Aesthetic Restoration of Distal Third of Nose by Composite Auricular Graft

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Abstract

Full thickness defects of the nose result in severe esthetic and functional problems. Regardless of the etiology of such defects, the complexity of the reconstruction process of full. Thickness defects of this region is not correlated with the size of the defect. Local flaps are frequently used for reconstruction but often yielding facial scarring and bulky alae. Composite ear grafts are used for relatively small defects less than 2cm in diameter.

Composite ear grafts from the root of the auricular helix or the posterior aspect of the ear has been used to reconstruct an anatomically diverse set of defects of the distal third of the nose with satisfactory success in this study of 12 patients.

Key Words: Alar defects – Composite graft ear – Nose – Reconstruction.

Introduction

NASAL tip and alar loss may lead to disturbing aesthetic changes in the external contour of the nose. Nasal defects impede normal social contact and create great self-identity problems for the patients. Nasal reconstruction dates back to the fourth Egyptian dynasty (2575 to 2467 B.C) when prostheses were molded for the deceased, because “only those without physical disfigurement would enter the kingdom of Osiris” [1].

The earliest discussion of tissue flaps for nasal reconstruction in the living appears as a description of the median forehead flap in the Sushruta samhita, [2] an Indian text written during the vedic period (1000 to 600 B.C). During this time, nasal mutilation was a common punishment and, together with trauma and disease, have served as a propelling force for innovation in nasal reconstruction for centuries [3].

Hippocrates had classified nasal injuries from simple contusions of soft tissues to complicated fractures. He provided detailed instructions for each case from poultice application and bandaging to reconstruction and reshaping of the nasal bones in cases of fractures and deviation. Hippocratic conservative and surgical management for each form of injury was adopted later by physicians and influenced European medicine [4].

In 16th century Italy, Gasparo Taglicozzi used an interpolated upper arm flap on patients, and the westernization of nasal reconstruction began [5].

Composite grafts were described in Germany in 1877 by Koenig, but the main emphasis was generated by Gillies in England and brown in the united states after world war II [6].

Aesthetic and functional reconstruction of full-thickness nasal alar defect has always been a challenge to the surgeon. Although several techniques are described in the literature, none has proved to be ideal [7]. Reconstruction of this anatomical area has some difficulties due to complexity of the anatomy of the nose. The contours of the nose are variable, with convex and concave surfaces in close contact with each other, and the skin texture and color is not easily to match. In partial and total reconstruction of the nose, plastic surgery actually should provide a complete functional and aesthetic reestablishment of the lost tissue with sophisticated refinement of the complex structures of the tip, alae and columella.

Today, deformities that result in tissue loss to any or all portions of the nose may result from trauma, cancer ablation, infection, or congenital malformation [8].

Mohs defects of the nose can be classified according to size. Defects less than 1cm in diameter are considered small. Medium-sized defects are defined as being 1 to 1.5cm, while those larger than 1.5cm are considered large [9]. Conceptually,
the difference between medium and large defects is often the distinguishing size where a local flap and grafts can be incorporated versus a regional flap. In addition, whereas small to medium sized defects can often be repaired with single staged procedure, large defects may necessitate multi-staged approach’s.

Defects of the lower third of the nose that involve the rim, tip, and columella are challenging. A “misplaced patch” appearance, depressed scarring, and nostril retraction should be avoided and nasal airway patency and aesthetically pleasant nasal shape should be maintained [10].

The perichondrial cutaneous graft (PCCG), first described by Brent and Ott in (1978) [11] is a composite graft of skin and perichondrium harvested from the anterior conchal bowl of the ear. This composite graft, consisting of epidermis, dermis, a small amount of subcutaneous tissue, and a perichondrial vascular plexus in the underlying perichondrium [12] has a naturally curved contour and yields excellent cosmetic and functional results in reconstruction of the nasal tip and ala.

Anatomy:

Nasal skin varies in texture, colour and appearance within different areas of the nose. The nasal dorsum, side walls, columella, alar margins and soft triangles are all covered with thin, smooth skin while the nasal tip and ala are covered with thick, pitted skin due to the presence of sebaceous glands [13].

