*Egypt, J. Plast. Reconstr. Surg., Vol. 36, No. 2, July: 187-192, 2012*

# Treatment of the Mid-Palatal Fistula by the Use of Inter-Positional Cartilage Graft Versus Temporalis Fascia Graft: A Comparative Study

NAHED SAMIR BOUGHDADI, M.D. and AHMED ELSHAHAT, M.D.

*The Department of Plastic Surgery, Faculty of Medicine, Ain Shams University*

## ABSTRACT

Palatal fistula has long been a resistant problem to treat. It is the most common complication following cleft palate repair. Different techniques can be used for repair of palatal fistulae. These include local turnover flaps, inter-positional cartilage graft or acellular dermal matrix, buccal fat pad flaps, and pedicled flaps from oral mucosa for small fistulae. For larger fistualae, tongue flaps, temporalis muscle flaps, nasal septal flaps and free flaps can be used. On reviewing the literature there was no previous studies show the use of inter-positional temporalis fascia graft to close palatal fistulae.

*Aim of the Work:* This is a prospective study comparing the use of and free conchal cartilage grafts and free non vascularized temporalis fascia grafts as inter-positional grafts between oral and nasal layers to close mid-palatal fistulae ranging from 2mm to 1cm in size.

*Patients and Methods:* Sixteen cases presented with mid-palatal fistulae to the Plastic Surgery Department at Ain Shams University Hospitals. Fistulae size ranged between 2mm to 1cm. Patients have previous surgeries for cleft palate repair. Ages ranged between 2-14 years. Cases were divided into 2 groups. The 1st group treated with conchal cartilage grafts and the 2nd group with free non-vascularized temporalis fascia grafts. Follow-up after fistulae closure was done for six months.

*Conclusion:* The inter-positional temporalis fascia grafts were as effective as the inter-positional conchal cartilage grafts in closure of palatal fistulae. The inter-positional natural materials proved to form scaffolds that strengthen the repair with no side effects or recurrence.

## INTRODUCTION

The management of the cleft palate has evolved from using obturators in the 1700s; to simple repairs of the cleft soft palate in the early 1800s; to two-flap complete palatal repairs, such as von Langenbeck's palatoplasty in the late 1800s; to repairs that lengthen the palate, such as the Veau-Wardill-Kilner V-to-Y advancement technique in the 1930s; to repairs that not only close the palatal cleft and lengthen the palate but also correctly align the palatal musculature **[1,2]**. The incidence of postoperative fistula formation after primary repair of cleft palate is relatively high, averaging 10-20% even in experienced hands. These usually occur at the junction of the hard and soft palate posteriorly or at the premaxillary-maxillary junction anteriorly **[1-3]**.

Recurrent palatal fistulae present a challenging problem to cleft surgeons frequently resulting in both patient and surgeon dissatisfaction. Multiple failed attempts to close the recalcitrant fistulae lead to increased scarring and fibrosis of the palatal tissue, which in turn increase the size of the defect because of the forces of contraction that are at work during the healing phase **[4,5]**. In addition, this heavily scarred soft tissue inevitably curtails palatal growth. With time, this pernicious cycle of events renders the local tissues intractable and unusable **[4-6]**.

Factors that may contribute to fistula formation are the type of cleft, type of repair, wound tension, single-layer repair, infection and dead space deep to the mucoperiosteal flaps **[7,8]**. Palatal fistulas are often symptomatic, depending on the size and location of the fistula. Symptoms include hypernasality of phonation due to audible nasal air escape during speech, leakage of fluids into the nasal cavity, and lodging of food with risk of infection **[7]**.

Many techniques have been proposed for the repair of palatal fistulas. However, the incidence of recurrence after initial fistula closure is high. Faced with recurrence, the surgeon's options extend to flaps; tongue flap **[10,11]**. Orbicularis oris musculomucosal flap, **[9,11]** free flaps, **[8]** or grafts; buccal mucosal graft, **[8]** conchal cartilage graft, **[14]** or bone graft **[5]**. Acellular dermal matrix has also been used in palatal fistula repair with good

results [15]. When speech disturbance occurs as a result of a fistula of significant size, prosthetic obturation of the fistula (even temporary) can be considered when weighed against repeated failed surgical procedures [16].

