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The hinged-door composite septal flap as structural support and lining of nasal reconstruction by a forehead flap*

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SUMMARY

In this paper we describe four patients who underwent extensive nasal surgery for carcinoma in the nasal vestibule. Two patients underwent salvage surgery after radiotherapy, whereas the other two patients were treated with primary surgery. In all cases the nasal defect was reconstructed using a composite hinged-door septal flap for structural support and internal lining combined with a paramedian forehead flap which supplied the skin coverage . All patients had a pleasing aesthetic and good functional result. The combination of a paramedian forehead flap with a composite hinged-door septal flap is an excellent reconstruction procedure for defects of the lateral nasal wall and alar region.

Key words: composite septal flap, nasal lining, nasal reconstruction, paramedian forehead flap, vestibular defects

INTRODUCTION

When surgery needs to be performed for squamous cell carcinoma of the nose or nasal vestibular skin, often extensive parts of the nose need to be resected to obtain a clear margin. The paramedian forehead flap is especially suitable for reconstruction of large defects of the nose, as the characteristics of the skin of the forehead, such as thickness, texture and color, match excellently those of the skin of the nose. Moreover, forehead flaps do not transpose hair-bearing skin to the midface and have no effect on the mimetic musculature of the face (Barton and Byrd, 1990; Alfort et al., 1995). Apart from excellent skin characteristics, the paramedian forehead flap is highly vascular which makes it well suited for the incorporation of cartilage or tissue grafts, which act as support or lining structures (Burget and Menick, 1989).

The goal of reconstruction is both a pleasing aesthetic and functional result. Many techniques have been described to reconstruct supporting tissue, i.e., cartilage and bone, and mucosal lining. One of the main problems of reconstruction after major oncologic resections in which the lateral nasal wall is involved is malfunction of the nasal valve. This functional disorder may be prevented when adequate support and lining are provided during reconstructive surgery (Robinson and Burget, 1990). When structural support of the lower two-thirds of the lateral nasal wall is needed, septal or conchal cartilage grafts are best used. Internal lining defects may best be resurfaced with pedicled mucosal flaps of the nasal interior (Baker, 1998).

To achieve adequate skin replacement with both structural support and internal lining in nasal reconstruction a composite hinged-door septal flap was combined with a paramedian forehead flap. We present our experience with this reconstruction procedure in 4 patients who underwent extensive nasal resection for carcinoma in the nasal vestibule.

MATERIAL AND METHODS

Subjects

Between 1995 and 1997, 4 patients with carcinoma in the nasal vestibule were surgically treated using a paramedian forehead flap in combination with a composite hinged-door septal flap for reconstruction of the defect. All patients were male. The age ranged from 63 to 78 years (mean age 72). Three patients had a primary squamous cell carcinoma of the nasal vestibule and were staged according to the Wang classification (Wang, 1976). One of these patients (no. 1) who was staged as T1N0, developed a recurrence 6 months after initial irradiation (5250 cGy + 1600 cGy low dose rate endocavitary brachytherapy) and received salvage surgery. The two other patients underwent primary surgical treatment and were staged as T2N0 (no. 3) and T3N1 (no. 4) respectively. The remaining patient (no. 2) had a primary squamous cell carcinoma of the skin on the right side of the nose staged as T1N0. After initial irradiation of the lesion

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Figure 1a. Intraoperative photograph of patient no. 1 showing the defect and the composite septal flap. On the forehead the paramedian forehead flap is outlined.

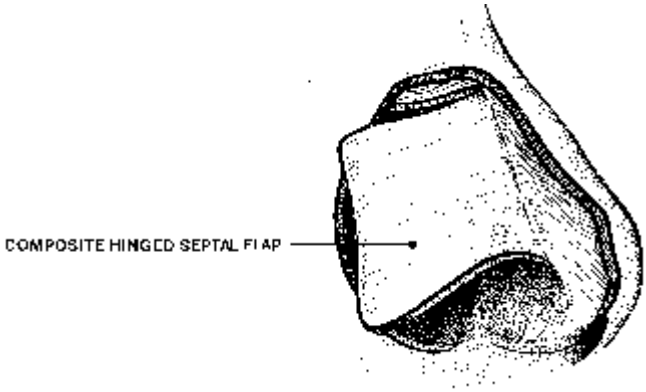

Figure 1b. Drawing of the composite septal flap rotated laterally in a hinged-door fashion leaving its base attached to the nasal dorsum.

