Surgical treatment of non-melanoma skin cancer of the head and neck: expanding reconstructive options

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Chapter 7

Reconstruction of nasal sidewall defects after excision of non-melanoma skin cancer

Analysis of uncovered subcutaneous hinge flaps allowed to heal by secondary intention

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ABSTRACT

Objective
To describe the experience of a single department using uncovered subcutaneous hinge flaps to repair the nasal portion and adjacent facial subunits of defects following skin tumor excision.

Design
Case series of 16 patients needing reconstruction for lesions of the alar subunit with one or more adjacent facial subunits following Mohs surgery for cutaneous neoplasms.

Results
All flaps healed well by secondary intention, while the results were gauged as at least satisfactory by the patients and surgeons. In four patients there were minor aesthetic concerns: in one patient the underlying cartilage graft was prominent and a minor revision was undertaken, one patient had effacement of the nasofacial sulcus, one patient developed a hypertrophic scar and one patient developed both effacement of the nasofacial sulcus and a scar.

Conclusions
The use of subcutaneous hinge flaps allowed to heal by secondary intention is an alternative, simple one-stage technique that may be useful in reconstruction of small but deep nasal sidewall defects.
INTRODUCTION
Reconstruction of defects involving the lateral nasal sidewall, medial part of the cheek, nasal alar subunit and upper lip areas poses particular problems. This area has complex anatomical relationships, with a number of different facial subunits meeting in a small area. Each unit has different characteristics of contour, soft tissue thickness, skin color and texture. There may also be a natural sharp change in contour where these areas meet. If a defect occupies more than one of these subunits it is preferable to reconstruct each area separately so that reconstructive flaps or grafts do not span or disrupt important anatomical and aesthetic landmarks such as the supra-alar groove, nasofacial sulcus or melolabial crease. Because of the superficial nature of the nasal cartilages in this region, additional cartilage grafting may be needed to replace any local cartilage resected to ensure tumor margin clearance. In addition, it is wise always to place additional non-anatomic cartilage grafts to support the repair because without these there may be postoperative compromise to the nasal valve area or retraction of the alar rim. ¹² Cartilage may also be valuable for replacing tissue bulk in deep wounds. This limits the possibilities of skin grafting because vascularized tissue is required to cover the cartilage.

When a single defect encompasses more than one of the anatomic facial subunits, the reconstruction may need to include tissue to fill a small defect of one of the subunits. The value of subcutaneous hinge flaps in the reconstruction of the nasal portion of such defects have been described and reviewed by Johnson et al.³ and by Baker.⁴ They recommend repairing the nasal portion of the defect by using a fat flap (and if necessary fat/muscle composite) from the medial part of the cheek. These flaps, which are hinged in the area of the nasofacial sulcus, allow filling of the deep soft-tissue defects often found after Mohs excisions in this region. The technique also allows free conchal cartilage grafting to provide support if necessary. The cheek portion of the defect is then addressed separately using a cheek advancement flap. According to Baker,⁴ the skin from the Burow triangles needed to allow the cheek advancement may be used as full-thickness skin grafts (FTSG) to cover the fat flap. In his discussion, Baker suggests that such subcutaneous fat hinge flaps might be amenable to healing by secondary intention should no skin be available to cover them. However, the two published series reporting the use of this technique both utilized FTSG to cover the hinge flaps.³⁵

We analyzed a series of 16 patients in whom reconstruction of Mohs surgery defects in the nasal area was successfully performed with a subcutaneous hinge flap, leaving it uncovered and allowing cutaneous healing to occur by secondary intention as suggested by Baker.⁴

METHODS
This study involves nine women and seven men (median age, 68 years; range 44-79 years) with resection of non-melanoma skin cancer. (Table) The resulting defects all involved a portion of a subunit of the nose (sidewall or alar areas). Some involved the medial part of the cheek and, in addition, a portion of the top lip unit (Figure 1). The nasal defects were all relatively small (10-20mm) but were often deep, although not involving nasal lining. Reconstruction was
Table. Patient and wound characteristics. *

<table>
<thead>
<tr>
<th>Pat. No.</th>
<th>Sex, age</th>
<th>Tumor</th>
<th>Prim./Recur.</th>
<th>% of wound in each facial unit</th>
<th>Cheek advancement</th>
<th>Follow-up mo.</th>
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<tr>
<td></td>
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<td>Medial cheek</td>
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* All patients underwent autogenous cartilage grafting.

BCC = basal cell carcinoma; SCC = squamous cell carcinoma
undertaken in a modular fashion, addressing each subunit individually. Typically, all nasal defects were reconstructed with an uncovered subcutaneous hinge flap, and the cheek defect repaired with a medial cheek advancement flap.

