Total Nasal Reconstruction

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Abstract

Introduction

Skin tumors have a high frequency in the nasal region due to the cumulative effect of UV light in this part of the face. The most frequent type of malignant tumor of the nose and paranasal sinuses is squamous cell carcinoma. Oncologic management of large tumours of the nasal cavity, with skin invasion or bone erosion, involves extensive resection surgery that can cause important tissue defects, in order to achieve tumor free resection margins. For the head and neck surgeon the nasal reconstruction is one of the most difficult challenges, especially in cases of complex full thickness defects remaining after malignant skin tumor resection. Full-thickness defects require demanding multi-step reconstruction.

Material and Method

This article is built around the case of a 61 years old patient with carcinoma of the right nasal vestibule extended to the anterior part of the nasal septum. In this case, we chose a three-stage nasal reconstruction.

Results and Conclusions

Total nasal reconstruction is one of the most challenging operations for a surgeon because both function and appearance must be as close to ideal as possible and due to the importance of the nose in the identity of the person. A well-executed forehead flap can result in the most natural-appearing, durable, nasal reconstruction. In terms of texture and color, no flap approaches its suitability in terms of skin matching.

Keywords: reconstruction, forehead, nose.

Introduction

Skin tumors have a high frequency in the nasal region due to the cumulative effect of UV light in this part of the face. About 25% of all facial tumors are nasal tumors. Malignant tumors of the sinonasal tract are quite rare (3% of all head and neck cancers), but aggressive with great capacity of invasion. The most frequent type of malignant tumor of the nose and paranasal sinuses is squamous cell carcinoma [1, 2, 3].

Vitamin D present gender particularities in overweight individuals, and may have a role in cancer protection, but the data are not clearly demonstrated yet. The association of vitamin D with colorectal cancer have been studied, but the result are inconclusive [4, 5, 6, 7].

Oncologic management of large tumours of the nasal cavity, with skin invasion or bone erosion, involves extensive resection surgery that can cause important tissue defects, in order to achieve tumor free resection margins. Covering these defects is a challenge considering the local particularities and implicitly the aesthetic aspect of the facial region, so one can opt for a simultaneous resection-reconstruction or postpone for a second surgery [8, 9].

The first examples of nasal reconstruction were found in the early writings in India about 2500-3000 BCE in a society where ear and nose amputation were the most frequent punishment inflicted on enemies and unfaithful wives, thus the demand for nasal reconstruction. Sushruta performed the earliest rhinoplasties, about 600 BCE, using local flaps collected from the cheek.

Nasal reconstruction using local flaps from the forehead, a technique known nowadays as the Indian method, was attempted only later. In 1794 two Indian surgeons performed a nasal reconstruction using a median forehead flap that was published in the "Gentleman's Magazine of London". The first nasal reconstruction performed in England, using the Indian method, was made in 1814 and published in Germany two years later. In the United States the first neo-rhinoplasty using the Indian method was performed in 1837. The method improved a lot ever since.

The management of head and neck cancer is multidisciplinary, with close cooperation between ENT surgeon, oncologist, radiotherapy specialist, nutritionist during all stages of treatment. It is especially important in the last stages of the disease when adequate palliative measures should be taken to comfort the patient [10].

The etiology of nasal defects is mostly represented by cutaneous malignancies, traumatic accidents or animal bites. The nose has very important vital functions in everyday life. It is a complex three-dimensional structure and along with the eyes, represents a major aesthetic focus of the face. In reconstructing the facial defects, the aim is to preserve the integrity of complex facial function and expressions, as well as obtaining facial symmetry and a pleasing aesthetic outcome [11, 12].

For the head and neck surgeon the nasal reconstruction is one of the most difficult challenges, especially in cases of complex full thickness defects remaining after malignant skin tumor resection. Full-thickness defects require demanding multi-step reconstruction. When planning the nasal reconstruction, a surgeon must consider a number of characteristics unique to the nose, including the symmetry of the nose, the structural complexity of the nose, with surfaces that are both convex and concave, in close proximity, the properties of the nasal skin, and the sebaceous composition of distal nasal skin. The function of the nose is to be maintained by preserving or replacing the cartilaginous and bony framework and the mucosal lining and by maintaining a patent airway. For achieving both function and form it is essential the re-establishment of the nasal framework. The surgeon must be well familiar with a variety of flaps in order to obtain best results [13, 14].

