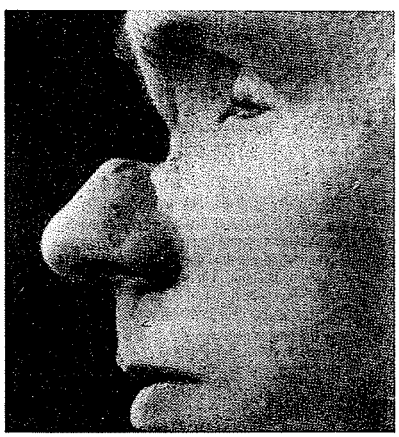
4.
Reconstructive Rhinoplasty



ALTHOUGH the goal in nasal reconstruction is both functional and aesthetic, other practical factors may occasionally be involved. For instance, a not uncommon injury seen in the trench warfare of World War I occurred when an Allied soldier tipped his helmet back to have a smoke. The moon came out from behind a cloud lighting his face and a German sniper in an apple tree put a bullet through his upper nose and one eye.

As plastic surgeons found, it was important not to rebuild the nasal bridge aesthetically and dangerously high, so that the patient could see an oncoming car from his blind side.

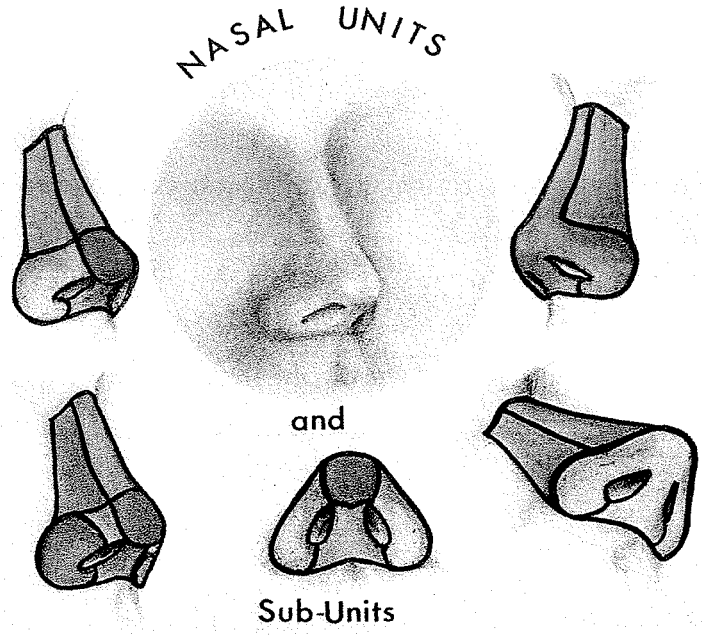
There is precedent for this surgical adaptation in the Middle Ages. The one-eyed Duke of Montefeltro had a portion of his nasal bridge removed to increase his field of vision. Thus his one good eye, peeking through the notch in his nose, discouraged guests sitting on his blind side at banquets from trying to poison him.

Nasal reconstruction is the attempt to return the nose to normal, even the ideal, state. Whether a small piece of tip

skin is missing or the whole nose is lost, the first requirement in treatment is in-depth diagnosis of what is displaced, what is missing, and what is in excess. The next step is the careful planning of moving what is normal into normal position and retaining it there. The displacement may be from crushing trauma, arrested embryogenesis, or long-term scar contracture. Release and replacement are essential. The final step is the design of replacing what is missing with as similar tissue as possible, skin for skin, mucosa for mucosa, cartilage for cartilage, and bone for bone. The replacements will be taken from excesses whether they are on the nose itself or from adjacent or distal areas, depending on the ability of the donor to spare the parts and the quality and vascularity of the donor area.

RESPECT UNITS

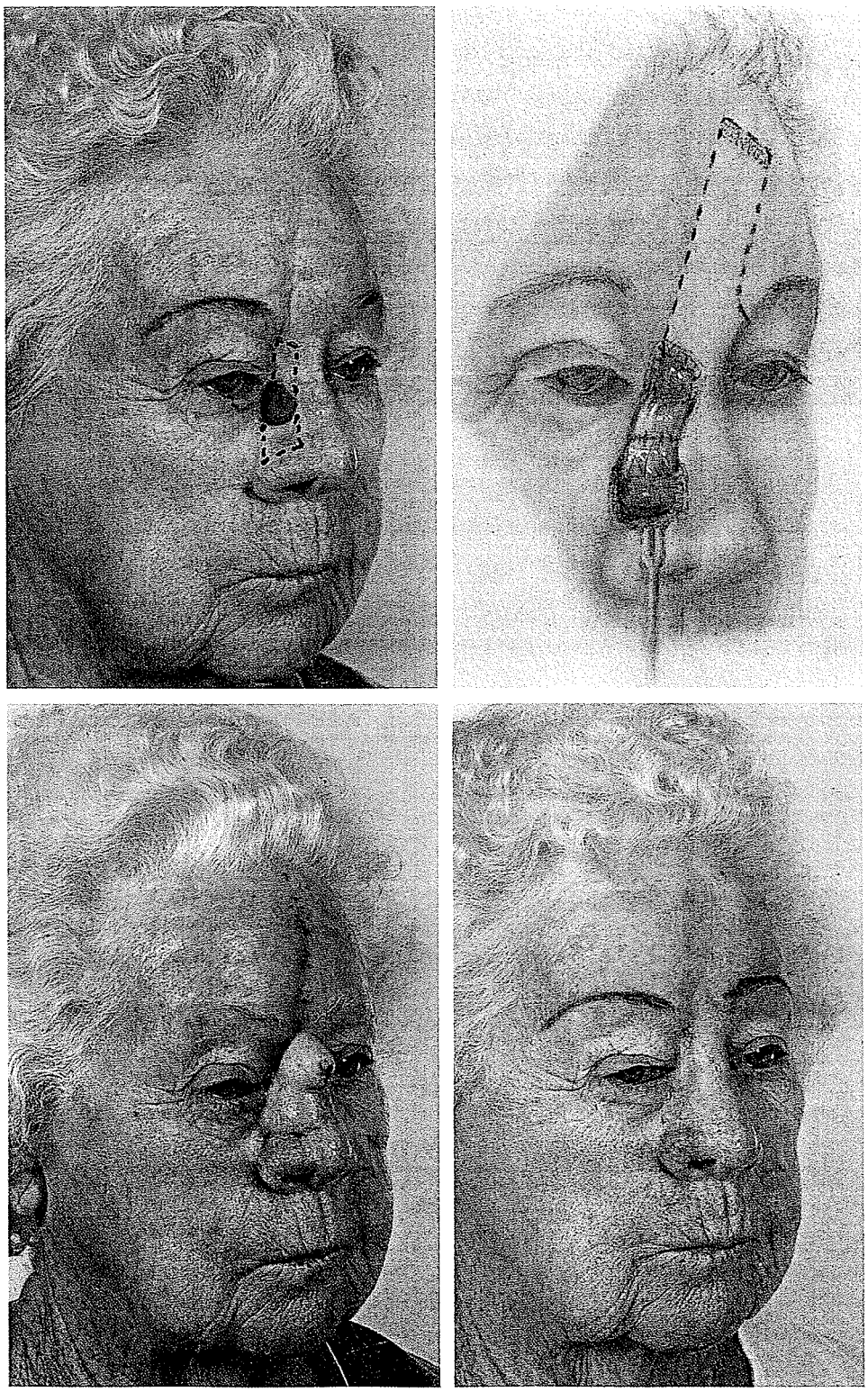
In nasal reconstruction nasal units and subunits must have priority. The various nasal units and subunits have been charted using the flow along the bridge over the tip into the columella as the main central unit. This is flanked by the upper-side units and the alar wings swinging into the nostril sills. All of the units are bounded by margins, creases, ridges, highlights, and shadows which can be used as guidelines in reconstruction.



When the defect involves most of a unit, the defect can be extended to an exact unit with camouflage advantages. For instance, if the defect is only a portion of a subunit and direct closure is not possible, one may better turn the partial subunit defect into a total subunit defect and then fill this unit. My basic principle in plastic surgery is: *"Do not cut a flap or a graft to fit a random defect. Make the defect fit the natural aesthetic unit and then fit the flap or graft to that unit."* When the sanctity of a unit is ignored the result is offensive as seen here.

This 83-year-old female had multiple basal cell carcinomas which eventually required D. Robinson to ablate the full thickness sidewall of her nose, including removal of the nasal bone, lacrymal bone, and a portion of maxilla. When the area was pronounced clear, local skin flaps provided lining along

the aesthetic unit. Then a midline vertical forehead flap, based on the left supratrochlear vessels and its end denuded of epithelium, was brought in as a cover to the sum of subunits from the alar crease to the brow. This disguised the repair.

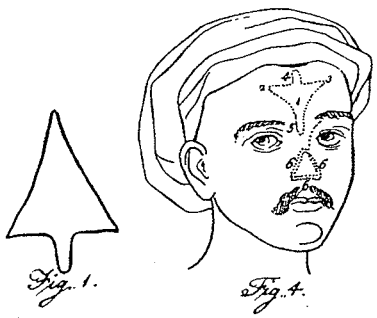


THREE NASAL LAYERS

The nose is composed of three general layers: skin cover, mucosal lining, and cartilage or bone support.

