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The use of local flaps in the one-step nose reconstruction after cancer resection

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The use of local flaps in the one step nose reconstruction after cancer resection

PURPOSE: *Purpose of this study is to assess different surgical techniques, comparing them in order to remove nasal skin cancer by restoring the anatomy and the function of the respiratory system without neglecting the aesthetic result.*
METHODS: *A total of 107 patients were enrolled in the study between January 2006 and December 2012. We compared the results obtained using 23 front-glabellar flaps, 30 bilobed flaps, 27 nose-cheek flaps, 15 sliding flaps, 12 frontal island flaps.*
RESULTS: *We obtained the oncological radicality with good aesthetic results. There were no infections and no sensory (numbness and tenderness) and motor abnormalities of the facial nerve. None of the used techniques has lead to scarring ectropion or to alteration of the nasal filter.*
CONCLUSIONS: *The best nasal reconstruction mostly depends on skin cancer location and on the amount of tissue to be removed to definitely eradicate the neoplastic lesion; during the planning of a nasal reconstruction we also must assess adjacent tissue characteristics, the presence of fixed structures and the donor skin area (color, thickness, pils, etc) . Using these parameters we have chosen for the ala the nose-cheek flap, for the dorsum the front-glabellar flap, the bilobed flap and the sliding flap (lateral region) and for the tip both the frontal island flap and the bilobed flap.*

KEY WORDS: Cancer of the face, Flap local, Nose reconstruction.

Introduction

The nose is placed in a central position on the face and may be the most difficult facial structure to well reconstruct.
Anatomically, the nose is covered by external skin, supported by a mid layer of bone and cartilage, and lined primarily by muco-perichondrium. If missing, each layer must be replaced. Aesthetically, the nose is a central facial feature of high importance. To appear normal, it must have the proper dimension, position and symmetry. Its surface can be divided into aesthetic subunits: the dorsum, the tip, the columella and the paired sidewalls, alae and soft triangles (Fig. 1). Restoration of these elements permits to get close and/or reach a "normal appearance". Functionally, the nose must allow unobstructed breathing.
Most patients want the wound healed and their appearance restored to its preoperative condition. In some cases, however, age, associated illness, or patient desire may lead to a more complicated reconstruction. A nasal wound can be allowed to heal by secondary intention. If there is a full thickness wound, the cover and lining

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can simply be sutured, although accepting a permanent deformity.

If a more complex repair is indicated, the surgeon must be aware of any previous treatments for the skin cancer both surgical and radiotherapy, as well as of nose traumas, previous rhinoplasty since all of them may interfere with the blood supply, impairing the healing process and/or precluding a specific flap option. Operative times, the type of anaesthesia and the need for hospitalization are other important element to must be considered and evaluated.

Nose defects are commonly the result of cancer resection and traumas and, fortunately, they can be managed with a lot of reconstructive methods. The goal is to select the most appropriate technique for each defect [1].

The nasal reconstruction after tumours resection is basically based on tumours location and in most of cases the surgeon comes across a small to medium-size defects reconstructible with local flaps. A meticulous preoperative planning enables to achieve good aesthetic and functional results. It is important to define the defect in terms of size, depth, orientation and location on the nose. The most complex reconstruction of defects is when multiple layers and multiple subunits of the nose are involved [3]. Nose defects have been classified by some authors into four groups: simple, small (skin only), larger (skin and cartilage), or full thickness [4,5]. Small defects can be closed primarily or with various local flaps. For larger defects, the three-stage paramedian forehead flap is the flap of choice with or without the use of cartilage grafts. For small inner lining defects, full-thickness skin grafts or turn-down lining flaps with delayed primary cartilage grafts at the intermediate stage are currently the authors' preference. For medium to larger inner lining defects, the folded forehead flap with delayed primary cartilage grafts at the intermediate stage is the authors' preferred technique. If the defect is full thickness, lining replacement must be enough vascularized to support the early replacement of the cartilage grafts, supple enough to conform to their proper shape and thin enough that it neither stuffs the airway nor distorts the external nose shape [6,7].

For (sub)total nasal reconstructions with very large inner lining requirements, the authors would now consider free vascularized tissue transfer [8].

