

# Repair of Nasal Soft Tissue Defects with Paramedian Forehead Skin Flap with Base at the Supraorbital Artery Region

Feng Liang<sup>1</sup>, Fanglei Han<sup>1</sup>, Xiaodan Jiang<sup>2</sup> and Lin Li<sup>3,a</sup>

<sup>1</sup>Department of Anesthesiology, China-Japan Union Hospital, Jilin University, 130033, China

<sup>2</sup>Otorhinary, Affiliated Hospital of Qingdao University, Qingdao, 266555, China

<sup>3</sup>Dept. Otolaryngology and head & Neck, China-Japan Union Hospital, Jilin University, 130033, China

**Abstract.** Purpose: This study is used to explore the method for repairing nasal soft tissue defects with paramedian forehead skin flap with base at the supraorbital artery region and its curative effect. Method: Retrospective case study. Clinical data of one case of a patient with defects of most nasal soft tissue in China-Japan Union Hospital of Jilin University were used. The forehead flap with base at the supraorbital artery will be transferred to nasal soft tissue defects so as to repair the nose of the patient. Result: All forehead flaps with the blood supplied by supraorbital artery of one patient case all survived. The blood supply of the flap is stable because quality, color and luster are all similar with those of the nose. No bleeding, flap hypertrophy or overstuffed pedicle appeared after the operation. They all healed up in Phase I. Conclusion: Paramedian forehead skin flap with base at the supraorbital artery region is an ideal flap supply for repairing most nasal soft tissue defects.

## 1 Instruction

Nose, which is in the center of our face, plays many important functions, such as breathing, smelling and beauty. The damage of nasal defects not only includes the loss of nasal functions but also some immense psychological trauma. Thus, the functional recovery and reconstructive beauty appearance are main aims of nasal repairing reconstructive surgery. When repairing nasal soft tissue defects, doctors shall consider both the color and thickness of the flaps. The typical patient with serious nasal defects in our department is the one experiencing the resection of external nasal malignant tumors. We used paramedian forehead skin flaps with base at the supraorbital artery region for the repairing and reconstruction of his nose and we obtained relatively satisfactory results.

## 2 Materials and Methods

### 2.1 Clinical data of typical cases

Clinical data of one typical case with serious nasal defects was accepted in Otolaryngology & Head and Neck Surgery Department of China-Japan Union Hospital of Jilin University. The study was approved by the institutional review board of China-Japan Union Hospital. The participant provided written informed consent before the study.

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<sup>a</sup> Corresponding author: lilin01@jlu.edu.cn

## 2.2 A typical case

Male, 34 years old, with a nasal neoplasm found for 40 days. The neoplasm with the size of a soybean is on the septum of the left nasal vestibule. The patient can feel a bit of bitterness. After the neoplasm is pierced, sanguinopurulent secreta flow out. The neoplasm grows progressively and it stands out on the left side of the external nasal tip. After the neoplasm, which has the size of 5X3.5X3.5cm, is cut, most parts of the nasal tip and the nasal septum lose. Then, mark the forehead according to the size and distance of the nasal soft tissue defects. Besides, the pedicle shall be appropriately widened when they are separated and 2-4mm of the subcutaneous fat shall be left. Operations near the flap root shall be done with care so as not to damage the blood supplying vessels. If the skin donor sites are defective, surrounding tissues can be appropriately loosened before they are sutured directly. After the flap design, the nose will be repaired from the paramedian forehead skin flap with base at the supraorbital artery region. The flap survives at Phase I after the surgery.

## 2.3 Postoperative pathologic findings

Well-differentiated and moderately differentiated squamous cell carcinoma with keratinization.

## 3 Discussion

Nose is in the center of our face and the nasal soft tissue defects will affect facial contours and features, which will bring both mental and physical damages to patients. Nasal tissues have bad elasticity, small looseness and thin subcutaneous soft tissues. Generally speaking, they cannot directly heal the wound after the appearance of large tissue defects. Nasal aesthetic subunits divide the nose into the dorsal nasal area, lobular areas on both sides of the nose and triangles and nasal tip areas on both sides of the soft tissue. The nasal defect repair shall abide by the nasal subunit aesthetic principle so as to reshape the nasal aesthetic structure<sup>[1]</sup>. In general, if the defects do not exceed 50% of the subunit, remaining normal mucosa shall be retained as much as possible. If the defect areas exceed 50%, the defect scope will be extended to the whole subunit<sup>[2]</sup>. Forehead flaps, which are adjacent to the nose and have similar skin color and luster with the external nose, are the first choice for the supply of flap for nasal defects. The traditional median muscle flap of the forehead uses the trochlea artery as the feeding artery. However, it has insufficient length and needs to be designed to median flap. After the operation, some side effects, such as narrow forehead, scars, bad structural form of external nasal subunits (alar base and nasal tip) or overstuffed structure, often appear, thus, patients are not quite satisfied with it after the surgery.

