The Nasal Dorsum as a Donor Site for the Correction of Alar, Lobular, and Columellar Malformations

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There is a wide variety of donor sites available for minor nasal reconstructions involving alar, lobular, and columellar defects. Unfortunately, the problems all these sites have in common are that the color match may be unsatisfactory or that the end result may be marred by conspicuous scarring. If nasal-skin resources could be fully exploited, the elimination of these two important problems could become an obtainable goal.

This article discusses the potential of the nasal dorsum as a donor site and describes methods that were used to try to achieve this goal. Skin redistribution, skin expansion, and skin distraction methods were used in 28 patients with alar (n = 13), lobular (n = 8), and columellar (n = 7) malformations and who had been followed up since the early 1980s. (*Plast. Reconstr. Surg. 107: 676, 2001.)*

Long-term results of nasal reconstruction are judged by the quality of the nasal skin, nasal contour, and nasal scars. Ideally, the color of the skin cover should match that of normal nasal skin. The contour should correspond with the age of the patient, and the scar should be invisible.

Unfortunately, it is impossible to achieve all these objectives in reconstructions of the vast majority of nasal malformations because there is such a wide spectrum of such malformations and because the support, lining, and cover in nasal elements may be partially missing or even completely absent. The reconstruction of anomalies is always performed on the basis of replacement of the missing parts by transposition or transplantation of tissues. A wide variety of donor sites from which skin, bone, cartilage, and mucosa can be harvested is available, and, in major defects of the nose when its composing parts are more or less absent, these sites are the only ones that can be used.¹–³

In contrast, with minor nasal defects, the surgeon has another option: the nose itself as a donor site. The problem is how to take full advantage of nasal-skin resources, how to preserve the skeletal growth potential, and how to minimize scarring.

In this article, we share our experience with techniques that have been developed at the Center for Craniofacial Surgery in Rotterdam for the solution of some of these problems.

**Patients and Methods**

The concept of using the nasal dorsum as a donor site for reconstruction and to reduce scarring by marginalization was applied in a group of 28 patients who had been followed up since the early 1980s for treatment of nasal malformations involving the ala, lobulus, or columella. The distribution of the anomalies in these 28 patients was as follows:

1. Alar dysplasia (retrusion, clefting, and similar conditions), n = 11
2. Alar aplasia (half-nose), n = 2
3. Lobular dysplasia (clefting), n = 8
4. Columellar dysplasia, n = 3
5. Columellar retrusion, n = 4

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Twenty-three of these 28 patients were operated on at the Center for Craniofacial Surgery in Rotterdam.

A representative group of 13 patients with alar \((n = 5)\), lobular \((n = 3)\), and columellar \((n = 5)\) malformations was selected to illustrate our experience. Patient age at the time of surgery ranged from 0 to 55 years (mean, 12 years; median, = 8 years). Sixty-seven percent of the patients were male, and 33 percent were female. The number of operations each patient underwent varied from one to four (mean, = 1.7 operations; median, 1 operation).

The timing of soft-tissue surgery was not dependent on any specific rule but was primarily dictated by patient need and referral time. The implantation of bone grafts was delayed for as long as possible.

With the exception of the patient shown in Figure 13, the follow-up duration for all patients was at least 1 year; the majority were followed up for years longer.

Methods

The choice between the various techniques that can be used for nasal reconstruction was primarily dependent on the degree to which different nasal elements were missing. Lack of skin was the major problem and was solved by redistributing skin, by taking advantage of its laxity (Figs. 1 and 2), by expanding the nasal dorsum, or by distracting it. Any problem with a lack of mucosal lining was solved by transposing mucosa or skin. A lack of skeletal support \((n = 3)\), which was rare, was corrected by implanting an L-shaped or straight bone graft.

Redistribution

If an incision is to result in a scar that respects the integrity of the nasal dorsum, there is only one choice of incision type: the L-incision. This type allows for the minimization and marginalization of scarring\(^4-7\) and consists of two elements: a classic inferior rhinotomy (Rethi incision) and a cranial extension, which courses along the lateral aspect of the nose. The incision permits the mobilization of the nasal dorsum as a whole and its transposition in three directions (Fig. 3): laterolateral, laterocaudal, or craniocaudal.

