Reconstruction of Nasal Alar Defects with Freestyle Facial Artery Perforator Flaps

Salvatore D'Arpa, MD, PhD[1] Roberto Pirrello, MD[1] Francesca Toia, MD[1] Francesco Moschella, MD[1] Adriana Cordova, MD[1]

[1] Chirurgia Plastica e Ricostruttiva–Dipartimento di Discipline Chirurgiche, Oncologiche e Stomatologiche, Università degli Studi di Palermo, Palermo, Italy

Facial Plast Surg 2014;30:277–286.

Address for correspondence Salvatore D'Arpa MD, PhD, Chirurgia Plastica e Ricostruttiva–Dipartimento di Discipline Chirurgiche, Oncologiche e Stomatologiche, Università degli Studi di Palermo, Via del Vespro 129, Palermo 90127, Italy (e-mail: turidarpa@hotmail.com; salvatore.darpa@unipa.it).

Abstract

In 2009, we have described the use of freestyle facial artery perforator flaps for one-stage nose reconstruction. Since then, several articles have reported the use of facial artery perforator flaps for nose reconstruction. The purpose of this article is to provide an update of the published technique after 10 years of experience. Since 2004, 21 patients have been treated with a freestyle facial artery perforator flap for one-stage reconstruction of the nasal ala. The flaps were 16 propellers, 4 V-Y, and 1 island transposition. A single venous congestion leading to a minor flap tip necrosis and a wound dehiscence was observed. All other flaps healed uneventfully. The V-Y design and multiple subunit reconstruction gave suboptimal results. It was concluded that indications for freestyle facial artery perforator flaps are total nasal alar subunit reconstruction or reconstruction of lateral alar defects when perforator anatomy allows. In these cases, freestyle facial artery perforator flaps are the first choice technique at our institution because they allow excellent results in one-stage operation. One-stage nasal ala reconstruction with freestyle facial artery perforator flaps.

Keywords
- freestyle flap
- propeller flap
- perforator flap
- facial artery perforator
- nose
- reconstruction

Facial artery perforator flaps were first introduced by Hofer et al[1] in 2005 for reconstruction of perioral defects.[2] Hofer et al introduced the fascinating concept of perforator flaps in the face. We have then described the freestyle facial artery perforator flap for one-stage reconstruction of the nasal ala,[3] expanding the potential of these flaps and introducing the concept of one-stage nose reconstruction that we have later applied to the forehead flap too.[4]

These flaps have prompted a great interest for the anatomy of the facial artery perforators[5,6] and for the applications of facial artery perforator flaps, which seem to have gained their place in face reconstruction.[2,5,7–9]

In this article, we report our long-term experience to provide an update after the first published article. Many times some techniques are lost to follow-up, while it is very useful to know if the authors have improved them—and how—or abandoned them—and why.

Facial Artery Anatomy

Although the exact position of a single perforator varies and requires accurate preoperative and intraoperative identification, perforator anatomy is still predictable and constant: the source arteries give their perforators to the skin in fixed areas of the body. A fixed area is a region where anatomical planes are firmly attached and do not glide, or glide less. This allows for vessel protection from shearing and for shorter and more direct course to the skin.[10] The facial artery sticks to this rule. It constantly gives off several perforators to the skin at the level of the nasolabial sulcus, a fixed area in the face.

An average of 5.05 $\pm$ 0.86 facial artery perforators of more than 0.5 mm can be found above the mandible. The average diameter of these perforators at their origin from the facial artery is 0.96 $\pm$ 0.21 mm. Based on injection studies the territory that these perforators can supply has an average

Issue Theme Nasal Reconstruction; Guest Editor, Helmut Fischer, MD

DOI http://dx.doi.org/10.1055/s-0034-1376873.
ISSN 0736-6825.

area of 8.05 ± 3.55 cm^2.[6] These areas are probably underestimated: injection studies are performed by manually injecting a colored dye into the artery and thus are very far from the physiologic condition of a dynamic circulation. During flap harvest, the anatomic territory is greatly enlarged because adjacent vascular territories are recruited by opening of choke vessels or by true anastomoses,[10] or by direct and indirect linking vessels at the perforasome level[11]: we have successfully used facial artery perforator flaps as big as 24 cm^2 for lip reconstruction without any vascular insufficiency.[12]

The diameter and anatomical territory of facial artery perforators decrease cranially. This is an expected finding and has been well explained by Taylor and Palmer's angiosome article.[10] With growth, perforator number does not change. Perforators increase their diameter to sustain growth of their territory[10]: the more the territory grows, the bigger the perforator is (e.g., deep inferior epigastric artery perforator is bigger after pregnancy and in obese women). The tissues of the face expand less and are less lax cranially and so does the perforator's diameter. However, this is not a cause of concern because bigger, more caudal perforators are needed for wider perioral defects, while smaller and more cranial perforators are needed for smaller nose defects: perforators are larger where larger flaps are needed and are more easily harvested thanks to the higher skin laxity.