In 1991, Matsuo et al. [17] described use of conchal cartilage to repair palatal fistulae in a 7-year old boy. This technique has also been used successfully in human patients in other studies. Others had reported their experience with use of cartilage graft on animals with oronasal fistulae [17,18].

No previous studies have been done for investigating the effect of using free fascial grafts as a scafold for treatment of small midpalatal fistulae.

Therefore the aim of this study was to compare the use of free non vascularized temporalis fascia and free conchal cartilage grafts as inter-positional grafts between oral and nasal layers to close small to medium sized mid-palatal fistulae.

## PATIENTS AND METHODS

Sixteen cases presented with midpalatal fistula 2mm-1cm in size. Fistulae causes included congenital and post palatal repair. Ages ranged between 2-14 years old Table (1). They were treated at the Plastic Surgery Department at Ain Shams University. Cases were divided into 2 groups, each included eight cases. The 1st group (group A) was treated with inter-positional conchal cartilage graft and the 2nd group (group B) with inter-positional free temporalis fascial graft. Cartilage grafts were harvested from the conchae through either posterior or anterior incisions. Temporalis free fascial grafts were harvested through incision at the temporal region behind the hair line. Patient data including age, sex, number of previous repairs and size of the fistulae are shown in Table (1).

The operations were performed under general endotracheal anesthesia. The Dingman self retaining retractor was applied. Fistula size was measured by using sliding caliber. Injection of local hemostasis (adrenaline 1/200000) and after seven minutes for small sized defects, inverted U shaped incision was done anterior to the site of the fistula and the dissection was continued between the oral and nasal layers until the fistula was split into nasal and oral fistulae. The nasal fistula and the oral fistula were repaired and the inter-positional material was harvested and placed between the closed oral and nasal fistulae. The inverted U-shaped flap was re-sutured again into their original position. For medium sized defects turn over flaps were done for lining and transposition mucoperiosteal flaps were elevated for coverage and the inter-positional cartilage or fascia were placed in-between. The choice of the inter-positional material whether cartilage or fascia was systematically randomized. The conchal cartilages were harvested through the anterior approach in 5 cases and through the posterior approach in 3 cases based on the surgeon preference. The temporal fascia free grafts were harvested from the deep temporal fascia after incising the skin and the superficial temporal fascia. At least (1 $^1/_2$cm X 1 $^1/_2$cm) piece of fascia or cartilage were harvested in order to brige over fistula site.

Pre-operative assessment included assessment of symptoms (fluid regurgitation, lodgment of foods inside the fistula tracts and speech affection) and the signs as site, size and the technique of previous palatal repair.

Follow-up was once weekly for four weeks then follow-up visits was done at 3 and 6 months. Figs. (1a-b, 2a-b, 3a-b, 4a-b) show the pre and intra-operative photos of 3 patients.

## RESULTS

A comparison of both techniques was done including length of operation, learning curve, intra-operative time, blood loss, donor site morbidity and complications. Table (2) shows the comparison between the two groups.

Objective assessment was done for both groups through evaluation of the postoperative symptoms and signs, and complications. Assessment was done through a questionnaire fulfilled by two peer plastic surgeons at the times of follow-up. Figs. (1c,2c,3c,4c) show the post-operative photos of 3 patients.

## DISCUSSION

Palatal fistula represents a technical failure of the palate repair and can result into significant functional consequences. The goals of cleft palate repair are to achieve normal speech and velar competence, minimizing infection while minimizing, mid-facial growth disturbances and middle ear complications. The presence of a fistula represents a failure of the surgical repair and compromises these objectives [19,20]. The incidence of fistula occurrence after palatoplasty has been reported to range from 0-50%, with a range of 11-34% reported in the more recent literature [19-23]. Equally troublesome is the high fistula recurrence rate, which ranges from 33-50% [20,21,24].