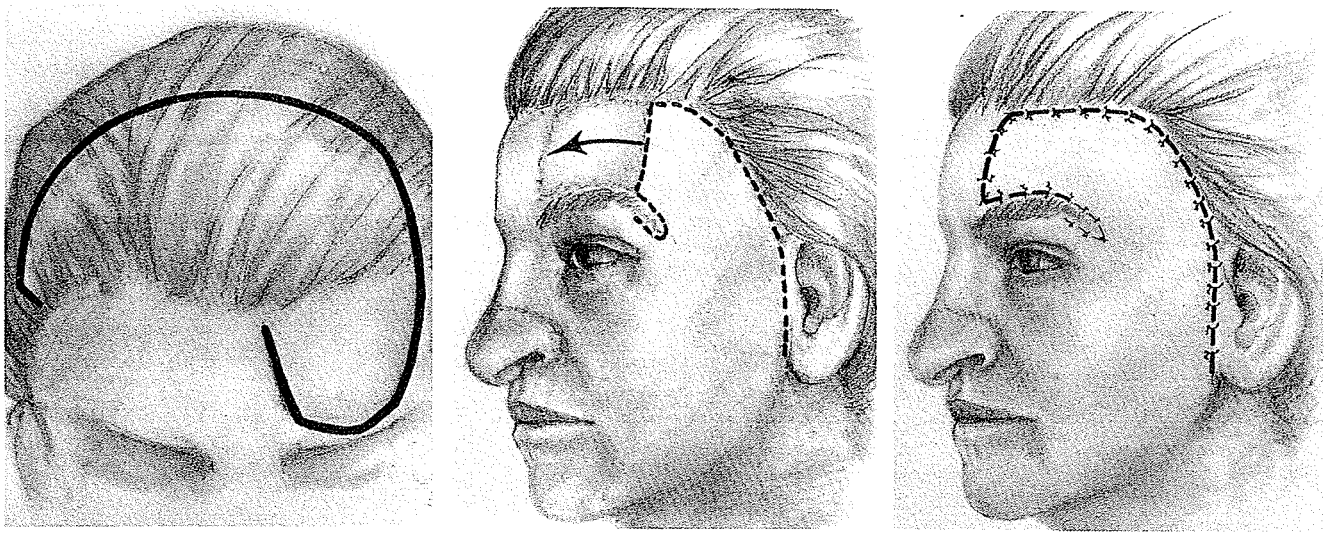
Skin Cover

At first rhinoplasty was limited to flaps for cover utilizing the cheek, then the forehead, and later the arm. It was not until World War I that the tube pedicle became popular. In our time the forehead flap is most popular for important nasal cover.



EARLY FOREHEAD FLAPS. According to the translation of the Sushruta Samhita, the art of nose-making with a forehead flap was born in the backstreets of India in the hands of the Koomas caste of potters, centuries before Christ. J. C. Carpue in 1816 revived the forehead flap in England and J. M. Warren followed in 1837 in America. Further development of the use of the forehead flap as cover in rhinoplasty extended through World Wars I and II during reconstruction of the war injuries. The different forehead flaps with their various bases and the scalp rotation flaps used to close the donor area are of only historical interest. Even the Converse scalping flap which hid the scars of the pedicle in the scalp is no longer popular. The depressed skin graft donor defect was quite noticeable and required such calisthenics as a temporofascio-cervical rotation flap which needs a delay before advancement, as described by J. Luri in 1982.


GRAFT
NO
YES



As the forehead flap, if specifically designed, is the best choice for nasal cover it will be described later in detail.

Mucosal Lining

The lining phase of reconstructive rhinoplasty began erratically with Volkmann in 1874 who turned down skin from the remaining nose. In 1819 Thiersch turned up flaps from adjacent facial areas and in 1898 Lossen utilized split thickness skin grafts. In general, however, the early reconstructive surgeon did not appreciate the importance of lining. He did cut his covering flaps 1/3 larger than necessary to try to offset the inevitable shrinkage of the unlined cover. It was not until 1900 when Keegan published the results of his five years of work in India that the importance of nasal lining in the prevention of cover contracture was clarified. When available, local flaps are preferred for lining, as they afford better lymphatic and venous drainage. Under certain conditions a forehead flap has been used for lining. There are also free skin grafts and even chondrocutaneous grafts for lining and support of the alar rim.

Cartilage or Bone Support

As larger reconstructions were attempted the need for support became embarrassingly apparent. At first various external metallic platforms were fixed within the nasal cavity with a

projecting framework shaped as desired, such as the 1828 gold-and-silver profiles of Rousset. In 1864, Ollier attempted autogenous bone grafting when he brought down a forehead flap with a piece of frontal bone attached by periosteum. Israel, in 1887, used a forearm flap carrying a strut of ulna and in 1896 used autogenous bone from the tibia as a nasal bridge support. The latter was adopted in 1907 by Joseph. Wolkowitsch, in 1902, used the little finger, and Mandry, in 1908, used a clavicular flap incorporating a portion of clavicle for subtotal nasal repair. Von Mangold, in 1900, was the first to describe transplantation of costal cartilage for nasal support. The surgeons of World War I on both sides capitalized on these developments and proceeded to improvise and modify.

FOREHEAD FLAP

The forehead, bounded by hair of the scalp and eyebrows, with its hairless, smooth textured pink-colored skin, robust vascularity and proximity of position, is the favorite site for covering flaps in nasal reconstruction.

A PLEA

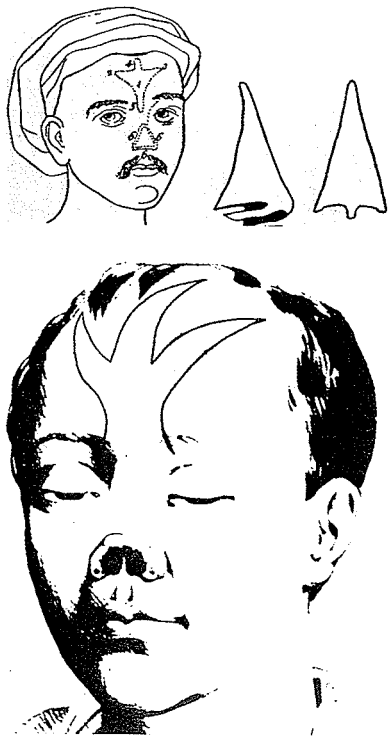
Careless or haphazard use of an important area of facial expression, such as the forehead, by the untrained should be *outlawed.* There is a tendency for surgeons untrained in reconstruction to use poorly designed forehead flaps which not only destroy the forehead but render the nose unacceptable. Also, this type of amateurish floundering about with facial tissue is infuriating! Such plastic surgery experts as Barrett Brown and Brad Cannon, during World War II at Valley Forge, became involved with a forehead flap rhinoplasty that added more scars than assets. If they set a precedent against forehead flaps by army plastic surgeons, certainly this procedure is a no-no for the untrained!

Forehead Design

The natural wrinkles and folds of the forehead mostly run transversely except in the glabella area. The best position for

placement of scars is transverse, with the midvertical next best. If a moderate portion of the forehead must be sacrificed electively, as with a flap, it is well to design the flap along the midvertical and transverse lines as seen in the seagull flap.

There is a subtle and important difference between the seagull design and the triangular Indian flap of 600 B.C. or the French three-finger flap of Delpech with the extensions running obliquely along an almost parallel axis. Although the similarity is remarkable the subtle difference offers double advantages. The wings of the seagull can extend as alar bases into nostril sills, and closure of the earlier flaps offered far greater difficulty as neither divides the donor axis as fairly as seen in the seagull. E. Peet set 1¼ inches as the optimum amount of tissue that can be removed from the transverse axis of the forehead and allow direct closure. This is generally true but it is usually possible to predict how much forehead is expendable by pinching it up into a fold. I recall one forehead flap in an elderly woman that was 2½ inches in width but its donor area closed primarily without difficulty. There have been others that would not spare a full inch.

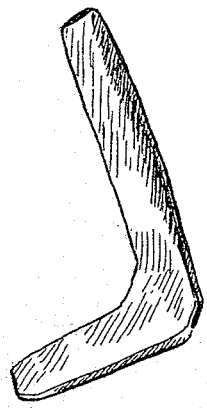


Expanders

This is somewhat historical because tissue expansion as developed by C. Radovan has rendered direct forehead donor closure far easier. I emphasize that expanders should be placed under the lateral unused forehead and not under the forehead flap itself. By expanding the lateral forehead, midline closure of the defect is facilitated and the tension of closure will retain the expansion achieved. When expanding the actual forehead flap a false security is engendered, and when the stretched flap is placed on the recipient bed without tension the flap will retract enough to threaten the result.

Layer Assembly

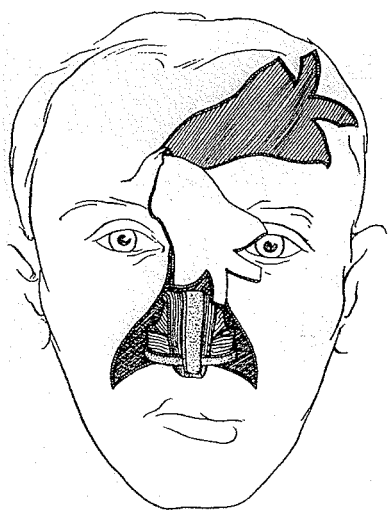
In full thickness nasal losses where replacement of the three layers is required, the order of assembly has four options.



1. Transport soft tissue for cover and lining to the nasal area first and later insert the supporting framework. Simple bone or cartilage rods were ineffective cantilevers offering no tip support. This precipitated uses of various L-shaped propped cantilevers, such as the hinge cartilage graft of Gillies in 1922, and the one-piece L-shaped cartilage described by J. B. Brown in 1940. R. Farina in 1951 inserted osteoperiosteal bone grafts from the crest of the tibia 90 days after supplying soft tissue. H. Antia in 1963 advocated retrograde insertion of ulnar bone graft wired to the nasal bones in leprosy. J. Converse in 1964 delayed his bone graft support until the soft tissue was in place.

Delayed insertion of support is architecturally unsound. The major function of framework is to achieve and maintain height of profile and potency of airway. Once these have been partially lost by the slightest collapse, shrinkage, and contracture, they can never be regained completely.

2. Bone and cartilage grafts can be incorporated under the covering flap to be brought down as one component. This option has had many champions, from Neleton in 1900 to Schmid in 1964. Gillies noted in 1920 "embedding the cartilage in the cover is an entire mistake" and he reconfirmed his feelings in 1952. The framework possible to carry in the cover cannot provide a propped cantilever for both bridge and tip support.