The anatomical configuration of facial artery perforators also changes from caudal to cranial and the relationships between arteries and veins are very peculiar. The arterial perforators do not always lie in proximity of the venous ones. The bigger and more caudal perforators are usually close to each other and can be dissected together. The more cranial and smaller perforators are more likely to be a few millimeters distant from the vein, enough to mandate a separate dissection for the artery and for the vein (►**Fig. 1**). Above the oral commissure, the veins can be found lying either medially (less frequent) or laterally (more frequent) from the artery.[3]

Sensory nerves usually lie close to the vessels and can be often incorporated into the flap to provide sensory innervation instead of being divided.[3]

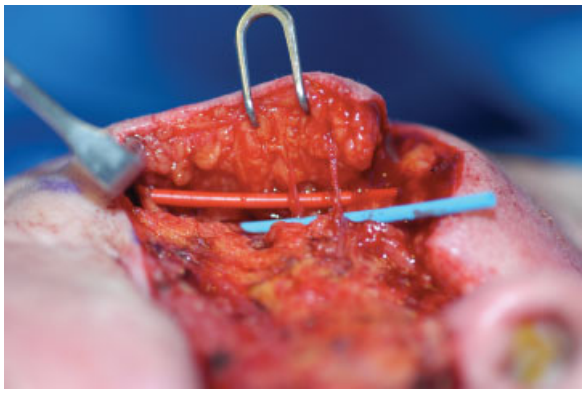

Fig. 1 This close-up medial view gives a clear picture of the anatomy with the vein often lying medial and apart from the artery. For comparison, note that the red (artery) and blue (vein) loops are 1.3 mm in diameter.

Flap History and Evolution

Hofer et al described[1] the facial artery perforator flaps for the first time for reconstruction of perioral and perinasal defects. They must be credited for having had the great intuition of starting to use perforator flaps in the face. In their first description the flaps were harvested with the artery and a cuff of subcutaneous tissue to provide venous outflow. The flaps were not used for nose reconstruction; we enthusiastically borrowed the idea and started using these flaps. We realized that not only these flaps could be harvested with a vein as well, but also that they would allow to improve results of one-stage nasal ala reconstruction.[3] Since then, several descriptions have been presented of the facial artery perforator flaps, either as pure perforator flaps or as perforator-based flaps.[2,5,7–9,13,14]

The concept of one-stage nose reconstruction was also applied to lateral nasal artery perforators[15] and afterward even to the forehead flap, leading to the description of the supratrochlear artery perforator propeller flap.[4] These flaps combine the concept of perforator flap surgery with the propeller design and the freestyle technique to transform conventional multiple stages techniques into one-stage techniques. All this is possible because of the safety of perforator flaps, the extreme arc of rotation provided by the propeller design and the freedom in design and movement provided by the freestyle technique.

The freestyle technique is harvesting of a customized flap based on a perforator vessel. The surgeon looks for a suitable perforator around the defect and, after having chosen a good one, draws a flap around it that is tailored to the defect. The freedom is given by the possibility of drawing any kind of flap without restrictions coming from a skin or subcutaneous pedicle.

The latest step forward of this concept is the lingual artery axial propeller flap.[16]

Indications

Propeller flaps are believed to have high rates of complications.

This is an incorrect presumption. Propeller flaps can be very safe and reliable provided that they are appropriately indicated and well executed.[12,17–19] Failures are often due to incorrect indication, which happens when a surgeon starts the operation committed to doing a propeller flap despite unfavorable anatomy. The propeller flap should be treated as a freestyle flap. The final decision in freestyle flaps is always taken intraoperatively. This does not mean that we will only plan the operation during the operation, but the exact opposite: any occurrence should be taken into consideration and dealt with preoperatively, to start the operation with a solution for every problem.[12]

The freestyle facial artery perforator flap is indicated in total subunit reconstruction of the nasal ala and partial reconstruction of the lateral portion that include the cheek-alar junction: no skin bridge must be left in the ala because it might be a cause of pedicle compression. If these indications

are not respected, the flap is more likely to fail and other techniques should be preferred.

In the following section, a step-by-step description of the surgical technique is provided.

Surgical Technique in 10 Steps

1. Flap Planning

Doppler identification of perforators comes first. This phase is not intended to verify that there are perforators: perforators are always there to nourish the skin. Since anatomy of perforators is variable, Doppler identification gives the surgeon an idea of the vascular anatomy of that particular patient. A hand-held Doppler probe with an 8 MHz frequency is normally used. All perforators in the area, not only the closest to our defect, should be identified.

2. Planning Alternatives

The second crucial step is planning alternatives; the possibility of damaging or cutting the perforator or of having a flap that won't work must be taken into account and dealt with preoperatively. In the first case, the alternative can be the same nasolabial flap, harvested with a traditional skin pedicle. In the second case, if other perforators cannot be used, other flaps should be planned. Alternative flaps must be planned in advance to avoid damaging them during the operation and to avoid interference between the planned flap and eventual alternatives.