Pre operative | Intra operative + Cartilage | Post operative

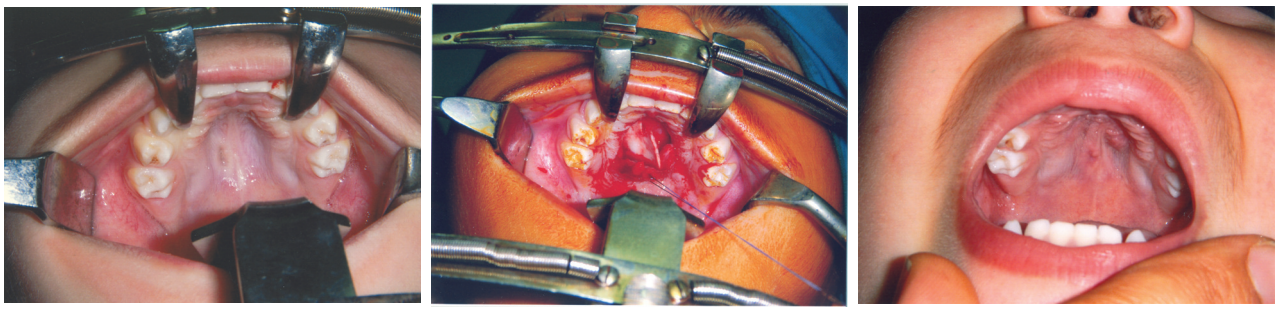

Fig. (1-a,b,c): Preoperative, intraoperative and late postoperative of a case of post surgical (cleft palate repair) palatal fistula repaired by interpositional cartilage graft.

Pre operative | Intra operative | Post operative

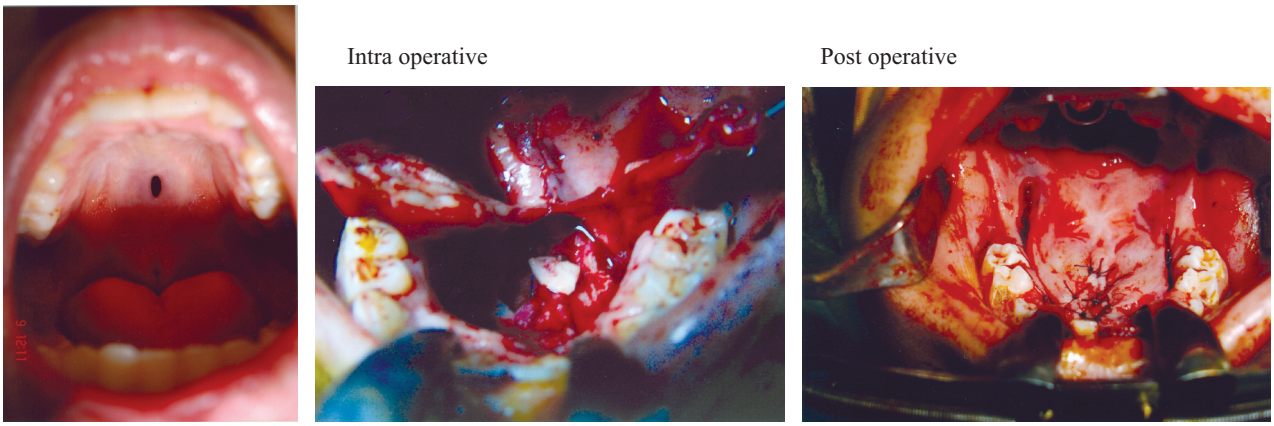

Fig. (2-a,b,c): Preoperative, intraoperative and early postoperative of a case of congenital palatal fistula repaired by interpositional cartilage graft.

