Nasal reconstruction in children: a review of 29 patients*

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SUMMARY

Acquired large nasal defects are much more common in adulthood than in childhood because of the frequency of skin tumors after a certain age. However, from their experience in treating a number of children with sequelae of noma and burns, the authors have collected a series of 17 total and 12 partial nasal reconstructions in children aged 1 to 15 years. After reviewing the various methods used for recreating the lining, the support, and the skin cover in the whole series, three cases are reported in detail. A 1-year-old patient received a temporoparietal flap after total amputation of the nose and was observed for 17 years. Another patient, who was burned as a baby, underwent reconstruction at age 10 with a deltopectoral flap and was observed for 7 years. The third patient underwent total nose reconstruction at age 12 with an Indian forehead flap. From their experience, the authors conclude that, for psychosocial reasons, nasal reconstruction should be started early, despite possible reoperation at a later age. The best results are certainly obtained at the end of growth or at least after the age of 12. Adjacent bone or soft tissue defects further enhance the difficult challenge of restoring a satisfactory aesthetic appearance in these children.

Keywords: Nasal reconstruction, childhood

Although the history of plastic surgery is largely linked with nasal reconstruction and the literature on the subject could fill entire books, there have been very few articles or reports solely concerned with pediatric nasal reconstruction, and most of these papers deal with treatment of congenital anomalies such as absent noses (Gifford et al. 1972, Das Gupta et al. 1979, Muhlbauer et al. 1993, Meyer 1997) or neoleism (Van der Meulen et al. 1982). As stated by Van der Meulen et al. (1982) these birth defects are often combined with other manifestations of focal fetal dysplasia such as defects in or between the frontal bones, teleorbitism, unilateral and bilateral microphthalmia, clefts, and so forth. In such cases, repair of the nose is just one part of a complex remodeling of the facial skeleton and soft tissues. A fair amount of the literature is also concerned with the handling of vascular malformations (hemangioma) of the tip of the nose, which pose particular problems related to the nature of the tumor (Van der Meulen et al. 1994).

Nasal reconstruction in children raises specific questions (Ortiz-Monasterio and Olmedo 1981, Burget and Menick 1994). When should the reconstruction be initiated? Will the rebuilt portion grow in proportion to the developing face and will surgical management stunt residual normal development? Must a definitive reconstruction be planned in adulthood, raising the necessity of saving possible future donor sites?

Reasoning purely with strategic outcome in mind, the surgeon is often tempted to delay as much as possible the reconstructive procedures in a young child. However, it is easy to understand that even more than in adulthood, a growing child with a mutilated or missing nose faces a huge impediment to his social and psychological development that cannot be solved by a temporary epithesis that he will never wear.

History and anthropology have taught us that in all ages and in every population, severe nasal mutilation affects the dignity of the human being and was therefore used to punish and ostracize some individuals. No doubt every effort should be made to reconstruct a child’s nose without delay, providing mutilating donor sites are avoided.

When planning a total nasal reconstruction, the surgeon must be familiar with the idealized “normal” nose form. Particularly when treating children from various continents, an accurate knowledge of morphometric variations between ethnic groups is necessary (Farkas et al. 1992).

After evaluation of the defect, planning the nasal reconstruction should include three concepts: creation of a volume with three different layers (lining, support, and skin cover); conservation of a satisfactory nasal airway; and aesthetic integration into the whole face (aesthetic unit, color match, etc.)

MATERIALS AND METHODS

At the Geneva University Hospital, we have treated 29 children aged 1 to 15 years for total or partial acquired nasal defects. The cause of nasal mutilation varied, and in several patients it was associated with extensive facial defects. In this series, we intentionally did not take into account those with congenital nasoschizis associated with clefts or hypertelorism or those with minor posttraumatic defects (dog bites) that could be repaired by skin or composite skin grafts. After a rapid overview of strategy and surgical technique for total or subtotal nasal reconstruction, three case reports illustrate different approaches.

Among the 29 children who underwent surgery to repair nasal defects, 17 underwent total or subtotal nasal reconstruction and 12 underwent surgery to repair partial but full-thickness defects. At the time of the primary repair, their age ranged from 1 to 15 years, with a mean of 9 years. The cause of nasal defects was: facial burn in 8 patients, sequelae of noma in 18 patients, total surgical amputation for vascular malformation in one patient, septocolumellar defect after trauma in one patient, and total lining loss by cauterezation in one patient. In most patients with noma sequelae or facial burns, extensive facial defects were also present and sometimes necessitated multiple procedures for reconstructing the lips, the palate, the cheeks, and the eyelid before building the nose. The mean follow-up time was 3 years (range, 2 months to 16 years).
Lining
For lining, local skin turnover flaps were used in most of the patients (14 patients). In patients with extensive defects compromising more than the nasal pyramid, it was necessary to reconstruct initially the forehead, the cheeks, and the upper lip with various flaps. After healing, local hinge flaps were borrowed from these reconstructed areas for nasal lining (six patients).