We analysed 107 patients who were operated for various nasal pathologies between January 2006 and December 2012. Our objective was to assess different surgical techniques, comparing them in order to remove skin cancer by restoring the anatomy and function of the respiratory system without neglecting the aesthetic result. In order to choose the most suitable reconstruction, we evaluated the location of skin cancer and the amount of tissue needed to be removed to eradicate the neoplastic lesion, the presence of fixed structures (internal canthus, ala, upper lip) that can be deformed after the intervention, the skin donor areas (color, thickness, adjacent structures).

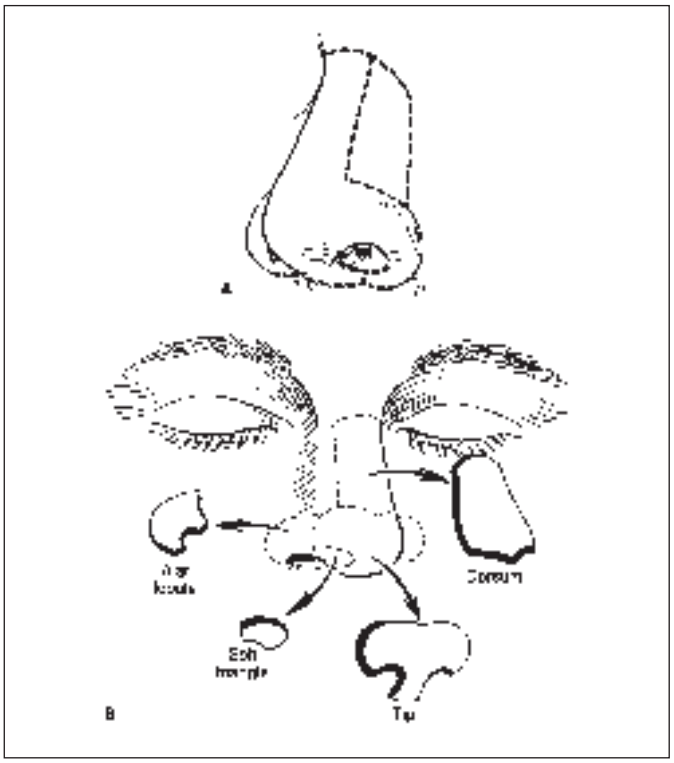


Fig. 1: Aesthetic units and aesthetic junction lines of the nose. A: Lateral wall subunit. B: The nasal lobule and its aesthetic subunits 2.

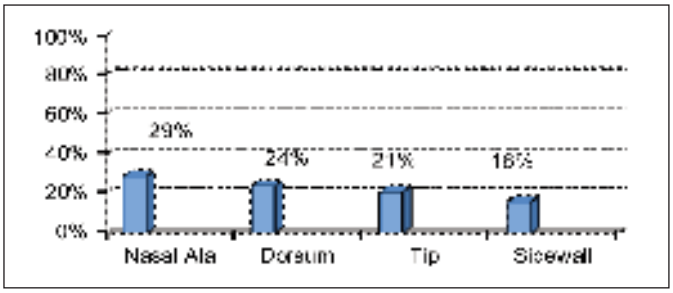
Material and Methods

From January 2006 to December 2012 we have operated 107 consecutive patients for nose cancers. The group consisted of 65 men and 41 women with a mean age of 67 years. The distribution of nasal tumors on the different nasal subunits is outlined in Table I.

The most frequent location was the nasal ala (29 %), followed by the dorsum (24 %), the tip (21 %), and the sidewall (16 %).

We compared the aesthetic and functional results obtained using 23 front-glabellar flaps, 30 bilobed flaps, 27 nose-cheek flaps, 15 sliding flaps, 12 frontal island