3. Cartilage struts can be incorporated in the lining to form a propped cantilever with a three-point tip support. This option was developed by Gillies during World War I. Three cartilage struts were implanted under the future lining flaps, one in the glabella region and one in each nasolabial fold. In a second stage the three composite flaps were turned as a supported lining tripod to receive the covering flap. The result of this approach was too bulky and not amenable to refinement.

4. The supporting framework can be inserted on top of the lining and covered directly with a flap. Delorme in 1889 was the first with this option, using metal for his frame. With bone or cartilage as the support a propped cantilever is possi-

ble and the main detraction is the resultant bulky sidewalls and an especially thick columella.

In general I prefer and use the fourth option but also incorporate part of the second option. For instance, the forehead cover flap has its alae lined with skin grafts and supported with cartilage strips. The same is sometimes done to the columella. Thus the nose is partially prefabricated in the forehead flap. Then the lining is turned down, the support is wired into position, and the prefabricated cover is brought over to complete the three-layered assembly. In certain cases it is conceivable that any or all four options could be involved to advantage in a specific reconstructive assembly.

Usually defects of the tip or ala or columella are not strictly confined to the one subunit area. More often the defect of the tip extends off into an ala and/or down into the columella. Whatever the case, the effect of the final result will rest on how well the repair blends the subunits into a unit. This may be achieved by extending a half subunit to a total subunit or extending several subunits to one full unit. Multiple examples of this camouflage will be seen in case after case. Look for it and see if you can see it!

COLUMELLA

The columella is the central column of the nasal tripod, flowing from the upper philtrum of the lip into the nasal tip. It assists in the support of the nasal tip as it divides the nares. It reflects any deviation of the anterior septum. Its deficiency can be seen in one or more of the triad, retraction, shortness, or absence. Without a columella the nasal entrance is an open funnel, an undivided tunnel, characterless, collapsible, even comical.

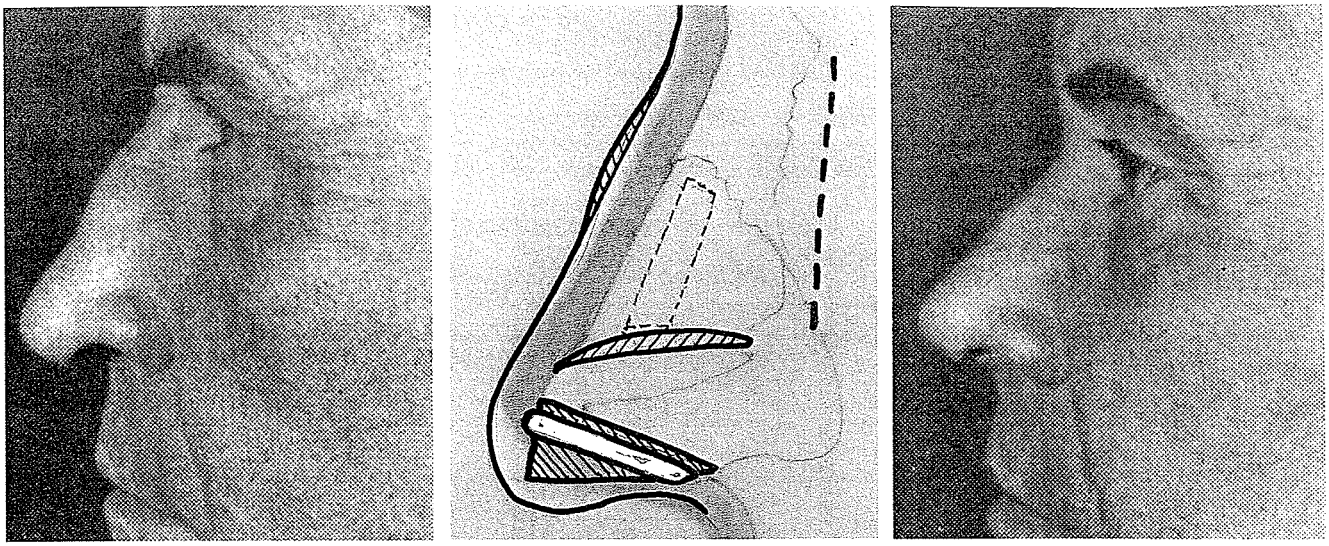
Retraction

Retraction of the columella indicates that through trauma or over-enthusiastic anterior septal resection of the septal backing the columella is deficient.

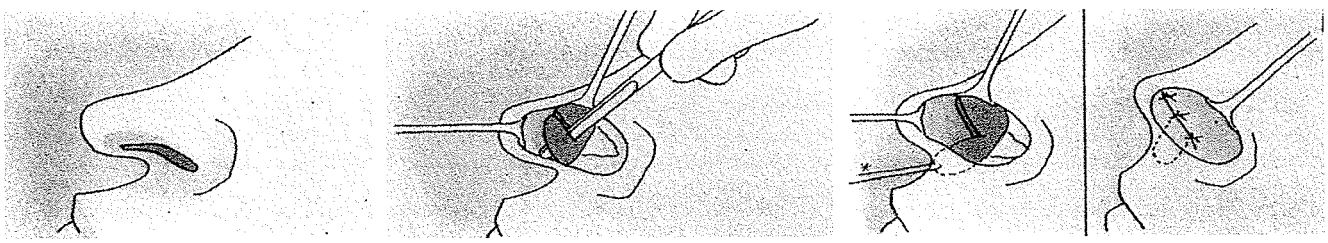
MINOR RETRACTION. Minor degrees of retraction can be corrected with a septal cartilage strut graft inserted up into the membranous septal tissue just behind the columella skin. When this graft is contemplated and a membranous septal incision is necessary for other corrections, it is important that this incision be made as far posteriorly as possible, flush with the septal cartilage to maintain enough membranous septum attached to the back of the columella to accept and house the cartilage strut.

An incision is made at the base of the columella inside the vestibule so that a tunnel can be dissected just behind the columella skin all the way to the nasal tip. A strut of septal cartilage can be inserted into this pocket without difficulty.

This 51-year-old male had several minor nasal deformities besides a retracted columella after over-enthusiastic anterior septal resection. At the same time that the hump was shaved and the anterior septum shortened at the tip, a cartilage strut was obtained during a submucous septal resection. This cartilage graft was inserted into a pocket in the membranous septum behind the columella to correct the retraction and support the tip.

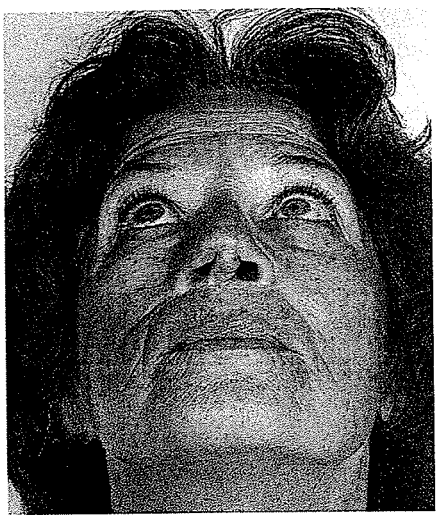
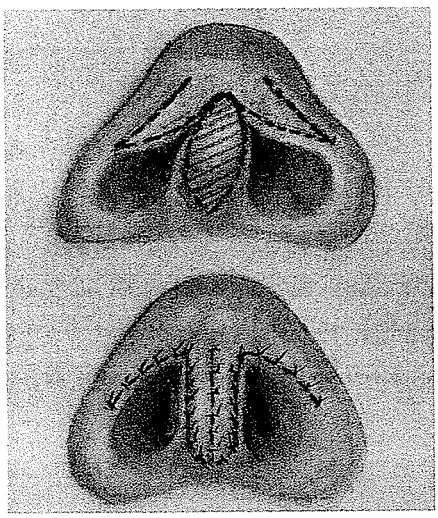
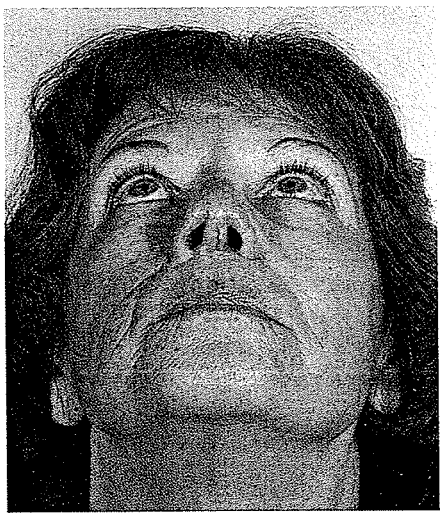


SEVERE RETRACTION. In severe columella retraction with shortness of mucous membrane lining and insufficient anterior septal cartilage several methods are available. For the exceptionally long nose associated with columella retraction, Cinelli's method has appeal. It takes excess septal tip as a composite flap and transposes it to correct the retraction at the columella base.

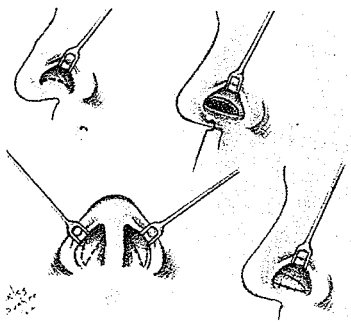


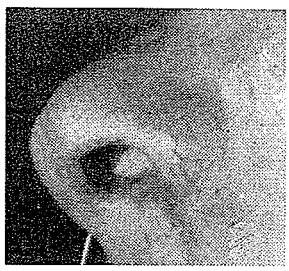
When the nasal sidewalls are relatively excessive, the onlay of alar margin flaps will reconstruct the columella and increase its contour. This flap was first described by Gillies in 1949 and we presented its various applications in 1957. Here is an example.

Excision of a columella cyst left external columella retraction. Bilateral alar margin flaps not only improved the retraction but symmetrized the front entrance of this distorted nose. Other uses of the alar margin flaps appear in secondary correction and in congenital deformities.