Materials and Method

The modality chosen to reconstruct the nose will depend largely on the size, location, and depth of the surgical defect. The best course is the individualized therapy, and numerous flaps have been designed to offer coverage of a variety of nasal defects. We describe our experience in the total nasal reconstruction following oncological surgery.

This article is built around the case of a 61 years old patient with carcinoma of the right nasal vestibule extended to the anterior part of the nasal septum. He underwent radiotherapy to the affected area. The oncologic treatment produced necrosis of alar cartilage, anterior part of the

nasal septum and nasal lobule. Besides the nasal carcinoma the man suffered from high blood pressure, insulin-dependent diabetes mellitus complicated with peripheral vascular disease and obesity.

The greater the defects, and when not only the nostril(s) and other parts of the wall of the nose are affected, but also the septum, the more precisely the operation must be planned in advance. Because of the extension of the lesiune to resect, therefor the large surgical defect to be covered, we decided the best surgical strategy will be a three-stage nose reconstruction. In general, for grater than 2.5-3 cm in diameter, the gold standard is considered the paramedian forehead flap. This flap provides an important amount of tissue, has a strong pedicle and it is extremely versatile by means of lengh and movement.

It is a multi-stage advanced procedure for reconstructing large and deep surgical defects of the distal nose, in particular where the cartilage framework has been sacrificed. The base of the flap lies close to the defect, between the medial brow and medial canthus. The first step is to design an exact three-dimensional pattern of the defect. Forehead skin does not contract, so the pattern is to be designed exactly. The forehead flap is excised at the base of the flap, to the periosteum, to the upper zones of the subcutaneous tissue, in order to avoid the axially and vertically oriented feeding arteries.

The anatomic studies of Shumrick and Smith evidenced the position and paths of the supratrochlearartery, that runs 1.7 to 2.2 cm lateral to the midline in a vertical direction. The artery runs submusculary to a more superficial, subcutaneous position that begins 1 cm above the brow. The current knowledge of the anatomical course of the supratrochlear artery allows for more precise flap design, increased pedicle length and greater mobility.

In this case, we chose a three-stage nasal reconstruction. The first stage of the reconstruction is represented by the surgical insertion of a tissue expander device in the forehead region with daily expansion of the device by gently injecting saline solution (10ml saline solution/day, 14 days) (Fig. 1). The role of the expender was to obtain enough tisue for the reconstruction as well as for the closure of the donor site.

Fig. 1. Aspect at the beginning of the main surgical procedure (with the tissue expander device in place)

Fig. 2. Aspect after complete resection

When we had enough extension of the skin in the forehead we proceded to the second step: the main surgical procedure. The tumor and the necrotic structures were resected in block (Fig. 2) with tumor free margins.

The entire scaffolding of the nose had to be restored using rib cartilage. An L-shaped central scaffolding was constructed out of rib cartilage in such a way that bending forces were neutralized (Fig. 3). Once this graft heals in place, one can count on lifelong stability (Fig. 4).

Pieces of costal cartilage were used also for alar and columella reconstruction.

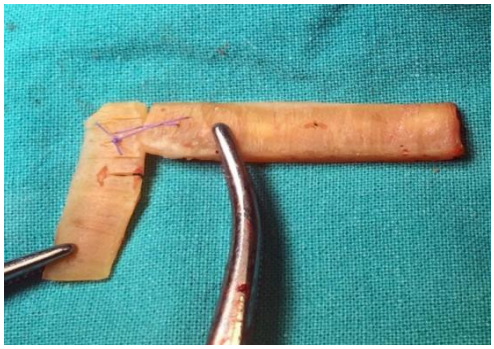

Fig. 3. The cartilaginous assembly that provides stability of the nose

Fig. 4. The new cartilaginous stability sistem of the nose

Once the support system for the nose was set in place it was the time to reconstruct the external nose with pedicle muscular forehead flap. After two weeks the expander produced enough forehead skin for the flap to be harvested (Fig. 5).