Expansion

Expanders with different sizes were used to augment the available skin surface.\(^8\) They were inserted through a glabellar incision and placed medially or laterally. All were custom-made and provided with a patch to allow adherence to the floor of the cavity. Nevertheless, some expanders tended to migrate in a cranial direction, thereby becoming less effective. The duration period between insertion and removal varied.

Distraction

In four patients with columellar retrusions of different origins, a soft-tissue distractor was used to lengthen the nasal skin and provide space for skeletal support (Fig. 4).\(^9\) The distractor consisted of three parts:

1. A cylinder that is placed medially under the nasal dorsum through an incision on the lateral aspect of the columella. The

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**Fig. 1.** Patient with Opitz syndrome. *(Left)* Extreme flaring of the nostrils. *(Center)* Excess of nasal skin that will be removed after lateral transposition of nasal skin, using the L-approach. *(Right)* Improved nasal contour and narrower nostrils.
tube is fixed to the glabella by means of a Kirschner wire.

2. A bar with a perforation in the middle. The bar is inserted through the same incision used for the insertion of the cylinder and is placed in position behind the alar rims over the inferior cartilage.

3. A piston with a torque converter, which is introduced through a small stab incision in the tip of the nose, passed through the bar, and lodged in the cylinder.

Turning of the piston will move the bar forward and stretch the skin, taking advantage of the “creep” phenomenon. The maneuver can be performed rapidly or slowly. In the rapid maneuver, load-cycling of the distractor was applied for three periods of approximately 4 minutes each, separated by 1-minute intervals in which the tension is released. Once sufficient skin had been harvested, a bone graft was inserted to maintain the lengthened nasal contour. In the slow maneuver, the distractor was first surgically inserted. Load-cycling was then gradually applied by daily turning of the piston on an outpatient basis. Once sufficient lengthening had been obtained, the distractor was replaced by a bone graft ($n = 2$).

**Cases**

The patient in Figure 1 was born with Opitz syndrome (teleorbitism, bilateral clefting of the lip, and hypospadias). After he underwent lip closure and correction of his hypertelorism, the dominant complaint was extremely wide nostrils. Narrowing and altering the shape of the apertures seemed to be the obvious solution. To achieve this, the dorsal skin was elevated using an L-incision. The shape of the apertures was changed by minor wedge incisions of the lining and approximation of the domes. The skin was then redraped over the tip, and the excess dorsal skin excised.

The patient in Figure 2 was born with an extremely severe nasomaxillary dysplasia (Tessier 3 cleft). The cleft had been repaired at another institution by transposition of a median forehead flap, leaving a residual deformity of the lower eyelid and an upward dislocation of a chronically inflamed right ala. After this correction, the discoloration of the remaining forehead skin and the redness of the right alar skin became more conspicuous.

In a two-stage resection, we corrected the anomalous forehead and alar skin and resurfaced the raw areas through lateral transposition of the dorsal skin, making use of the L-incision.

The patient in Figure 5 was born with a combination of teleorbitism, frontal anomalies (ectopic hair patches), left upper eyelid coloboma, and left alar retrusion. After correction of the hypertelorism, the repair of the eyelid anomaly, and the insertion of a bone graft to lengthen the nose, the child’s appearance was still not satisfactory. However, expansion of the nasal dorsum made it possible to produce excess skin in the left alar region, allowing reconstruction of a wider and lower nasal aperture.

The patient shown in Figure 6 was born with a combination of teleorbitism, nasomaxillary dysplasia, and bilateral clefts of the lip. The
Clefts were closed at another institution. In this patient, we first corrected the hypertelorism. Five attempts to open the left nasal aperture, widen the ala, and improve the lip contour were only partially successful because of a shortage of skin in the left alar region. To solve this problem, a nasal expander was inserted. The excess skin thus produced made it possible to reconstruct an adequate alar fold. Three additional minor corrections were necessary to achieve the result shown in Figure 6, left.

