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Case Report

Free Helix Cartilage Graft Roll Technique for Ala Nose Reconstruction: New Technique Description

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Abstract

According to several authors, autologous cartilage transplantation is an ideal technique to correct nose deformities, providing a stable and potentially long lasting alternative to "off the shelf" nose implants. Structural reconstruction of the nose involves multilayered pedicled propeller flaps and the ala of nose involves a delicate and precise design to obtain form, function and aesthetics.

In this article the author has found that immediate helix cartilage graft seems to be a suitable donor site when the wing of the nose repair is a needed. When ear cartilage graft is used to replace partial loss of the ala of nose, good results can be obtained and the results are very predictable when the right technique is used. The objective of this publication is to demonstrate this cartilage feasibility for nasal ala reconstruction after skin cancer removal.

Purpose: The author describes a combined surgical procedure named Helix Cartilage Graft Roll (HCGR) technique for partial ala of nose reconstruction. The HCGR technique is recommended to be performed concomitantly with the first surgical procedure which is comprised of Mohs surgery for removal of the skin tumor and immediately wound coverage on the top of the helix cartilage graft, after making sure the borders are completely free or negative for tumor. Mohs surgery offers high cure rates for high-risk cancers like basal cell and squamous cell carcinoma by mapping and analyzing 100% of the surgical margins. In case Mohs technique is not readily available, the procedure for reconstrcution should be staged. A primary excision should be performed for simple tumor removal, the wound left without any reconstruction at this time and the residual wound covered only with special dressing to be changed as many times as necessary, until histopathological result returns. The pathologist examines the entire edges and base of the mapped tissue under a microscope. If borders are not yet free, meaning cancer cells are found, additional excisional biopsy must be performed and the map guides the surgeon to remove only the cancerous spot in the next layer. This procedure should be repeated until results show margins are completely clear, free. Negative margins is the goal for facial tumors, as it will improve both local control and long-term survival. Once the patient is microscopically cancer-free, the wound can be now reconstructed in a second phase with the HCGR technique performed at this moment. The authors consider it is important to describe and publish this surgical procedure which uses immediate free helix cartilage graft for ala of nose reconstruction during the first stage of primary nose tumor for three reasons:

A) Firstly, because it is difficult procedure, recommended for surgeons with relevant experience in skin surgery.

B) Secondly, oral and maxillofacial cosmetic surgeons face several problems to reconstruct the most lateral inferior portion of the nose when the wing of the nose is resected in patients with nose skin cancer. Not only cartilage graft is needed but knowledge of diverse types of local skin flaps with pedicle which might involve fat and/or muscle.
C) The absence of similar report or any technique described in nose cosmetic scientific literature, up to the date of this publication, giving a road-map to this type of partial ala of nose reconstruction.

Keywords: Nose; Ala of Nose; Wing of the Nose; Free Flap; Pedicled Flap; Cartilage; Ear Cartilage; Helix Cartilage

Introduction

Facial skin tumor reconstruction is done by experienced skin surgeons based on steps or stages, making it easier, less surgical work demanding and more predictable. Therefore, the primary objective of skin tumor reconstruction after excisional biopsy is to protect underlying tissues covering them with uni- or multi-layer structured autologous free or pedicled grafts that can be composed of: a) subcutaneous or mainly not processed adipose tissue transplanted as a unit, b) muscles, c) nerves and vessels and d) bone [1]. The aesthetic aspect of reconstruction of any part of human body to its essence is always a secondary objective and it might involve soft tissue debulk and fat, cartilage and bone grafting with the purpose of bring back the most natural aspect of the anatomic area which was destroyed, first by the tumor and secondarily by the invasive surgical resection of the tumor.

Reconstruction of the ala of nose is a very difficult procedure due to several factors such as but not limited to: 1) reproduction of the natural contour of the wing of the nose; 2) recreate nasal mucosa and its cilia in the vicinity of the wing of the nose; 3) final acceptable nose aesthetics, respecting the nose aesthetic subunits which were introduced by Burget and Menick based on differences in elasticity, color, contour and skin texture, contributing to the refinement of nasal surgery [2].

