

## ORIGINAL PAPER

# Single Stage Turn in Perforator Infraorbital Artery Island Flap for Nasal Ala Reconstruction

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**Background:** The reconstruction of full-thickness nasal ala defects is challenging procedure. Use of local flaps is acceptable approach. Flap based on infraorbital artery could be used for primary reconstruction of nasal ala defects. **Methods:** The prospective study include consecutive series of 15 patients with advanced skin carcinoma of the nasal ala and medial cheek staged T4 by TNM, in whom the turn in infraorbital flap was used. The patient characteristics, type of carcinoma and complications were analyzed. **Results:** The turn in infraorbital flap was used mostly in male patients (80%), mean age 64 years. The basal cell skin carcinoma was found in 60%. Skin layer was skin grafted. All flaps survived, but in one case a partial wound dehiscence in one partial skin graft loss was found, and in two patients partial nasal obstruction occurred. These three complications were solved as secondary procedures under local anesthesia. **Conclusion:** Full-thickness defect of the nasal ala can be properly reconstructed using flap based on infraorbital artery providing exceptional esthetic and functional results, as single stage procedure. **Key words:** nasal reconstruction, infraorbital artery, infraorbital flap, perforator flap, nasal ala

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## 1. INTRODUCTION

Skin carcinomas in facial region frequently appear in the nasal ala where advanced disease and recurrent tumors could infiltrate alar cartilage (staged as T4 by TNM system for non-melanoma skin carcinoma). In those patients radical surgery with excision of full-thickness nasal ala is obligatory as curative procedure. If skin carcinoma spreads from the nasal ala to the medial cheek region or in the upper lip, the tumor excision is more challenging. In some cases, the carcinoma spreads into the subcutaneous tissue and the excision of the adjacent tissue in the cheek region is necessary, frequently reaching the bones of piriform aperture.

The reconstruction of full-thickness nasal ala defects is still demanding

problem. The aim of the reconstruction is to meet esthetic and functional goals. [1] The nose cheek groove must be reconstructed, enabling the nose breathing. [2] One of frequently used flaps for this reconstruction is the nasolabial flap supplied by facial and angular artery. [3,4] That flap can not be used in cases where: the tumor infiltration is deep and facial- angular arterial arcade is interrupted during surgery, or when this flap has been used in previous surgery. The use of perforator infraorbital island flap based on infraorbital artery is described as insular flap for reconstruction of nasal dorsum and side walls. [5]

Regional anatomy important for study: The infraorbital artery continue maxillary artery. It emerges on the face through the infraorbital foramen.

Facial branches enter the face deep to the infraorbital head of the quadratus labii superioris muscle, where they provide labial, nasal and palpebral branches to serve the lacrimal sac, nose and upper lip. The various branches anastomose with angular branch of the facial artery; others run toward the nose, anastomosing with the dorsal nasal branch of the ophthalmic; and others descend between the quadratus labii superioris and the caninus muscle and anastomose with the facial, transverse facial, and buccinator arteries. The skin territory of the perforator infraorbital flap based on infraorbital artery takes approximately 8 cm<sup>2</sup>, and it is in high 2 cm below the orbital rim and in wide 4 cm lateral from the alar cartilage. [6] The infraorbital island perforator flap can be used for the reconstruction of the whole nasal ala.

**Flap design:** The flap elevation begins with incision of the skin and subcutaneous tissue through the tailored margins according the defect size. During the preparation through subcutaneous layer, the medial margin of zygomaticus major muscle must be identified. Blunt dissection is performed and the flap raised from levator anguli oris and quadratus labii superioris muscle. The vascular pedicle consisting infraorbital artery and vein has to be preserved and flap raised and mobilized from lateral to medial. The perforator infraorbital flap is used as turn in flap

placed in defect of nasal ala, and re-sorbable sutures are used for flap positioning. The wound is closed in layers (flap skin and mucosa, and other layer is the flap subcutaneous tissue and surrounding subcutaneous tissue in defect edge). The reconstruction of external skin layer is performed using a partial thickness skin graft. The donor region is primary closed.