The patient shown in Figure 7 was born with a series of facial malformations, including a coloboma of the left upper eyelid, nasal aplasia (half-nose), bilateral clefting of the lip, and eye and ear anomalies. Corrective procedures in this patient first focused on repair of the coloboma. Lip closure required leaving a small aperture on the right side of the lip, which opened into a rudimentary nasal passage. After an expander was implanted, an alar fold overlying the aperture was reconstructed by caudal transposition of excess skin, using the L-incision. Two secondary corrections led to the result shown in Figure 7, below, right.

The patient shown in Figure 8 was born with a combination of internasal dysplasia (Tessier 0 cleft) and alar retrusion. Access to the inner sanctuary of the nose was obtained through an upper buccal sulcus incision. Dissection revealed a transversely situated bar of bone that obliterated the nasal apertures and widened the columella. This bar was removed and the columella narrowed using intranasal transcutaneous stitches. The removed bone was used as a graft to raise the tip of the nose. Figure 8, right, shows that significant improvement can be obtained in some of these cases without the use of midline or marginal skin incisions.

The patient shown in Figure 9 was born with a massive teratoma in the midfacial area, which produced severe teleorbitism and separated the intact nasal halves. The teratoma was removed and the two facial halves approximated using a facial bipartition procedure. The skin cover of the right nasal half was killed and replaced with excess skin from the midline, leaving a marginal L-incision scar that, years later, has become inconspicuous.

The patient shown in Figure 10 was born with a combination of internasal dysplasia (Tessier 0) and left-side nasoschizis (Tessier I). The cleft in the patient’s left nostril was closed by transposing the nasal dorsum, using an L-incision. In a second stage, the scar was reopened, both nasal apertures were approximated, and the wide columella was remodeled. After these maneuvers, the L-flap was pulled laterally, thus covering and obliterating the midline depression. In retrospect, the result, shown in Figure 10, right, could perhaps have been obtained in one stage.

The patient shown in Figure 11 was born

![Fig. 3. Redistribution of nasal skin. (Above) L-incision. (Second row) Laterolateral transposition. (Third row) Latero-caudal transposition, with incorporation of an alar wing flap for columellar reconstruction. (Below) Cranio-caudal transposition, with incorporation of an alar wing flap for columellar reconstruction.](image-url)
with a combination of teleorbitism and bilateral clefting of the lip. When he was first seen, his lip was tight, short, and scarred. The columella was partially absent and the tip of his nose was flat and asymmetric. His lip deformity was repaired with an Abbé flap, and the columella was reconstructed in the following manner: the nasal dorsum was first undermined widely using an inferior rim incision. A small flap was then sculptured in the overriding skin of the right ala. The dorsal skin was pulled downward and the small flap rotated to form the columella. The resulting excess skin on the left side was trimmed.

The patient shown in Figure 14 was born with craniofrontal dysplasia. His teleorbitism was first corrected, but several attempts, including a bone graft, to lengthen his short nose failed. Expansion of the nasal dorsum was equally unsuccessful (Fig. 14, left), probably because of the midline scar. Wide undermining of skin and mucosa, followed by intraoperative sustained distraction, finally allowed for the insertion of a bone graft in the columellar region. The result shown in Figure 14, right, proved to be stable 1 year after the operation.

The patient shown in Figure 15 was born with a short nose. He was first seen after having undergone 10 abortive attempts to lengthen it. The columella was retruded and severely scarred. The dorsal skin was thick and had no laxity, and the nasal apertures were narrow. Insertion of a distractor was followed by daily turning of the piston, thus stretching the skin. Tissue was added to the columella by tunneling and transposing two buccal flaps. The distractor was removed 6 weeks later and replaced by

Fig. 4. A nasal skin distractor that consists of three parts: a cylinder that is fixed to the skeleton; a piston with a torque converter that is placed inside the cylinder; and a perforated bar (left). This bar is moved forward by turning of the torque (right).

