used finger flap (*Burian flap*) as buccal flap since it was simple, easy, and in close vicinity to the repair site.

For fistulae that are located in the hard palate, in 22 cases we encountered a high complication rate (13.6%), we thought this is due to scary area which makes mobilization of the flap more different.

In the fistulae located in the soft palate, we found that the use of dermis-fat graft had excellent results. The flexibility of the dermis-fat graft simplified the positioning of the graft in the defect. 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, necessitates concomitant posterior pharyngeal flap. As stated by Ach Watson,this flap can surprisingly reach to the incisive foramen.[18]

We followed the policy that all patients with dental caries were referred to pediatricdentist 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 duringthe time of the surgery. Stoeling,[20] had suggested the extraction of abnormal teeth should be done

three months before the surgery to improve the quality of keratinized mucosa.

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

The thickness of the graft which was used in our study was 4-6 mm, which was lessthan the graft thickness which proposed by Vandeput (8 mm).[16] We thought that graft with 8 mm thickness is bulky and prevents approximation of the palate flaps, also it needlong time for revascularization. The size of the grafts were always larger than size of the defect by at least 2 mm. This overlapping was found to be suitable for occupying the defect and provided more stable fixation.

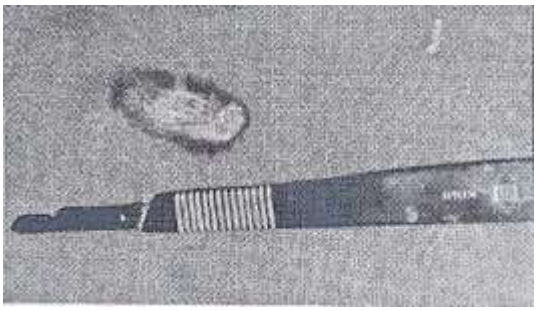
As stated by Spira,[21] only large anterior palatal fistula of more than 5 mm might interfere with development of normal speech. According to Stark, there are great difficulties in differentiating between the causes of hyper-nasality, whether it is related to the retropharyngeal incompetence (short non-function soft palate) or from big fistula.[18]

According to our study, we found that there is an 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 along with palatal fistula will not improve because of persistence of the incompetence.

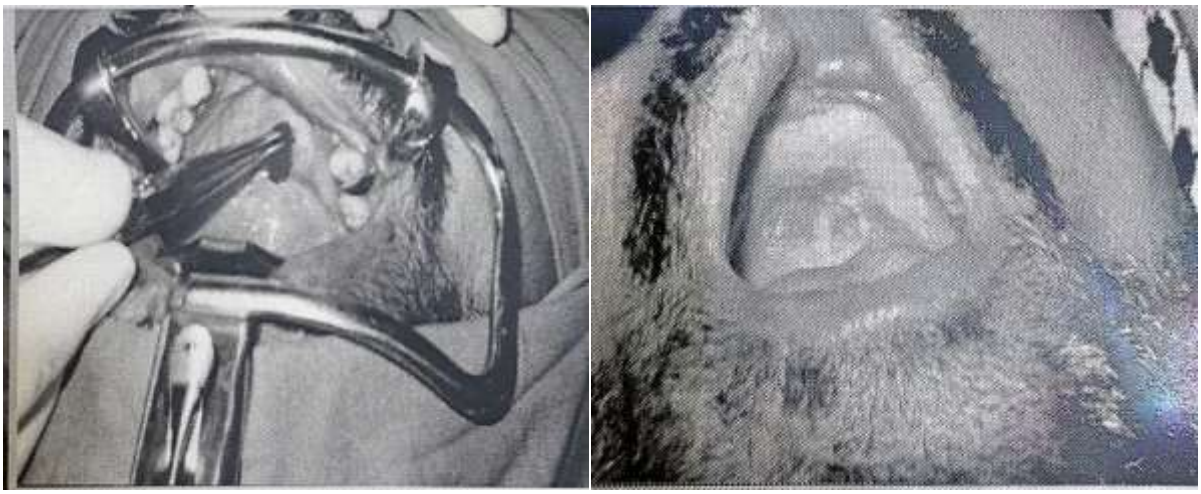
According to our study, fistula recurred in 3 cases. One case showed partial recurrence because the size greatly reduced from 12 mm to 3 mm and the fistula became nonfunctional (i.e. no symptoms). In the second case of recurrence, the size was reduced from 10mm to 5 mm. the cause of fistula closure failure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

CONCLUSION AND RECOMMENDATION

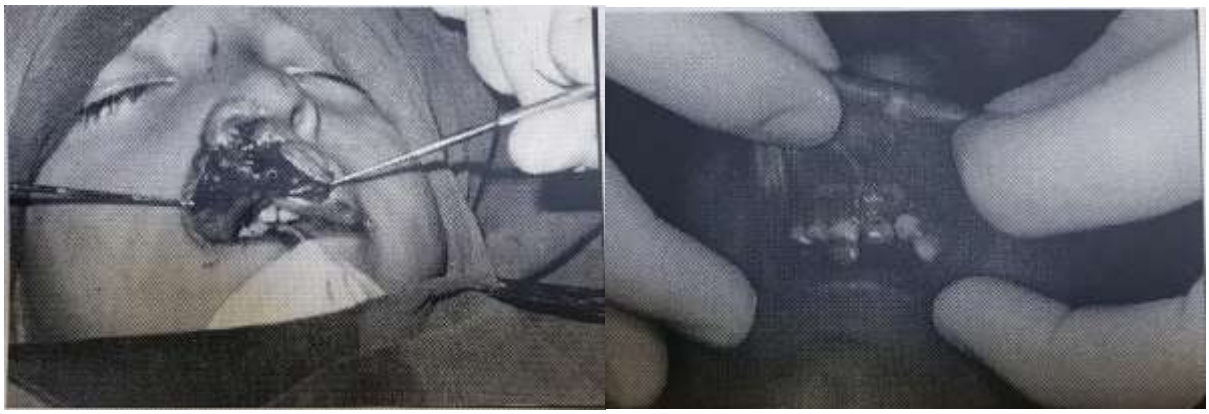
After using interpositional dermis-fat graft, there were promising results in the closure of oro-nasal fistula that followed the cleft palate surgery. It provided durable, stable,and flexible coverage with minimal donor site morbidity. It can be used for fistula of less than 1.5 cm of various locations.



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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