TABLE I - *Localization of nasal tumours.*



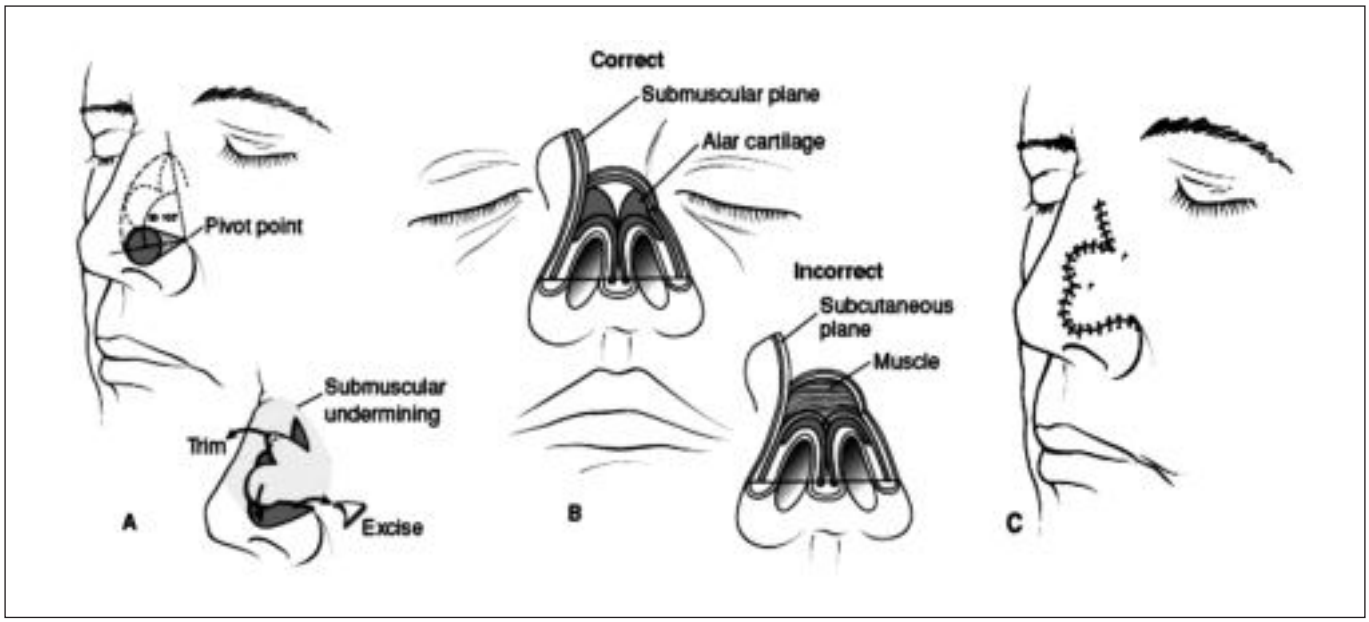


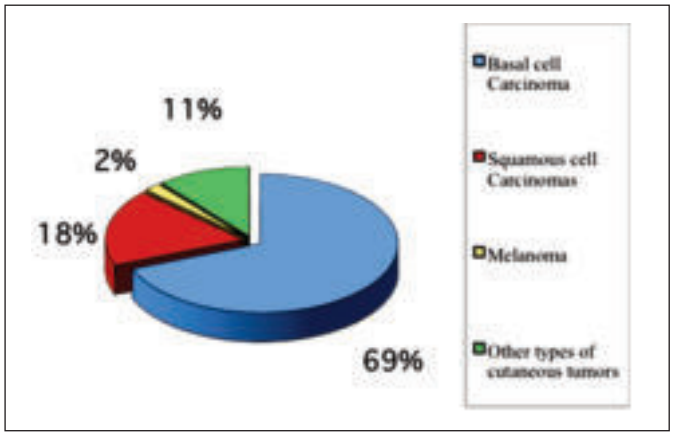
Fig. 1. In 1918, Esser first described the bilobed flap to repair nasal tip defects. A) the primary flap used for reconstructing the defect usually lies within the mid-access at 45° or less to the defect, and it is slightly smaller than the defect. A secondary flap, somewhat triangular in shape, is designed to achieve closure of the donor defect. B) the flap has to include the muscular plane. C) flap appearance after donor site closure.