The simultaneous use of perforator island infraorbital flap and nasolabial flap on facial artery is advised for defects in the nasal ala and upper lip including the anterior part of the floor of the nose. Anterior nasal tamponade is used after surgery for three days.

## 2. MATERIAL AND METHODS

The prospective study (2000-2010) includes consecutive series of patients operated in an University Clinical Centre for skin carcinoma in the nasal ala infiltrating the cartilage and staged as T4 according to the TNM classification for non-melanoma skin carcinoma. In all patients fullthickness nasal ala defect is combined with a defect of medial cheek region or upper lip including anterior part of the nasal floor. In all cases, the turn in infraorbital island perforator flap was used for full-thickness nasal ala reconstruction. We analyzed the patient characteristics (age, sex), tumor histology, size of skin flap, early and late complications and duration of hospital stay. The study was approved by the Ethical Committee of the Faculty of Medicine University of Nis, and the written consent from all patients.

## 3. RESULTS

The perforator island infraorbital flap was used in 15 patients for the full-thickness nasal ala reconstruction. In 12 patients, a part of the medial cheek was removed, but in three patients the tumor was infiltrated into the nasal ala and a part of the upper lip and nasal floor. Most patients were males. The mean age of the patients was 64 years (58 to 77)(Table 1). The primary carcinoma were found in five patients, and in 10 the recidivant disease. In nine patients the histology revealed the basal cell carcinoma (BCC), while other forms of non-melanoma skin carcinoma (squamous cell carcinoma (SCC)

Characteristic		No
Sex	Male	12
	Female	3
Age (years)	<60	3
	61-70	10
	71 +	2
Histological Type	BCC	9
	SCC	4
	Mixed BCC/SCC	2
Total		15

Table 1. Patient characteristics and histological type

Complication	No
Skin graft loss	1
Wound dehiscence	1
Delayed nasal obstruction	2
Total complication	4
Uneventful course	11
Total	15

Table 2. Postoperative course

or mixed type (SCC/BSS)) were less frequent (Table 1). All patients were operated with 5 -8 mm clinically clear margins, and the clearance of excision margins was proved histologically in all patients. All surgeries were performed under general anesthesia.

All flaps had isosceles triangle shape with its base medially. The size of the skin island was from 1.8x3.4 cm<sup>2</sup> to 2.2x 3.6 cm<sup>2</sup>. The counted surface of the skin island was on average 3.75 cm<sup>2</sup>. In all patients, the perforator island infraorbital flap was well vascularised and we did not register total flap loss (Figure 1,2). The partial loss of the skin graft was found in one case, but the defect healed by secondary intention during 14 days. In one case, a partial wound dehiscence was found near the nasal septum (the most distal part of the flap) and managed with secondary procedure under local anesthesia. The donor area healed without complications in all patients. In two patients during the follow-up we found the nasal breathing problems and partial nasal obstruction. The delayed trimming of flap was performed under local anesthesia in those

patients. The overall complications are presented in Table 2. All patients scars were inconspicuous. The hospital stay was 3 to 8 days (5 days on average).

## 4. DISCUSSION

The nose is the most prominent esthetic structure in the facial region, and the reconstruction is demanding. The nasal reconstructions were described in bibliographic data from the XVth century.[7] The description of nasal reconstruction with arm flap was described in the first textbook for plastic surgery "De curtorum chirurgia per insitio-nem" in 1597 by Gaspare Tagliagozzi. [8] The reconstruction of the nasal skin defects could be performed by different procedures. The most simple one is the reconstruction with full-thickness skin graft; the next one is the use of local and regional flaps.[9] A well-known and mostly used skin flap from the nasolabial region is supplied by the facial, angular and infraorbital artery. [7] For the reconstruction of skin de-



Figure 1. A- Preoperative view of skin carcinoma on nasal ala. B- defect, C- Flap raised, scissors point at flap pedicle, D- Early postoperative result, E and F postoperative view after 3 years.