Nasal Chondromucosal Flaps





To avoid normal scars—and especially adaptable to long and/or bulbous tipped noses—an alternate method for severe columella retraction was described in 1963. A generous membranous septal incision releases the columella retraction. Then to maintain this correction the gap between the columella and the septum is filled by bilateral alar chondromucosal flaps. These bilateral flaps, taken from the nasal lining and carrying mucosa and cartilage, are long and narrow (3 cm $\times$ 0.5 cm). Their posterior incisions are along the intercartilaginous line. They are based superiorly at the upper edge of the septum at the nasal tip just beside and above the membranous septum incision. Each flap makes half a turn as it swings down into the membranous septal gap to join its mate from the opposite side. With cartilage touching cartilage and mucosa turned out these flaps are sutured together between columella and septum. The cartilage in these flaps not only maintains the forward projection of the columella but protects by splinting the blood supply during the twist. In addition to the correction of columella retraction through this approach, there can be simultaneous reduction of the long bulbous nasal tip. A dividend from this procedure is a relative gain when the overhanging sidewalls are lifted when the lateral vestibular defects are closed with sutures. When the overhang is not enough to allow this lift then the lateral donor areas of the chondromucosal flaps can and should be skin grafted.

Columella Shortness

The most common cause of columella shortness is lack of complete embryogenesis, as seen in bilateral clefts and to a lesser degree the asymmetric shortness of the columella in unilateral clefts. This deformity is discussed in the congenital section. When the shortness of the columella is due to contracture by disease or loss by trauma or surgery, then reconstruction is required.

Total Absence

Absence of the columella with the septum intact is merely a problem of cover and contour which can be repaired by the usual ear lobe graft, composite graft, or nasolabial flap. Reconstruction of the columella in the absence of the anterior septum calls for columella support and lining in addition to cover and contour. Total columellas have been constructed with varying success from skin of the forehead by H. D. Gillies (1949), C. Heanley (1955), A. D. Cardosa (1959), R. H. Ivy (1925), V. H. Kazanjian (1948), and F. X. Paletta and R. T. Van Norman (1962). When the forehead is required for the reconstruction of the nose and the columella is included, this is ideal. When the forehead is used to make only a columella, justification is more difficult.

The columella has been reconstructed from neck skin by H. D. Gillies and D. R. Millard (1957) and F X. Paletta and R. T. Van Norman (1962). It has been made from the arm by E. F. Malbec and A. R. Beaux (1958), and even from the hand by V. P. Blair and L. Byars (1946), M. H. Shaw and S. R. Fall (1948), and F. Young (1949).

Labial mucosa is in ample supply in the vicinity and has been used by several surgeons. Liston in 1846 took the full thickness of the upper lip philtrum on a superior base, excised

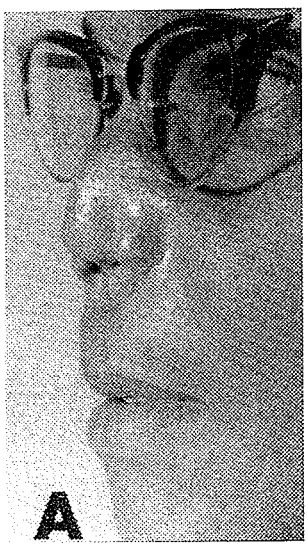
the skin and sutured the flap with the mucosa externally. Liston claimed mucosa assumes the color and appearance of integument after a time of exposure.

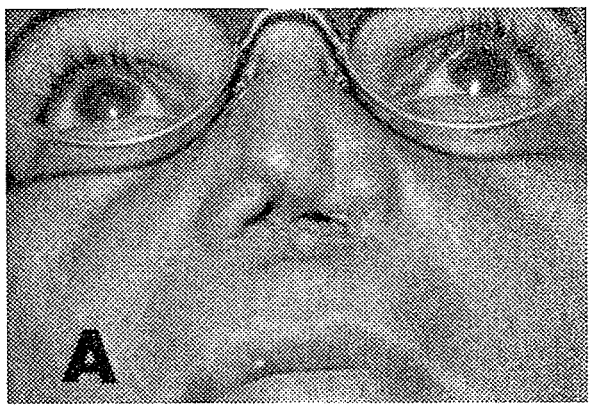
H. D. Gillies in 1920 presented a columella made from lip mucosa. Even after many months it still retained its red flare in contrast to the pale skin, and looked more like a nasal hemorrhoid than a columella. He simply excised it. E. Lexer in 1931 used labial mucosa in the form of a vertical tube pedicle and pulled it through an opening in the upper lip. F. Smith in 1950 lined a mid-vertical mucosal strap with a skin graft, and dividing its upper base, swung the lined flap out and over the lip for attachment to the nasal tip with skin external. This required an awkward period of several weeks.

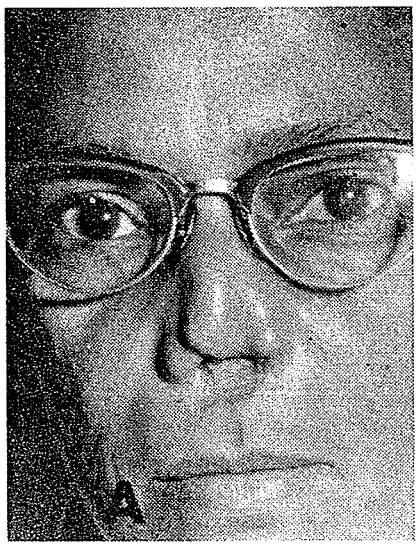
In the early 1960s I tapped the upper labial sulcus mucosa for columella reconstruction. Buccal mucosa can be recommended for columellas in dark-complexioned patients where the degree of pigment is sufficient to camouflage the mucosal color. A buccal mucosal flap can be tubed primarily, transported to its final columella position and later resurfaced in front with a postauricular skin graft.

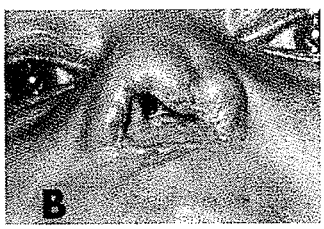
A better approach first lined a horizontal buccal mucosal strap flap with a chondrocutaneous graft from the postauricular area. This produced a natural skin color for the future front of the columella and at the same time produced a support and definition to the column. The mucosal strap need not be as wide as is necessary for making a tube, making closure of the donor area easier. The medial base of the flap is set just past the midline and as soon as the chondrocutaneous graft has become well vascularized, the lateral end can be divided, turned over with skin in front, threaded through a slit incision at the future site of the columella base, and attached to the nasal tip. Several weeks later the inferior end is divided from the lip mucosa and attached to the lip skin. The method of inset involved one triangular flap turned forward on the lip, leaving a recipient area for the base of the new columella. The triangular lip flap, if let into a split in the anterior base of the columella, tends to blend the columella-lip join.

Noses that have been unlucky enough to lose their columellas often have suffered damage to their lining of mucous membrane. Here is a luetic nose with loss of septum, columella, nasal lining, and distortion of skin cover (A).

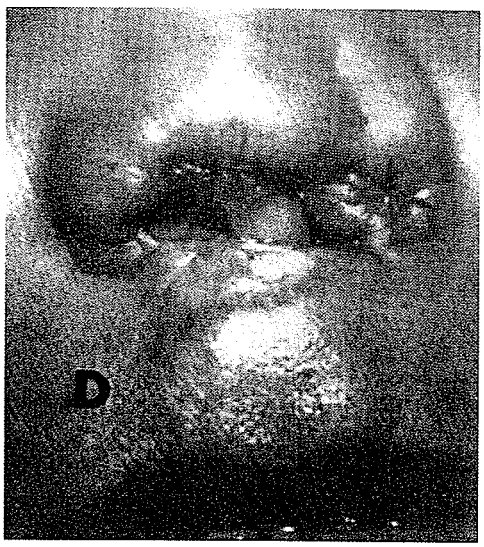


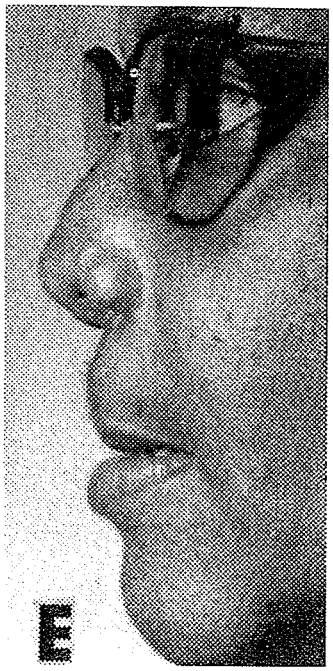


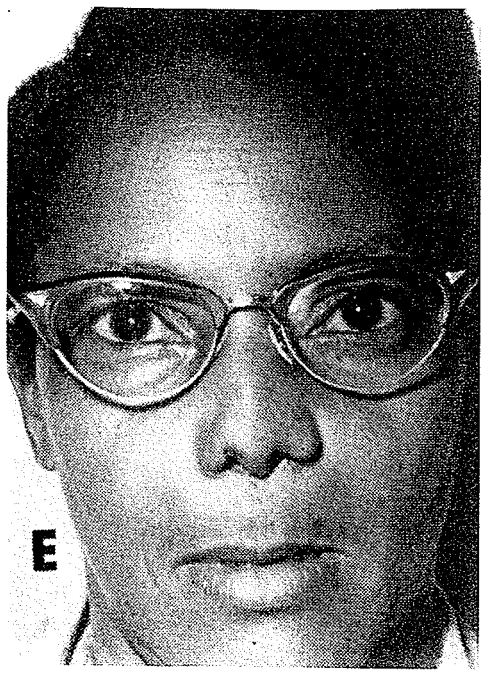




First, lining was supplied by a Gillies inlay skin graft (B). A buccal mucosal strap, ½ inch by 1½ inch, was lined with a chondrocutaneous postauricular graft (C. *arrow*). The distal end of the flap was delayed so that an extra ½ inch of mucosa would be available to line the raw area presented when the rolled nasal tip was uncurled. Thus, as the mucous membrane pedicle was pulled through the upper lip buttonhole and attached under the nasal tip, it takes a turn which presents the postauricular skin graft forward into view as columella (D). Finally the inferior pedicle was divided and implanted into the lip at the columella base (E).