### 3.1 Applied anatomy of supraorbital arteries, veins and nerves:

Supraorbital artery is an ophthalmic artery from the internal carotid and it comes with the supraorbital nerve. It runs forward between the superior levator muscle and the superior orbital wall in the orbital cavity. The supraorbital artery goes out of the supraorbital hole (incisura) when it is  $25.0\pm 0.6\text{mm}$  ( $24.4\text{mm}-25.6\text{mm}$ ) away from the anterior median line. The distance between that place and the place where the supratrochlear artery goes out of the orbital cavity is  $1.0\pm 0.4$  ( $0.6-1.4$ ) cm. The external diameter of the supraorbital artery at the place where it goes out of the orbital cavity is  $1.4\pm 0.1$  ( $1.3-1.5$ ) mm<sup>[3]</sup>. After that, the artery will pass the supraorbital margin and run to the fronto-partial. It has anastomosis branches with the superficial temporal artery at the forehead<sup>[4]</sup>. After the supraorbital artery goes out of the supraorbital hole or the incisura, it will be divided into the deep and superficial branches: (1) The external diameter of the starting point of the superficial branch is  $0.9\pm 0.1$  ( $0.8-1.0$ ) mm and this branch mainly anastomose into meshes. Then, it will send branches inwards to anastomose with the supral trochlea artery and will send branches outwards to directly anastomose with frontal branch of superficial temporal artery<sup>[5]</sup>. They will be anastomosed in the frontalis muscle in outer half-side of the forehead. In most cases, the supraorbital artery will be directly

connected with the end of the frontal branch of superficial temporal artery. Sometimes, they may also survive by forming a communicating branch between them. Then, they will send several branches upwards to anastomose a mesh with the forehead artery and will send some branches downward which will spread over the upper eyelid. (2)The deep branch of the supraorbital artery will run upward and backward tightly along the periosteum after it separates from the supraorbital artery. It will not be connected with the frontalis muscle<sup>[6-7]</sup>. Suprorbital vein goes together with the supraorbital artery to collect the venous blood in the arterial distribution area.

### 3.2. Advantages of forehead flaps with the base at supraorbital artery

(1) Supraorbital artery is the main longitudinal blood supply artery of the central forehead flap<sup>[8]</sup>. It is crossed with the angular artery into a net in the inner canthus. It has reliable blood supply and there is no need to dissect blood supply arteries. Besides, it has enough venous returns. Stage I shows that the survival rate of flaps is high. Thus, the pedicle skin flap with the blood supplied by the supraorbital artery can be narrower than that of the median forehead flap<sup>[9]</sup>. (2) Supraorbital artery comes from the side and its pedicle is both wide and thick. It can transfer some sensory nerves to the repair region simultaneously and can partially recover some sensory functions. (3) The color, quality, texture and thickness of forehead flaps are similar to those of the nasal skin. Besides, it becomes thin with the running of the supraorbital artery and thus, the thickness of flaps can be designed according to the need. It shows high beauty values. (5) Aesthetic subunits can be totally covered by the flaps in the design and the scars can be hidden in the junction of the subunits (which is usually the turn-back site). (6) There can be narrower pedicles and thus the flaps can rotate and stretch freely. (7) It can reduce the occurrence of eyebrow malformation after the flap transposition. (8) The vertical projection of the supraorbital artery is 2cm away from the central line, which means that it is located in the central zone of the eyebrow. The pedicle can be designed to be 1.5cm because this will not affect the twist operations of the flap.

### 3.3. Operative Indications

1. Repair and reconstruct defects of soft tissues at face, cheek and chin, including the immediate repair of defects after the tumor operation; 2. Reconstruct organs of some maxillofacial regions and the defects of jaw, nose, eyelids and auricular. 3. Seal or cover deeper tissues (such as muscle tendon, muscles, nerves, large blood vessels and bones, etc.) or exposed wound surfaces. 4. Repair and reconstruct penetrating defects of cheek and nose.

### 3.4 Surgical Considerations

During the lateral stripping of flaps, the subdermal vascular network shall be intact so as to prevent necrosis of wound margins. Protection of vascular pedicle and skin branches: Supraorbital transverse veins run within one centimeter of the supraorbital rim while nasal dorsum venous arch runs in the deep epidermis within 1cm above the inner canthus connection line of the osseous of both sides. Below the eyebrow, the median flap pedicles near the forehead had better be separated to the superficial layer. Besides, do not hurt supraorbital transverse veins so as to increase venous returns of the flap and avoid postoperative hematoma. Nasal dorsum venous arch runs in the deep epidermis within 1cm above the inner canthus connection line of the bone so as to protect the vein, increase venous returns of the flap and avoid postoperative hematoma.

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