The size and depth of the nasal defect were first assessed (Figure 2A). Autogenous free ear cartilage grafting was undertaken to replace any resected cartilage and to give support in a nonanatomic fashion for the alar rim and nasal valve (Figure 2B, arrows). A skin incision made lateral to the defect in the melolabial crease allows undermining of the cheek to raise a skin flap. (Figure 2C) The subcutaneous tissue was exposed and a hinge flap was marked out lateral to the defect. The subcutaneous fat flap was raised from lateral to medial, leaving the pedicle intact in the nasofacial sulcus area on which the flap was hinged into the deep nasal defect, similar to turning over a page in a book (Figure 2D). The flap was raised at a depth estimated to fill most of the resulting nasal defect after the cartilage grafting, while leaving an adequate pedicle thickness for vascular supply. The skin surrounding the original defect is undermined to allow the fat flap to be tucked in under the margin on all sides. A number of absorbable tacking sutures was placed between the surrounding skin of the nose and the superficial surface of the fat flap to help smooth the contour between these areas and avoid any depressions following re-epithelialization. Subsequently, the cheek skin was advanced medially in the standard manner to specifically repair the cheek portion of the wound. (Figure 2E) Up to this point, part of the bare fat flap had been covered with the cheek flap as well. Care was taken when anchoring the cheek flap at the nasofacial groove area not to compromise the vascularity of the hinge flap’s pedicle. The subcutaneous tissue flap was dressed with fusidic acid ointment and allowed to heal by secondary intention. Figures 2F, 2G, and 2H show the postoperative appearance.

We illustrate the technique with two typical cases:

CASE 1
A 54-year-old male (patient three in the Table) presented with a recurrent basal cell carcinoma of the left side of the nose. Mohs excision was undertaken to ensure full tumor clearance. Of the resulting defect, 20% involved the nasal alar subunit, leaving the alar rim intact at a height of 3 to 4 mm (this was 40% of the alar subunit), 50% involved the nasal side wall, and the remaining 30% involved the medial part of the cheek (Figure 2). Reconstruction was undertaken with the use of autogenous conchal cartilage covered by a subcutaneous hinge flap. The cheek defect
Figure 2. Reconstruction of the nasal defect in patient 3. A, Original defect, mainly of the nasal side wall. B, Two pieces of autogenous cartilage (arrows) are placed in the defect to give support, in a nonanatomic fashion, to the alar rim and nasal valve. C, A skin incision is made in the nasofacial groove above and in the melolabial crease below the defect. D, The subcutaneous hinge flap. E, Subcutaneous hinge flap is in position and the remaining defect can be left to secondary intention healing. F, Postoperatively, the cheek skin extends onto the nasal sidewall, with some minor effacement of the nasofacial groove. G and H, additional postoperative views.
was repaired with a cheek advancement flap, and the exposed fat flap allowed healing by secondary intention. Full epithelialization was seen at four weeks. The patient was entirely satisfied with the cosmetic effect of the repair and defaulted from follow-up after 17 months.

CASE 2
A 44-year-old healthy man (patient four in the Table and Figure 3) presented with a primary basal cell carcinoma of the left side of the nose. After Mohs excision, 80% of the defect involved the alar subunit and 20% involved the lateral nasal wall. The depth of the defect was approximately 3 to 4 mm. Because the defect was less than 5 mm from the free alar margin, an autogenous cartilage graft was taken from the cymba conchae and positioned in the alar subunit while filling the defect. In this way, contraction of the alar rim is prevented and a good contour of the ala was achieved. The cartilage was covered with a subcutaneous hinge flap and left to heal by secondary intention. To preserve the supraalar groove, no cheek advancement was used. The patient and physician were satisfied with the result after seven months. There was still some redness of the scar, but this will improve over time.

Figure 3. Aesthetic result of reconstruction of a lesion mainly on the alar subunit in patient 4.
RESULTS
In all 16 cases there was successful reepithelialization by secondary intention. This was normally complete by four to six weeks. Both patient and physicians assessed the results as either good or satisfactory. Follow-up in these patients ranges from five months to 65 months, with a mean of 20 months.

A suboptimal cosmetic result was seen in patient 12 (Figure 4). A 63-year-old diabetic woman presented with a primary basal cell carcinoma of the lateral part of the nose. After Mohs excision, 80% of the defect was on the nasal sidewall, 10% on the medial cheek and 10% on the alar subunit. Reconstruction involved only autogenous cartilage grafting and subcutaneous fat hinge flap. The adjacent cheek skin was elevated only to allow the hinge flap to be raised. The cheek skin was then replaced in the same position. Healing by secondary intention was allowed. At 13 months of follow-up, the patient still had a hypertrophic scar. Although the result was considered good, some degree of dissatisfaction remained because of the scar formation.