Pre operative | Intra operative + fascia | Post operative

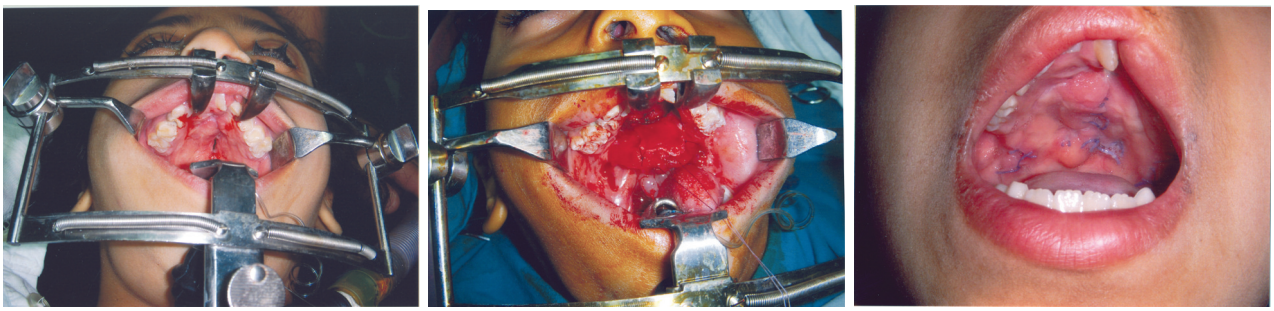

Fig. (3-a,b,c): Preoperative, intraoperative and early postoperative of a case of post surgical (cleft palate repair) palatal fistula repaired by interpositional fascial graft.

Pre operative | Intra operative + fascia | Post operative

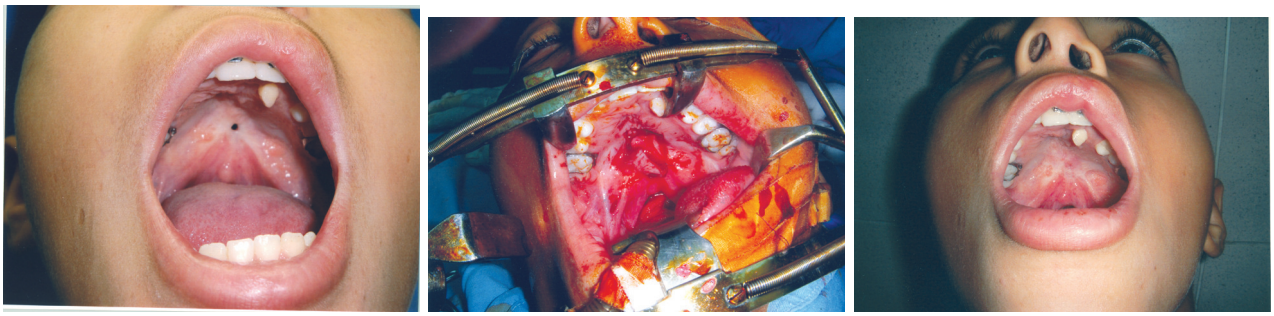

Fig. (4-a,b,c): Pre-operative-intraoperative and late postoperative of a case of post surgical (cleft palate repair) palatal fistula repaired by interpositional fascial graft.

Table (1): Patient data including age, sex, number of previous repairs and size of the fistulae.

| | Age | Sex | Number of repairs | Size of the defect (small 2-5mm) – (medium from 5-10mm) |
|---|---|---|---|---|
| Group A | 2-14 years old | 7 females and one male | Three cases were tertiary repair and the remaining cases were secondary repair | 4 cases medium size and the rest small size |
| Group B | 2-10 years old | 6 females and two males | Two cases were tertiary repair and the remaining six were secondary repair | 5 cases medium size and the rest small size |

Table (2): Comparison between results of the two groups.

| | Group A | Group B |
|---|---|---|
| Length of operation | 1-1.5 hour | 1-1.5 hour |
| Learning curve | Steep | Steep |
| Judging the healing | Relatively faster (cartilages are nourished by imbibition) | Slower (fasciae need revascularization) |
| Bloodloss | Less | Relatively higher |
| Donor site morbidity and complications | No | No |
| Longtivity of results | Competence was excellent for the six month follow-up | Competence was excellent for the six month follow-up |

A variety of factors has been reported to increase the incidence of palatal fistulae, including tension along the palate repair, site, upper respiratory infection, hemorrhage, absent multilayer closure, and increasing cleft severity **[21,23]**. Experience of the operating surgeon, patient age and sex, and type of palate repair used have also been reported to influence the occurrence of fistula; however, these factors are not universally agreed upon. The plethora of reported techniques for fistula closure attests to the frequently disappointing results attained with some conventional methods of repair **[19,20,22,25]**.