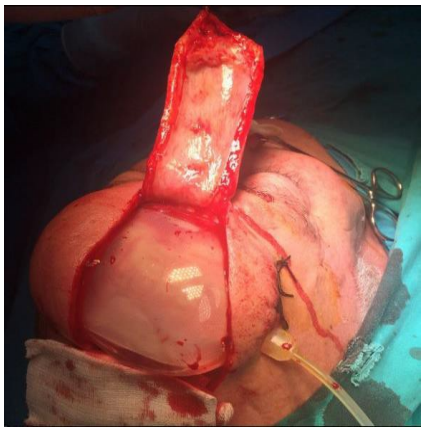

Fig. 5. Harvesting the forehead flap

Fig. 6. Aspect at the end of surgery

At the end of the second intervention (the main surgical procedure) the patient regained a nose (Fig. 6).

This is a schematic view of the way this flap was folded in order to obtain adequate exterior and interior reconstruction of the nose (Fig. 7, 8).

Two months after the reconstruction, the patient presents overplus of skin at glabella and internal angle of the right eye, frontal scar covered with crusts, viable reconstruction flap of the external nose (Fig. 9). The third stage of the intervention was planned in order to ablate the vascular pedicle of the glabella and perform aneliptical plasty of the nasal vestibule and columella. The vascular pedicle at the glabella was ablated (Fig. 9).

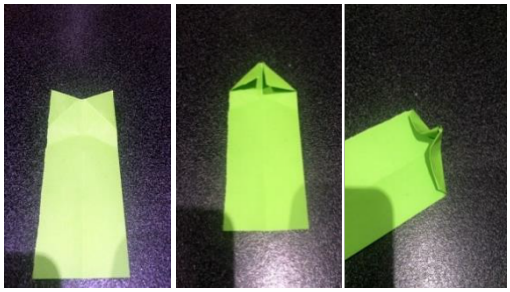

Fig. 7. The folding of the flap

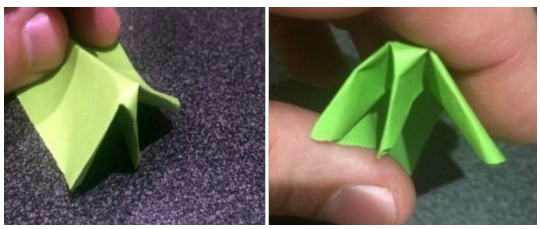

Fig. 8. Obtaining enough skin to reconstruct the nasal vestibule

Fig. 9. Ablation of the vascular pedicle at the glabella,
and final aspect at the end of the surgery with goodclosure of the donor site

The final stage of the intervention ended with adequate aesthetic and functional results (Fig. 9). We registered a good evolution of the flap and donor site in spite complicated insulin-dependent diabetes mellitus.

Results and Discussion

We reexamined the patient eight weeks after surgery. We were satisfied to notice good stability of the external nose with good aesthetic and functional results (Fig. 10), aesthetic closure of the donor site, despite the comorbidities of the patient (high blood pressure, insulin-dependent diabetes mellitus complicated with peripheral vascular disease, obesity).

Conclusions

Total nasal reconstruction is one of the most challenging operations for an ENT surgeon because of the both the function and the appearance must be as close to ideal as possible and due to the importance of the nose in the identity of the person [15].

The principles for obtaining an appropriate forehead flap are: torespect the axial pattern, to use a flap with the pedicle ipsilateral to the defect, try to create a narrow pedicle, use subperiosteal dissection, creating right angles of the forehead flap has to be avoided.

Fig. 10. The aspect of the nose and donor side eight weeks after surgery

A well-executed forehead flap can result in the most natural-appearing, durable, and inconspicuous, nasal reconstruction. In terms of texture and color, no flap approaches its suitability in terms of skin matching. The significant limitations of the flap are the investment of time and the morbidity involved in the necessary staging of the operation.

Both the cosmetic and functional outcomes are desired along with minimal scarring of the donor site.

The success of this flap is based on the preservation of the vascular pedicle, represented by the supratrochlear artery, as well as the thinning of the subcutaneous tissue from the distal part of the flap before suturing it into the wound.

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