flaps. The front-glabellar flap was used to cover losses of substance located in the dorsal region of the nose. The pedicle was positioned contralateral to the cutaneous loss of substance, taking advantage of the skin features (cutaneous abundance and high mobility) of the nasal pyramid upper two-thirds. Later, the muscles of the inner ipsilateral canthal region were dissected along the subperiosteal plane allowing maximum rotation and preventing deformation of the inner part. The donor area was closed in 4 cases with V-Y plasty trying to limit the approximation of the eyebrows and the front-nasal angle filling. We used the bilobed flap to repair losses of substance with a size never exceeding 1 x 1 cm of the median dorsal region of the nose. The flap has been harvested in accordance with the preoperative drawing outlining the two lobes so as to achieve a total arc of rotation of 100° (50° rotation for each lobe) and placed outside the circular loss of substance (Fig. 1). In 20 cases we placed the second vertical flap, so that the donor site closure was parallel to the aesthetic subunits margin and, in 7 cases, we have targeted the first flap along the ala margin. For ala losses of substance smaller than 1.5 cm we preferred the nasal-cheek flap, harvested upward along the ala margin to reduce residual scars. We used the sliding flap to rebuild the lateral ala dorsal region, taking care of never extending to more than one side.
In 12 cases of tip lesions we planned an "Indian island flap". The flap was dissected along a deep plane, directing medialward along the back of the nose, between the donor site and the receiving area, to create and to allow the passage for the pedicle. It was then set up a flap from the medial frontal region that was then rotated of 180 ° through the subcutaneous tunnel previously created and finally positioned to cover the loss of substance. In 80 cases (75%) we planned the nose reconstruction after the resection of a primary cancer, while in the remaining 27 cases (25%) the reconstruction was made after a recurrent cancer excision. Of these 27 cases, none of them underwent radiotherapy.
During the preoperative planning, in some doubtful cases, we performed a multislices CT to better visualize and explore all the tumour adjacent structures in order to guide our reconstructive option toward the best one.

Results

There were no severe intra- or postoperative complications. The patients left hospital 7-9 days after surgery. In the immediate post-operative, our equipe has constantly assessed patients' general clinical conditions and both patients' referred sensations and the local status (bloody gauzes, bleeding, etc). In almost all the cases we medicated the flaps daily, starting from the 3rd post-operative day, until stitches removal. The postoperative follow-up was performed after 3, 6, and 12 months and then annually thereafter to assess possible disease recurrence. Some of our patients, 6 cases underwent surgery recently and therefore their follow-up is still in progress. The patients were free of relapse or metastases at every follow-up. All tumors were confined to the cartilaginous plane without invasion of the underling bony structures; all the patients had just single tumoral lesions.

TABLE II - *Percentage of tumors*



There were no donor site complications at any follow-up. None of theme received chemotherapy and/or radiotherapy in the both in the pre and post-operative period.
All the patients received an i.v. prophylactic antibiotic therapy starting a couple of hours before the intervention and continuing for a mean of 6 days. In Table II are summarized the percentage of the various nose tumors we treated.
Risk factors for skin cancer include age, gender, and race, but the most important risk factor is sun exposure. Ultraviolet (UV) light exposure at the earth's surface is primarily in the form of long-wave UVA and shorter-wave UVB rays. While UVB has been traditionally thought of as the most damaging form of UV light, current evidence implicates UVA as an increasingly important contributor to UV-induced skin damage. The areas on the body most susceptible to skin cancer are those that are least protected from the sun, such as the nose, ears, cheeks, and forehead.
In particular, the alar and tip regions of the nose, the most outwardly protruding areas on the face, are most vulnerable. It is not surprising that the majority of skin cancers on the nose (approximately 75 %) in our study were on the alar and dorsum regions, likely owing to their prominent exposure to UV light.
The aesthetic result was rated as very good or good by all patients. Breathing was rated as good by all patients. The nasometric examination revealed a symmetric but slightly reduced nasal airflow in one patient.
The fronto-glabellar flap is one of the best suitable technique for the reconstruction of the upper two-thirds of the nasal pyramid when the loss of substance does not exceed 1.5 cm, in order to avoid an excessive decrease of the distance between eyebrows and front-nasal angle that would modify face's morphology. Patients treated with this flap had good scars, no ischemic process, hematomas or seromas developed.
The bilobed flap is considered an excellent method both for the reconstruction of the back of the nasal pyramidand for the "critical" reconstruction of the nose tip (Fig. 2). The main advantage of this flap is its distribution of the tensile force at the ala, preventing distortion of the area. In one patient we noticed a mild post-operative edema that resolved spontaneously within a few days. This common complication was due to excessive width

Fig. 2: A) Pre-operation view of the modify bilobed flap; B) Intra-operative view of the Zitelli modify bilobed flap used for the reconstruction of the nose dorsum after BCC excision.

