

Use of Butterfly Composite Conchal Cartilage Graft with Local Posteriorly Pedicled Flap in Repair of Nasal Septum Perforations

Original
Article

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ABSTRACT

Background : Nasal septal surgery is the most frequent cause of nasal septal perforations (NSP). Sometimes when symptomatic they need repair. There are many methods described for repair with a variable percent of success. The multiplicity of techniques and approaches reflect the difficulty of repair.

Objective: To describe a new effective method to repair NSP using a butterfly composite conchal cartilage graft (BCG) with local posteriorly pedicled flap in repair of NSP.

Patients and Methods: Eleven patients with NSP after nasal septum surgery were involved in this study. In all of them an ample flap, right sided, pedicled posteriorly on sphenopalatine artery was fashioned. It was rotated to cover the perforation on the right side. A composite skin choncal cartilage graft equal to NSP diameter is dissected. The cartilage graft was fashioned by splitting its edge circumferentially with a depth of 2-3 mm and was positioned with the skin island lying on the left side and the fissured graft edge embracing the perforation cartilaginous border inside its fissure. The graft and the flap were fixed in place with quilting and mattress sutures and silastic sheets on both sides. Mucosal flap was used alone in three cases with small perforations.

Results: Complete closure of NSP was achieved in 10 cases (91%). Only one case the graft was rejected with partial closure of the perforation due to bad fixation and secondary infection.

Conclusion: BCG was an excellent graft to repair NSP if associated with posteriorly pedicled mucosal flap supplied by the sphenopalatine artery.

Key Words: Butterfly graft, composite conchal cartilage graft, septal perforation repair

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INTRODUCTION

Nasal septal perforations are caused by many factors including surgical trauma after septal surgery, casual trauma, granulomatous diseases as syphilis, vasculitis, malignancy and drug induced as cocaine inhalation^[1]. The authors encountered septal perforations in patients with the habit of shewing and storing Kaht in the oral cavity in Yemen.

Frequently nasal septal perforations are asymptomatic, but occasionally they cause troublesome symptoms like nasal crust formation, nasal obstruction, epistaxis and whistling sounds^[1, 2, 15].

Medical treatment may be given to alleviate these symptoms including topical vasoconstrictors, and nasal saline irrigation conjugated with estrogen^[2]. The authors successfully used local honey drops or saline irrigation mixed with honey to control the symptoms. This method was previously used in treatment of atrophic rhinitis^[3].

Sometimes symptoms persist, in such cases there is a need of surgical repair.

Several surgical approaches were used for repair. These included endoasal approach^[4,15], endonasal endoscopic assisted approach^[8, 9, 10, 18, 19], Post- cartilaginous [intercartilaginous] incision as used in closed rhinoplasty^[15]. Open rhinoplasty^[16, 20] or midfacial degloving approach^[21] were also used.

Several techniques were described to close septal perforation mainly by two ways: by using local nasal flaps and interposing a free graft.

Local mucosal flaps included inferior turbinate flap^[4,25], superior mucosal flap^[23], inferior meatal flap^[5], anterior flap^[1], antro-inferior and postro-inferior rotation flaps^[10] Posterior nasal flap^[6] and superior nasal flap based on Anterior ethmoidal artery^[7], (Figure 10).

Interposition of different grafts were also used with the local flaps including acellular human dermal grafts^[11], temporalis fascia^[12, 22] and cartilage grafts including Split Septal Cartilage Graft^[13], conchal cartilage^[14, 15, 22], composite conchal cartilage graft^[16] and Upper Lateral Cartilage Flap^[17].

The multiplicity of techniques and approaches reflect the difficulty of repair of septal perforations.

Aim of the study:

The present work describes a novel technique which has not, been described in the available literature. We used a butterfly composite conchal cartilage graft to close the perforation. Then it was covered by a posteriorly pedicled flap based on the sphenopalatine artery. We also discussed the causes of success or failure of different ways used to repair the septal perforations reported in literature.

METHODOLOGY:

Eleven patients with septal perforations were included in this study. The diameter of the perforation ranged from 1-4 cm. Three cases had small perforations [1-3 cm.] and treated with local posterior flap only. The other 8 cases had larger perforation [3-4 cm] and were operated by both local flaps and composite cartilage grafts.

Inclusion criteria:

Patients with anterior septal perforation following septal operations [septoplasty - SMR]. Only symptomatic cases were included: e.g. excessive crust formation, nasal obstruction by crusts or residual septal deviation, recurrent epistaxis and noisy whistling nasal breathing.

Exclusion criteria:

Asymptomatic cases and cases due to or associated with pathological mucosa (e.g. atrophic rhinitis, granulomas, neoplasms or drug addicts).

Surgical technique:

Surgery was done with endoscopic assistance.

1a- If the perforation edge was covered with thick mucosa it is preserved. A circumferential incision is made on the right side 2-3 mm away from the edge then it is dissected keeping the mucosa on the perforation edge intact, then the circumferential flap is everted to the opposite side (Fig.1).

b – But, if the mucosa lining the perforation was atrophic, the edge was trimmed and the surrounding mucosa was dissected on both sides, till exposing the cartilaginous

margins of the perforation. If there is associated residual septal deviations or spurs, they are corrected first using endoscope (Fig.9). The size of the mucosal and cartilage defects was then measured.

2- A posteriorly based mucosal flap was fashioned on the right side, it included the mucosa anterior, inferior and posterior to the perforation. Inferior dissection began at the nasal floor to have a large flap with additional supply from the greater palatine artery, with a wide intact posterior base keeping the septal branch of sphenopalatine artery intact. Posterior dissection is done till the flap can be mobilized to cover the perforation without tension (Fig. 2 & 9).