Literature Review on Ala of Nose Structure and Reconstruction

The ala of the nose or ala nasi which means wing of the nose, is the lower lateral surface of the external nose, shaped by the alar cartilage and covered in dense connective tissue [3]. The alae flare out to form a rounded eminence around the nostril as described by Tortora and Anagnostakos [4]. The nasal ala is a complex structure whose constitutional convexity and skin characteristics make reconstruction of this area a challenge. The unique fibrofatty soft tissues of the alar lobules provide support to this three-dimensional structure of the nose. Reconstruction of the ala can be achieved using the nasolabial flap utilizing the subunit principle, as described by Burget and Menick or using a defect-only approach [5]. After the defect is exposed, contralateral ala can be used as a template for size and shape, facilitating designing the new ala. Reconstruction of the nasal ala using the nasolabial flap represents a well-established technique for nasal reconstruction but with some caveats. The nasolabial flap is not ideal for the nasal lining of the ala, as this has produces inferior results. If lining is required, than forehead flap should be the option, according to Weathers, et al. [6].

Recently several authors have presented ala reconstruction on a secondary step and among them are Lambert and Dzubow, El-Marakby, Romaní and Yébenes, Zimbler, Thornton and Weathers, Guo, Pribaz and Pribax and Wolfswinkel, et al., describing different nasolabial, advancement and local flaps [7-13]. The nasolabial flap is ideal for repair of full-thickness defects as it provides soft, pliable skin that when used simultaneously with a cartilage graft can easily recreate the three-dimensional shape of the nasal ala. In addition, the skin match provided by the nasolabial fold is exceptionally suitable for the alar region. These characteristics make the nasolabial flap invaluable for alar reconstruction

Helix Cartilage Graft Roll (HCGR) Technique Indications

Even though this procedure has its limitations because its local delineation, a few indications are proposed by the author, as follows: 1) when the ala of the nose is compromised during the first tumor resection; 2) when the wings of the nose need primary support for further nose reconstruction; 3) when the aesthetics nose wings are compromised.

Case Report and Technique Description

A 67 years-old female patient was referred by her dermatologist for treatment of a diagnosed basal cell carcinoma involving the right base of the ala of nose and the most superior aspect of right upper lip, as shown in Fig. 1. Nasal specific subunits of our case are appreciated in Fig. 1.