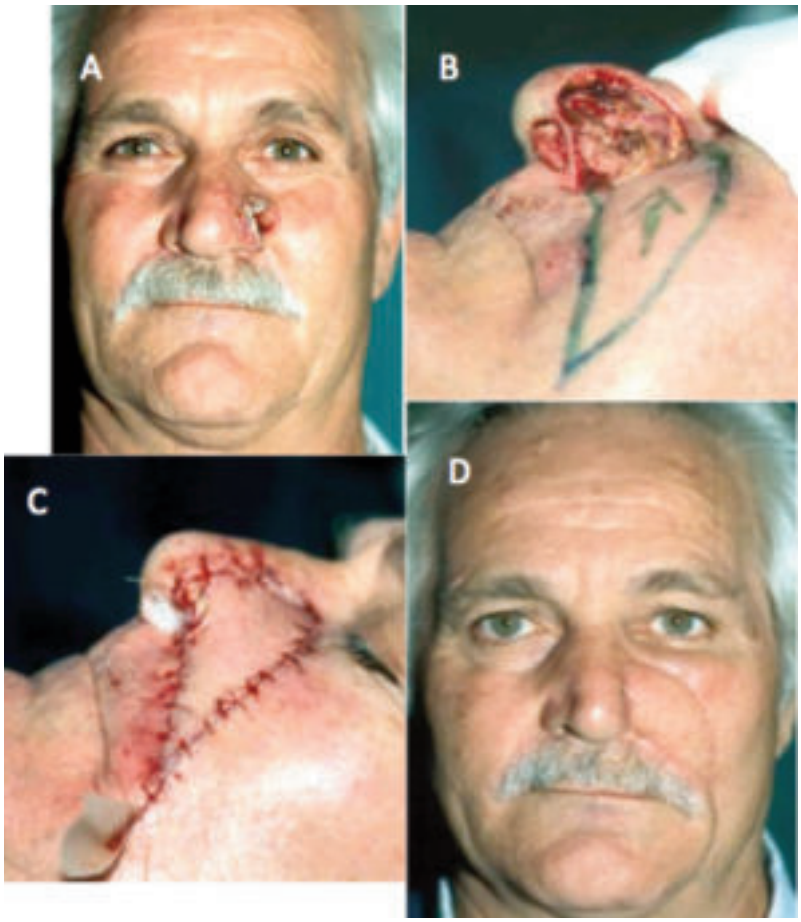


Fig. 3: A) Squamous cell carcinoma of the alar region. B) Intra-operative view after tumor resection and preparation of the "sliding" cheek flap. C) Intra-operative view: the flap is sutured. D) Post-operative view after 8 months from the operation.

of the bilobed flap compared to its basis so as to cause the formation of scar tissue underneath the flap that prevents the lymph flow. To avoid a lifting of the area, we incised the donor area edges deeply, weakening margins to reduce the tensile strength. By the use of this device we have moved the force vectors centrally, limiting the action and obtaining excellent results. The tendency to edema formation is greater when the skin used for the bilobed flap is thin and rich in sebaceous glands, and when flaps are harvested more cranially because the lymphatic flowtends to invert its direction.

The use of nose-cheek flap has provided excellent results for loss of substance of the ala. In fact, both the size of the lesion and the arc of rotation are limiting factors of this flap for its using in tip and dorsum reconstruction. The nose-cheek flaps are particularly indicated for ala reconstruction thanks to the tendency to recover with a rounded configuration.

The sliding flap was very useful for the latero-nasal loss of substance limited to the nose (Fig. 3). The disadvantage of this technique is that often requires a second-stage procedure and that usually flatten the nasolabial fold. In men it may transfers hair-bearing skin to the nose.

In our case we preferred to limit the extension of the scars by placing the incisions parallel to Langer's lines. Bilobed flap, as well as the frontal island flap, is a valid reconstructive technique for loss of substance of the dorsum and, just in selected cases, for lesions smaller than 2 cm over the tip of the nose. Overall, patients were satisfied with the results. In none of the eighteen patients there were facial nerve abnormalities, as well as sensory and motor disfunction. We also evaluated the symmetry of the facial structures, with careful attention to the upper lip, omolateral eye and nasal pyramid. We didn't register any cases of scarring ectropion or nasal filter deformation.