3. Flap Drawing

The flap is drawn like a conventional nasolabial flap by obtaining a template of the defect (►**Fig. 2**) and drawing the flap around the perforator that has been chosen preoperatively. This drawing might need to be modified during surgery based on the perforator but it is needed for two reasons: (1) choosing incision placement and (2) planning a conventional flap should a perforator flap not be feasible. The drawing is not centered on the perforator. If the perforator is centered on the perforator it will create a symmetric flap and a 180 degrees rotation will shift two equal portions. If the perforator is eccentric, the flap is divided in two parts of different lengths: 180 degrees rotation will swap the shorter with the longer that will cover the defect.[17–22]

4. Exploratory Incision

The exploratory incision gives access to and exposure of the perforators: thus it should be wide enough to allow optimal view. The lateral margin is preferred for the exploratory incision (►**Fig. 3**). The cranial side should never be incised until the end because it might be needed as a skin pedicle. The caudal side should never be incised until the end because we might need a longer flap caudally in case of caudal perforators. We would normally choose a lateral access because it is more comfortable for the surgeon standing lateral to the patient and there is less risk of damaging the medial veins that sometimes can be needed for drainage. The medial side is not a good choice for the exploratory incision because it is usually located at the nasolabial fold where the dermis is thicker due to fibrous attachments to the underlying facial musculature and thus dissection is harder.

5. Identification of Perforators

Identification of perforators is less straightforward than in many other perforator flaps because it is not performed in an anatomical plane. We have to choose the appropriate thickness of the flap and then proceed with a subcutaneous dissection; a supra-superficial muscular aponeurotic system (SMAS) dissection would be easier, but the flap will be too thick for alar reconstruction. Subcutaneous dissection is

Fig. 2 This is not the ideal case for a freestyle facial artery perforator flap because more than one subunit is involved and a part of the cheek too. However, in older patients a one-flap/one-stage operation can be desirable. This picture is taken after basal cell carcinoma resection. Flap planning is the same as a conventional nasolabial flap with a template of the defect used to draw the flap around the supposed perforator pedicle.

Fig. 3 The exploratory incision should be lateral to avoid damage to medial veins, should one need to use them. The perforators are typically found in a row within the subcutaneous tissue. The need to harvest a thin flap contraindicates supra-SMAS dissection, which will make the flap too thick. Dissection within the subcutaneous tissue, without the guide of a clear anatomical plane can sometimes be tricky but it is just for a few millimeters. SMAS, superficial muscular aponeurotic system.

slightly more demanding, but—with little training—it always allows perforator identification.

6. Perforator Dissection

Once all perforators have been identified and exposed, the medial incision is performed. If no vein is found through the lateral incision, this is the time to find one. In case no vein is found at all, a cuff of tissue will be left around the artery to warrant venous outflow.

7. Choice of Perforator

The cranial most perforator is usually chosen because it allows the easiest movement and the least dissection. However, sometimes it can be sacrificed in a tumor resection that extends beyond the ala, be damaged during dissection, or simply considered unreliable by the surgeon. These flaps are so small that even a small perforator can supply them very well, thus caliber is not a criterion for choice. The vein is a bigger source of concern: although the veins often do not lie close to the artery, the pedicle will tolerate torsion very well. Should the cranial most perforator not be available, the flap can be used as a reverse flap by ligating the facial artery caudally to the perforator and including the facial artery itself in its cranial portion in the pedicle. This will allow a sufficient arc of rotation to bring a caudal perforator cranially. During dissection, take care not to injure the facial nerve branches, although damage of such a peripheral branch does not usually result in palsy thanks to compensation by the other branches.

8. Perforator Dissection

Once the perforator is chosen the caudal margin is incised and the flap now is a peninsula attached cranially. At this point, the perforators are isolated and dissected as needed (the more caudal the perforator, the longer the dissection needed), sometimes up to the facial vessels. The facial musculature is not divided but just dissected like any other perforator flap. Facial nerve branches are preserved. Should a sensory branch be present between artery and vein it will be preserved to maintain sensation (►**Fig. 4**).

If additional pedicle length is needed to reach the ala, the facial artery and vein can be ligated and divided caudally to the perforator and the flap based cranially on it (reverse flow).

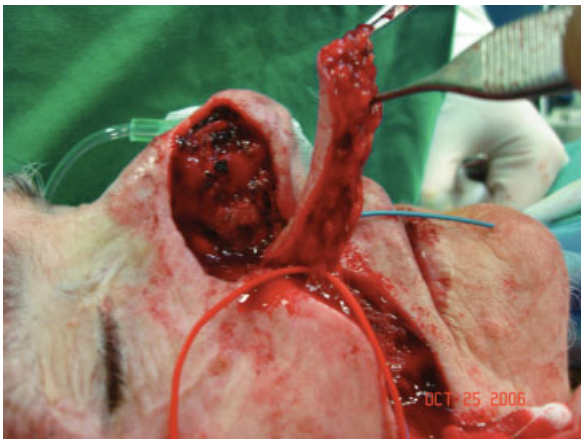

Fig. 5 This picture shows the thinness of the flap, suitable for alar reconstructions. The flap is usually rotated toward the midline (counterclockwise in this case and in right-sided flaps, clockwise in left-sided cases) to allow for the smaller arc of rotation.