Fig. 5. Patient with teleorbitism and alar retrusion. (Left) The condition shown with an expander in situ. (Center) Patient appearance after removal of the expander and lateral caudal transposition of excess skin that will be used for alar reconstruction. (Right) Postoperative result. In retrospect, the inferior part of the incision should have been longer to allow for greater rotation of the flap.
a bone graft, producing the result shown in Figure 15, right.

Fig. 7. Patient with a half-nose and bilateral clefting of the lip. (Above, left) Appearance after closure of the upper eyelid coloboma and left-sided lip cleft. (Above, right) Appearance after expansion of the nasal dorsum and closure of the remaining lip cleft. (Below, left) Excess skin transposed caudally using the L-approach and folded into the nostril overlying the aperture shown above, right. (Below, right) Postoperative appearance.

DISCUSSION

Nasal reconstruction, particularly in a young child, can involve a major surgical dilemma. On the one hand, there is a need to relieve the suffering of a patient for psychosocial reasons; on the other, there is always the fear of a less-than-optimal result.

This danger is quite real, because although surgeons have several techniques, ranging from distant to free and composite to lamellar grafts,\textsuperscript{10–14} at their disposal and can choose between a wide variety of donor sites, there are still several factors over which they have little or
no control; for example, skin color, which is dependent on the quality of the donor site; the visibility of nasal scars, which is related to their position and direction; and the stability of the nasal contour, which depends on the degree of growth retardation. All three factors are to some extent related to the severity of the nasal defect and to the magnitude of the reconstruction.

With major reconstructions, when total resurfacing is required and scarring can be minimalized by marginalization, decision making must take into consideration the growth retardation that is bound to occur. Definitive treatment, using donor sites with the best possible color match, is therefore best delayed until after the age of 10. Pittet and Montandon wisely advocate the use of alternative methods in younger children, to save possible donor sites for future definitive repair.

With minor reconstructions that involve alar, lobular, or columellar defects, growth retardation plays a less dominant role. In these patients, decision making is dictated by the color match of the reconstructed part and the quality of scars that will interfere with the integrity of the nasal dorsum. Disappointing results do occur, however, despite a rich reservoir of donor sites for both alar and columellar reconstruction. In terms of beauty, the skin of a young child is more vulnerable than the skin of a much older person. Different-colored patches of skin delineated by scars are difficult to conceal or to ignore.

Total resurfacing and marginalization of
scars as alternative has several disadvantages. The color match may be disappointing, and growth retardation that necessitates secondary correction after age 10, and preferably involving use of the forehead, cannot be excluded. Even more importantly, a considerable amount
of normal skin with superior color is killed. Many of the disadvantages of nasal reconstruction could be eliminated if this skin could be used to full advantage; if differences in color would cease to be a problem; if reconstruction would only leave a marginal scar in a natural fold and the integrity of the aesthetic areas would be respected; if elaborate transposition procedures involving the forehead or the cheek could be avoided; and finally, if the operation could be repeated without additional scarring, when growth retardation demands it. The Rieger flap, the axial frontonasal flap, and, possibly, the axial nasodorsal flap come close to this ideal.

Gubisch et al. have used the frontonasal flap for alar reconstruction, but the design of this flap does not respect the integrity of the aesthetic areas. However, the L-flap does. With this flap, the incision remains inside the alar rim but traverses the columella. It allows for maximal use of the nasal dorsum and allows the procedure to be repeated without causing additional scarring. This technique was first used for alar reconstruction, although not in its definitive form. Completion of the L-incision by transection of the columella, however, considerably extended the range of motion of the resulting flap and its range of applications.

Despite this advantage, use of the L-flap also raises new questions, first with regard to the treatment of alar dysplasia. Reconstruction has been relatively straightforward in unilateral cases, with only one case requiring a secondary procedure. If the amount of dorsal skin is clearly insufficient, preexpansion of the dorsum may be indicated. The question again is what strategy to follow in patients who have bilateral clefting. In the one such patient who was studied in our series, reconstruction was performed in two stages, producing additional scarring. Perhaps this could have been avoided with preexpansion.

