

Evaluation of the Median Forehead Flap and the Nasolabial Flap in Nasal Reconstruction

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Abstract. Basal cell carcinoma, which accounts for 70%–80% of all cutaneous malignancies in the United States, has increased recently in Japan. We compared methods for reconstruction after surgery for basal cell carcinoma, which is expected to increase further in the future. Thus patients who underwent reconstruction after surgery for basal cell carcinoma of the nose using medial forehead flaps and nasolabial flaps were selected, and the effectiveness of these flaps was compared by taking the size and location of the tissue defect into consideration. As a result, possibly because of anatomical and histological differences of the face between Caucasians and Asians, better results were obtained with nasolabial flaps than with median forehead flaps.

Key words: Nasal reconstruction—Flap—A scoring system

Since the nose is located in the center of the face and is more prominent than other structures of the face, it plays an important role in providing characteristic features to the face. For this reason, nose reconstruction is not considered to have accomplished its goal unless it is reconstructed in harmony with the entire face.

Recently, a number of reports have appeared on reconstruction of the nose, especially its tip [2,8]. However, no detailed comparisons of reconstruction methods have been made according to the location or the size of the tissue defect.

In this study, we selected patients who underwent reconstruction of tissue defects resulting from surgery of

basal cell carcinoma of the nose using median forehead flaps (M-flaps) or nasolabial flaps (N-flaps), which are common techniques for nose reconstruction. The effectiveness of these flaps was evaluated, especially taking into consideration the location and size of the tissue defect.

Materials and Methods

The subjects were 22 patients (12 males and 10 females) with basal cell carcinoma of the nose. The tumor occurred in the nasal base in two patients, nasal dorsum in seven, nasal tip in four, and nasal alae in nine. Resection was carried out 5 mm from the margin of the tumor to the surface of the periosteum or the perichondrium. In some patients, resection included the cartilage. The size of the resection area 5 mm wider than the margin of the tumor was measured as the size of the tissue defect resulting from surgery. Reconstruction was performed with an M- or N-flap. The appropriate flap was determined on the basis of the experience of the surgeon. Photographs of the reconstruction were taken at least 6 months after operation.

For evaluation, (1) the color match, (2) nasal morphology, (3) texture feeling of the nose, (4) pigmentation, and (5) donor scar were assessed by a scoring system of excellent = 4, good = 3, fair = 2, and poor = 1. Table 1 summarizes the scores according to the reconstruction site. The sum of the scores of the above five items (total score) was expressed as excellent (20–18), very good (17–15), adequate (14–11), suboptimal (10–8), or poor (7–5) (Table 2). Two-stage nasolabial flap operation was performed in one patient, but the N-flaps used in 12 other patients and the M-flaps used in nine patients were subcutaneous pedicle flaps. All 22 patients had uneventful courses without recurrence.

Table 1. Analysis of reconstructive methods (mean)

Location	Flap	Cases	Defects (mm ²)	Color	Morphology	Texture	Pigmentation	Donor	Total
Base	M	2	450	3.0	1.5	2.5	2.5	2.5	12.0
	N	0	—	—	—	—	—	—	—
Dorsum	M	4	769	3.0	2.5	2.8	2.8	2.3	13.4
	N	3	1228	3.0	2.3	2.7	3.0	2.7	13.7
Tip	M	2	344	4.0	4.0	3.5	1.5	3.0	16.0
	N	2	298	4.0	4.0	3.5	3.5	4.0	19.0
Ala	M	1	600	3.0	2.0	2.0	3.0	2.0	12.0
	N	8	472	3.5	2.3	3.1	3.3	2.8	15.0
Mean	M		604	3.2	2.6	2.8	2.2	2.4	13.2
	N		571	3.5	2.5	3.1	3.2	2.9	15.2

Abbreviations: M = median forehead flap; N = nasolabial flap.

Note: Score: 4 = excellent; 3 = good; 2 = fair; 1 = poor.

Table 2. Evaluations of flaps (cases)

Total score	Median forehead flap		Nasolabial flap	
	Males	Females	Males	Females
Excellent (20–18)	0	0	2	1
Very Good (17–15)	1	1	4	1
Adequate (14–11)	3	2	1	3
Suboptimal (10–8)	1	1	0	1
Poor (7–5)	0	0	0	0

Results

The mean size of the tissue defects was 900 mm² in the dorsum, 486 mm² in the alae, 450 mm² in the base, and 321 mm² in the tip. The area of tissue defects was larger in the dorsum and smaller in the tip.