9. Flap Isolation

Once perforator dissection is completed, the caudal flap can be incised and the flap islanded (►**Fig. 5**). The flap is now observed for vascularization. Should the surgeon be insecure, the flap should be left in place for 20 minutes before rotation to let the circulation settle. This is often very useful in freestyle propeller flap surgery.[12]

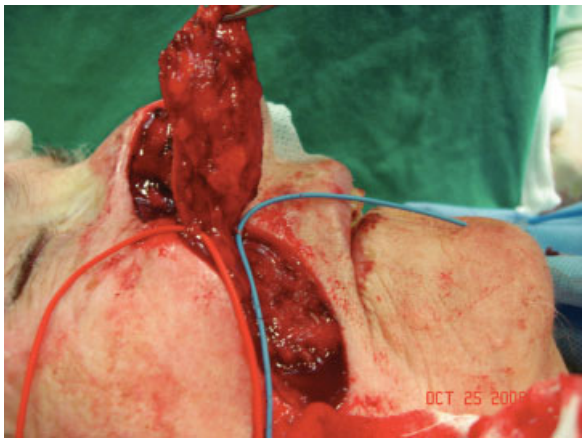

Fig. 4 The cranial most perforator will usually be chosen. Such a small flap can be nourished by an artery of any size, so position will be more important than caliber in these cases. Once the perforator is chosen, the others are ligated and divided and the vein is identified and dissected. Between the two vessels it is most of the time possible to identify sensory nerves going to the flap. This picture clearly shows how distant can the vein and the artery be.

Fig. 6 This picture is taken at the end of the operation, before dressing. This is the color of a flap that will never have problems. Despite the shortness of the pedicle, the distance between artery and vein, and the extreme rotation, no vascular impairment will be observed. In this particular case, the interposition of the tail of the flap between the donor site and the recipient site will eliminate any risk of compression (see ►**Figs. 9–11**).

10. Flap Inset

The caudal part of the flap is normally rotated inward (left-sided flaps are rotated clockwise and right-sided flaps are rotated counterclockwise) because this allows a little smaller degree of rotation. The real enemy can be pedicle compression with donor site closure: be sure that there is enough space for the rotated pedicle, that torsion is not occluding flow, and that donor site closure is not too tight. Should closure be too tight and exercise compression on the pedicle, the best solution is to leave the apex of the donor wound open and let it heal secondarily; the pedicle won't be compressed and the scar won't be bad.

Such small flaps show any vascular compromise faster than bigger flaps. If a flap works well it will immediately be seen at the end of the operation (►**Figs. 6** and **7**), and the same will happen for a flap with a vascular insufficiency (►**Figs. 8–15**).

Fig. 7 As mentioned earlier (►**Fig. 1**), this case is a good example of a bad indication of this flap. The tail of the flap obliterates the cheek-alar junction and thus this cannot be considered a good one-stage reconstruction because that defect, should the patient want a correction, will have to be corrected with a second operation.

Fig. 8 Skin defect involving the whole alar subunit after basal cell carcinoma resection. The flap is planned after Doppler identification of the cranial most perforator. The arrow indicates the most likely rotation. The striped parts will be resected for closure.

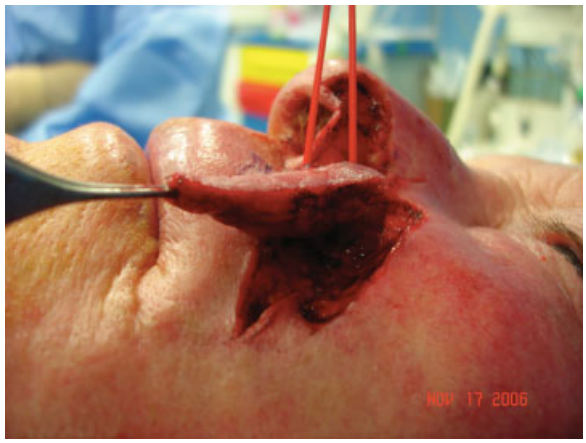

Fig. 9 This flap had to be thinned. It was one of the early cases and dissection was performed in the supra-SMAS plane (see ►**Fig. 2**). This picture shows the difference between the thinned tip and the base of the flap, where the perforator is. The red loop is passed around the pedicle. SMAS, superficial muscular aponeurotic system.

Fig. 10 Flap inset after clockwise rotation. The vessel loop is placed around the pedicle. Such high perforators would usually have the artery and vein lying close to each other, theoretically minimizing the risk of torsion.

Materials and Methods

Since 2004, we have performed 86 reconstructions of the nasal ala after cancer resection. Of these, 21 were performed with freestyle facial artery perforator flaps in one stage.

