

Reconstruction of nasal defect with the composite expanded forehead flap

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Key words: nose reconstruction; forehead flap; expander; rib cartilage graft.

Summary. Nasal tip and septal perforations may lead to significant upper airway problems as well as disturbing esthetic changes in the external contour of the nose. Nasal defects impede normal social contact and create great self-identity problems for the patients.

We report the case of a 37-year-old woman, taking drugs for 10 years, who had sepsis and nasal abscess with necrosis of the nasal tip and septum. Using a composite expanded forehead flap for reconstruction of the nose, good esthetic and functional results were achieved.

Introduction

A mutilated nose is a severe affliction that impedes normal social contact and creates great self-identity problems. The nose is the most projected part of the face and can be mutilated by shot, bite, and avulsion during battle, crunched on the road, or destroyed by the bacillus of leprosy or spirochete of syphilis. In the recent time, people began devastating attack to their nose snorting cocaine (1). This drug in the nasal cavities causes a constriction of the blood vessels and during the time, necrosis of mucosa. Then the septal and alar cartilages are exposed and open to infection, which can cause necrosis of the distal part of the nose.

The history of nose reconstruction begins with the history of plastic and reconstructive surgery. Countless ways of replacing, repairing, and restoring this most important landmark of the human face have been devised (2).

The first nasal reconstructions were begun possibly in India as early as 3000 BC. These operations were performed by one caste called Koomas. These reconstructions were introduced for the western world only in the 20th century and published in the *Gentleman's Magazine* in London. The forehead flap leaves no significant scarring on the face. The skin of the forehead is utilized because it affords excellent color match with the nose. The base of the flap incorporates at least one of the major facial or scalp vessels and may be single or bipedicle, thus permitting unusual length-to-width ratios (2).

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 (3).

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 Word War II (2).

Surgeon must still provide for a complete functional and esthetic re-establishment refinement of the complex structures of the tip, the alae, and the columella. The forehead should be spoiled as little as possible in partial and total reconstruction of the nose. Nasal defects in certain areas such as the columellar-lobular junction, the alar rim, and the soft triangle are cosmetically challenging to reconstruct (4).

Plastic surgeons use the forehead composite islands flaps (5), the frontotemporal flap, the fronto-parieto-retroauricular flap, the fronto-parieto-retroauricular scalp flap (6), and nasolabial flap (7) for reconstruction of the nose.

Case report

A 37-year-old woman taking drugs for 10 years had sepsis and nasal abscess with necrosis of the nasal tip and septum. She recovered from sepsis, stopped taking drugs, and returned to normal social life, working as a dressmaker. The defect of soft tissues of the nose tip and alar cartilage was 13×20 mm in size. Septum perforation was 15×17 mm in size (Figs. 1 and 2). The nasal tip defect impeded her normal social contacts. The woman had great self-identity problems, always had to wear a bandage on the nose tip. She had whistling nasal breathing, turbulence airflow.

We decided to use the forehead flap for nose reconstruction. During the first stage of reconstruction,

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we prefabricated a composite forehead flap for the nose. We took the rib cartilage and constructed the nasal tip and alar. These cartilages we implanted into the forehead for three weeks. For the septal reconstruction, we implanted the prefabricated rib cartilage into the cheek submucosally. Wound suppuration and protrusion of the cartilage have occurred. Therefore, we eliminated this cartilage. The septum was reconstructed with a prosthesis.

The second stage of reconstruction included expansion of the composite forehead flap. The patient's forehead was low so the flap pedicle was too short for the rotation to the nasal tip. That is why we implanted 200-mL expander for three weeks. The expander was filled with 20 mL of saline every three days (Fig. 3). Protrusion of the expander after two weeks occurred, but there was no infection, and the expander was left for one week. Flap extension let us lengthen the flap pedicle, thin the flap and gave us an excess of the skin for better donor side coverage. The capsule of the expander after flap rotation worked as the mucosal layer of the nose.

The third stage of reconstruction included wound débridement and rotation of the forehead flap with the supraorbital vessels to cover the nasal defect. Before the operation, we determined the supraorbital vessel going to the composite flap by Doppler ultrasonography. We removed the expander, excised the composite flap, prefabricated pedicle flap, and rotated on the nasal tip (Figs. 4–6). The forehead defect was closed primary.