3- The composite graft was collected from the right ear concha (Figures 3 & 7). A skin island was defined by elliptical skin incision on the lateral surface of the concha. Its diameter was 2-3 mm more than the mucosal defect (Fig.7A). The island was left adherent to the underlying cartilage. The surrounding skin was dissected to expose a bigger sized cartilage island 3mm more than the diameter of cartilaginous defect of the perforation. The graft is dissected and excised leaving the skin island attached to it (Fig.7B). The skin of the donor site is sutured by primary intension (Fig.7C). The cartilage graft was fashioned by splitting its edge all around with a depth of 2-3 mm (Fig. 3, 7D & E).

4- The graft was positioned so that the skin island lies on the left side and the fissured graft edge embraces the perforation cartilaginous border inside its fissure. On the left side the dissected mucosal edge is sutured to the skin island (Fig.3 & 4). On the right side the mucosal flap is rotated to cover the bare surface of the cartilage graft and sutured to the superior and anterior perforation edges (Fig.5). It was fixed in place with mattress or quilting sutures. If the cartilage graft was not applied, the circumferential mucosal edges were everted and adjusted on the left side and the posterior flap was rotated and fixed in place as usual (Fig.6). Silastic sheets were applied on both sides of the graft and sutures to the septum with mattress sutures and left in place for 4 weeks. The nasal flaps and grafts were fixed in place with mattress or quilting sutures and silastic sheets were applied & fixed on both sides. The silastic sheets were removed after one month.

Figure (8) shows a case treated with BCG and Figure (9) shows another case with steps of endoscopic flap preparation and correction of septal deviation. BCG was not used in this case.

Postoperative follow up was done for 1-3 years, saline nasal wash and local application of honey were advised in the first 3 months.

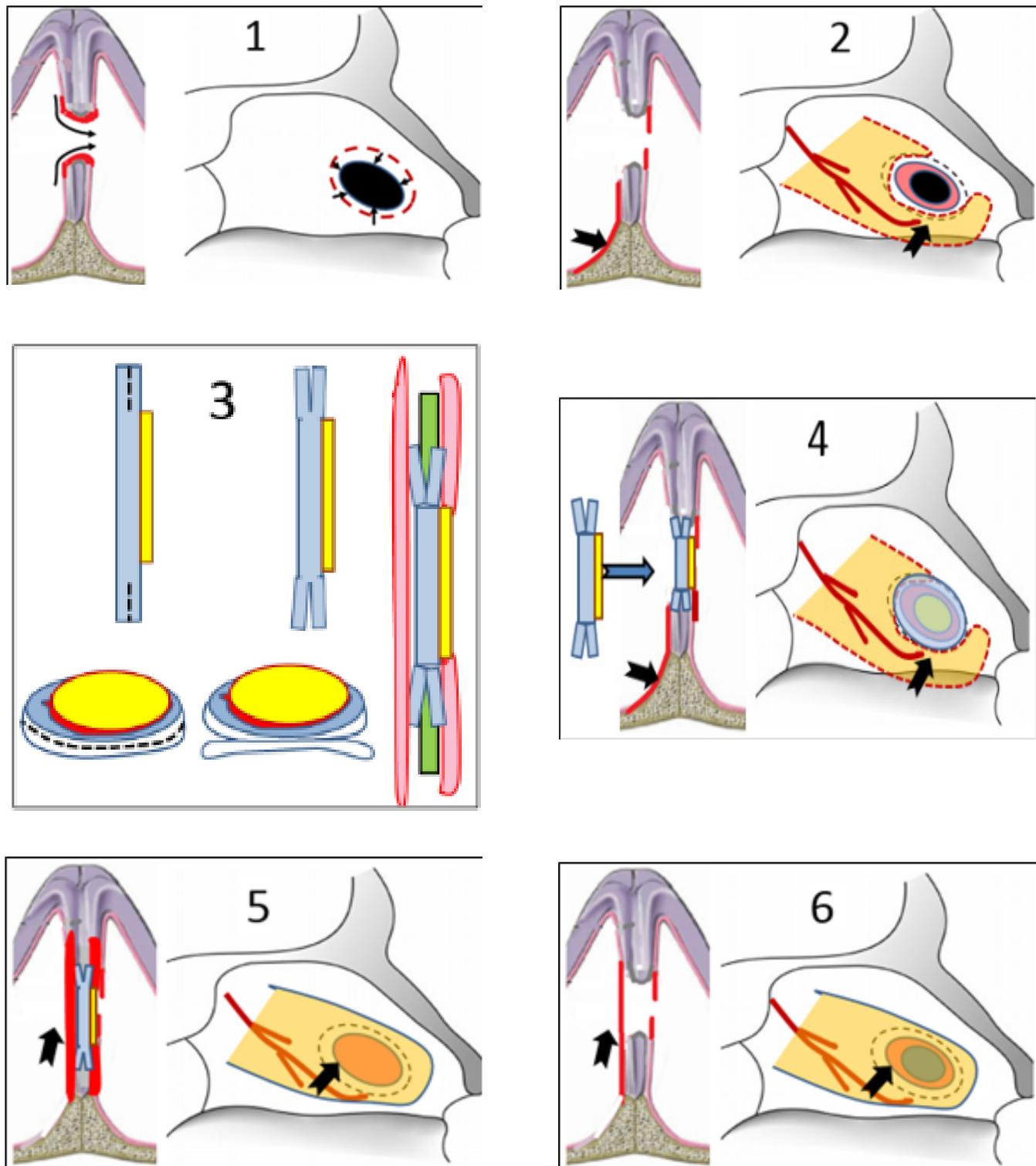
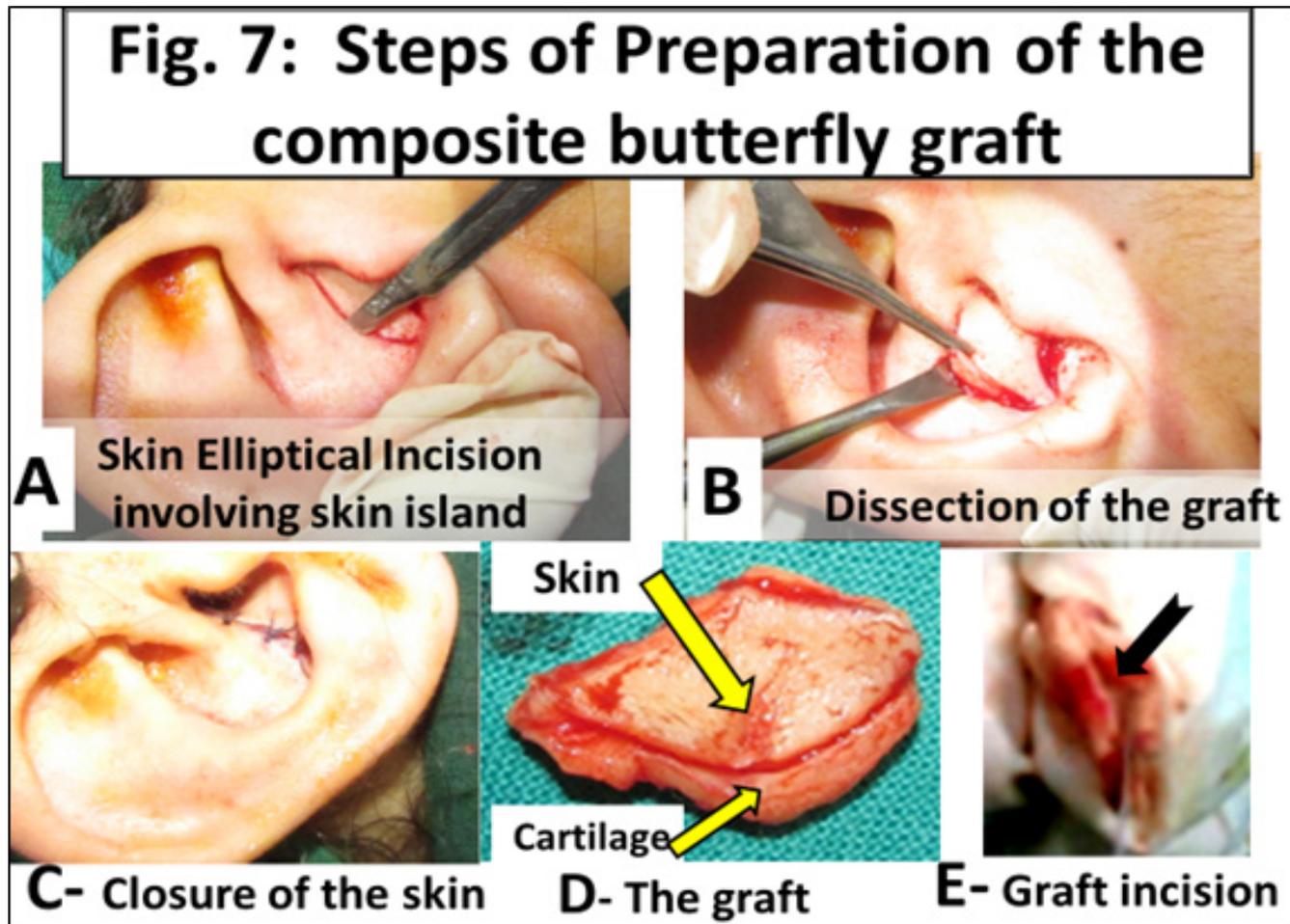