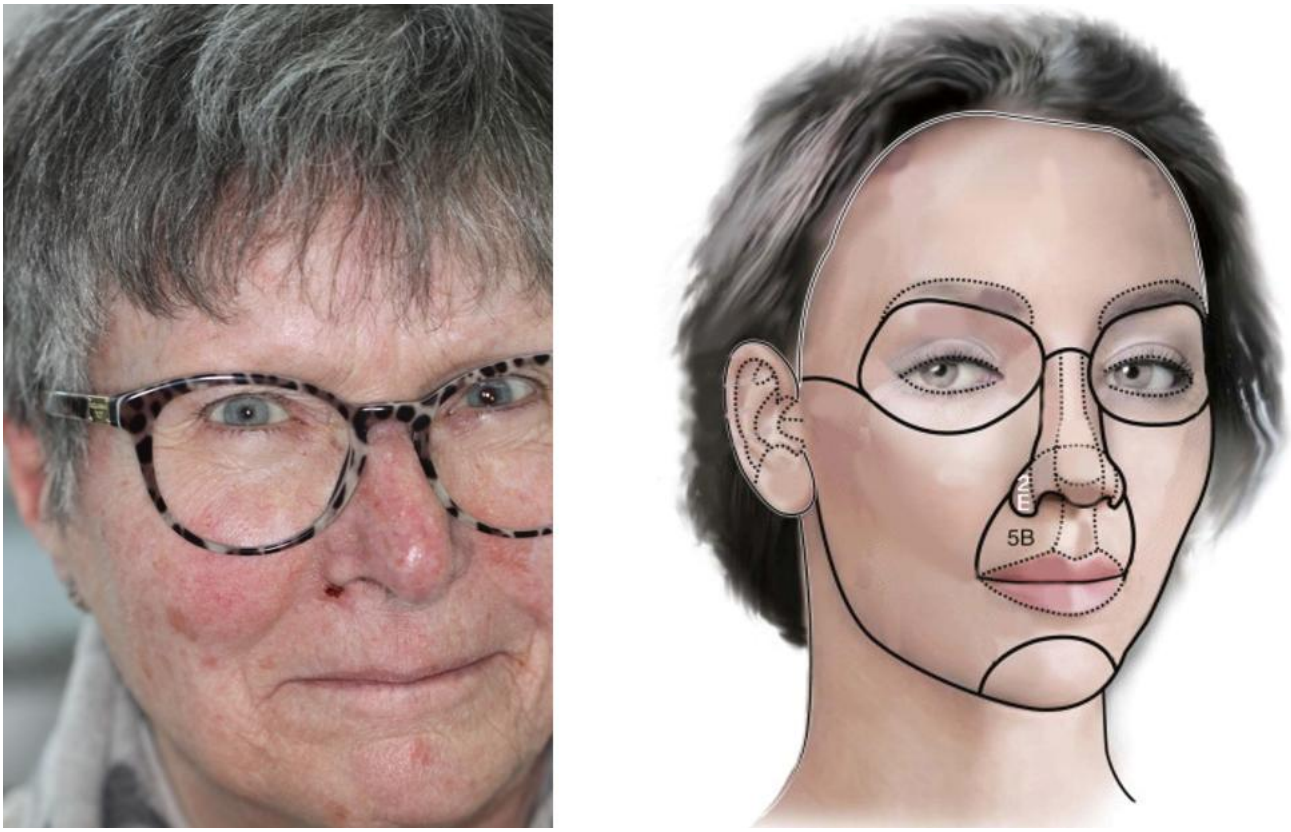

Figure 1: a: Basal Cell Carcinoma invading nasal subunit: 2E and upper lip subunit: 5B, Mucosal; b: Facial units. Nasal subunit: 2E, Right alar base; Upper lip subunit: 5B, Mucosal. Adapted pocket dentistry [14].

The HCGR technique is described below in several steps, along with the case report. The margins of the ala of the nose have to be exposed, cleaned and well surgically delineated. At this point any active and more intense bleeding has to be contained without damaging the blood supply to the future grafted area as shown in Fig. 2.

Figure 2: a: Aspect of the first biopsy site after eight days; b: Aspect of the site after the second biopsy. Margins are 5-7 mm free of local tumor.

Adequate measurements of defect size are taken note and a sequence of surgical approaches are to be determined, as shown in Fig. 3. These measurements can be done with sterile surgical calipers as well.