Concerning the relationship between the location and method of reconstruction, the base was reconstructed with an M-flap alone, and the score for the nasal morphology was markedly low. In the nasal dorsum, the score was slightly higher in patients who underwent reconstruction of large tissue defects with N-flaps than for those who underwent reconstruction with M-flaps. In the tip, the score was lower in patients who underwent reconstruction of large tissue defects using M-flaps. The score for pigmentation was markedly low. In the alae, the score was low in all five items in patients who underwent reconstruction of large tissue defects using M-flaps. In this study, the score was highest in patients who underwent tip reconstruction using N-flaps (Fig. 1) and lowest in those who underwent base and alar reconstruction using M-flaps.

The mean size of the tissue defects reconstructed using M-flaps and N-flaps was 604 mm² and 571 mm², respectively, showing no marked difference, but the scores of four of the five items were higher in patients who underwent reconstruction using N-flaps.

In the 22 patients, the total score of five items was better in patients who underwent reconstruction using N-flaps. It was not different between males and females who underwent reconstruction using N-flaps, but the results were better, especially in those males who underwent reconstruction using N-flaps.

In addition, the size of the tissue defect and the score were compared in nine patients who underwent reconstruction using M-flaps. The mean score of five patients in whom the defects were 400 mm² or smaller (mean 353 mm²) was 15, but in that of four patients in whom defects were 600 mm² or larger (mean 915 mm²) was 11.5. The mean score of donor scar was 2.8 in the former group and 2.0 in the latter group, with a clear difference.

Discussion

The shape of the nose is different between Caucasians and Asians; it is generally lower and wider in Orientals than in Caucasians. Differences in not only the nasal morphology but also in the national sentiments, medical system, number of patients, and problem of scarring lead to differences in the therapeutic approach.

In Japan, Mohs' chemosurgery [9] or curettage-electrodesiccation [6] is not a common treatment for basal cell carcinoma [10].

Since the therapeutic results of basal cell carcinoma are not widely different among treatments [4,6], we usually select surgical treatments. The area of resection has been reported to be 5–10 mm from the margin of the tumor [3] or 4 mm from the margin if the border of the lesion is grossly clear [12]. Our area of resection is 5 mm from the margin. Concerning the depth of resection, we resect the tumor en bloc with muscles and confirm complete resection by frozen section histology. We have not experienced recurrence probably for this reason.

The subcutaneous pedicle skin flap as a reconstruction technique is considered to date back to 1887 [1]. Thereafter, the median forehead flap with supratrochlear vessels as the vascular pedicle was reported in 1946 [7], and