Fig. 1-6 operative steps: Left Figures are coronal sections and right Figures show the view on right side: 1- circumferential incision on right side and eversion of dissected mucosa to left side. 2- fashioning of the posterior flap based on sphenoplatine artery and extending downwards to nasal floor. 3- preparing the composite conchal cartilage graft (Cartilage & skin, see also Figure 7). 4- application of the graft 5- rotation and fixation of the posterior flap over the graft. 6- flap rotation and fixation if there was no graft applied.



RESULTS

Eleven healthy adult patients with septal perforations were included in this study. They were 6 females and 5 males, their ages ranged from 18-35 years. All of them had previous nasal septum surgery and had no local disease as nasal granuloma or drug intake.

They complained of: recurrent nasal bleeding (9 pt.), nasal crusts (8 pt.), nasal obstruction (7 pt.), headache (5pt.) and whistling breathing sounds (3 pt.). The diameter of the perforation ranged from 1-4 cm. Three cases had small perforations [1-3 cm.] and were treated with a

local posterior flap only. The other 8 cases had larger perforations [3-4 cm] and were operated by both local flaps and composite cartilage grafts. Five patients had residual septal deviations which were also corrected. Surgery was done with endoscopic assistance. Follow up was done for 1-3 years, Examination showed that ten cases healed completely without complications (91%). One case the graft was rejected. The cause of failure was secondary infection and bad graft fitting. All the patients were symptom free even the case with rejected graft as the hole became smaller.