(5000 cGy) this patient developed a recurrence in his nasal vestibule 5 months later and was surgically salvaged. In all patients the surgery involved total resection of the lateral nasal wall including the alar region.

Surgical technique

Approximately two weeks after resection, when tumor free margins are reported, the reconstructive procedure is performed using a hinged-door composite septal flap (Figure 1a, b) which was laterally covered by an ipsilateral paramedian forehead flap. Before paramedian forehead flap inset a hinged-door composite nasal septum flap is prepared. A through and through U-shaped incision is made in the nasal septum leaving the flap attached to the nasal dorsum. The size of the flap is adjusted to the amount of lateral support needed for the paramedian forehead flap. Care is taken that the caudal part of the septum is left intact to provide nasal tip support.The composite septal flap is transposed in a hinged door fashion, leaving its vascular supply intact at the nasal dorsum where it receives branches from the ethmoidal arteries. The ipsilateral mucosa is removed before suturing the septal flap into the defect (Figure 2). The contralateral mucosa of the flap is sutured to the mucosa of the defect (Figure 3a, b). A three-dimensional template exactly mimicking the area of the defect is fashioned from a suture pack. This template is used to outline the flap design on the ipsilateral forehead skin. The length of the flap is determined, measuring the distance between a central point at the base of the flap pedicle and the most distal part of the nasal defect. This length including the template is outlined on the forehead. The base of the pedicle was traced approximately 1.5 cm wide to allow for maximal axial rotation without strangulation. The flap is elevated in a subfascial plane from superior to inferior, except for the most proximal part were the flap is elevated in a subperiostal fashion to protect the vascular supply. After adequate flap mobilisation has been accomplished the flap is rotated about its pivot point in a coronal plane and then sculptured to fit the defect. Donor site closure is accomplished by extensive undermining of the forehead skin in the subfascial plane to both the anterior borders of the temporal muscle. When necessary bilateral galear releasing incisions are made. Primary or near primary closure of the donor defect could be performed in all cases. In 3 of the 4

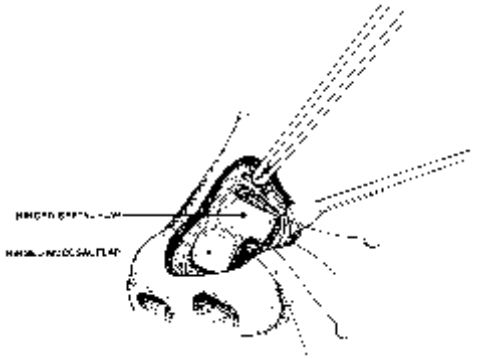

Figure 2. The ipsilateral mucosa of the septal flap is removed before the flap is sutured in the defect. When needed this mucosal flap can also be used in a hinged-door fashion to provide internal lining of the neonasal vestibule.

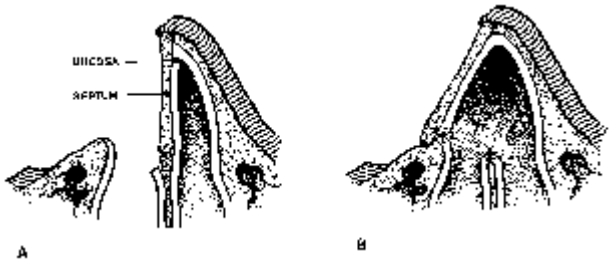

Figure 3a, b. Drawing of the lateral rotation of the hinged-door septal flap in the nasal defect. The contralateral mucosa of the septal flap is sutured to the mucosa edge of the defect.