In total, four patients had minor cosmetic problems. In one patient (from early in the series) the underlying cartilage graft was prominent because of overretraction, and a minor revision was undertaken. One patient had obvious effacement of the nasofacial sulcus, possibly due to placement of cheek tissue onto the nasal side wall. One patient developed a hypertrophic scar (Figure 4B) and one patient had effacement and hypertrophic scar formation together (Figure 5; patient 14). In the latter patient, cheek tissue that was brought medially contributed to the effacement of the nasofacial sulcus. None of these patients considered revision at last follow-up.

DISCUSSION
Reconstruction of defects in the region of the supra-alar groove poses particular problems. Various aesthetic units and subunits are contiguous in this area, and the contours of the tissues change abruptly between them. Reconstructions involving single pieces of tissues spanning these borders can efface the natural sulci and look both unnatural and unaesthetic. Consequently, it has become common practice to reconstruct defects spanning such boundaries in a modular fashion, addressing that portion of the defect in each aesthetic unit separately. This maintains the natural sulci and allows camouflage of suture lines in the natural borders of light and shade seen between different units and subunits. Generally this makes for a more pleasing cosmetic end result.

In lesions of the lower and lateral parts of the nose, a single defect may encroach on more than one subunit and so require a number of reconstructive techniques to be undertaken in a small anatomic area. These defects are also quite deep. In addition to the surface covering, it is vital to consider the structure and function of the underlying cartilage, which may be very superficial and may be involved with the resection. As well as playing a part in the contour of the nasal tip, the cartilage gives structural support to the nasal valve, and provides structure to the nasal alar margin in order to resist retraction. The necessity of nonanatomic cartilage grafting in reconstructions of this area has been well documented previously.

The need of free cartilage grafts in this area excludes
Figure 4. Result of reconstruction of a large lesion in diabetic patient (patient 12). A, preoperative view of the lesion. B and C, postoperatively, a hypertrophic scar developed.

Figure 5. Effacement of the nasofacial groove and hypertrophic scar formation in patient 14.
the use of free skin grafts alone and necessitates the use of a vascularized cartilage covering.

A lesion of the nasal alar subunit can be traditionally reconstructed by means of a melolabial flap. This can be accomplished as either an interpolated or a transposition flap. An interpolated melolabial flap will be wide enough to replace alar tissue alone and would not be of use in situations where there is a concomitant nasal sidewall or cheek defect. In addition, where lesions extend into the cheek, an interpolated melolabial flap may be impossible as its pedicle will be disrupted by the cheek advancement flap necessary to reconstruct the cheek portion of the defect. A second-stage procedure is necessary to divide the flap’s pedicle if an interpolated flap is used. In contrast, if a melolabial flap is used as a local transposition flap, no second stage is necessary and a larger area of tissue can be reconstructed, but this technique may blunt the naso-facial sulcus and the result may be unaesthetic. Another possibility for larger defects of the alar area might be a forehead flap. This procedure requires the use of at least two stages and will result in a forehead scar. Many patients and surgeons believe that this technique may cause unnecessary morbidity for the repair of a defect often measuring 10-20 mm in diameter.

Subcutaneous hinge flaps were described by Baker4 more than ten years ago, but literature regarding them is sparse. They are proposed to be a useful option where there is a small but also deep lesion of the lower or lateral part of the nose in conjunction with a contiguous cheek defect. The subcutaneous hinge flap is used to repair the nasal portion of the defect, and cheek advancement is easily performed to address the cheek portion. It has been suggested that the hinge flaps may be either covered with full-thickness skin grafts or left open to heal by secondary intention. Two series have been published previously showing good results with the subcutaneous flaps covering units of defects with skin grafts.3,5

In our series of 16 cases reconstructed with uncovered subcutaneous hinged fat flaps, the areas healed well by secondary intention in all patients. There were no cases of infection or flap failure. Most of the patients were satisfied with the end cosmetic effect of their treatment while only one needed revision surgery. However, three types of aesthetic problems were delineated. To prevent effacement of the naso-facial groove, it is important to take the cheek advancement up to, but not over, the naso-facial groove area. Furthermore, the risk of effacement is decreased if the pedicle is not too thick and the hinge point is placed medially enough. To prevent hypertrophic scarring, reconstruction of a large defect may be facilitated by the combination of the subcutaneous hinge flap and a skin graft. Obviously, cartilage grafts need to be placed meticulously to prevent visible edges.

Our results indicate that the technique of uncovered subcutaneous hinge flaps is a simple, useful one-stage method of reconstructing small but deep defects involving the lower part of the nose and medial cheek area.
References