A total of 16 flaps were propeller flaps, 4 were V-Y, and 1 was an island transposition flap. ►**Table 1** summarizes the main characteristics of the population treated with freestyle facial artery perforator flaps. Left-sided propeller flaps were rotated clockwise, while right-sided flaps were rotated counterclockwise (►**Table 1**). Patients were followed up for 5 years (1–5 years, mean: 39 months). Five of 21 flaps (24%) had a medial vein. We performed all operations under local anesthesia.

Results

The technique was indicated in 24.4% (21/86) of all nose reconstruction cases. Only one (4.8%) case had a venous

Fig. 11 This is the flap at the end of the operation. This is the typical aspect of a flap that will have a venous problem (see ►**Fig. 5**). The most likely reason is the tight donor site closure in cases of pure alar defects. Leaving the apex of the donor site wound open for secondary healing to avoid pedicle compression might be an option in these cases.

Fig. 12 With any other flap this would be a desperate situation and a complete failure. But if you look at the following pictures, you will realize how forgiving these flaps are.

congestion probably due to pedicle compression or overzealous trimming of the flap; this congestion resulted in a minor tip necrosis of the flap that had little consequence on final outcome (►**Figs. 8–15**). A wound dehiscence has been observed in one case (4.8%) but was unlikely to be related to the technique.

The use of the V-Y advancement design has a tendency to flatten and pull the reconstructed ala laterally.

Discussion

We have been using this technique since 2004. After 10 years we are still using these flaps for one-stage reconstruction of total or partial lateral alar defects.

The main results of this review concern the indications for one-stage reconstruction with freestyle perforator flaps. The most common problem with pedicled freestyle flaps—and especially propeller flaps—is that, having a variable anatomy

Fig. 13 This is the final result 7 months after the operation. The flap survived almost completely, leaving only a small skin defect in the soft triangle.

and extreme rotations, they are generally perceived to be less safe than other techniques; if the flap is not perfectly executed, may undergo necrosis. We have extensive experience with freestyle and propeller flaps and we have shown that freestyle perforator flaps can be as safe as other flaps.[12] This

Fig. 14 In the three quarters view, the defect in the small triangle becomes more apparent.

Fig. 15 The lateral view shows an acceptable result. The soft tissue defect in the soft triangle, due to loss of the flap tip, was more disturbing to the surgeon than to the patient.

retrospective review confirms this finding: in only 1/22 cases (4.8%) we have observed a venous congestion that had little consequences on the final outcome and that was likely due to a technical mistake (pedicle compression or overzealous flap trimming), thus likely to be avoidable.

The most important issue that results from this review is that this technique is indicated in approximately a quarter of the cases of cancers of the nasal ala (24.4%): this means that strict selection of patients is needed to guarantee a good outcome. One of the most common mistakes in freestyle flaps or propeller flaps surgery is starting the operation already committed to a predetermined plan, trying to adapt the patient's conditions to the operation: success will depend on the luck of finding the right patient, and the chances of failure will be higher.

The indications for this technique are as follows:

1. Total alar subunit reconstructions
2. Partial alar reconstructions that involve the lateral portion of the ala
3. Favorable perforator anatomy

If the lateral portion of the ala is preserved, it might compress the pedicle and cause failure. Thus, partial alar defects that preserve the lateral portion are an absolute contraindication to this technique because it is impossible to create a comfortable tunnel to house the pedicle. However, we would discourage partial resections of the medial part of the ala leaving the lateral intact. They will go against the subunit principles and create a patch effect.[23]

Defects that involve more than one subunit are a relative contraindication because the final outcome is suboptimal; this is not exclusive of this technique but a corollary of the rule of subunit reconstruction in the nose.[23] If these indications are respected and the flap is properly executed following the 10 rules provided in this article, these flaps are safe enough.

When the defect involves the cheek, reconstruction of the cheek and the ala with these flaps will lead to obliteration of the cheek-alar groove that will need to be recreated with a revision operation. Thus the operation won't be a one-stage operation anymore. However, with this in mind and with the aim of doing a one-stage/one-flap operation at the expense of the cosmetic result (instead of doing multiple flaps or stages), the technique can be an option like in case 3 (►**Figs. 2–7**).

Our experience has shown that freestyle pedicled perforator flaps in the face are safer than other freestyle perforator flaps in the body.[4,12] This is likely due to the face's high vascularity. Although artery and vein are often very short and not close to each other[12,24,25] and facial artery perforator flaps are sometimes harvested without a vein,[1] they have very high success rates. They are very forgiving and rarely fail, can be done under local anesthesia and need all skills that freestyle perforator flap surgery requires. For all these reasons, these flaps—and facial artery perforator flaps in general—are ideal to let residents start with this surgery avoiding the trauma of failures.

After Hofer et al's first description of facial artery perforator flaps,[1] many groups have started using the technique or studying the anatomy of facial artery perforators[2,5–9,13,15,26,27] with various modifications. The possibility of harvesting a customized flap based on a known pedicle, possibly innervated as well[3] is an evolution in facial reconstructive surgery.[28] Human anatomy is sometimes very surgeon-friendly: perforators are located at the level of natural folds,[10] thus in the areas were scars can be concealed better.