Fistula symptoms include nasal regurgitation of food or liquid which may be socially embarrassing, fetor oris, chronic inflammation, and hearing loss **[23]**. Reported speech symptoms include nasal escape, hypernasal resonance, and velopharyngeal incompetence **[21,23]**. Isberg and Henningsson in 1987 showed significant improvement in both velar and lateral wall movement with closure of the fistula **[26]**.

Reported methods for management include nonsurgical techniques utilizing palatal obturators and surgical techniques, including excision and primary repair of the fistula, local mucoperiosteal flaps, or turnover flaps from the palate and vomer, regional tongue, pharyngeal, or buccal myomucosal flaps, free grafts of bone, cartilage, or dermal/fat, and free tissue transfer for large or recalcitrant fistulas **[19,22,26]**. The multiple reported methods of fistula repair are indicative of the fact that no single method provides consistent results. Failure rates as high as 65% have been reported **[24]**.

Factors such as fibrosis, poor blood supply, wound contraction and limited tissue availability contribute to failure of fistula repair **[22,27]**. The choice of procedure will depend on the patient's symptoms, size and location of the fistula, age of the patient, number and type of previous procedures, and surgeon preference **[22]**. It is of paramount importance to avoid tension along the suture line, avoid using scarred devascularized tissue, and prevent mucosal continuity between the oral and nasal cavities **[28]**.

While local flaps may suffice for smaller defects, regional flaps such as the tongue flap, pharyngeal flap, and buccinator myomucosal flap have been advocated for larger defects. Inter-position grafts of bone, cartilage, and dermis/fat have been used successfully in fistulas up to 2cm in size **[22,29]**. The inter-position material acts as an additional layer of closure and may act as a scaffold

for mucosal spreading across the fistula site in the event of oral mucoperiosteal breakdown **[29]**.

In our study we used inter-positional natural materials to treat midpalatal fistula. The procedure used was simple with no excessive time consuming and no donor site morbidities. As recorded in literature the inter-positional materials in both groups added a new layer which both acted as

scafolled for epithelization, strengthened the fistula site and reduced the stress tension due to healing on the fistula site. Basically, the judgment of fistula healing in case of cartilage grafts was easier and faster than the judgment in case of fascia graft. Nourishment of the cartilage is through imbibitions and therefore exposure of part of cartilage will not causes fistula repair. On the other hand free fascia grafts need revascularization and exposure of either nasal mucosal lining or oral mucosal coverage may end up with dryness, desiccation and fistula recurrence. In this current study both cartilage and fascia inter-position grafts healed uneventfully and there was no recurrence.

Different other synthetic materials had been used in repair such as alloderm. AlloDerm is an acellular dermal matrix derived from human cadaver skin. It has been specially treated to remove all antigenic components and potential viral contaminants. The remaining structure is an acellular matrix consisting of collagen, elastin, glycosaminoglycans, and vascular channels. This matrix provides a scaffold for tissue ingrowth, revascularization, and mucosal epithelialization without any evidence of immunologic rejection or donor-site morbidity **[15,30,31]**. AlloDerm has been used successfully at the time of primary cleft repair in a series of patients with cleft size greater than 15mm in width **[15]**. In our study we prefered to use autologus materials as scaffold to minimize the cost of the procedure and to avoid any incidence of infection or hypersensitivity reaction.

Several authors had utilized the concept of two layers closure of palatal fistula. Different success rates were recorded using two flap palatoplasty as Enrina et al., study which showed success rate of 90.5% **[32]**. Arlen and Christian used palatal mucoperiosteal flaps, with 90% success and Tiwari and Sujiata used orbicularis oris mucosal flap with 92% success **[9,33]**. Al Badawy used bipedicled mucoperiosteal flap reconstruction with 92.8 success **[34]**. We believe that our technique which adopt the idea of using three layer repair represented by the nasal mucosa, the inter-positional autologus cartilage or fascia and the rotational turn over oral flap has a higher success rate as it resulted into

more competent repair and stronger healing site. The addition of this inter-positional material resulted into 100% success rate.