The second potential problem involves the treatment of alar aplasia. In patients with this condition, the question is not how to produce sufficient skin, because preexpansion is clearly the only solution. The question is how to create a natural-looking fold that will conceal a blind pit or a rudimentary canal. Attempts to reconstruct an adequate airway have never been quite successful, and the need for such reconstruction is therefore questioned. Even in the bilateral cases in the study presented here, none of the four patients with a half nose who were treated by the first author had respiratory problems.

The third potential problem is related to the treatment of lobular dysplasia. In patients with minor or moderate bifidity, correction can be
achieved by the implantation of a skeletal support, using a buccal approach and thus avoiding external scarring. Preexpansion or intraoperative expansion could help create a larger intranasal space. In patients with moderate to severe bifidity, raising the L-flap exposes the domes of both nostrils, thus allowing for accurate approximation of the separated halves and for columellar sculpturing. Lateral traction of the L-flap reveals the excess of skin that should be resected. In this study, correction was obtained in patients with internasal dysplasia and unilateral clefting of the nostril (nasoschizis) by laterocaudal and laterolateral transposition of the L-flap. The question of how to solve the problem of nasal bifidity in combination with bilateral retraction of clefting of the nostrils still remains, however. Preexpansion seems to be a logical answer, but even with this tool, there may not be sufficient skin to allow reconstruction of both nostrils, forcing the surgeon to operate in two stages or more.

The fourth potential problem involves columellar aplasia. With this condition, the use of excess skin from the nasal dorsum is a logical consequence of the concept discussed in this article. Alar flaps have been used to lengthen a short columella in patients with bilateral clefting of the lip\(^2\) but never, it seems, for the reconstruction of this important anatomical structure. If used, however, the transposition of these flaps would produce an undesirable scar in the columellar midline. The use of one alar flap created in the lobular region after extensive undermining and downward traction of the nasal dorsum does not have this disadvantage. The decision to use this method was inspired by the article by Hirshowitz et al.,\(^3\) in which the authors reported their successful attempt to resurface part of the nasal tip and part of the columella by making use of the “creep” phenomenon.\(^4\) Our experience shows that it is possible to perform complete reconstruction of the columella in this manner in one or two stages. The question to be answered now is how much of the skin gain is a result of the extensive undermining of the nasal dorsum and how much is the result of “creep,” if any.

There is a fifth potential problem, which is related to the treatment of columellar retrusion. The idea to use a distractor for rapid frontal advancement of the columella was based on the concept that a certain amount of tissue gain can be achieved in a short period by the creep phenomenon. Recent studies have shown, however, that the tissue gain which is indeed observed may not be produced by the creep behavior of skin but by the extensive undermining of the tissue that is required for the insertion of adequate skeletal support.\(^4\) This is true, then a distractor is not useful for intraoperative sustained limited expansion. Prolonged distraction, however, is a different matter. In two of our patients, it certainly helped to lengthen the nose by advancement of the columella. However, it could not prevent secondary shortening of the nose in one of these patients because of atrophy of the bone graft.

In conclusion, we believe that the nasal dorsum offers a valuable donor site for the reconstruction of minor anomalies involving the ala, the lobulus, and the columella. The color match with this donor site is excellent and the resulting scar on the lateral aspect does not interfere with the integrity of the nasal skin cover, although long-term results will have to decide whether it is superior to scars of the dorsum. The merits of the “classic Rethi” incision are well known, and there is no need to violate the integrity of intact donor sites such as the forehead or cheek.

Further exploration of this strategy is intended to answer the questions that remain: in particular, those that concern the potentials of expansion and distraction. Expansion of the skin by inflation of an implant carries the risk of infection. Handled with care, however, this potential complication never caused us to choose alternative methods. Distraction of the skin is still under investigation. The distractor used in this study is not commercially available, pending the development of a more advanced model by one of the authors (J.M.V.).

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