The technique of one-stage nasal ala reconstruction with the freestyle facial artery perforator flap deserves credit for having introduced a fascinating concept in head and neck reconstruction: one stage use of multiple stage techniques. It puts together the freestyle pedicled perforator flap concept[12,24,25]—that allows complete customization of the flap to suit the patient's and surgeon's needs,—the propeller flap concept[17–22]—extreme rotations of 180 degrees are feasible,—and the safety of perforator flaps. After having introduced this technique, we have applied the same concept to the forehead flap[4] and the lingual flap.[16]

The drawbacks of this technique are that it is not suitable for all alar reconstruction, that cranial most facial artery perforators are smaller compared with more caudal ones, and that alternative techniques are available that do not need a perforator dissection.

Indications for this technique are limited. In our experience, only one quarter of cases of nasal ala reconstruction can be treated with it. However, when appropriately indicated, this technique allows excellent outcomes in one stage (►**Figs. 16–20**). It is another tool that we can use to optimize our results and widen our choices. Reconstruction of defects that extend beyond the alar subunit, or use of the V-Y advancement design for these flaps is associated with suboptimal results.

Table 1 Descriptive characteristics of the patients treated

Patient	Pathology	Side	Pedicle	Size (cm)	Flap type/rotation	Complications
1	BCC	Left	Artery and vein	1.2 × 0.8	180 degrees propeller + nonanatomical cartilage strut graft/ clockwise	None
2	BCC	Left	Artery alone	0.5 × 0.7	Island transposition	None
3	BCC	Right	Artery and vein (medial)	2.2 × 1.6	180 degrees propeller/ counterclockwise	None
4	SCC	Left	Artery and vein	0.9 × 0.8	180 degrees propeller/ clockwise	None
5	BCC	Left	Artery and vein	1 × 1.1	180 degrees propeller/ clockwise	Venous congestion and 2 mm tip necrosis
6	BCC	Right	Artery and vein	2.3 × 1	V-Y advancement	None
7	BCC	Left	Artery and vein(medial)	1.8 × 0.9	V-Y advancement	None
8	BCC	Left	Artery and vein	2 × 1.5	180 degrees propeller/ clockwise	None
9	BCC	Right	Artery and vein(medial)	1.4 × 1	180 degrees propeller/ counterclockwise	None
10	SCC	Right	Artery alone	1.2 × 0.8	180 degrees propeller/ counterclockwise	Temporary congestion, no complication
11	BCC	Left	Artery and vein	2 × 1	180 degrees propeller/ clockwise	None
12	SCC	Right	Artery and vein	1.3 × 0.7	180 degrees propeller + anatomical cartilage strut graft/ counterclockwise	None
13	BCC	Left	Artery and vein	1.5 × 0.6	180 degrees propeller/ clockwise	None
14	BCC	Left	Artery and vein, reverse	2.1 × 1.3	V-Y advancement	None
15	BCC	Left	Artery and vein(medial)	1.8 × 0.9	180 degrees propeller/ clockwise	Minor cranial wound dehiscence
16	SCC	Left	Artery and vein	2.4 × 1.1	180 degrees propeller + anatomical cartilage strut graft/ counterclockwise	None
17	SCC	Left	Artery and vein	2.1 × 1.3	180 degrees propeller + anatomical cartilage strut graft/ counterclockwise	None
18	BCC	Right	Artery and vein, reverse	2.4 × 1.2	V-Y advancement	None
19	BCC	Right	Artery and vein	2.0 × 0.9	180 degrees propeller/ clockwise	None
20	BCC	Right	Artery and vein (medial)	1.8 × 0.8	180 degrees propeller/ clockwise	None
21	BCC	Left	Artery and vein	2.2 × 1.3	180 degrees propeller + non anatomical cartilage strut graft/ counterclockwise	None

Abbreviations: BCC, basal cell carcinoma; SCC, squamous cell carcinoma.

When the cranial most perforators are not available or are damaged, similarly to other regions,[12] more caudal perforators can be used by ligating and dividing the facial artery and vein caudally of the perforator: the flap will rely on a reverse flow and have a wide arc of rotation thanks to mobilization of the source vessel. In men, this might bring beard to the ala and thus become a relative contraindication: a forehead flap should be used in these cases. However, in most cases the

Fig. 16 This young lady had simultaneous basal cell carcinomas involving the left ala and the lobule.