In some patients it was decided that the skin of the forehead would not be used for the nasal cover. Therefore, an island forehead frontalis muscle and skin flap based on the epistrochlear vessels was dissected and turned down under the glabella to replace the lining (three patients). In extensive defects, the lining was obtained using prefabricated galea flaps (three patients). In one patient, mucosal flaps from the upper buccal sulcus and composite grafts were used.

Support
Even in large defects, a support was not always necessary. In cases of burns, when the scar tissue was thick and rigid, the turnover flaps provided sufficient support for nasal reconstruction (three patients). An L-shaped advancement of the septum as described by Millard (1974) was used in older children for supporting the lower half of the nose (two patients).

A tempororetroauricular flap (Washio 1969) may include ear cartilage. This procedure provides support that may grow with the child. It was used in six patients. When a bone graft was necessary, we used a full-thickness cranial bone, usually taken from the parietal region. The donor site was replaced with a split bone of adjacent skull. The graft was fixed to the frontal bone with micro- or minititanium plates and screws (five patients). In two patients, a rib was used as a bone and cartilage graft.

Skin Cover
For skin cover, a preexpanded forehead flap was used in seven patients, retroauricular skin based on a temporal pedicle (Washio flap) was used in four patients (Maillard and Montandon 1982), and a Chinese free forearm flap was used in three patients. Distant migrating flaps were sometimes the only solution we found to bringing enough skin to the facial region, as in patients with dramatic facial destruction by fire or noma (four patients). In one patient with a subtotal deep facial burn we used a sandwich galea temporalis flap with a skin graft for cover.

From this series, we present three cases of total nasal reconstruction that illustrate different aspects of reconstruction including the age of the patient, the cause of the defect, and the associated lesions.

CASE REPORTS
Patient 1
An African girl was diagnosed with a cavernous hemangioma invading the entire nose (Fig. 1A). At age 1, a total nasal amputation was required for repeated bleeding (Fig. 1B), which was performed by Dr. G. F. Maillard. One year later she underwent reconstruction with a tempororoauricular skin flap in two steps, including conchal cartilage for support. Local skin turnover flaps were used for lining (Fig. 1C). She was not seen for the next 13 years and then returned to our service for minor corrections (Fig. 1D). She declined to undergo surgery to replace the darker auricular skin with a forehead skin flap. At age 16 she underwent an elongation of the nose with a calvarium bone graft and some scar corrections. She is now 19, and no further surgery is planned (Fig. 1E).

Patient 2
The second patient experienced dramatic facial destruction by fire at the age of 1 month. At initial examination, this boy had no lips, nose, eyelids, or ears. The forehead and one third of the scalp were replaced with very thin scar tissue (Fig. 2A). The first stage of the reconstructive surgery, performed in another institution, consisted of full-thickness grafts to the eyelids. He came to our service at age 10 for nasal reconstruction (Fig. 2B). We used a preexpanded, two-stage, deltopectoral flap to reconstruct the nose.

The same flap was also used to reconstruct partially the upper lip. Hinge flaps from the surrounding scar tissue were turned over and sutured together for lining and were hard enough to support the framework.

The boy was last seen at the age of 17 years with a satisfactory functional results: he was able to breathe adequately and to wear glasses (Fig. 2C, D). The improvement of his facial appearance had a tremendous impact on his psychosocial development, particularly because he had also lost both hands during the initial accident.

Patient 3
This 12-year-old African boy had noma sequelae with a centrofacial defect, including total nasal destruction and a defect of the midportion of the upper lip comparable with a central cleft (Fig. 3A, B).

The first step of the surgical reconstruction was upper lip reconstruction using cleft lip principles with mobilization and suture of the orbicularis muscle and multiple Z-plasty for lengthening the cutaneous portion of the lip. At the same time, an expander was placed in the forehead area. Eight weeks later the reconstruction of the nose was performed. The lining was obtained with hinge flaps, and the area of insertion for the nose was designed at the same time. The seventh rib harvested at the junction of the bone and cartilage was used as a support. An additional bone fragment was placed under the graft to secure the projection of the support. The two bony fragments were fixed with two screws (Fig. 3C). The overall skin coverage was obtained with a preexpanded forehead flap. The frontalis muscle and the capsule from around the expander were removed distally to obtain a very thin and pliable skin flap. It was folded on itself to reconstruct the columella and the two nostrils. Rubber tubes were inserted into both nostrils. Sectioning of the pedicle was performed 3 weeks later (Fig. 3D, E).

DISCUSSION
It is our belief that, independently from other defects, the reconstruction of a nose should be undertaken in childhood even if an aesthetic result cannot be obtained at that time and will necessitate correction or total rebuilding at a later age.