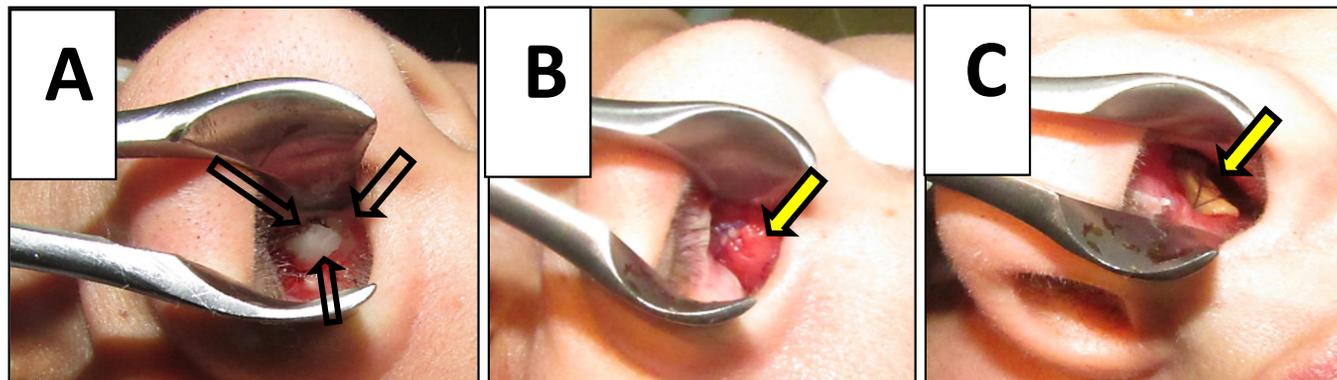


Fig. 8: a case of nasal septum perforation treated with BCG. A- Preop. view, a white cotton was put on the left side to have a better view of the perforation. B- postop. view on the right side with healed posterior flap. C- postop view on the left side showing the thick yellowish skin graft.

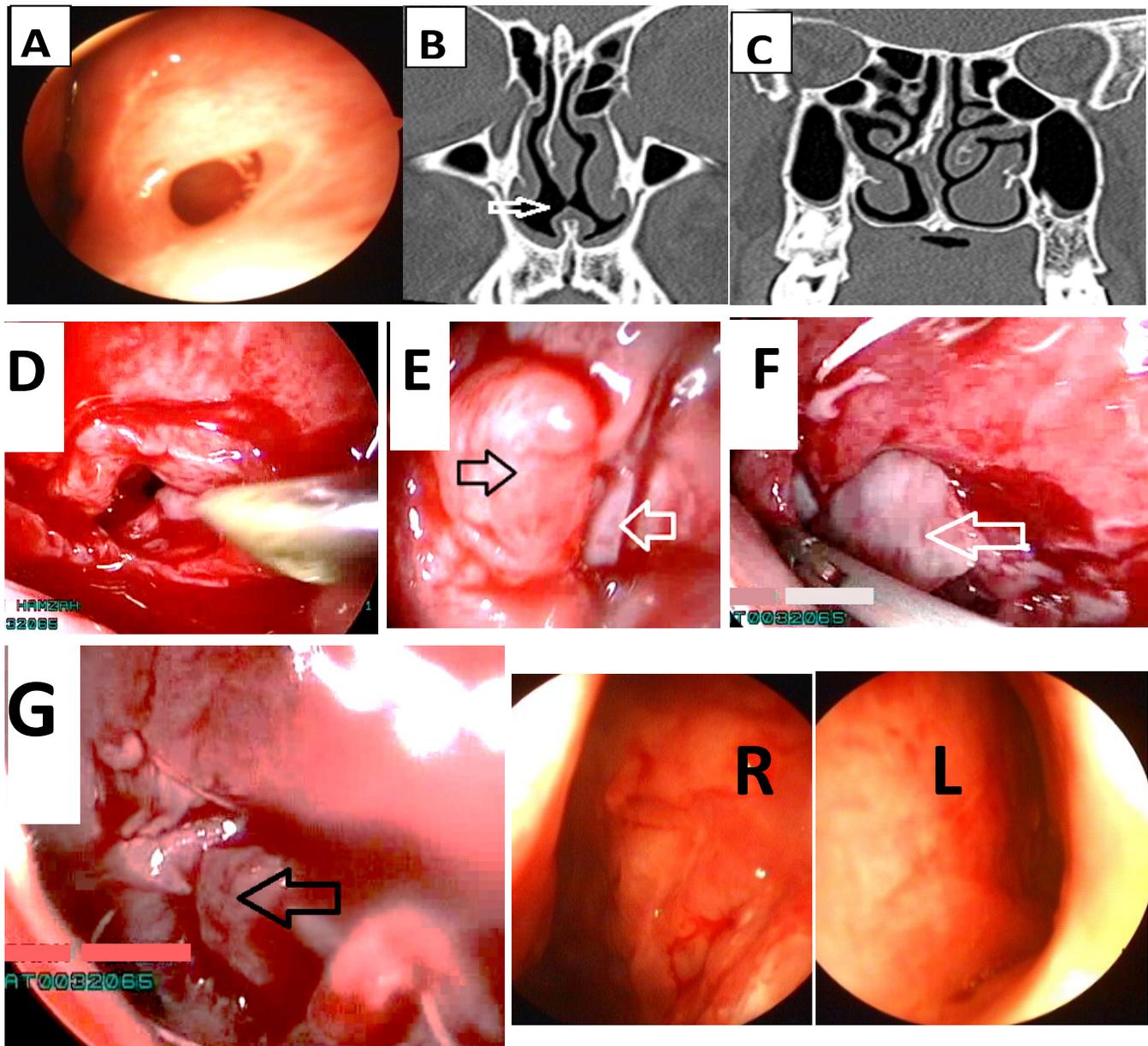


Fig. 9: A case of nasal septum perforation treated with local posterior flap without BCG. A- Preop. view, B- Coronal CT through the perforation (arrow). C- CT showed associated residual deviated nasal septum (DNS) and hypertrophied inferior turbinates which were treated by SMD. Endoscopic procedure: D- Circumferential incision and partial eversion of the flap. E- The posterior flap was fashioned (black arrow) and the septal cartilage is exposed (white arrow). F- DNS was endoscopically corrected. G- The flap is positioned in place and fixed with sutures. R-L: three months postoperative view on right R and left L sides shows complete healing of the flap and closure of the perforation.