Using cartilage grafts had been reported before in different types and sites of fistulas in both animal and human studies. A large amount (2cm x 2cm) of robust cartilage can be harvested so it may have application for larger defects. Cartilage can be harvested from the pinna and conchal cartilage **[17,18,22,35]**. In this current study cartilage was harvested from conchal cartilage with no donor site morbidity.

In the 2nd group (group B) we used fascial graft as a scaffold. The aim was to study different autologus materials to detect the best material that gives more competent closure and less recurrence, complications and longer results. Both materials are recommended equally.

*Conclusion:*

Both conchal cartilage and fascial grafts can be used freely in management of small to medium size midpalatal fistulae sizes ranging from 2mm-1cm. Fistulae showed no complications or recurrence with success rate up to 100%, as both materials act as a scaffold for epithelization and support of the turnover flap used in repair. We recommend further studies on this subject including trials of these materials as interpositional grafts in bigger fistula sizes >1cm and also trials of injection of platelet rich plasma with this procedure to enhance the healing process.

## REFERENCES

1- Nguyen P.N. and Sullivan P.K.: Issues and controversies in the management of cleft palate, Clin. Plast. Surg., 20 (4): 671-682, 1993.

2- Arosarena O.A.: Cleft lip and palate. Otolaryngol. Clin. N. Am., 40: 27-60, 2007.

3- Sadove A.M. and Eppley B.L.: Cleft lip and palate. In: J.L. Grosfeld, J.A. O'Neill, A.G. Coran, E.W. Fonkalsrud, A.A. Caldamone (Eds.), Pediatric Surgery, sixth ed., Mosby Elsevier, Philadelphia, pp. 803-812, 2006.

4- Abyholm F.E., Borchgrevink H.H.C. and Eskeland G.: Palatal fistulae following cleft palate surgery. Scand. J. Plast. Reconstr. Surg., 13: 295, 1979.

5- Schultz R.C.: Management and timing of cleft palate fistula repair. Plast. Reconstr. Surg., 78: 739, 1986.

6- Posnick J.: Craniofacial and Maxillofacial Surgery in Children and Young Adults, Vol. II. Philadelphia: Saunders, Pp. 785-980, 2000.

7- Wilhelmi B.J., Appelt E.A., Hill L. and Blackwell S.J.: Palatal fistulas: Rare with the two-flap palatoplasty repair, Plast. Reconstr. Surg., 107 (2): 315-318, 2001.

8- Honnebier M.B., Johnson D.S., Parsa A.A., Dorian A.

and Parsa F.D.: Closure of palatal fistula with a local mucoperiosteal flap lined with buccal mucosal graft, Cleft Palate Craniofac. J., 37 (2): 127-129, 2000.

9- Tiwari V.K. and Sujata S.: Orbicularis oris musculomucosal flap for anterior palatal fistula, Indian J. Plast. Surg., 39: 148-151, 2006.

10- Al-Qattan M.M.: A modified technique of using the tongue

tip for closure of large anterior palatal fistula, Ann. Plast. Surg., 47 (4): 458-460, 2001.

11- Barone C.M. and Argamaso R.V.: Refinements of the tongue flap for closure of difficult palatal fistulas, J. Craniofac. Surg., 4: 109-111, 1993.

12- Abdel-Aziz M., Abdel-Nasser W., El-Hoshy H., Hisham A. and Khalifa B.: Closure of anterior post-palatoplasty fistula using superior lip myomucosal flap. Int. J. Pediatr. Otorhinolaryngol., 72: 571-574, 2008.

13- Futran N.D. and Haller J.R.: Considerations for free-flap reconstruction of the hard palate. Arch. Otolaryngol. Head Neck Surg., 125: 665-669, 1999.

14- Skoll P.J. and Pienaar C.H.: Conchal grafts for closure of palatal fistulae. Ann. Plast. Surg., 56 (4): 467, 2006.

15- Steele M.H. and Seagle M.B.: Palatal fistula repair using acellular dermal matrix: The University of Florida experience. Ann. Plast. Surg., 56 (1): 50-53, 2006.