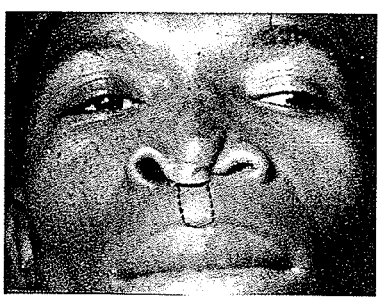


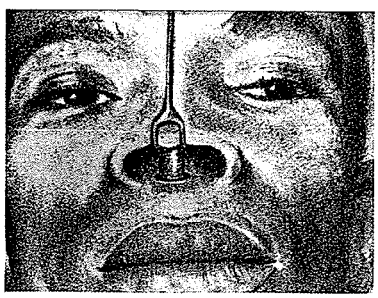


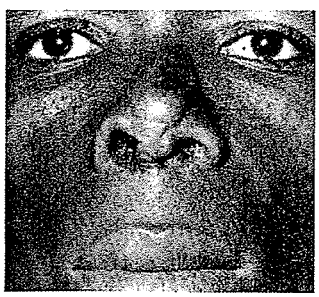
Although this method has served well occasionally and specifically in a Leishmaniasis case, which is presented under the specific disease, the popularity has waned. The blood supply of these mucosal flaps is not robust and requires surgical delay. There is also the color contrast of the mucosa in the Caucasian.

A SUBCUTANEOUS FLAP AND GRAFT

Here is a luetic nose in a Jamaican with loss of nasal lining and support as well as almost the entire columella. A vertical muscle flap with its base at the residual stub of columella has been marked for subcutaneous dissection. The only skin incision circumscribed the columella base. A raw muscle flap was cut and pulled out of the lip like a fat earthworm and wrapped with a split skin graft. A Gillies onlay graft released the nasal lining with modest improvement to the nose and airways. This case was published in 1963 but the principle will appear again.







Nasolabial Flap

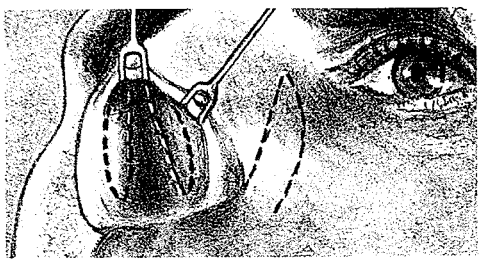
The nasolabial flap is my favorite form of columella cover. The color and texture are natural and the donor scar unnoticeable. For instance, here is a nose that had had a primary rhinoplasty and six secondary procedures by the same surgeon. The nose revealed generalized contracture and snubbing and the presence of a mummified columella. Closer scrutiny revealed two scars of open rhinoplasty, one at the tip join of the columella and the other at the base. Obviously the surgeon had forgotten or ignored his first scar when he made the second cut and inserted a silastic strut for tip support that sloughed the entire intervening unit.

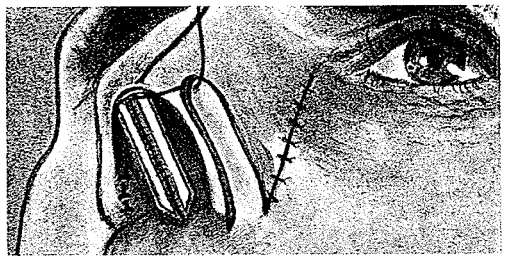
First, it was necessary to release the vestibular lining and replace the loss with a skin graft to lengthen the contracted nose. Then a nasolabial flap was attached to the nasal tip and finally the other end was divided from the cheek and inset in the upper lip for a good columella repair.

The ideal reconstruction is one that replaces lost tissue with similar tissue in kind. Thus a whole new columella requires skin cover with natural nasal color, cartilage support of medial crura proportions, and mucosal lining snugly adherent to the cartilage to avoid a bulky effect. Such a reconstruction is possible by taking a portion of each alar cartilage along with its attached mucosa as chondromucosal flaps. They are based superiorly and forward under the nasal tip. When swung down the anterior edge of each chondromucosal flap turns medially touching the other, and then they can be sutured together. The cartilage strips now face forward, backed by mucosa. This simulates the normal columella with a pair of cartilage strips similar to the medial crura and neatly adherent to their lining. A nasolabial flap is then let into this chondromucosal cradle with its tip joining the tip of the nose.

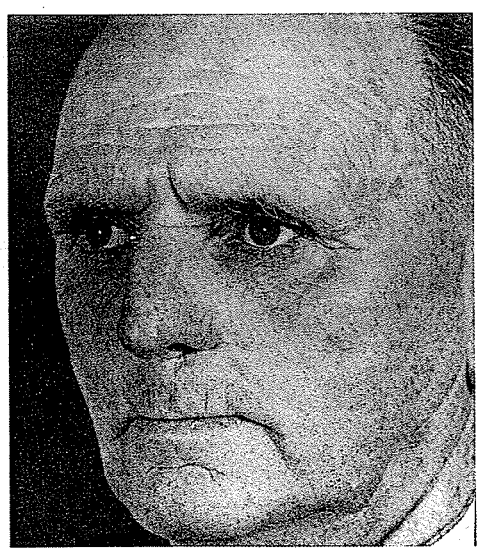
This procedure was first used as an immediate repair following radical excision for squamous cell carcinoma of the base of the columella. V. Dembrow made a transverse incision

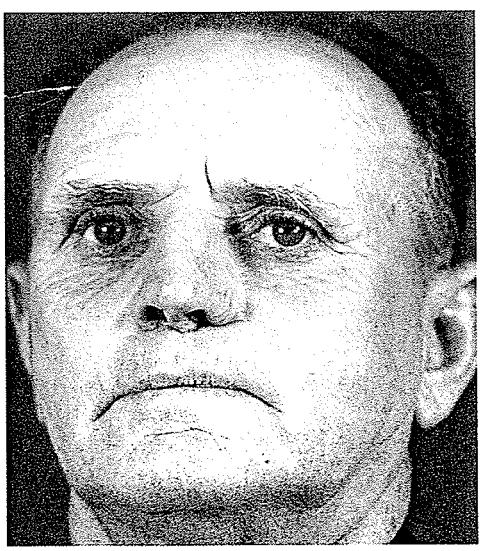
through the skin of the columella where it joined with the nasal tip. The resection was a block excision of the entire columella, the attached 1½ inches of anterior full thickness septum, adjacent upper lip, and left alar base. With such total loss of the columella and any back-up of septum required a reconstruction that would stand on its own.





Reconstruction was begun immediately by development of bilateral vestibular chondromucosal flaps which were cut, swung out, sutured together and covered anteriorly with a nasolabial flap. The donor areas were closed after undermining. Three weeks later division of the base of the nasolabial flap allowed it to swing left so that its tip could repair the left alar base defect. Two weeks later the flap was divided and attached to its final destination as a columella base. This columella has a graceful stand-up quality with natural color. The method



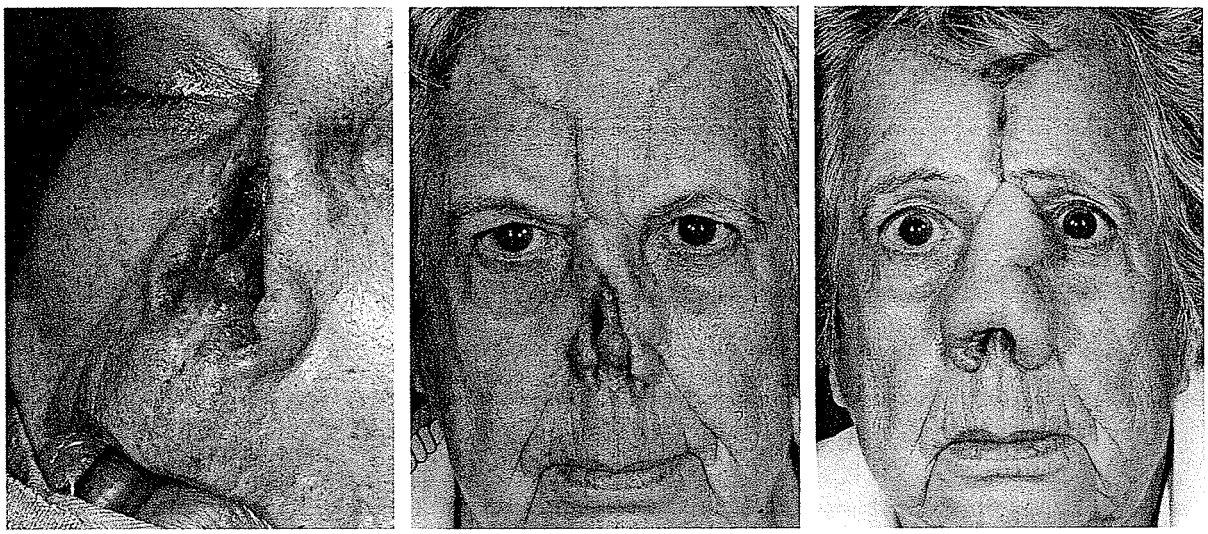


was first published in *Plastic and Reconstructive Surgery* in 1963.

When a good part of the entire distal nose is missing, columella reconstruction is merely a fraction of the total lining,

support, and cover required. The columella is usually designed as an elongated midline extension on the end of the forehead flap. Yet the fact that it is at the distal end of the pedicle increases the hazards of its arrival and survival as a columella. Adequate surgical delays are essential and are described specifically in this book.

When the forehead seems insufficient in height to allow a long columella to be designed on the end of the forehead flap, then the sides of the forehead flap can be taken wider than required for alar reconstruction.