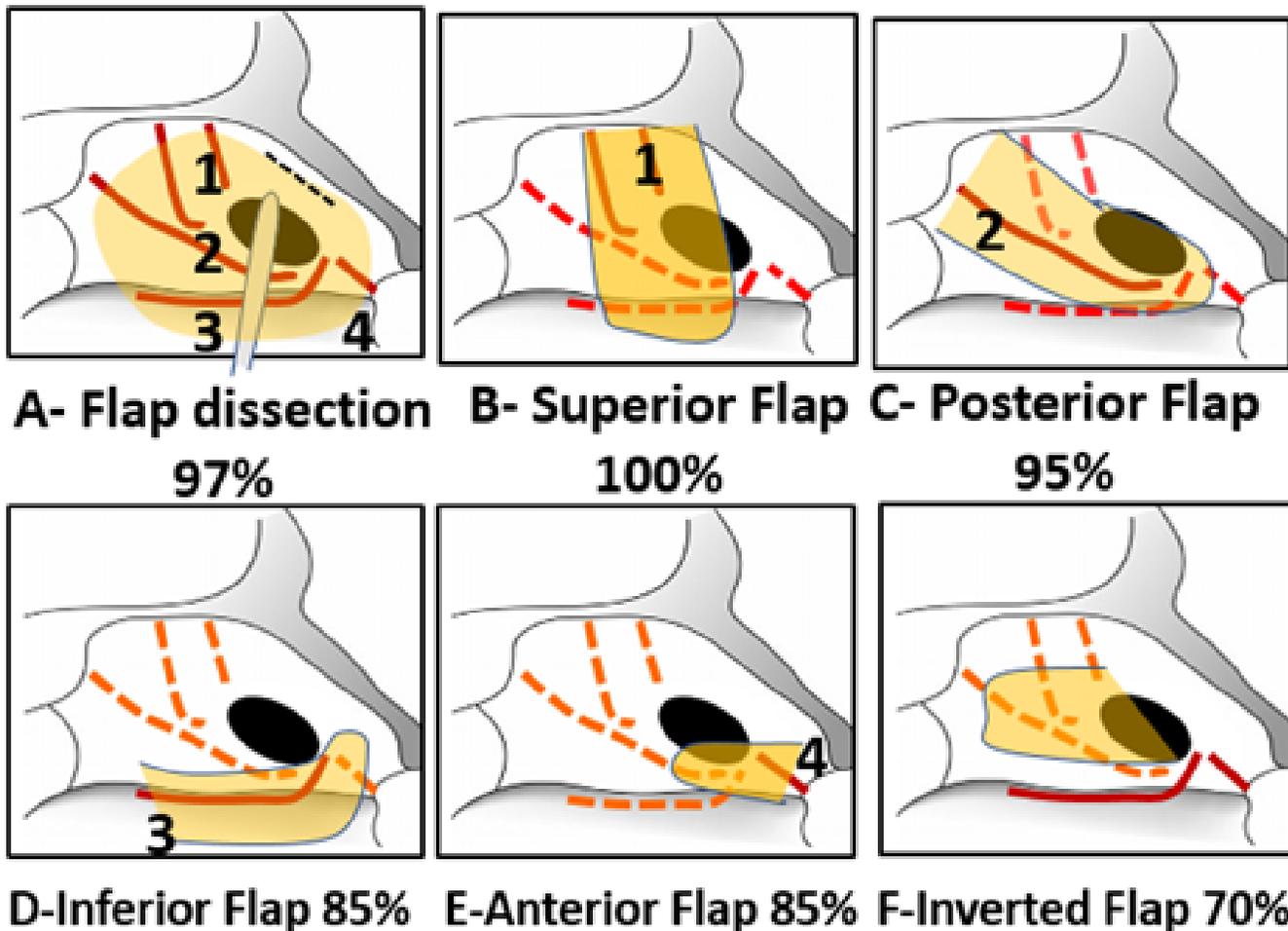


Fig. 10: This is a diagram drawn by the authors. It compares different local septal flaps used in some other literature, the relation of each flap type to its blood supply and the success rate (SR). A- Shows the main 4 arterial supplies: 1- anterior and posterior ethmoid arteries 2- the sphenopalatine a. 3- the greater palatine a. 4- the superior labial a. In this Figure wide dissection with release incision is done keeping most of the arterial supply intact SR 97%. B- superior flap based on 1 SR 100%. C- posterior flap based on 2 SR 95%. D- inferior flap based on 3 and E- anterior flap based on 4 both have SR 85%. F- inverted superior flap the main blood supply of the area (1 & 2) were cut with low SR 70%.

DISCUSSION

The most frequent cause of septal perforations is nasal septum surgery^[22]. Therefore, if any lacerations are noticed at opposing mucosal flaps, they must be sutured immediately to prevent further septal perforation^[24]. We used quilting sutures^[26] followed by silastic sheet. The sutures should not be very tight in order not to impair the local vasculature. We tried to interpose septal cartilage graft between the teared flaps but it usually fails unless the graft is fixed in place and completely covered with mucosa.

Surgical treatment may not yield satisfactory results in perforations caused by cocaine abuse, granulomatous diseases, nose picking habit, and cauterization^[24], so these cases were excluded in our study.