fects in the lateral nasal wall there are different advanced, rotation or transposition flaps on infraorbital artery. [10-12] For the reconstruction of the defect on the nasal ala base, a jigsaw puzzle flap can be used. [13] For the lateral side of the nose and nasal cheek groove, a shark island pedicle flap from nasolabial fold can be used. [14] The defect on the nasal tip can be solved by a myocutaneous flap m.orbicularis oculi based on angular and infraorbital arteries. [15] In the available literature the use of glabellar, forehead flap, cheek

advancement flap, temporo-mastoid flap and microvascular flaps (forearm flap) have been described. [16] All flaps have been described with all their advantages and disadvantages, and in some of them the need for secondary reconstruction has been referred. [15] The infraorbital artery is a permanent anatomic structure with rich anastomotic network, including the facial artery and transversal facial artery. Skin flap based on infraorbital artery has been described in the last years for the reconstruction of paranasal region after burn injury or for the saddle nose deformity after surgery for Wegener's granuloma. [17,18] Some authors have used this flap in oncologic surgery for facial and nasal reconstruction. [19] Another authors have described the flap for nasal reconstruction based on transversal facial artery or as a flap on cutaneous zygomatic branch (from facial artery). [18,20,21] Gardeto et al. defined the flap for nasal reconstruction as a flap on infraorbital artery with strong anastomosis with transverse facial artery (branch of facial artery). [20] Some authors have defined the flap in nasolabial fold as reverse vascularized flap on angular artery but additionally supplied by infraorbital artery. [22] In recent reports the infraorbital flap is described for reconstruction of penetrated nasal defects as a single procedure. [5]

The reconstruction of full-thickness of the nasal ala must be analyzed as esthetic and functional problem. The re-



Figure 2. A- Preoperative view of skin carcinoma on nasal ala. B- Early postoperative result, C and D postoperative view after 6 years.

constructed ala has to be concave in shape. Lining of the ala has to be stable, and the flap from the nasal septum, skin graft or turn in the skin flap can be used. Sometimes, the reconstructed ala is too bulky causing airway problems. For the defects larger than 1.5 cm in diameter, the nasolabial flap is preferred, and the donor area is closed primary. [23] We did not use the cartilage support but in only 2 cases had moderate airway obstruction and performed correction under local anesthesia. Some authors have described the vascular supply of nasolabial flap with angular artery and lateral nasal artery. [24] The investigation of Rochrich et al. described the vascularization of the nasolabial flap as a random pattern on narrow subdermal plexus, and they favor neither angular nor facial artery with its perforating branches through the muscle. [25] The insular flap based on infraorbital artery can be used in size 4 x 3 cm. [17] We found that smaller flap is sufficient for nasal ala. The infraorbital artery and its anastomosis with angular artery participate in vascularization of frontal region, additionally supplying the glabellar flap. [26] The esthetic requirement in the nasal reconstruction is aimed to form the nasal cheek groove. This can be obtained using pedicle flaps from nasolabial fold. [2] The biggest problem in the reconstruction of the nasal ala is obtaining the vestibular lining. [27] The disadvantage of the skin grafting as lining of the vestibule

is a potential graft loss and prolonged use of splint. [21] We used the turn in flap and skin graft for reconstruction. In our study, we found that the turn in flap achieved proper lining, but only in two cases we found partial airway obstruction. The use of turn in flap is previously referred for nasolabial flap. [28,29] As the flap is well-vascularized, while we did not find any partial or total flap loss. The infraorbital artery is sufficient vascular supply for the perforator infraorbital flap, and its vascular supply does not depend on the facial artery.

## 5. CONCLUSION

Turn in the infraorbital island perforator flap has well-defined pedicle, and can be used for reconstruction of full-thickness nasal ala defects. The flap can be safely used in cases where the nasolabial flap based on facial artery has been used for previous surgery, or in cases where the facial-angular artery arcade had been cut during the previous tumor removal or injury. The flap can be used without cartilage support and the obstruction is rare. The technique for flap harvesting is quite versatile and we can suggest its use for nasal reconstruction.

CONFLICT OF INTEREST: NONE DECLARED.

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