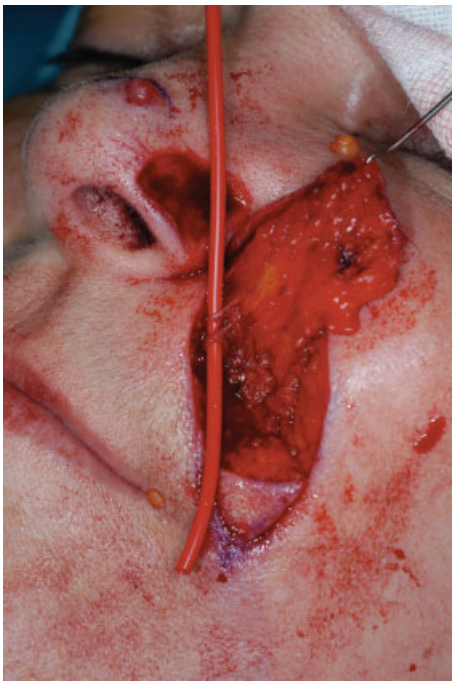

Fig. 17 Simultaneous resection was performed: the ala was reconstructed with a facial artery freestyle perforator flap, while the tip defect was closed primarily. This is the most common anatomy of the pedicle: the artery is medial and the vessels are slightly separated. The skin triangle at the caudal end of the donor site wound is the skin that will be resected to allow direct closure.

choice of the cranial most perforator allows to harvest the flap above the beard, without bringing any hair into the ala.

Some surgeons still deem perforator dissection to be tedious, but the need for a perforator dissection is not necessarily a drawback. Preconceptions about perforator flap harvest should be abandoned. Although it is obviously technically more demanding, its results are superior to alternatives techniques: it allows achieving a one-stage reconstruction with superior cosmetic results, thus compensating for the extra effort.

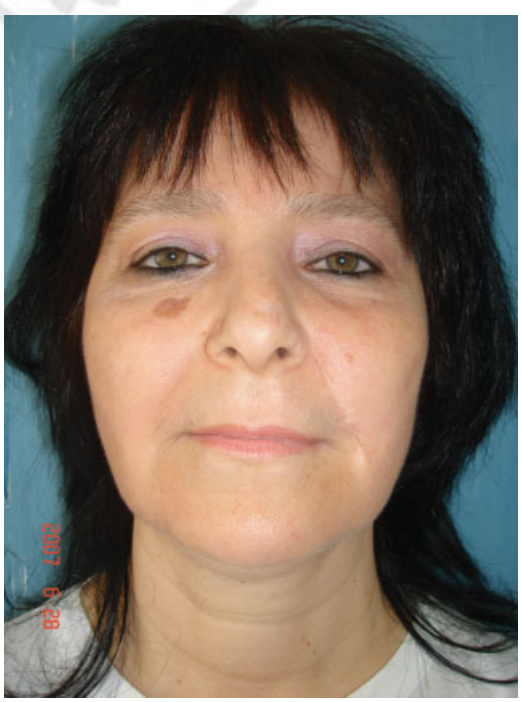

Fig. 18 Frontal view 3 years after the operation.

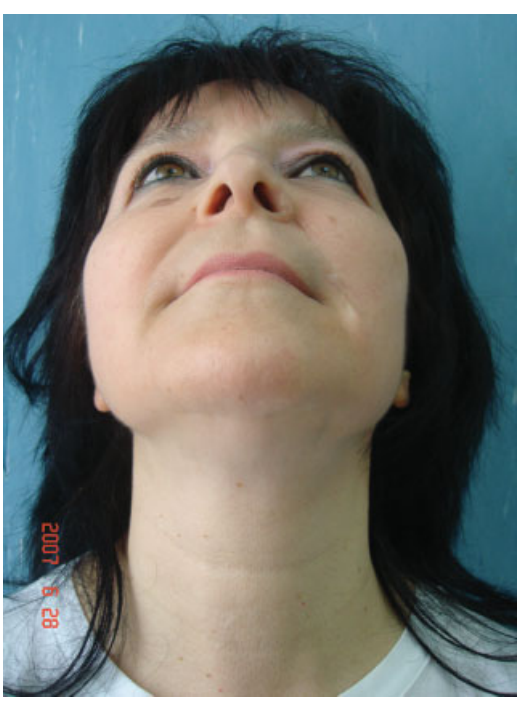

Fig. 19 On the basal view, 3 years postoperatively, there is good symmetry of the nostrils.

Fig. 20 The three quarters views, 3 years postoperatively, allows to appreciate the cheek-alar groove. To reconstruct this groove in a single stage is a very difficult task with other techniques.

Conclusion

One-stage nasal ala reconstruction with freestyle facial artery perforator flaps has withstood the proof of time: although their dissection is technically a little more demanding than conventional facial artery flaps, their results are not obtainable with other techniques.

These flaps are not indicated for all nasal alar reconstruction, but only for:

1. Total alar subunit reconstructions
2. Partial alar reconstruction that involve the lateral portion of the ala
3. Favorable perforator anatomy

Failure to comply with these indications is likely to result in a failure or in a bad result.