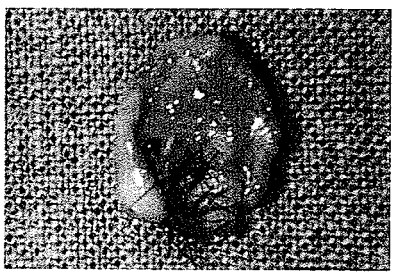
Later a pair of flaps can be pared off the edges based near the tip and brought together in the midline to reconstruct a substantial columella.

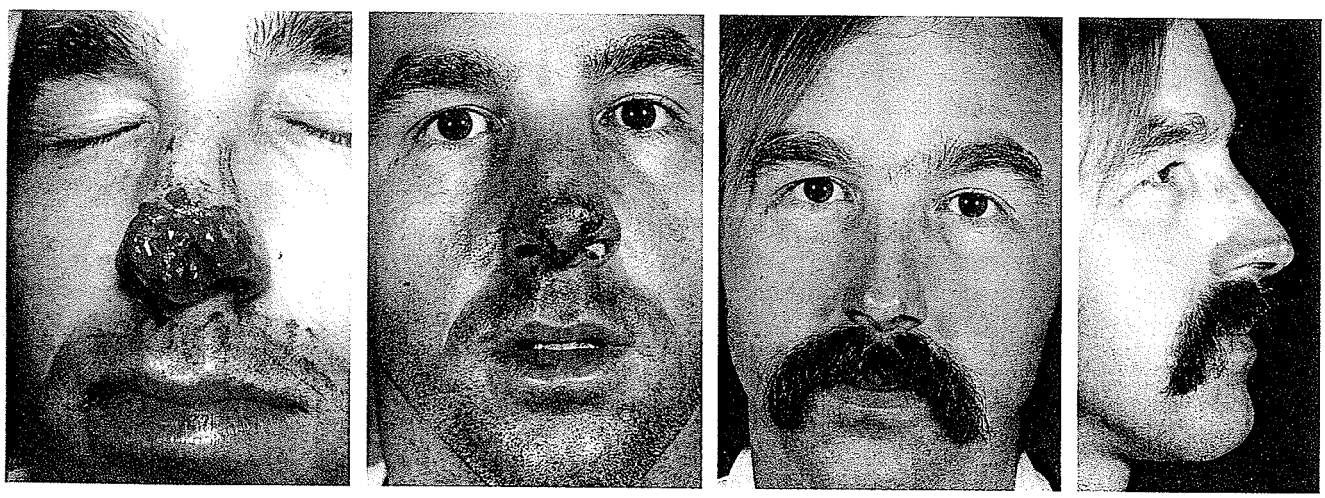
RECONSTRUCTION OF THE NASAL TIP

Replacement of a composite graft to the nose, according to Carpue (1816), goes back to the sixteenth century. A Spaniard had a piece of his nose sliced off by an irate soldier. Sir Leonard Fioravanti, an Italian surgeon, who happened to be nearby, grabbed the amputated part, irrigated it with his urine, and replaced it on the Spaniard's nose. Eight days later the dressing was removed. Suppuration was expected but instead the graft was healthy and all of Naples marveled thereat.

Following Avulsions

This patient had the tip and a full thickness portion of his left ala bit off by an angry friend. The patient arrived in the emergency room without the end of his nose. True to the axiom "Keep the piece," another friend was dispatched to the scene of the injury to retrieve the missing nasal bit, but not without concern because it was known the patient's dog was loose in the house with every opportunity of getting to the tip-bit first. Fortunately, the nasal tip was found, irrigated with saline, and carefully sutured into position with 100% take.



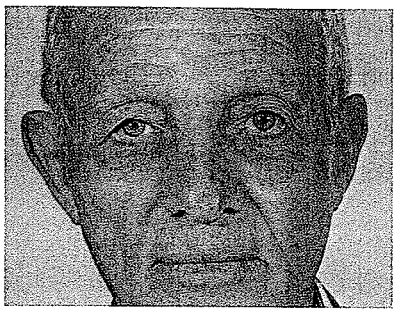


Auricular Grafts

Of course successful replacement with the original in kind offers the best possible reconstruction.

When the nasal tip is truly lost then replacement in kind is next best when taken from the ear. Simple skin defects of the nasal tip are often seen after excision of basal cell carcinoma.

These defects can be well covered with full thickness post-auricular skin. The resultant color blends well with nasal skin as seen in this example. Occasionally the graft may be a little



too pink or brown during the early healing phase but eventually blends in well. Sometimes the graft heals paler than the skin.

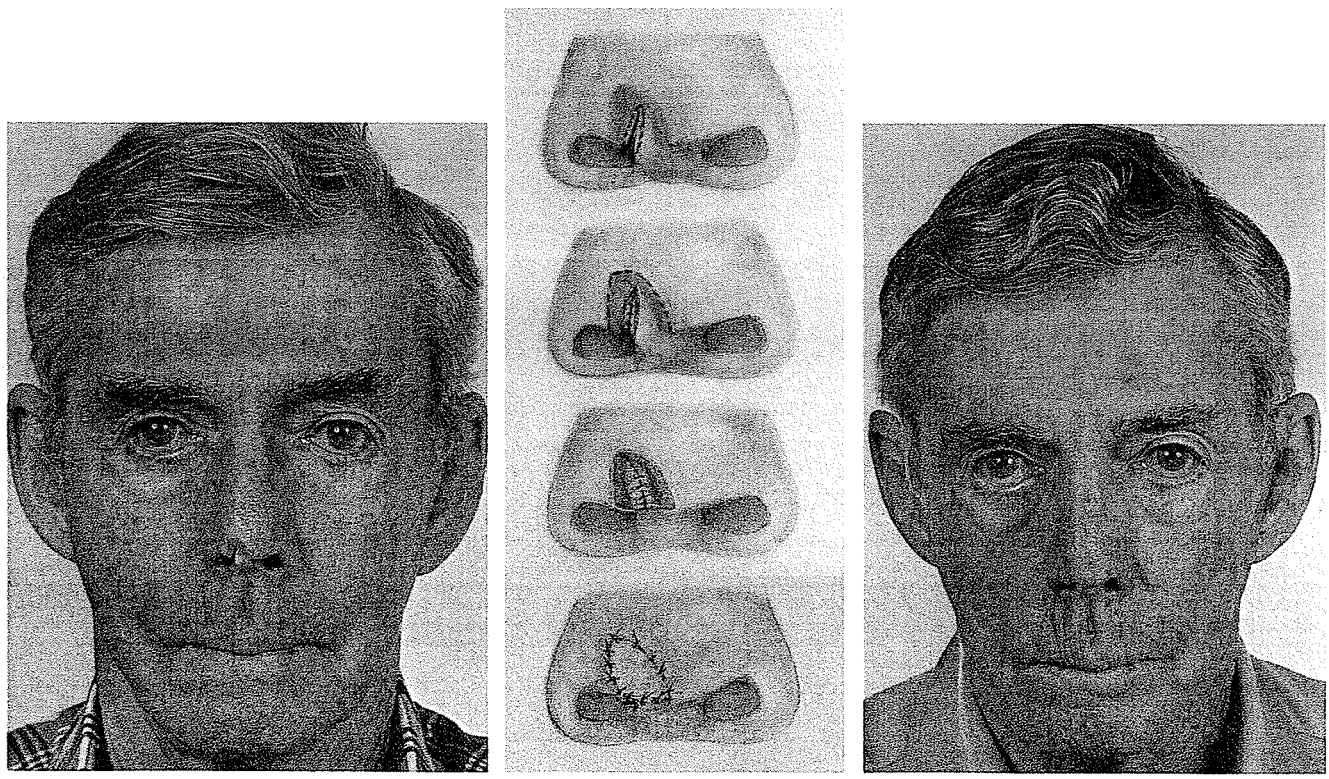
If the graft is depressed, dermis or cartilage can be inserted under the graft in a second stage if the patient so desires.

When there is discoloration, either too pink, brown, or pale, then make-up may be all that is necessary.

I have used postauricular skin for replacement of a pigmented nevus on a Black nasal ala. This graft healed with a reasonably good color match.

SIMPLE COMPOSITE GRAFTS

The seemingly simple little tip defect represents missing lining, ala, and composite tip. By in-turning the edges of the lining defect and suturing them, the platform of the defect was delineated. Excision of the rest of the surface scar provided a bed for an auricular composite graft.