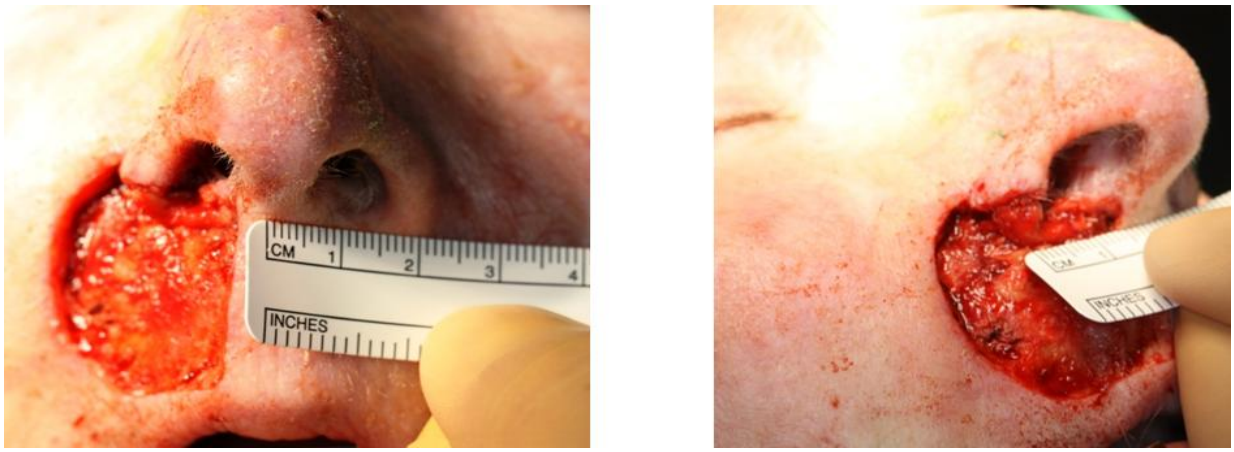

Figure 3: a: Contralateral ala of nose serves as a blueprint for the right ala reconstruction; b: Right ala of nose follows the same measurement found on the contralateral side.

Ipsilateral cartilage of the earlobe, for uni or bilateral nose reconstruction, is obtained by simple and direct approach, as shown in Fig. 4. Donor site suture is performed at this stage, as shown in Fig. 4.

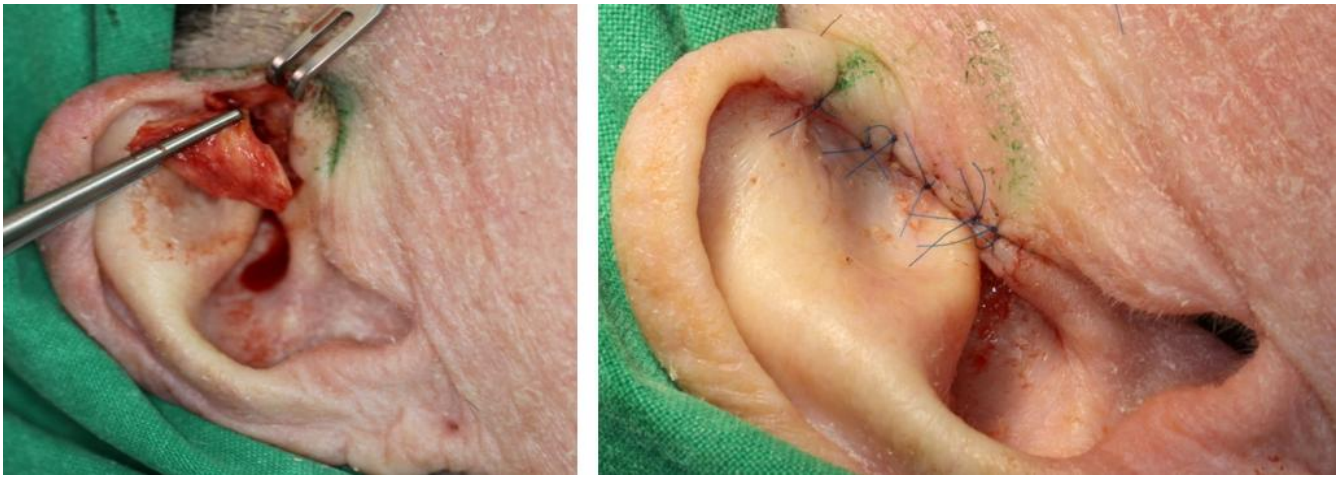

Figure 4: a: Right helix cartilage donor site; b: Final suture after cartilage removal from right helix with Supramid 6-0.

The cartilage is then shaped as a roll using a few of suture resorbable 5-0 sutures and three non-resorbable 6-0 nylon clear sutures. The new conformed cartilage graft is adapted into position simulating the wing of the nose, as appreciated in Fig. 5.

Figure 5: a: HCGR technique being designed and cartilage is sutured in position with 4-0 clear non-resorbable suture; b: Helix cartilage graft must be well secured in its final position, giving support for the covering tissue.

