Correction of Nostril Stenosis and Alteration of Nostril Shape with an Orthonostric Device

S. Anthony Wolfe, M.D.
Silvio Podda, M.D.
Marta Mejia, D.D.S.
Miami, Fla.; and Paterson, N.J.

Maintaining the patency of a round structure against the forces of scar contracture is a difficult matter in many areas of the human body, attested to by the frequent need for reoperation for urethral strictures, obstructed lacrimal passages, stenotic ear canals, contracted eye sockets, and, certainly, stenotic nostrils. Surgical release of the contraction may involve use of an interposed skin graft or flap, but in all of these areas, some sort of long-term stenting is required if patency is to be maintained.

For the correction of nostril stenosis, a round stenting tube is unsuitable, because a normal nostril shape is not round. Soft silicone rubber stents are commercially available specifically made for the shape of a nostril (Porex, Newnan, Ga.; and Koken Co., Ltd., Tokyo, Japan), but we have found that these tend to be easily extruded, particularly in children, unless they are held in place with transseptal sutures (Fig. 1). We have had difficulty maintaining them in place in children for longer than a few weeks and have seen several instances where the transseptal suture cut through the columella.

Previous authors have reported bending hollow acrylic tubing into a horseshoe shape,[1] fashioning splints out of polyvinyl dental bite registration material,[2] fabricating splints from methylmethacrylate,[3] and altering the Koken stents by making a more everted rim.[4] Expansile stents, where the stent is sectioned perpendicular to the desired axis of expansion, have also been described. In all of the latter instances,[5–8] the screw drive for expansion is placed along the desired axis of expansion, and is intranasal, requiring removal of the stent to access the screw or screws to be turned.

All of the types of stents mentioned above taper off as they pass intranasally, so there may be difficulties with the stent frequently sliding out of the nostril, and taping may be required to keep the stent in place. Taping is cumbersome, often ineffective, and generally not liked by the patient, particularly children.

DISCUSSION

Drawing on experience gained with passive nasoalveolar molding devices for presurgical treatment of children with cleft lip, we have designed a new stent that we feel addresses all of these problems. Minor degrees of nostril asymmetry or stenosis can be corrected by the use of this stent alone. The stent has the following features (Fig. 2):

1. It is custom-fabricated for each patient.
2. It is expansile, and the direction of expansion can be oriented as desired.
3. The head of the screw for the drive mechanism can be accessed without removing the stent.
4. The stent is maintained comfortably in position by an adjustable wire flange, which wraps around the alar crease.

Disclosure: *The device described in this article was developed and is fabricated by Dr. Marta Mejia. Neither Dr. Podda nor Dr. Wolfe receives any compensation for the fabrication of this device. Insurance companies have been billed for the fabrication of the orthonostric devices and generally have paid according to standard Current Procedural Terminology codes. None of the authors has a financial interest in any of the products, devices, or drugs mentioned in this article.*

From the Division of Plastic Surgery, Miami Children's Hospital; the University of Miami School of Medicine; and the Regional Cleft-Craniofacial Center of New Jersey, St. Joseph's Children's Hospital.
Received for publication January 27, 2006; accepted June 29, 2006.
Presented at the 10th Annual Meeting of the Rhinoplasty Society, in New Orleans, Louisiana, April 28, 2005.