Several approaches were used to repair septal perforations. Our approach was endoscopic assisted endonasal approach. This approach was simple did

not need much tissue dissection as open rhinoplasty and was not associated by external scar. However, its disadvantage is the narrow field and the difficult manipulations^[22]. The use of endoscopes compensated the narrow exposure. We could expose narrow field, see behind septal deviation, with precise flap fashioning avoiding tearing of the flaps. Endoscopic correction of residual DNS could be safely done (Figure 9).

Open rhinoplasty approach^[21] or midfacial degloving^[21] need meticulous dissection and proper alignment of tissues after the operation. They take longer time of healing beside the postoperative edema of nasal skin and face after the operation. Yet, they offer a wider operating field, better access to the superior and posterior margins of the perforation and binocular vision^[22]. These approaches are needed in very big septal defect to obtain large flaps enough for big perforations^[10]. In this study, the endoscopic exposure was enough to see and dissect hidden areas

around the corners and compensated the less exposure offered by open approaches. It was also superior to the endonasal approach alone, which was less precise specially in the depth of the nose.

Surgery aimed at correcting nasal septal perforations is based on two main principles: first, repairing the perforation using local mucosal flaps from the nasal cavity, and second, interposition of connective tissue autografts between the mucosal flaps^[22]

Many local flaps were used to close septal perforations. Knowledge of the vascular anatomy is mandatory to fashion any pedicled flap in human body. Keeping the blood supply intact in the pedicled flap is a crucial factor of success. The nasal septum is supplied by 2 main groups of arteries viz the ethmoidal arteries [anterior and posterior] coming superiorly from nasal roof and the sphenopalatine artery coming from posterior-superior direction (Figure 10-A). Less contribution comes from the septal branches of the greater palatine and superior labial arteries.

Inferior turbinate [IT] flap has good vascularity but it needs a second procedure to cut the flap after 3 weeks during which the nose will remain obstructed^[4]. Sometimes IT flap is combined with septal cartilage interposed graft^[25]. The success rate in these 2 researches was about 70% & 60%. This low rate is explained as the flap was pedicled anteriorly, and the posterior end was incised. This will partially cut the main blood supply coming from posterior end viz the sphenopalatine artery branch to inferior turbinate. This may result in flap necrosis and failure. Addition of septal cartilage graft^[25] actually lowered the rate of success due to graft rejection. The presence of IT pedicle prevents application of silastic sheet which gives additional support and stabilization of the flap and graft.

One of the bad fashioned flaps is what was called the superior flap, it was based towards the perforation edge cutting its superior, posterior and inferior blood supply (Fig.10 F). Then inverted to cover the perforation in the opposite side. This had a low success rate of 70%^[23].

Local antro-inferior and postro-inferior rotation flaps were also used with advancement flaps^[10]. The antro-inferior flap was based on the septal branch of superior labial artery and the postro-inferior flap was based on greater palatine artery branch (Fig.10 D & E). The opposite side local bipedicled advancement flap was used. Ample wide dissection was needed to avoid tension on closure. The success rate of this technique was about 85%.

Local wide sub-perichondrial /periosteal dissection

involving the nasal mucosa from the septum, floor, and roof of the nasal cavity was used (Fig10A). Exposure was done through Post-cartilaginous [inter-cartilagenous] incision used in closed rhinoplasty, then suturing of nasal mucosa^[15]. This technique had success rate of 97%. Wide dissection was done to avoid tension on the sutures which may be an important cause of recurrence. However, the authors used additional temporalis fascia or conchal cartilage in 66% of cases which gave additional support of the repair.

Superior flaps taking blood supply from anterior ethmoidal arteries were described by Castelnovo, 2011^[7]. The flap should be big enough to cover the perforation without tension. Dissection should extend down to nasal floor and to enough distance posterior to perforation, in order to cover it (Fig. 10B). Success was achieved in all operated 11 cases^[7]. This flap recently became popular due to high rate of success^[7, 8, 9].

We used Posterior flap based on Sphenopalatine artery. This achieved success rate of 91%. The flap dissection was wide enough extending to the nasal floor to include the septal branch of greater palatine if possible (Fig. 2, 10 C). The flap had posterior wide pedicle. Our technique resembled the method used by Sapmaz et al. 2018^[6] who had 95% successful results.

It is of utmost importance not to raise identical flaps on both sides the septal cartilage. The septum will be uncovered on both sides on the areas of the raised flap leading to a new perforation^[22]. In our study one sided flap was enough.

Fashioning of a good vascularized flap is one of the most important factors of success it should have a wide base, supplied with one of the main vessels, and big enough to cover the perforation and to be fixed with sutures without tension. If we compare different flaps, it was found that the best results were achieved by the superior flap based on ethmoidal arteries (100%)^[6] and the posterior flap based on Sphenopalatine artery (95%) [7 and this study]. These arteries form the main supply of the nasal septum. Similar comparable result (97%) was obtained with wide dissection and release suture keeping most of the blood supply intact^[15]. To less extent the local anterior and inferior flaps [based on septal branches of the superior labial and greater palatine arteries [85%]^[10]. However, the worse results [60-70%] were obtained with anteriorly pedicled inferior turbinate flap because of interruption of the main blood supply [Sphenopalatine artery] coming from posterior direction^[4, 25]. Also, the flap based on the perforation edge^[1, 23] had lower rate of success [70%] because most of superior and posterior blood supply was cut (Fig.10).

The association of a connective tissue interpositional graft with an intranasal mucosal flap is well described by several authors. The graft creates a barrier between both repaired flaps during healing, thus decreases the risk of incisional breakdown^[15].

Several autologous interposition grafts were used, including acellular human dermal allograft^[11], temporal muscle fascia^[12, 15, 22], and septal cartilage^[13, 27]. Mastoid bone with periosteum, pericranium, tragus cartilage with perichondrium, and iliac crest were also used [cited by 15]. However, conchal cartilage had greater popularity among many surgeons^[14, 15, 22].