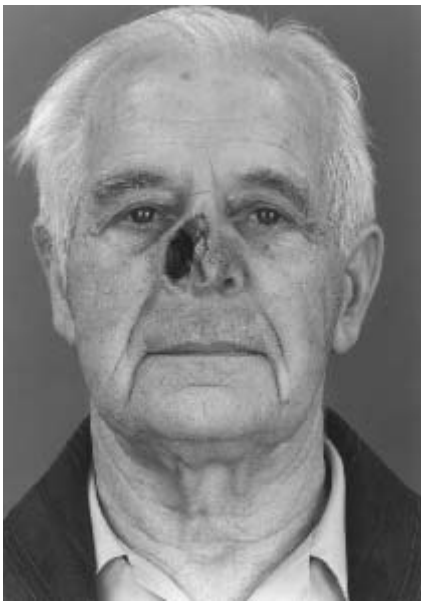

Figure 4a

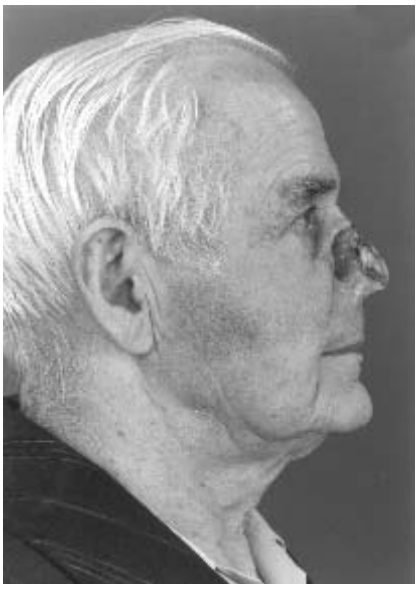

Figure 4b

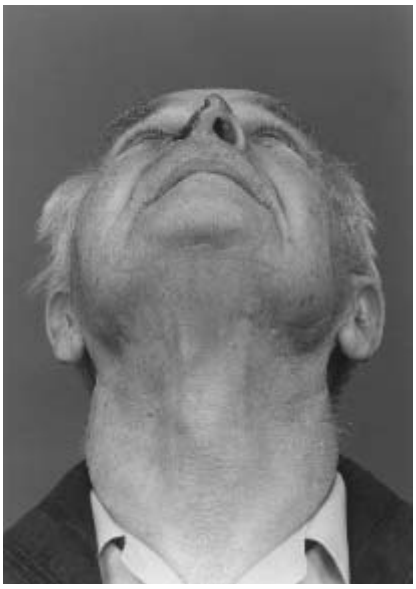

Figure 4c

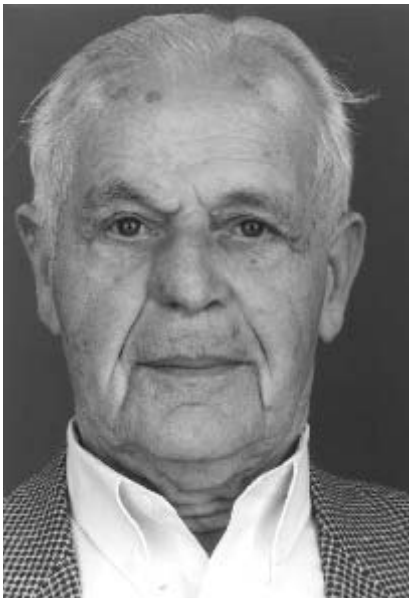

Figure 4a

Figure 4b

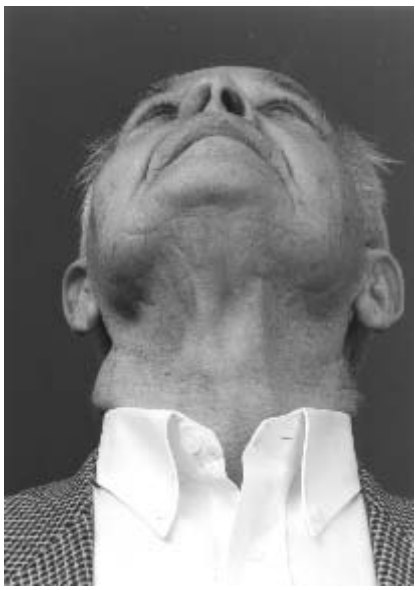

Figure 4c

Figure 4a, b, c. Frontal, lateral and, basal view of the nasal defect of patient no. 1, two weeks after resection (top) and 2 years after surgery (bottom). The patient was pleased with the result in terms of functionality and cosmesis.
Note the inconspicuously healed donorsite of the forehead flap.

patients a sculptured free auricular cartilage graft was incorporated in a pocket made by folding the distal part of the flap to provide contour and inspiratory support of the neo nostril margin. After the procedure had been completed the nasal cavity was packed during 1 week with a paraffin gauze. Pedicle separation and closure of the glabellar defect was performed 3 weeks after flap transfer since peripheral ingrowth of bloodvessels is considered sufficient at that moment, even in irradiated patients.