DOI: 10.1097/PRS.0b013e3181712350

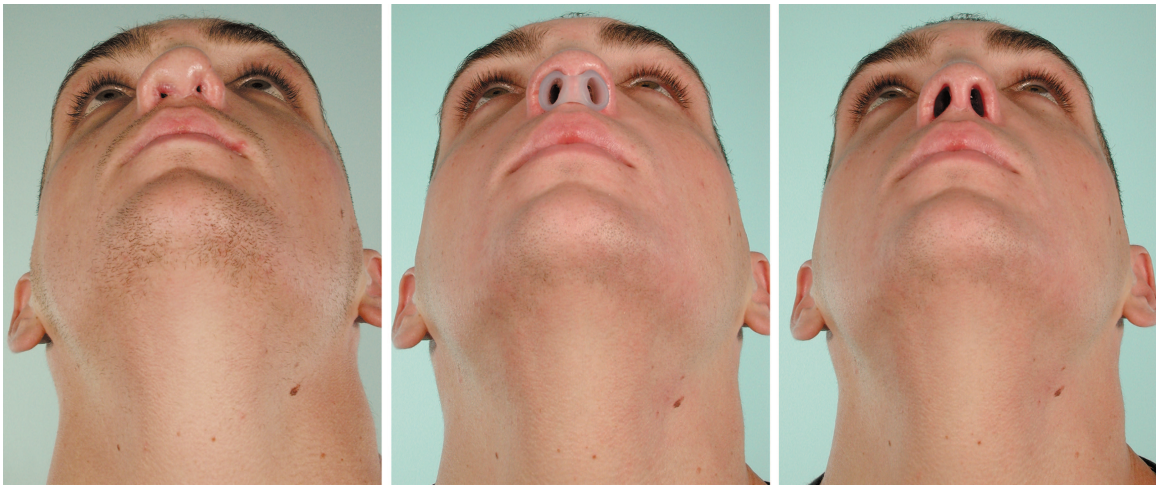

Fig. 1. A patient with severe nostril stenosis was treated by release of scar tissue through an open rhinoplasty approach and constant wearing of silicone nasal stents for 3 months and for an additional 3 months at night. Postoperative result is at approximately 9 months. It takes a committed patient to follow this regimen, and tape is often needed to keep the stents in place. Long-term maintenance of this device in children is difficult.

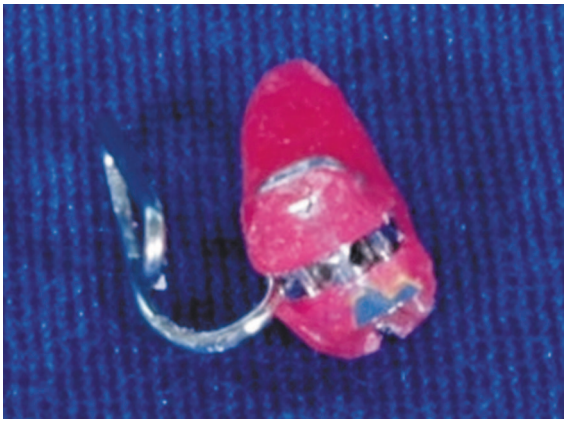

Fig. 2. An orthonostric device made from a plaster model of the nose and nostril of the patient. The miniature jack screw is aligned perpendicular to the axis of elongation desired, and the wire flange gently hugs the ala to maintain the device comfortably in place.

Protocol

After alginate impressions of the nose are taken, the device is fabricated on a stone model, inserted, and the expansion is started on the second day. The expansion of the device is performed daily in increments of 0.5 to 1 mm at a time. The expansion can be continued at home, but adjustments have to be made by the orthodontist or the surgeon at the office. The appliance is used initially 24 hours per day for 4 to 6 months, and then for an additional 4 to 6 months at night only. It is generally preferable to initially perform an overcorrection, because the forces of contraction frequently cause recurrence of the stenosis.

More severe degrees of stenosis or nostril asymmetry require surgical correction: in these cases, a