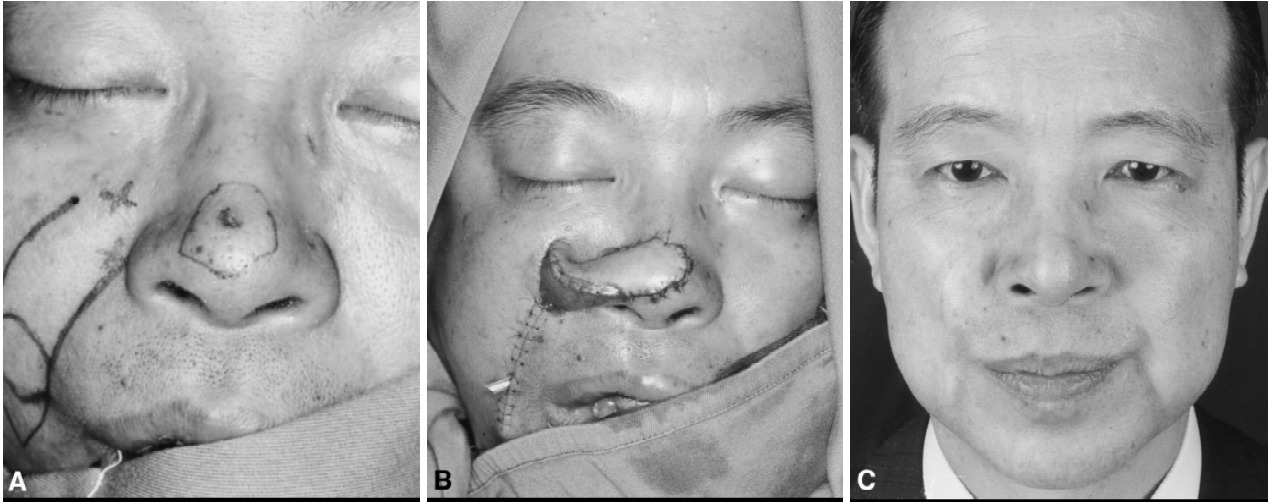


Fig. 1. Excellent case. Tissue defect was 400 mm². Two-stage nasolabial flap is selected.

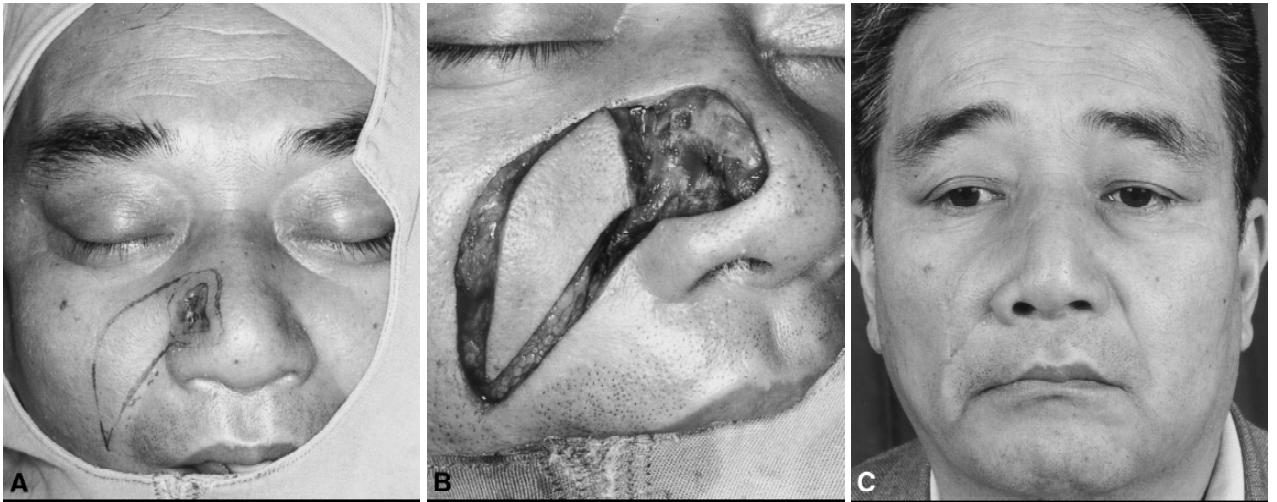


Fig. 2. Very good case. Tissue defect was 650 mm². Sliding nasolabial island flap is selected.