16- Pinborough-Zimmerman J., Canady C., Yamashiro D.K. and Morales L. Jr.: Articulation and nasality changes resulting from sustained palatal fistula obturation. Cleft Palate Craniofac. J., 35 (1): 81-87, 1998.

17- Matsuo K., Kiyono M. and Hirose A.: Simple technique for closure of a palatal fistula using a conchal cartilage graft. Plast. Reconstr. Surg., 88: 334-337, 1991.

18- Celial C.L., Hunt G.B. and Cadier M.M.: Repair of Oronasal Fistulae Using Auricular Cartilage Grafts in Five Cats. Vet. Surg., 36 (2): 164-9, 2007.

19- Muzaffar A.R., Byrd H.S., Rohrich R.J., et al.: Incidence of cleft palate fistula: An institutional experience with two-stage palatal repair. Plast. Reconstr. Surg., 108: 1515-1518, 2001.

20- Cohen S.R., Kalinowski J., LaRossa D., et al.: Cleft palate fistulas: A multivariate statistical analysis of prevalence, etiology, and surgical management. Plast. Reconstr. Surg., 87: 1041-1047, 1991.

21- Emory R.E., Clay R.P., Bite U., et al.: Fistula formation and repair after palatal closure: An institutional perspective. Plast. Reconstr. Surg., 99: 1535-1538, 1997.

22- Jeffery S.L.A., Boorman J.G. and Dive D.C.: Use of cartilage grafts for closure of cleft palate fistulae. Br. J. Plast. Surg., 53: 551-554, 2000.

23- Denny A.D. and Amm C.A.: Surgical technique for the correction of post palate-plasty fistulae of the hard palate. Plast. Reconstr. Surg., 115: 383-387, 2005.

24- Schultz R.C.: Management and timing of cleft palate fistula repair. Plast. Reconstr. Surg., 78: 739-745, 1986.

25- Isberg A. and Henningsson G.: Influence of palatal fistulas on velopharyngeal movements: A cine radiographic study. Plast. Reconstr. Surg., 79: 525-530, 1987.

26- Tezel E.: Buccal mucosal flaps: A review. Plast. Reconstr.

Surg., 109: 735-741, 2002.

27- Clark J.M., Saffold S.H. and Israel J.M.: Decellularized dermal grafting in cleft palate repair. Arch. Facial Plast. Surg., 5: 40-44, 2003.

28- Furlow L.T.: Secondary cleft palate surgery. In: Grotting J.C., ed. Reoperative Aesthetic and Reconstructive Plastic Surgery. St. Louis: Quality Medical Publishing, 799-846, 1995.

29- Vandeput J.J., Droogmans B. and Tanner J.C.: Closure of palatal fistulas using a dermis-fat graft. Plast. Reconstr. Surg., 95: 1105-1107, 1995.

30- Scalfani A.P., Romo T., Jacono A.A., et al.: Evaluation of acellular dermal graft in sheet (AlloDerm) and injectable (micronized AlloDerm) forms for soft tissue augmentation. Arch. Facial Plast. Surg., 2: 130-136, 2000.

31- Kirschner R.E., Cabiling D.S., Slemp A.E., Siddiqi F., LaRossa D.D. and Losee J.E.: Repair of Oronasal Fistulae with Acellular Dermal Matrices. Plastic Reconstr. Surg., 118 (6): 1431-40, 2006.

32- Enrina D., Lun J.L., Claudia Y.M., et al.: Cleft oronasal fistula: A review of treatment results and a surgical management algorithm proposal. Chang. Gung. Med. J., 30 (6): 530, 2007.

33- Arlen D.D. and Christian A.A.: Surgical technique for the correction of palatoplasty fistula of the hard palate. Plast. Reconstr. Surg., 883-887, 2005.

34- Al Badawy M.A.: Bipedicle mucoperiosteal flap repair of palatoplasty fistula: Can it reduce postoperative recurrence. Ain Shams J. Surg., 4 (1): 127-132, 2011.

35- Contesini E.A., Pipp N.L., Beck C.A., et al.: Clinic and macroscopic view of immediate palatoplasty with auricular pinna cartilage preserved in 98% glycerin in canine experimental cleft palate. Ciencia Rural, 33: 103-108, 2003.