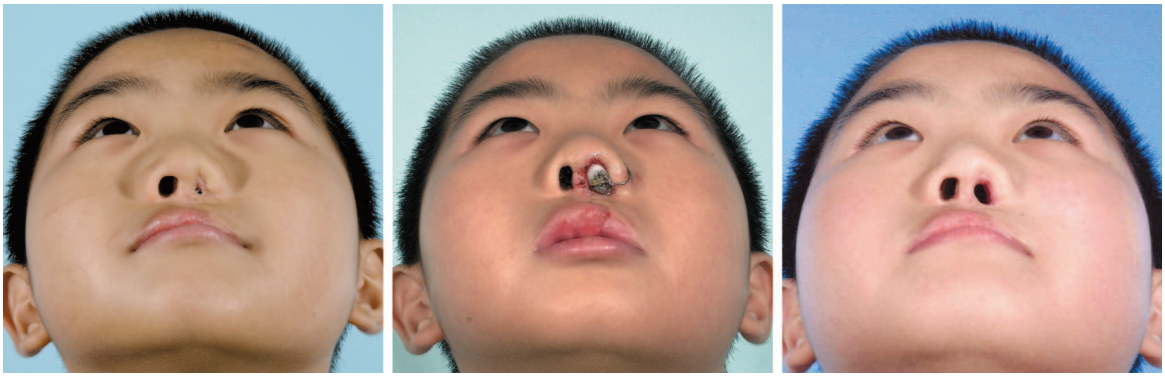

Fig. 3. A patient with left unilateral cleft lip with stenotic nostril. The stenosis was released by a number of radial incisions creating triangular flaps that were turned up into the nostril. A silicone stent was used for the first 10 days and then replaced with an orthonostric device that was maintained constantly for 3 months and then for another 3 months at night. Postoperative results are shown at 6 months.

Fig. 4. A patient with a right unilateral cleft who had also lost her columella because of prolonged contact from a positive-pressure mask in the neonatal period. The columella was reconstructed with medially based flaps taken from the alar margins, along with a costal bone graft to the nasal dorsum and "golden arch" conchal cartilage grafts for the nasal tip. An orthonostric device was used to increase the caliber of the right nostril. The patient is shown before surgery and 13 months postoperatively.

Porex stent is placed at the time of surgery and maintained in place for the first week or two; an expansile stent of the same dimensions of the silicone stent is fabricated in the meantime and inserted at the time of removal of the silicone stent. Further expansion, if necessary, may be started 2 weeks postoperatively.

No complications have been encountered with the use of this appliance in 31 patients. Results are better when the patient is old enough to understand the goal of the treatment and can actively cooperate. The youngest patient treated was aged 5 years; the oldest, 65 years (Figs. 3 and 4).

Another common problem encountered is loose fit of the device. This is the most difficult technical problem to solve and requires continuous adjustments of the appliance.

Once the corrected nostril seems soft with a mature wound, the stent can be discontinued. It can be replaced if there is any evidence of recurrent contraction. We are now using the appliance prophylactically in certain cases that we feel have a high propensity for developing nostril stenosis.

CONCLUSIONS

The collaboration between a pediatric dental specialist accustomed to performing presurgical nasoalveolar molding and a surgeon has provided an "orthonostric" approach to the correction—and maintenance of correction—of nostril stenosis and other nostril shape abnormalities. Lesser degrees of deformity can be corrected nonsurgically by the use of this device alone.

S. Anthony Wolfe, M.D.
Miami Children's Hospital
3100 S.W. 62nd Avenue
Miami, Fla. 33155
awolfemd@bellsouth.net

REFERENCES

1. Loftus, J., and Neale, H. Cleft lip micronostril: The problem and proposed solution. *Cleft Palate Craniofac. J.* 33: 348, 1996.
2. Gregory, G., Das Gupta, R., Morgan, B., and Bounds, G. Polyvinylsiloxane dental bite registration material used to splint a composite graft of the nasal rim. *Br. J. Oral Maxillofac. Surg.* 37: 139, 1999.
3. Casey, D., and Schaaf, N. Custom surgical stent for naris stenosis. *Plast. Reconstr. Surg.* 100: 108, 1997.
4. Yuzuriha, S., Matsuo, K., and Kondoh, S. A newly designed nasal retainer to sustain the corrected shape of the nostril rim and anterior nasal recess for cleft lip patients. *Plast. Reconstr. Surg.* 108: 452, 2001.
5. Ramstad, T., and Gorm, B. Nasal stenosis after operations on the nose: Expansion and subsequent maintenance of the nasal airway. *Scand. J. Plast. Reconstr. Hand Surg.* 28: 235, 1994.
6. Costa, P., Orlando, A., and Di Mascio, D. An expansible splint for treatment of nostril stenosis. *Ann. Plast. Surg.* 34: 197, 1995.
7. Cenzi, R., and Guarda, L. A dynamic nostril splint in the surgery of the nasal tip: Technical innovation. *J. Craniomaxillofac. Surg.* 24: 88, 1996.
8. Wolfe, S. A. A pastiche for the cleft lip nose. *Plast. Reconstr. Surg.* 114: 1, 2003.