Skin colour may vary from pale, with a matt texture on the side of the nose to a shade of red pink with a shinny appearance over the nasal tip. Of course these patterns show large individual differences but detailed knowledge of nasal skin characteristics helps predict final scar outcome in a patient and is of consideration in choosing donor tissue (grafts or flaps) to improve the matching of nasal skin. Thick sebaceous skin is more difficult to handle because it is inelastic, bleeds more and cannot be easily everted [14] and this contrasts with thinner skin which often produces finer scars where small dog ear protrusions tend resolve spontaneously.

Furthermore, skin over the nasal tip and ala is fixed, compared to the relatively mobile skin over the upper two thirds.

The nasal unit sits on a platform in the midface defined by the soft tissue surrounding the piriform aperture. This platform is the base of the nasal structure and must support any reconstructive work.

The platform is located 1cm anterior to the maxilla and contains separate foundations for the alar bases, columellar base, septum, and skin lining of the nasal floor. The nose itself is a multilayered structure with a thin, vascularized lining of mucosa and squamous epithelium, a support layer of bone and cartilage, and finally an outer skin envelope with unique colour and texture to match the surrounding areas of the face Fig. (1) [9].

![Fig. (1): Aesthetic sub-units of the nose according to Burgett. Transition zones between the aesthetic units may be used to hide scars](image)

**Composite graft:**

Composite grafts contain two or more tissue layers. Due to the metabolic demand of the large bulk of tissue, they heal with great difficulty and are limited to defects less than 1cm in size [15].

This type of graft requires a non-smoking patient without systemic illnesses or prior irradiation that would compromise revascularization. Composite grafts have been used for small full-thickness defects of the columella, alar margin, and soft tissue triangle.

The auricle is an excellent source for a composite graft. It is well suited for defects in the columella and alar cartilages. Other donor sites are: Helix, antihelix, tragus. The similar nature of a tight thin skin overlying cartilage without subcutaneous fat makes these areas a good match.

Alar wounds, especially those that approach the superior aspect of the alar, are prone to notching and retracting [9].
Harvesting auricular graft requires maintenance of the tight thin skin to the overlying cartilage.

Defect analysis:

Analysis of a nasal defect begins with classification by location, size, and depth with an eye towards possibilities for graft design.

Defect location is categorized into aesthetic subunits that separate nasal topography into nine distinct areas based on natural contours and creases of the nose. Scars that are strategically placed at the junction of two adjacent subunits blend with the normal transition and maximize scar camouflage. Moreover, when most of the subunits is missing, the entire subunit should be reconstructed for ideal camouflage. Modifications on aesthetic subunits have been described focused on local characteristics such as, color, texture, contour, and actinic changes that may take precedence over the traditional nasal subunits [9].

However it is precisely this pre-operative planning and aesthetic considerations that led to the wide application of the subunit principle and the strategic placement of facial scars it is important to recognize that the subunits are defined by changes in contour and shadows.

Patients and Methods

A total of 12 patients between November 2006 and May 2009 complaining of small and medium sized distal nasal defect in ala and or nasal tip treated by composit graft from ear.

There were 9 men and 3 women their ages ranged from 18 and 37 years (26.6 mean, years). Eight patients had deface following trauma, while three patient had a defect caused by tumour resection (Basal cell carcinoma) and the last one was due to infection and cellulites as a result of piercing of the nose for the purpose of putting a nose ring by some local person with an unsterile object.

According to the aesthetic subunit principles in six patients (50%) the defect involve one aesthetic subunit which is the ala, in four patients (33%) two subunits are involved which are the ala and tip and in the remaining two patients (17%) three subunits are involved which are nasal tip, columella and part of ala nasi.

Surgical technique:

Under general anaesthesia the site and size of the defect evaluated and a plan was made to reconstruct the defect in a single stage operation, using a composite, three layer (skin-cartilage-skin), graft taken from the root of the helix (mainly to reconstruct ala) or two layer composit graft (skin and cartilage) from the posterior aspect of the ear to reconstruct tip.