Cartilage grafts were successfully used in tympanoplasty by many authors with high success rate over 95%^[28]. Cartilage grafts need minimal blood supply and can survive with poor circulation provided that it was stable in its bed. Although the cartilage cells may degenerate yet the matrix remain intact. New chondrocytes may form after several years^[29]. Conchal cartilage grafts were also used to reconstruct the depressed nasal dorsum^[30] and absent parts of alar nasi^[31].

The butterfly cartilage graft was used in repair of TM perforations. A disc of cartilage graft was split circumferentially to fit in the edges of the tympanic membrane. The success rate was 95%^[32].

This work aimed to apply the same idea to repair nasal septum perforation. To our knowledge it was not previously described for this indication. It differs from butterfly graft used in rhinoplasty in which conchal cartilage is implanted on nasal dorsum to alleviate internal nasal valve dysfunction^[33].

In our practice we found that the use of butterfly graft to close nasal septum perforations had many advantages: It stabilizes the graft in place, as it embraces the bony-cartilaginous skeleton in its fissure. Stabilization of the graft is a very important factor for success. The skin surface on one side provides a tough cover instead of the previous thin delicate mucosa liable for injury. The cartilage provides better support to the reconstructed defect than those techniques using mucosal flaps only. Besides, the vascularized flap on the other side provides blood supply to the new graft. However, it may not be needed in small perforations.

Fixation of the graft in place was also achieved in this work using simple sutures between skin graft and the elevated mucosal defect, mattress or quilting sutures to fix the graft and the mucosal flaps on both sides. They should not be very tight to strangulate and decrease the flap vascularity^[26]. Additional soft thin silastic sheets were put and fixed with loose mattress

stitches on both sides to stabilize the graft and flaps in place.

Postoperative saline nasal wash and application of honey (any available local honey) were advised to be used. Honey was used by the authors to alleviate the nasal symptoms associated with septal perforation. Also, it was used after the operation to promote healing and combat infection. The effect of honey was previously described by the second author. It was used to promote healing of problematic, previously irradiated, neck wounds after cancer surgery^[34]. Also, it was successfully used in treatment of atrophic rhinitis^[3, 35]. Honey was found to promote formation of new capillaries and blood vessels in atrophic rhinitis and in irradiated wounds, beside of reducing edema and inflammatory reaction in the tissues and promoting epithelial growth^[3, 34]. It was also found that it destroys biofilm secreted by the nasal bacteria causing sinusitis thus rendering them more sensitive to antibiotic action, also it has a direct bactericidal effect. The main active ingredient of Manuka honey was methylglyoxal which has a high phenol content, which is known to be bactericidal, especially against *S. aureus* and *P. aeruginosa*^[36]. Sinus irrigation with honey was also useful in treatment of sinusitis^[37].

CONCLUSION

Butterfly composite cartilage graft is an easy and effective technique in closing symptomatic septal perforations after nasal septum surgery. The posteriorly based pedicled flap used by the authors has an ample blood supply from the septal branch of the sphenopalatine artery, which is one of the main blood supplies of the nasal septum. Review of other methods showed that the success rate is high if the flaps were well vascularized as posterior and superior flaps. Good fixation using sutures, silastic sheets and proper fitting of the BCG are also important factors for success.

CONFLICT OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Sedaghat A, Bleier B: Repair of Nasal Septal Perforations. Open Access Atlas of Otolaryngology, Head & Neck Operative Surgery. Editor: Fagan J, 2017;1-7.
2. Batniji RK. Septal perforations: medical aspects. Medscape Otolaryngology and Facial Plastic Surgery. <https://emedicine.medscape.com/article/863325-overview>. 2018.