A Nasolabial Propeller Perforator Flap (NPPF) is designed and performed, as appreciated on Fig. 6. At the right nasal and right upper lip this flap is not debulked at this first reconstruction nor the skin de-epithelized where the future nasal mucosa will be. The NPPF is then sutured in position by layers, as demonstrated in Fig. 6.

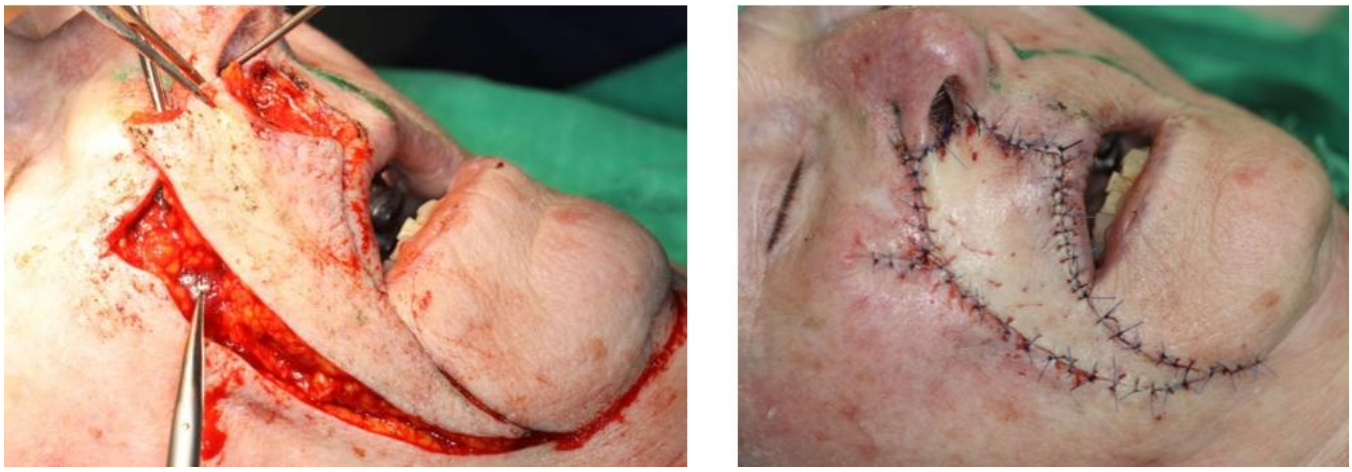

Figure 6: a: Fat tissue of the NPPF is not debulked at this point nor its extremities because it will cover the cartilage with soft tissue excess for future de-epithelization giving the final format to the nasal ala; b: NPPF sutured in position with 5-0 and 6-0 Prolene sutures. It is possible to appreciate the right nasal and right upper lip subunits reconstructed.

Postoperative photographs the perfect adaption of the propeller flap covering the area of the previous defect and the aesthetic at the donor site, as shown in Fig. 7.

Figure 7: a: Postoperative photo of the right ala of nose and right upper lip, after three days; b: Postoperative photo of the cartilage (right helix) donor site, after three days; c: Postoperative photo of the right ala of nose and right upper lip, after five days; d: Postoperative photo of the right ala of nose and right upper lip, after seven days.