References

1 Hofer SO, Posch NA, Smit X. The facial artery perforator flap for reconstruction of perioral defects. Plast Reconstr Surg 2005; 115(4):996–1003, discussion 1004–1005
2 Yoon TH, Yun IS, Rha DK, Lee WJ. Reconstruction of various perinasal defects using facial artery perforator-based nasolabial island flaps. Arch Plast Surg 2013;40(6):754–760
3 D'Arpa S, Cordova A, Pirrello R, Moschella F. Free style facial artery perforator flap for one stage reconstruction of the nasal ala. J Plast Reconstr Aesthet Surg 2009;62(1):36–42
4 Cordova A, D'Arpa S, Moschella F. A new one-stage method for nose reconstruction: the supratrochlear artery perforator propeller flap. Plast Reconstr Surg 2012;129(3):571e–573e
5 Kannan RY, Mathur BS. Perforator flaps of the facial artery angiosome. J Plast Reconstr Aesthet Surg 2013;66(4):483–488
6 Qassemyar Q, Havet E, Sinna R. Vascular basis of the facial artery perforator flap: analysis of 101 perforator territories. Plast Reconstr Surg 2012;129(2):421–429
7 Demirseren ME, Afandiyev K, Ceran C. Reconstruction of the perioral and perinasal defects with facial artery perforator flaps. J Plast Reconstr Aesthet Surg 2009;62(12):1616–1620
8 Duzgun S, Unlu E, Bali Y. A new facial artery free-style perforator flap and conchal cartilage graft for one-step reconstruction of the alar defects. J Craniofac Surg 2013;24(6):2053–2055
9 Krijgh DD, Mureau MA. Aesthetic and functional outcome following perioral defect reconstruction using the facial artery perforator flap. J Reconstr Microsurg 2012;28(8):529–538
10 Taylor GI, Palmer JH. The vascular territories (angiosomes) of the body: experimental study and clinical applications. Br J Plast Surg 1987;40(2):113–141
11 Saint-Cyr M, Wong C, Schaverien M, Mojallal A, Rohrich RJ. The perforasome theory: vascular anatomy and clinical implications. Plast Reconstr Surg 2009;124(5):1529–1544
12 D'Arpa S, Cordova A, Pignatti M, Moschella F. Freestyle pedicled perforator flaps: safety, prevention of complications, and management based on 85 consecutive cases. Plast Reconstr Surg 2011; 128(4):892–906
13 Ahmad QG, Shankhdhar VK. Novel flaps for head and neck reconstruction. Indian J Surg Oncol 2010;1(2):120–124
14 Tan NC, Hsieh CH, Riva FM, Jeng SF. The nasolabial flap as a one-stage procedure for reconstruction of intermediate-to-large lip defects with functional and aesthetic assessments. J Plast Reconstr Aesthet Surg 2013;66(3):352–357
15 Karsidag S, Ozcan A, Sumer O, Ugurlu K. Single-stage ala nasi reconstruction: lateral nasal artery perforator flap. J Craniofac Surg 2010;21(6):1887–1889
16 Cordova A. Apporto innovativo dei lembi perforanti nella chirurgia del distretto testa-collo. Paper presented at: 62° Congresso Nazionale SICPRE; September 25–28, 2013; Bari, Italy
17 Pignatti M, Pasqualini M, Governa M, Bruti M, Rigotti G. Propeller flaps for leg reconstruction. J Plast Reconstr Aesthet Surg 2008; 61(7):777–783
18 Teo TC. The propeller flap concept. Clin Plast Surg 2010;37(4): 615–626, vi
19 Teo TC. Perforator local flaps in lower limb reconstruction. Cir Plast Iberolatinoam 2006;32:15–16
20 Hyakusoku H, Ogawa R, Oki K, Ishii N. The perforator pedicled propeller (PPP) flap method: report of two cases. J Nippon Med Sch 2007;74(5):367–371
21 Hyakusoku H, Yamamoto T, Fumiiri M. The propeller flap method. Br J Plast Surg 1991;44(1):53–54
22 Pignatti M, Ogawa R, Hallock GG, et al. The "Tokyo" consensus on propeller flaps. Plast Reconstr Surg 2011;127(2):716–722
23 Burget GC, Menick FJ. The subunit principle in nasal reconstruction. Plast Reconstr Surg 1985;76(2):239–247
24 Wallace CG, Kao HK, Jeng SF, Wei FC. Free-style flaps: a further step forward for perforator flap surgery. Plast Reconstr Surg 2009;124 (6, Suppl):e419–e426
25 Yildirim S, Taylan G, Aköz T. Freestyle perforator-based V-Y advancement flap for reconstruction of soft tissue defects at various anatomic regions. Ann Plast Surg 2007;58(5):501–506
26 Ng ZY, Fogg QA, Shoaib T. Where to find facial artery perforators: a reference point. J Plast Reconstr Aesthet Surg 2010;63(12): 2046–2051
27 Wang R, Cen Y. Vascular basis of the facial artery perforator flap: analysis of 101 perforator territories. Plast Reconstr Surg 2012; 130(5):743e
28 Rossi M, Milia A, Carmisciano M, D'Arpa S, Cordova A, Moschella F. Advancement perforator cheek flap for aesthetic one-stage reconstruction of postoncological extended split-thickness defects of the nasal sidewall. ScientificWorldJournal 2013; 2013:169208