3. El-kahky M, El- nashar M., El samma M. Samir M and El-Begermy M. A comparative study between the traditionally used drugs and the local application of honey in treatment of primary atrophic rhinitis, A clinical and histopathological study. *The new Egyptian journal of medicine*. 1991; 5[1]: 101-105.
4. Friedman M, Ibrahim H, Ramakrishnan V. Inferior turbinate flap for repair of nasal septal perforation. *Laryngoscope*. 2003;113[8]:1425-1428.
5. Teymoortash A, Werner JA. Repair of nasal septal perforation using a simple unilateral inferior meatal mucosal flap. *J Plast Reconstr Aesthet Surg*. 2009;62[10]:1261-1264.
6. Sapmaz E, Toplu Y, Somuk B. A new classification for septal perforation and effects of treatment methods on quality of life. *Braz J Otorhinolaryngol*. 2018. <https://doi.org/10.1016/j.bjorl.2018.06.003>.
7. Castelnuovo P1, Ferreli F, Khodaei I, Palma P. Anterior ethmoidal artery septal flap for the management of septal perforation. *Arch Facial Plast Surg*. 2011; 13[6]:411-4.
8. Lee WC, Ming Ku PK, van Hasselt CA. New guidelines for endoscopic localization of the anterior ethmoidal artery: a cadaveric study. *Laryngoscope*. 2000; 110[7]:1173-1178.
9. Hegazy M. Endoscopic repair of anterior septal perforation using anterior ethmoidal artery flap. *International Conference on Aesthetic Medicine and ENT*. July 06-08, 2017 Kuala Lumpur, Malaysia. *Otolaryngology* 2017, 7:4 [Suppl].
10. Park J, Kim D, and Jin H. Nasal septal perforation repair using intranasal rotation and advancement flaps. *American Journal of Rhinology & Allergy*. 2013; 27(2): e42-e47.
11. Kridel R, Foda H, Lunde K. Septal Perforation Repair with acellular human dermal allograft. *Arch otolaryngol head Neck surg*. 1998; 124(1): 73-8.
12. Jeon E, Choi J, Lee JH, Kim SW, Nam I, Park YS, Jin SG, Cheon BJ. The Role of Temporalis Fascia for Free Mucosal Graft Survival in Small Nasal Septal Perforation Repair. *Journal of Craniofacial Surgery*. 2014; 25(2): e164–e166.
13. Uygur S, Aral M, Kandal S, Ayhan S. Nasal Septum Perforation Repair Using a Split Septal Cartilage Graft. *Journal of Craniofacial Surgery*. 2015; 26(3): 983–984.
14. Chua DY, Tan HK. Repair of nasal septal perforations using auricular conchal cartilage graft in children: Report on three cases and literature review. *International Journal of Pediatric Otorhinolaryngology*. 2006; 70[7]:1219-24.
15. Pedroza F, Patrocinio LG, Arevalo O. A Review of 25-Year Experience of Nasal Septal Perforation Repair. *Arch Facial Plast Surg*. 2007;9:12-18
16. Woolford TJ, Jones NS. Repair of nasal septal perforations using local mucosal flaps and a composite cartilage graft. *J Laryngol Otol*. 2001;115[1]:22-25.
17. Smith D, Albathi M, Lee A, Lee L, Boahene K: Upper Lateral Cartilage Composite Flap for Closure of Complicated Septal Perforations. *Laryngoscope*. 2017; 127(8): 1767-1771.
18. Hier MP, Yoskovitch A, Panje WR. Endoscopic repair of a nasal septal perforation. *J Otolaryngol*. 2002;31[5]:323-326.
19. Cassano M. Endoscopic repair of nasal septal perforation. *Acta Otorhinolaryngol Ital*. 2017 ; 37[6]: 486–492.
20. Newton JR, White PS, Lee MS. Nasal septal perforation repair using open septoplasty and unilateral bipedicle flaps. *J Laryngol Otol*. 2003;117[1]:52-55.
21. Romo T III, Foster CA, Korovin GS, Sachs ME. Repair of nasal septal perforation utilizing the midface degloving technique. *Arch Otolaryngol Head Neck Surg*. 1988; 114[7]:739-742.
22. Paolucci M, Romeo R and Mardi V. Surgical treatment of nasal septal perforations. Our experience. *Acta Otorhinolaryngol. Ital*. 2006; 26[2]: 102–109.
23. Atallah A, Khalil Y, Abdelshafi I, El-Demerdash A, Hamdan A. Superiorly based septal mucosal flap for endoscopic repair of nasal septal perforation. *Menoufia Med J*. 2019; 32 [1]: 380-6.
24. Younger R, Blokmanis A. Nasal septal perforations. *J Otolaryngol*. 1985;14:125-31.
25. Al-Bassiouny A. Inferior Turbinate Flap Combined with Septal Cartilage Interpositional Graft for Repair of Nasal Septal Perforation. *Journal of Medical Sciences*. 2008; 8[6]: 569-573.
26. Hari C, Wormald PJ, Marnane C. Quilting sutures for nasal septum. *The Journal of Laryngology & Otology*. 2007; 122(5):522-3.

27. Goodman WS, Strelzow VV. The surgical closure of nasoseptal perforations. *Laryngoscope*. 1982; 92:121-124.
28. El-Begermy M.; Sorour N, Ezzat WF. And Rasslan M.: Use of homologous and autologous cartilage grafts in the treatment of tubo-tympanic type of Simple Chronic Suppurative Otitis Media. *Egyptian Journal of ENT and Allied Sciences, EJENTAS*. 2001; 2[2]: 73-83, June.
29. Hamed M, Samir M and El-Bgeremy M.: Fate of cartilage material used in middle ear surgery. Light and electron microscopy study. *Auris nasis larynx*. 1999; 26: 257 - 262.
30. Nasser M, Rabie N., El-Begermy M. Use of conchal cartilage for reconstruction of saddle nasal deformity. *The Egyptian journal of Otolaryngology*. 1989; 6[2]: 144-153.
31. Chen C, Patel R, Chi J. Comprehensive Algorithm for Nasal Ala Reconstruction: Utility of the Auricular Composite Graft. *Surg J (N Y)*. 2018; 4(2): e55–e61.
32. Kaya I, Murat Benzer M, Uslu M, Bilgen C, and Kirazli T. Butterfly Cartilage Tympanoplasty Long-term Results: Excellent Treatment Method in Small and Medium Sized Perforations. *Clin Exp Otorhinolaryngol*. 2018; 11(1): 23–29.
33. Clark JM, Cook TA. The 'butterfly' graft in functional secondary rhinoplasty. *Laryngoscope*. 2002;112(11):1917-25.
34. Effect of local honey application on problematic neck wounds after cancer surgery. El- Begermy M, Mohamed Mos, El-Sayed S and Rasslan O. *Microbiology journal of Al-Azhar University*. 1988; 1-17 June.
35. El-nashar M, Adel lofty A, Nasr H, El-Begermy M, Khalil I. Clinical, pathological and bacteriological effects of the local use of honey in cases of atrophic rhinitis. *The medical journal of teaching hospitals and institutes*. 1989; 7: 59-66.
36. Fastenberg J, Hsueh W, Mustafa A, Akbar N, Abuzeid W. Biofilms in chronic rhinosinusitis: Pathophysiology and therapeutic strategies. *World J. Otorhinolaryngol Head Neck Surg*. 2016; 2[4]: 219–229.
37. Lee V., Humphreys I, Purcell P, Davis G. Manuka honey sinus irrigation for the treatment of chronic rhinosinusitis: a randomized controlled trial. *International forum of allergy and rhinology*. 2017; 7(4): 365-372.