Discussion

Ala of the nose also known as "wing of the nose" is a cartilaginous structure that forms the lateral side of each naris or nostril opening and is covered in dense connective tissue. When this structure is affected by a tumor and has to be excised the lower lateral surface of the external nose becomes compromised and aesthetic are to be addressed during the posterior reconstruction phases. The primary reconstruction of the ala of the nose has one big advantage which is a very strong foundation for redefining the nose structure, bringing back its normal anatomy altered by tumor resection. The subunit principle described by Burget and Menick, should be used to convex central subunits such as the ala [7]. Those authors suggested that the entire subunit should be removed when the defect is greater than 50% of the subunit for better aesthetic results. With this approach the scar is better hidden layin on the subunit transition. In the authors' experience, partial or total anterior and posterior alar defects can be successfully reconstructed using defect-only nasolabial flaps but because of the lack of ideal ala curvature (format), is becomes more visible than scars themselves. Due to a very specific anatomy, free cartilage grafting with special treatment is needed to provide support for nasolabial flap preventing alar collapse or telescopic aspect resulted from scar contracture. The ear helix provides cartilage that has a similar contour to the ala, is simple to harvest, easy to work with, resulting in very low morbidity on the donor site. Therefore, for these ala reconstructions using free helix cartilage graft, a slightly bulky flap is needed to avoid intense contracture. Differently than claimed by Rosseto, et al., in their technique which used an Inferior Pedicle Nasolabial Flap (IPNF), none of their series of cases presented had a full resection of nasal ala [15]. They were not able to demonstrate that the IPNF was sufficient, adequate and able to fully reconstruct any entire nasal ala. So their technique cannot be considered a competent method for correcting the ala of nose in its intricate shape and curvatures when compared to the HCGR technique presented in this article. During the excisional biopsy of the tumor it is very important to have negative tumor margins, not only horizontally but in depth as well. But it is as much imperative not to damage the alar nasalis muscle which structure dilates the nostrils, depresses the ala nasi (nostril wings) laterally and wrinkles the nasal skin. These actions enable flaring of nostrils, which occurs during breathing and is emphasized in various emotionally driven situations. The absence of foundation and good support of this are of the nose will cause the covering tissue, normally a dermo-cutaneous flap, to shrink consequently distorting the ala of the nose and nostril. The author agrees with Posso, et al., which affirm that Nasolabial Propeller Perforator Flap (NPPF) is an excellent choice for covering extensive wound defects resulting from skin cancer removal at the nose region because it allows a precise skin island design, is not too bulky, has a wide arc of rotation and facilitates one-staged reconstruction without increasing the rate of complications [16]. The motive for not debulking the NPPF is to avoid excessive tissue shrinkage due to undesired fat avascular necrosis and subsequent nasal distortion. A refinement procedure can be performed to debulk the the most cephalic aspect of the flap after its total integration to the region, giving the formal format for the nasal ala which is hidden underneath. Even though this technique reduces the number of reconstructive surgeries and has a low morbidity related to the donor site, one main disadvantage could be the patient satisfied with the aesthetic result after the first surgical reconstruction not willing to undergo other reconstructive procedures. Using HCGR technique does not eliminates the need of further aesthetic refinements but helps to build up a solid foundation for the next surgical reconstructive steps [17].

Conclusion

Reconstruction of nasal ala poses major difficulty to experienced oral and maxillofacial surgeons, even with advanced surgical skills, due to its thin skin, cartilage format and distinct appearance. In order to diminish the number of subsequent surgical refinements, the HCGR technique is an alternative way to correct this structure. Based upon the feasibility and incontestable results found with this technique applied over more than three dozens of patients, the author recommends primary ala of nose reconstruction to be performed at the moment of the first wound surgical repair when Mohs surgery shows the borders are free of cancerous cells or in the second phase, when surgeon and pathologist are using traditional methods for soft tissue preparation and microscopic examination and both are certain the edges and depth of the tumor were completely removes during the excisional resection. Further applications of the HCGR technique by oral and maxillofacial cosmetic surgeons have to be tested and publications of their results are paramount for make it a common and reliable technique, consolidating the HCGR procedure and making it the golden standard for nasal ala reconstruction.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Acknowledgement
None.

Data Availability Statement
Not applicable.

Ethical Statement
This single case report was conducted in a private office, therefore adhering national counselling and the Declaration of Helsinki guidelines, prioritizing and ensuring patient privacy, confidentiality and anonymity.

Informed Consent Statement
Informed consent was taken for this publication with patient giving her written consent for her image to be published particularly and only for case report. All signed documents are legally being kept in the author PM's private office under patient's chart.

Authors' Contributions
ELS: Specifically developed the new technique/concept for ala nose reconstruction, drafting, reviewing the manuscript, collecting bibliographic scientific information, performed surgical procedures, case report description; PM performed surgical procedures; TS: Reviewing the manuscript. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work were appropriately investigated and resolved.

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