After debridement of the defect the size is evaluated and meseared and bone wax is used as template.

Local anaesthetic was injected peripheral to the harvested site to maintain tight adherence of skin and cartilage in addition one or two central sutures may help prevent disruption of cartilage and skin. Finally trimming the underlying cartilage to allow for a slight excess of skin to cartilage can lead to increased uptake of composite grafts.

The composite graft was harvested from the root of helix in three layer graft and from the posterior auricular skin and cartilage in two layer graft after marking the defect and the donor site is closed primarily.

Expect in one patient of nasal tip defect in which the donor site closed by STSG (Split Thickness Skin Graft) used from ipsilateral infra clavicular region.

The composite graft was immediately sutured to the recipient site under loup magnification of 3 x for better opposition of margins.

The inner mucosal layer was sutured first to the composite graft using 6-0 vicryl if the graft is small, no sutures are needed for the cartilage and only skin 6/0 poly propylene sutures are necessary. In some cases stabilizing struts are used for composite grafts at the alar rim. These are cartilaginous extensions that are placed under skin adjacent to graft using tongue in groove technique and the skin was sutured using 6-0 prolene taking interrupted sutures.

The nasal cavity was packed with paraffin gauze and a small dressing was applied after applying a thin layer of ointment outside.

The packing was removed on the 5th post operative day and the skin sutures were removed on the 10th postoperative day.

Results

A total of 12 patients (9 men and three women) underwent composite grafting repair for distal third nasal defect between 2005 and 2009. The average follow-up was 16.7 months (range, 6 to 28 months).

The average age was 26.6 years (range 18-37 years). The indication for surgery are listed in
Table (1) the donor site for composite graft was conchal in 3 patients (two layer graft skin and cartilage) and root of helix in nine patients (three layer composite graft skin-cartilage-skin).

The total complication rate was 17 percent, including partial loss of one graft and one case of hypertrophic scar formation. There were no functional complications such as nasal obstruction.

![Image](A)

![Image](B)

![Image](C)

![Image](D)

![Image](E)

![Image](F)

Fig. (2): A,B) Pre-operative view of Lt alar defect (Post. Traumatic). C) Composite graft applied on nostril defect. D) Early post-operative view with congested graft before removal of pack. E) Zoomed view after one year. F) Complete lateral right view of the patient, as control.

**Aesthetic results:**

From an objective point of view patient satisfactory results were evaluated by assessment scale Table (2).

Patients with score from 4 to 5 are considered excellent, patients score from 7 to 9 are considered good while patients with score from 10 to 12 are considered poor results.
Fig. (3): A,B) Hemialar defect involving part of tip and part of columella. C) Bone wax template resembling the defect and the
donor site of helical root of the ear. D) Primary closure of the donor site with minimal disfigurement. E) Three layer
Fig. (4): A,B) Pre-operative frontal and lateral views of lost tip, part of both alae and part of columella (treated previously by STSG). C,D) Frontal and lateral view of applied two layers (skin and cartilage) composite graft. E,F) Postoperative complete lateral (Lt. and Rt.) views of the patient after one year.

Table (1)

<table>
<thead>
<tr>
<th>No</th>
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<th>Sex</th>
<th>Cause</th>
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<td>BCC</td>
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BCC: Basal cell carcinoma.
Table (2): Assessment scale of nasal reconstruction.

1) Contour satisfaction:
- Excellent (1) normal contour.
- Good (2) bulge or depression.
- Poor (3) distortion.

2) Pigmentation:
- Excellent (1) patient's normal skin colour.
- Good (2) scar pigmentation.
- Poor (3) graft hyperpigmentation.

3) Notching:
- Excellent (1) no notch on scar.
- Good (2) notch on scar.
- Poor (3) retracted graft.

4) Satisfactory scar:
- Excellent (1) cannot identify at one meter distance.
- Good (2) can be weakly identified at one meter distance.
- Poor (3) can be identified at one meter distance.