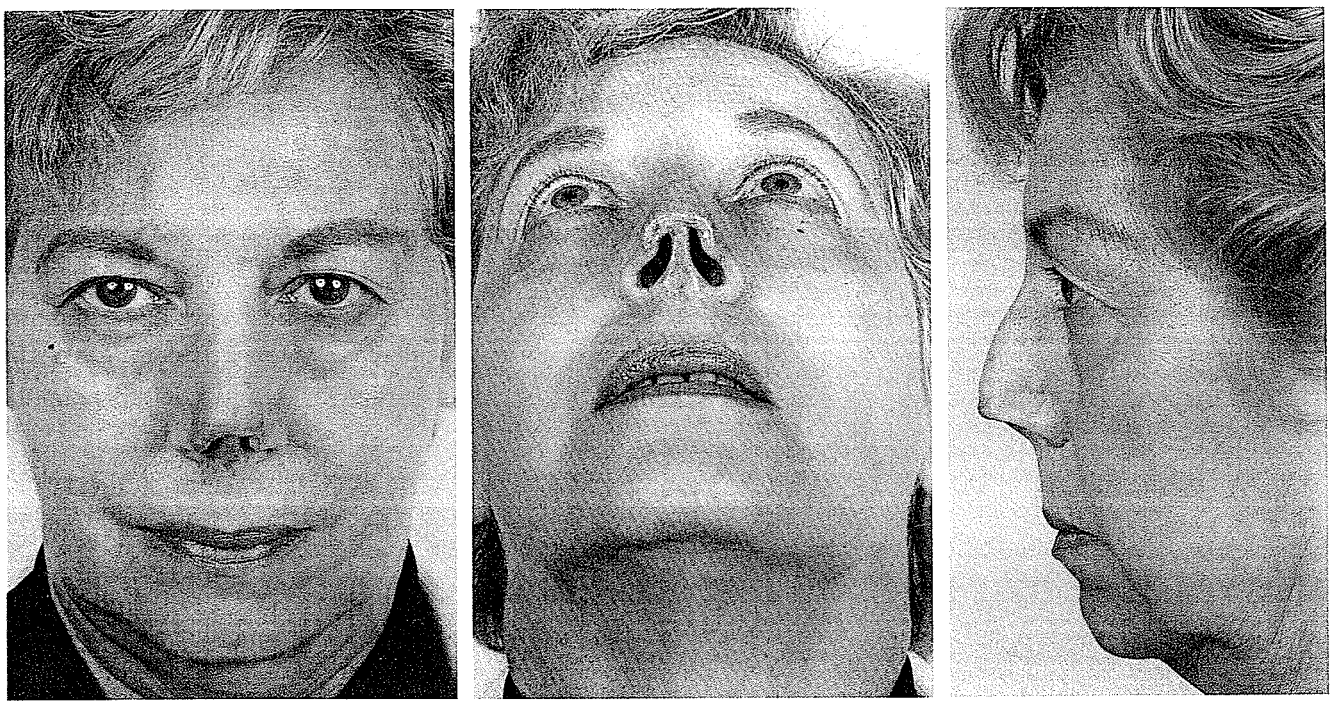


Antitragus Graft

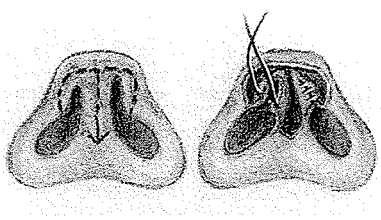
My favorite donor area for nasal tip reconstruction is a chondrocutaneous graft of the prominent antitragus cut in the shape of a tricornered hat to top the nasal tip and blend off along both alae and down the columella.

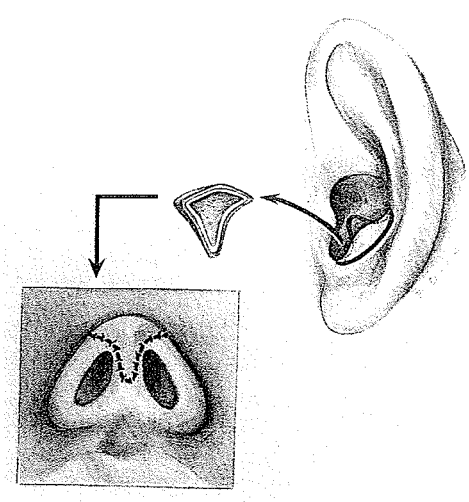
This graft was described in 1981 and part of its appeal is the fact that the antitragus often is too prominent, requiring reduction during routine otoplasty. Thus theft of this expendable mound improves the auricle and leaves an unnoticeable scar.

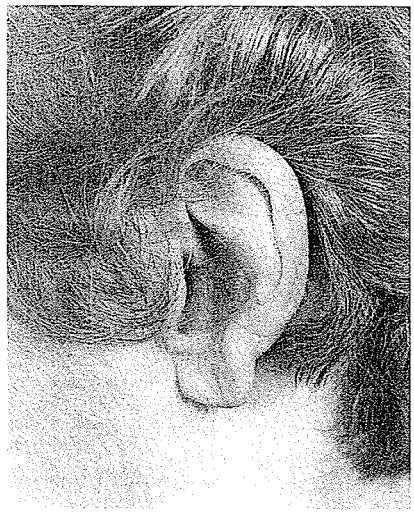
This 60-year-old female presented a nasal tip deformity following chemosurgery for a basal cell carcinoma. There was a defect of the tip, columella, and alae with no area loss more than 1 cm in thickness. This placed it within the safe range



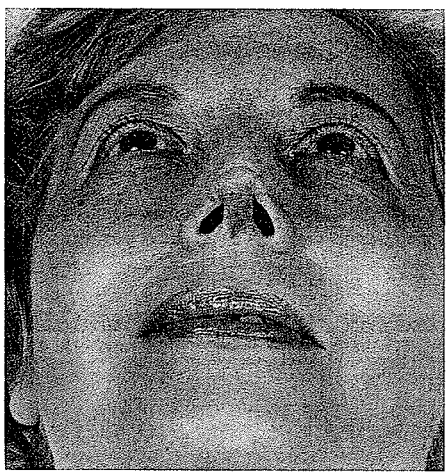
for a chondrocutaneous free graft. An efficient way to freshen this defect was to split the upper columella and turn the dissected edges out and suture them to the freshened alar edge to reline the alar webs. The tricornered composite graft of antitragus was applied to the freshened defect, resulting in a perfect take and an unnoticeable donor scar. Corrective rhino-

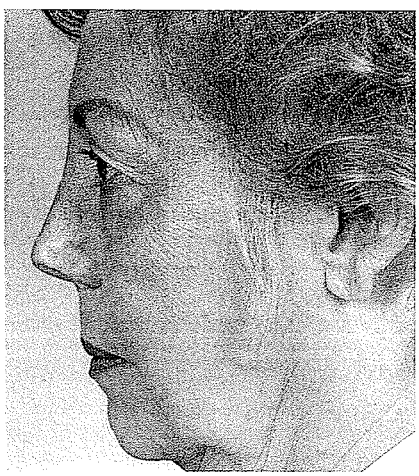




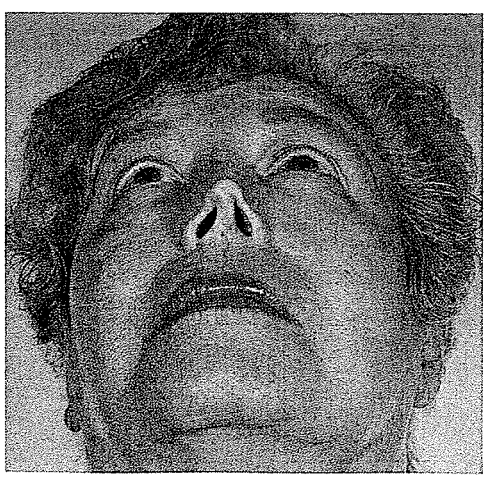


plasty with straightening of the bridge hump and bilateral osteotomies rendered the patient's nose more aesthetic than her original. It is interesting to observe how this chondrocu-

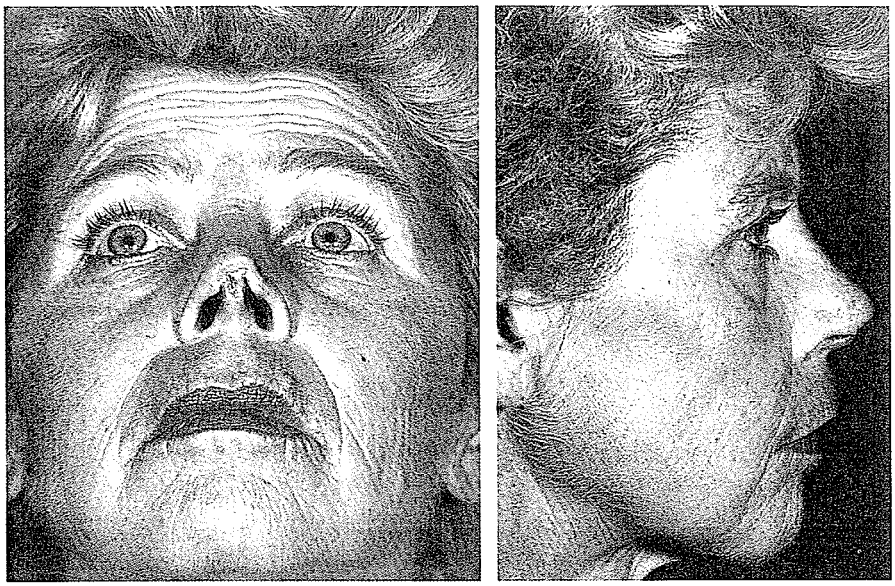


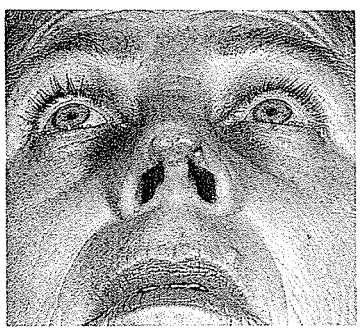


taneous graft survived and thrived with minimal absorption over the next 15 years.