Discussion

Nasal skin cancer is an increasing problem. Proper treatment of nasal skin cancer, including nasal reconstruction, requires a structured multidisciplinary approach to achieve excellent tumor control and a satisfactory aesthetic and functional result.

The nose-cheek flaps appear to be very effective to repair injuries and defects of the lateral surface of the nose dorsum. The nose-cheek flap is easily moved up; the defect created by lifting the flap is closed by direct advancement of the cheek region skin. The drawback is its short range of motion, which makes impossible to reach defects

located over the distal part of the nose back. For limited loss of substance involving the dorsal and the tip we used the bilobated flap, while in patients with larger lesions, involving the tip, we preferred to use nose-cheek flap, which is able to provide the covering of the ala. If a defect involves the tip or the ala for more than 50% of the subunits, it will be necessary rebuild the entire subunit .We also noticed that front-glabellar flap causes a lower strain than the bi-lobed and the sliding ones and, therefore, we increased the number of subcutaneus sutures in this two flaps to distribute the tension over a larger region [9]. The most commonly used techniques for nasal reconstruction are the sliding flap, the nose-cheek flap, the bilobed flap and the front-glabellar flap. In our study we used different techniques and methods for the nasal pyramid reconstruction, depending on the loss of substance characteristics, on the donor site condition and on the respect of the relationship between facial structures [4]. Using these parameters we have chosen different surgical techniques with which we have obtained, overall, good results, always respecting the surgical oncologic principles: for the alar region the nose-cheek flap, for the dorsum the front-glabellar transposition flap and the bilobed flap and the sliding flap (lateral region) and for the tip the frontal island flap and the bilobed flap.

Conclusion

The incidence of nasal skin cancer is increasing rapidly worldwide. Clear guidelines and a multidisciplinary approach for treatment of nasal skin cancer are important to ensure that patients receive optimal care with satisfactory final results.
In all circumstances, missing tissues must be replaced in the exact amount: if the donor tissue is not enough, adjacent landmarks will be distorted, leading to the collapse of the underlying cartilage grafts. Otherwise, if the donor tissue is in excess, adjacent landmarks will be pushed outward, distorting the external shape or pushing the lining inward with airway obstruction.
For this purpose, it is necessary developed a reconstructive algorithm for all types of nasal defects,
based on personal clinical experience combined with literature review. The goal of treatment is to appropriately define the defect and then to select the best reconstructive options.

Riassunto

La ricostruzione della piramide nasale può essere annoverata tra gli interventi della chirurgia Plastica e Ricostruttiva che necessitano più esperienza, abilità e creatività. Questi interventi possono riconoscere un'eziologia post-oncologica, traumatica o congenita, sebbene carcinomi squamocellulari e soprattutto basocellulari costituiscano il più frequente motivo di ricostruzione.
Il nostro studio riguarda 107 pazienti che si sono sottoposti presso la struttura complessa di Chirurgia Plastica e Ricostruttiva dell'Università degli Studi di Perugia, a ricostruzioni della piramide nasale.
Il nostro obiettivo è stato quello di raggiungere la radicalità oncologica ripristinando l'anatomia e la funzionalità delle vie respiratorie senza tralasciare il risultato estetico. Per scegliere il lembo più adatto alla ricostruzione abbiamo valutato la sede e l'estensione della perdita di sostanza, adeguata per eradicare la malattia neoplastica, cos' come anche le caratteristiche tissutali del paziente. Il risultato della ricostruzione della piramide nasale, più di ogni altro intervento ricostruttivo è legato non solo all'esperienza e all'abilità dell'operatore, ma soprattutto alla creatività e alla leggerezza della mano del chirurgo, capace di ottenere l'eradicazione neoplastica con un ottimo risultato estetico. Con questo studio abbiamo messo a confronto le diverse tecniche ricostruttive utilizzabili per la ricostruzione nasale, valutandone per ciascuna le caratteristiche positive ma anche gli svantaggi legati a ciascuna metodica.

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