Discussion

There are plenty of methods to reconstruct small and medium-size defects of the nose. Nevertheless, the big challenge is to reconstruct combined defects of the skin, cartilages, and nasal mucosa and to achieve good aesthetic and functional results. We have to reconstruct not only the skin defect but also cartilage support [10].

Depending on size and site, different reconstructive options, such as primary closure, FTSG, local flaps, and composite grafts are available to cover defects of the lower third of the nose. Because the skin is often thick, sebaceous, and particularly stiff, [10,16] an elliptic incision with primary closure yields poor results with depressed scar, which can considerably contract and distort the topography of aesthetic unit [16]. Therefore closure with FTSGs and local flaps are mostly employed. However, in the lower third of the nose, cosmetic appearance of FTSG, is often suboptimal in terms of thickness, rim contour with scar contraction and notching, color match, and poor graft survival over the exposed cartilage [12,16].

When compared with FTSG, local flaps are subject only to minimal contraction and provide a better color match; furthermore, flaps have higher survival rates than grafts [12]. Despite these advantages, local flaps are associated with extra incisions that cross aesthetics subunits [10,12] and are delicate in terms of thickness, notching, and tip distortion by flap rotation or transposition because of the relative mobility of the nasal tip. The human eye can easily detect any difference in nostril rim contour after flap surgery despite the best design [10].

Results with flap coverage are frequently less than composite skin grafts for nostril rim reconstruction, which include epidermis, dermis, superficial layers of subcutaneous tissue, fat, or cartilage segments, have been extensively described in literature [10,16,17]. Particularly, composite chondrocutaneous auricular grafts harvested from the conchal cavity [18] or the helix can provide the required thickness for both inner nasal lining and nostril rim [17,19].

Even if providing good cosmetic outcomes when placed over cartilage in the distal portion of the nose, their survival, depending on revascularization from recipient bed and defect periphery, might be critical [10,19].

Mark [20] in his study on 38 patients with distal third nasal loss, treated by median forehead flap, reported that a mean of three operations per patient were necessary to reach an acceptable aesthetic and functional result, which is comparable to other investigators reporting a mean of 2.5 operations per patient, [21] necessary secondary revisions in 11 to 54 percent [22,23] and one to three operations in 81 percent of all patients to reach optimal results [9]. It is important to emphasize that most of our patients were satisfied with their reconstructive outcome and refused further surgery after their forehead flap pedicle had been severed.

This was somewhat to our discontent, because we sought perfection in our surgical results. In general, we feel it is difficult to reach perfection in just a three-stage operation. These patients usually will need one or more additional operation to reach a better result.

Protuese, et al. [7] showed that PCCGs contract less and maintain the original thickness if compared with skin grafts, secondary to improved revascularization through the perichondrial vascular plexus, thereby increasing the chance for graft take even in case of suboptimal graft bed [12]. Moreover, it has been shown that the outer perichondrial layer included in the graft rapidly induces fibrous growth and provides stable connections to the wound bed [25]. Harvesting of the PCCG from the posterior auricular donor site or the anterior conchal bower is a simple procedure that maintain excellent functional and aesthetic outcomes [26].

The present study assessed aesthetic outcome following subtotal nasal reconstruction in 12 patients with a mean follow-up of (16.7) months the data analyzed by standardized questionnaires and physical examination.
In the current series, only two patients has postoperative complications one of them had hypertrophic scarring and the another one had partial loss of the graft.

A total of ten patients (83%) were very satisfied with their nasal appearance, color match, nostril size and alar contour.

Graft color match was poor in one patient in whom partial loss of the graft had occur leaving also notching of nasal rim.

In conclusion reconstruction of distal third of the nose of small and medium size defects using composite grafts from root of helix or post-auricular perichondrial cutaneous graft is a simple and reliable option, with minimal donor-site morbidity and a low complication rate, that can be performed as a single-stage outpatient procedure resulted in nicely contoured reconstruction of the alar rim and nasal tip.

References