The fourth stage of reconstruction was as follows: the pedicle flap was disconnected, and soft tissue excess was removed (Fig. 7).

The fifth stage of reconstruction included nasal soft tissue reshaping using the Z plastic procedure and alar cartilage resection for the better esthetic results.

We examined the patient after one year following the last operation. Forehead wounds healed without significant scarring. The patient was happy and satisfied with the esthetic results (Figs. 8 and 9).

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 esthetic and functional results. We have to reconstruct not only the skin defect but also cartilage support. The main donor sites of cartilage are cartilages of the auricular concha and ribs.

In this case, we could not use the auricular cartilage because the defect was too big and we wanted to reconstruct the whole nasal skeleton: the nasal tip, alar parts, and septum. Therefore, for soft tissue support, we decided to use cartilage from the rib. Using this cartilage, we constructed the nasal skeleton and septum (8).

For soft tissue reconstruction, a few flaps are available: forehead composite islands flaps, the fronto-temporal flap, the fronto-parieto-retroauricular flap, the fronto-parieto-retroauricular scalp flap, reversed flow retroauricular island flap, nasolabial flap (7), radial forearm flap (9). To achieve good esthetic results, the flap has to fit some requirements. The flap has to provide the adequate tissue match according to skin color, thickness, and texture.

A free temporoparietal flap is a thin, pliable, and well-vascularized flap (10). However, it is more difficult to harvest this flap, and autodermoplasty is necessary. Using the forehead flap, we have thin, well-vascularized flap with good color match.

A nasolabial flap (7) is recommended for the nose defects with a diameter of 2–4 cm². We think that this flap is very useful for the reconstruction of small nasal defects but not for big defects requiring transplantation of cartilages.

A radial forearm free flap is an alternative to the forehead flap. This flap is thin enough and pliable. With this flap, it is possible to achieve good nasal contour. The radial forearm flap has a few main disadvantages. The first main disadvantage is that color match is bad. The second one – using this flap, we have to sacrifice the radial artery, and unsatisfactory esthetical view of the donor site is present.

We think that one of the best choices is the forehead island flap because the flap of neighboring facial parts has a similar skin color and texture. The disadvantage of this flap is donor site morbidity and quite a big scar after the flap harvesting. We solved this problem using tissue expansion. In addition, in this localization, we have possibility to make a composite flap implanting cartilages for nasal tissue support.

Conclusions

1. Reconstruction of nasal tip defects could be performed using a composite soft tissue and cartilaginous flap.
2. Soft tissue expansion is important for closing the donor site and for flap pedicle lengthening.
3. The expanded composite forehead flap is the first choice operation for the reconstruction of medium nasal tip defects with a good esthetic outcome.



Fig. 1. Patient's frontal view



Fig. 2. Patient's oblique view



Fig. 3. Flap expansion



Fig. 4. Flap premodelation



Fig. 5. Flap dissection and closure of the donor site



Fig. 6. Postoperative view



Fig. 7. View after dissection of pedicle



Fig. 8. Patient's frontal view 1 year after the last correction



Fig. 9. Patient's oblique view 1 year after the last correction

Nosies defekto rekonstrukcija išplėstu daugiasluoksniu kaktos lopu

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Raktažodžiai: nosies rekonstrukcija, kaktos lopas, šonkaulio kremzlės transplantatas.

Santrauka. Nosies galo trūkumas ir nosies pertvaros perforacija sukelia ne tik kvėpavimo sutrikimą, bet žaloja ir nosies estetinį vaizdą. Pacientams, turintiems nosies audinių trūkumą, atsiranda tiek socialinių, tiek psychologinių problemų bendraujant su aplinkiniais.

Pateikėme 37 metų pacientės klinikinį atvejį. Pacientė 10 metų vartojo narkotikus, dėl ko susiformavo nosies abscessas bei pertvaros nekrozė, o vėliau atsirado sepsis. Nosies trūkumui padengti naudojome daugiasluoksnį išplėstą kaktos lopą. Funkciniai ir estetiniai rezultatai geri.

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