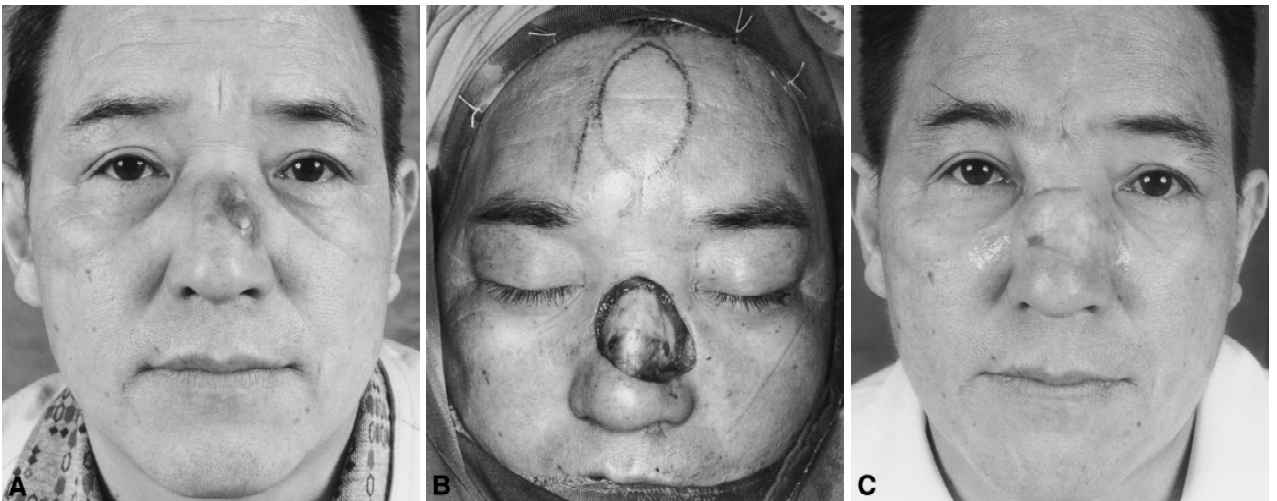


Fig. 3. Suboptimal case. Tissue defect was 1350 mm². Median forehead flap is selected.

the island flap was reported as its variation [5]. The median forehead flap (M-flap) and nasolabial flap (N-flap) have since been developed as typical subcutaneous pedicle skin flaps.

In this study, the merits of these flaps in nasal reconstruction were evaluated by taking the size of the tissue defects into consideration.

Only M-flaps were used for reconstruction of the base of the nose, but the score especially of the nasal morphology was low, and the results were unsatisfactory in some patients. These results are considered to be related to the nasal morphology of Asians. Since the nose of an Asian is wide-based and low, the subcutaneous pedicle of the M-flap appeared as a bulk and gave an unfavorable impression.

In the nasal dorsum, reconstruction of large-tissue defects was needed so that wide flaps were necessary when M-flaps were used. For this reason, healing of the donor scar was unsatisfactory, leaving relatively noticeable scars. N-flaps were used in patients with even larger-tissue defects. Since the skin of the nasal dorsum is thin and highly mobile, the curvature of this region could not be reproduced well, resulting in a slightly lower score in nasal morphology (Fig. 2); however, the score was better after reconstruction of large-tissue defects with N-flaps than after reconstruction of smaller defects with M-flaps. This suggests that M-flaps are acceptable in reconstruction of the nasal dorsum if the tissue defect is small, and closing of the donor site in the forehead can be readily accomplished. However, reconstruction of considerably large-tissue defects are expected to be needed in many patients so that N-flaps are more likely to be selected.

Good results were obtained in the nasal tip, presumably because the area of the tissue defects was small. However, partial superficial necrosis was observed only in patients who underwent reconstruction using M-flaps, and, consequently, the score for pigmentation was low. However, this is a problem of skill and is expected to be easily overcome. The results were satisfactory with regard to other items. Klingensmith et al. (8) observed that the M-flap is the first choice for defects greater than 2 cm and reported excellent results. None of our patients had defects 400 mm² or greater in the tip of the nose, so that comparison was impossible, but we do not expect similar results in Asian patients. In our patients with defects in the tip of the nose, the best results were obtained in a male treated with two-stage nasolabial flap grafting. Although secondary separation of the flap is needed, it is considered to be a good method in cooperative patients.

In reconstruction of the alae of the nose, reproducing a natural curvature of the ala without flattening it and restoring balance with the opposite ala are points of caution. For this purpose, N-flaps are considered to be advantageous to M-flaps. Although the score for the nasal morphology was low due to chondrectomy necessitated in many patients, average scores were obtained in the other four items.

In Europe and America, N-flaps, which contain bearded skin, are considered to be generally undesirable

for males because of the dense beard. Also, M-flaps are considered to be undesirable for individuals, especially females, with a low hairline. According to our results, however, better outcomes were obtained in males who underwent reconstruction using N-flaps. No difference was observed in the outcome between males and females when M-flaps were used. This may be ascribed to anatomical and histological differences of the face between Caucasians and Orientals. For example, a donor site for the M-flap in the median forehead up to a width of 4 cm is reported to be closed by suturing [11]. However, in our patients, healing of the donor site was cosmetically unsatisfactory after lifting of a flap 2 cm or greater in width (Fig. 3). This also suggests racial differences in the anatomy and histology of the face.

From these observations, M-flaps are considered to be acceptable for small defects, that is, about 400 mm² or smaller, but better results will be expected with N-flaps for greater tissue defects. N-flaps are considered to be advantageous for reconstruction of the nasal alae, which may involve chondrectomy, because this technique is compatible with lining of the nasal cavity. M-flaps are considered to be undesirable for reconstruction of the nasal base.

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