RESULTS

All patients had a good functional result meaning that none of the patients had complaints of nasal obstruction or nasal discharge after wound healing. Moreover, all patients were content with the aesthetic result (Figure 4a, b, c). Despite the fact that all patients had a large septal perforation none complaint about nasal turbulence or crustae on the perforation edges. No revision surgery was needed in any patient. Patient characteristics are summarized in Table 1.

DISCUSSION

Nasal reconstruction after oncologic resection should not only be focused on aesthetics but also on optimal nasal function. To obtain maximal aesthetic and functional result the subunit principle of nasal reconstruction combined with the concept that missing tissues have to be replaced should be used (Burget and Menick, 1989; Burget and Menick, 1984). When multiple subunits of the nose are lost, i.e., the laterodorsal part and the alar region, the preferred skin replacement procedure is an ipsilater-

Table 1. Individual patient characteristics.

Patient / sex	Age (years)	Stage	Primary RT# (cGy)	Primary surgery	Interval after RT before salvage surgery (months)	Auricular cartilage (yes/no)	Functional/ aesthetic result	Follow-up (months)
1; male	76	T1N0	5250 (+1600)[$]	-	6	yes	good	24, free of recurrence
2; male	78	T1N0	5000	-	5	no	good	12, dead of local recurrence under chemotherapy
3; male	70	T2N0	-	yes	-	yes	good	18, dead of lung metastasis during chemotherapy
4; male	63	T3N1	-	yes	-	yes	good	23, dead of lung metastasis

($) patient 1 recieved additional brachytherapy of 1600 cGy

(#) RT; radiotherapy

al paramedian forehead flap (Shumrick et al., 1999; Burget, 1999). The paramedian forehead flap was introduced in 1990 as an alternative for the median forehead flap which was, due to its relatively short length, not always suitable for large and distally located nasal defects. The paramedian forehead flap had a narrower base resulting in a greater freedom of rotation and greater effective length (Menick, 1990). Moreover, it is also a highly vascular flap as a result of numerous connections of the supratrochlear artery with other arteries, which makes the incorporation of bone, cartilage or mucoperichondrium transplants possible (Manghold et al., 1980).

Except for skin coverage structural support and adequate lining are equally important in nasal reconstruction. In the presented patients we used a composite nasal septum flap for lateral support and internal lining. This hinged-door septal flap was first described by DeQuervain in 1902 (DeQuervain, 1902). The inside lining tissue of the reconstructed lateral nasal wall is formed by the contralateral mucoperichondrium of the nasal septum. The ipsilateral mucosa of the septal flap is removed before suturing the septum flap to the paramedian forehead flap. It should be noted, that when needed, this mucoperichondrium can also be used as second hinged-door flap providing lining tissue for the lower nasal vestibule or nasal dome (Figure 2a) (Baker, 1998). Except for this hinged-door technique many other procedures of internal nasal lining and support have been described (Burget and Menick, 1989). Ideally lining should be thin, pliable and well vascularized to feed its underlying cartilage or bone grafts. Moreover it should not distort the external shape of the nose nor compromise the airway. When nasal reconstruction for full thickness defects of the lateral nasal wall has been performed various undesirable sequelae can occur. Functionally, nasal obstruction is the most frequent problem and may be due to alar notching, stenosis of the external nares, inadequate release of a mucosal lining flap, internal bulging of a mucosal lining flap or cartilage support flap and turbulent nasal airflow due to the iatrogenic septal perforation or reactive turbinate hypertrophy. Cosmetically, a flattened ala due to an undersized cover flap or inadequate support from the nasal interior, a malpositioned alar base due to unavailability of an alar remnant for reference, and unsatisfying scars are the most frequently encountered problems. Treatment of these problems has to be focused on the underlying problem.

CONCLUSION

In cases of nasal reconstruction after extensive oncological resection there is great need for reliable tissue transfer for internal lining and support. As is shown in the herein presented patients, the composite hinged-door nasal septal flap provides these qualities when applied in lateral nasal wall and nasal vestibular reconstruction. In addition, the paramedian forehead flap provides excellent skin coverage for these defects.

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