This 58-year-old female lost her nasal tip, a portion of both alae, and the upper columella during chemosurgery for a basal

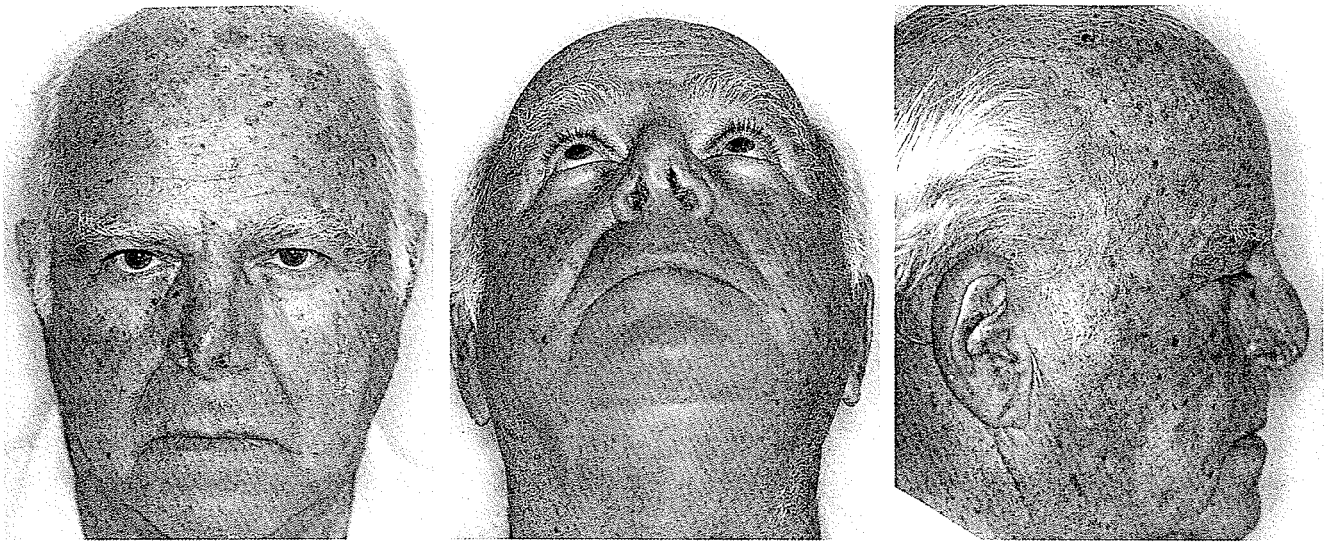




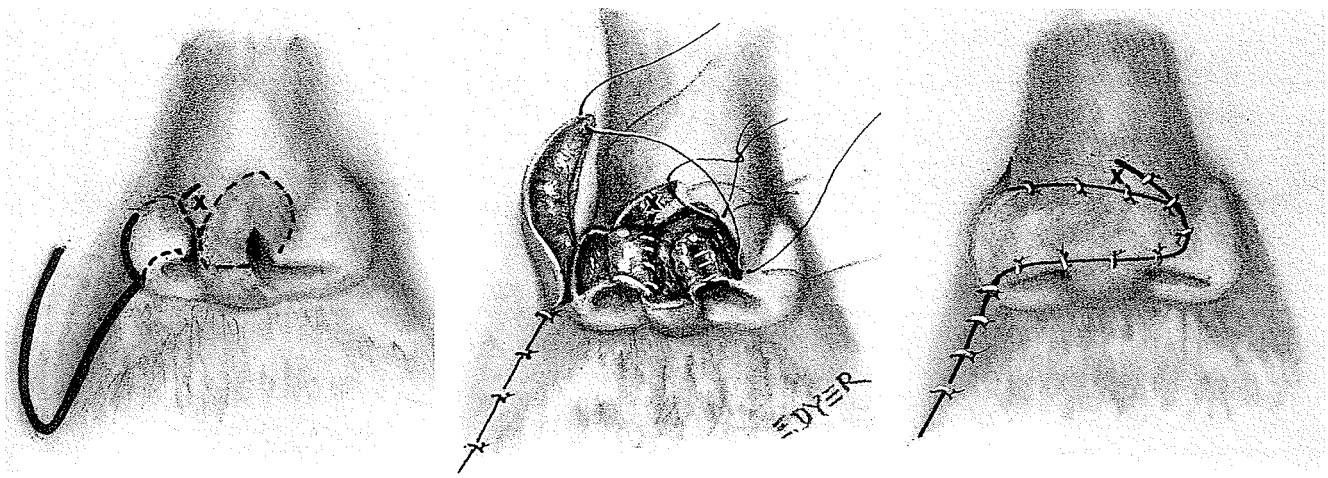
cell carcinoma. The area of the defect was freshened and covered by a tricornered composite graft taken from the auricular antitragus with a small extension of skin and cartilage from the conchal hollow for the columella. The take was satisfactory and the result a success after one minor revision.

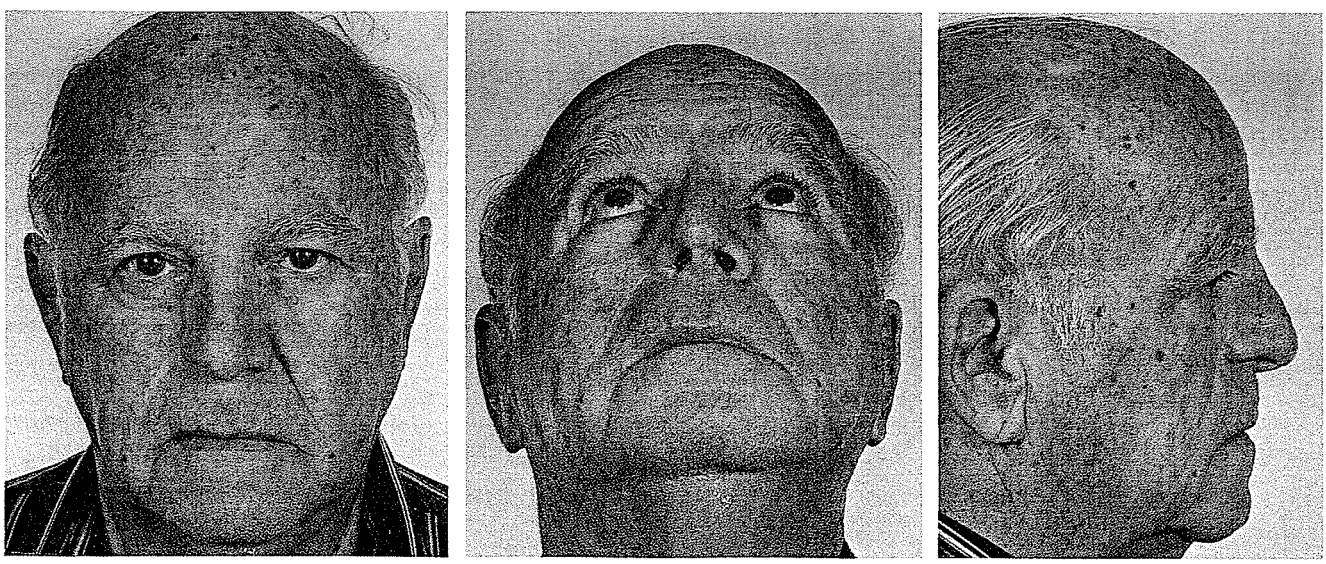
NASOLABIAL FLAP

This 68-year-old Cuban male had had multiple excisions of basal cell carcinoma of the nasal tip, leaving full thickness losses through both alae along with distortion and loss of tip projection. Turnover flaps of the right and left alae and the tip

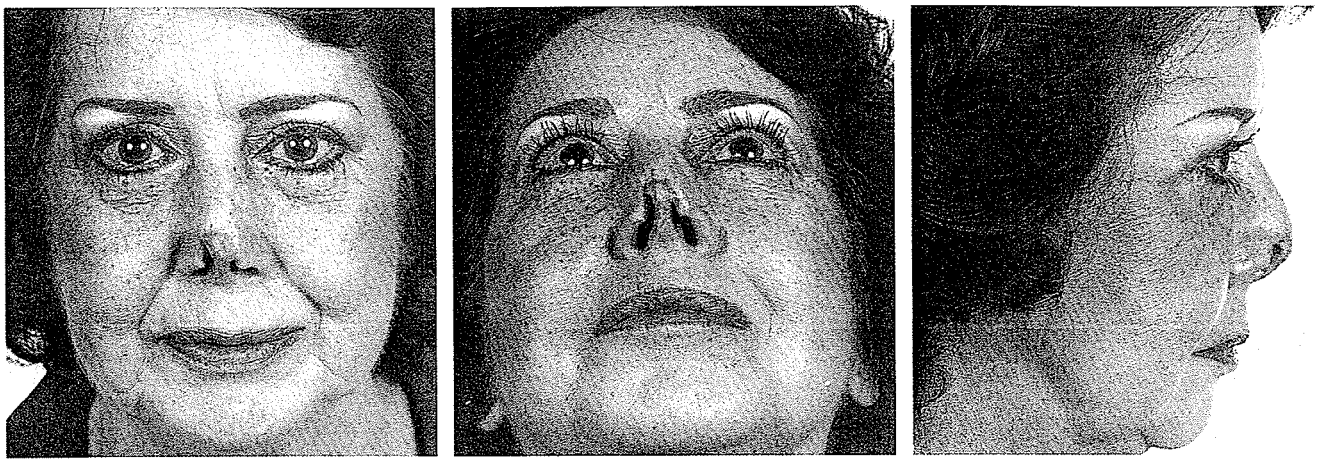


provided lining for all losses. Then a nasolabial flap was transposed as cover of the alar and tip units which camouflaged the reconstruction.

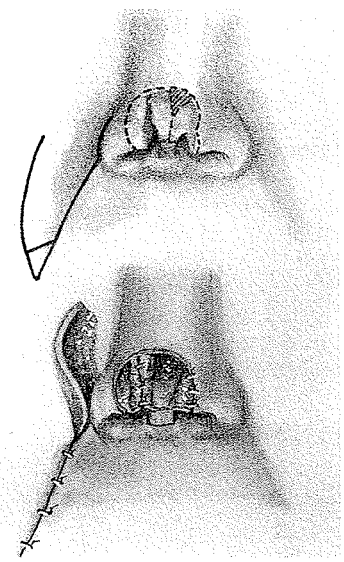




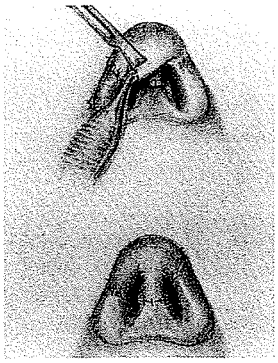
A 63-year-old female with basal cell carcinoma of the nasal tip had been treated with Mohs excisional surgery. The defect revealed skin and contour loss of the tip with scarring, full thickness loss of varying amounts of the medial portion of both alar rims, presenting bilateral notching and contour loss of the upper portion of the columella.



In this case a nasolabial flap was considered for cover of the entire defect with a small distal flap to be cut off its inferior edge for transposition into the upper columella defect. Unfortunately this required the main flap to be too wide to camouflage its theft from the nasolabial area.



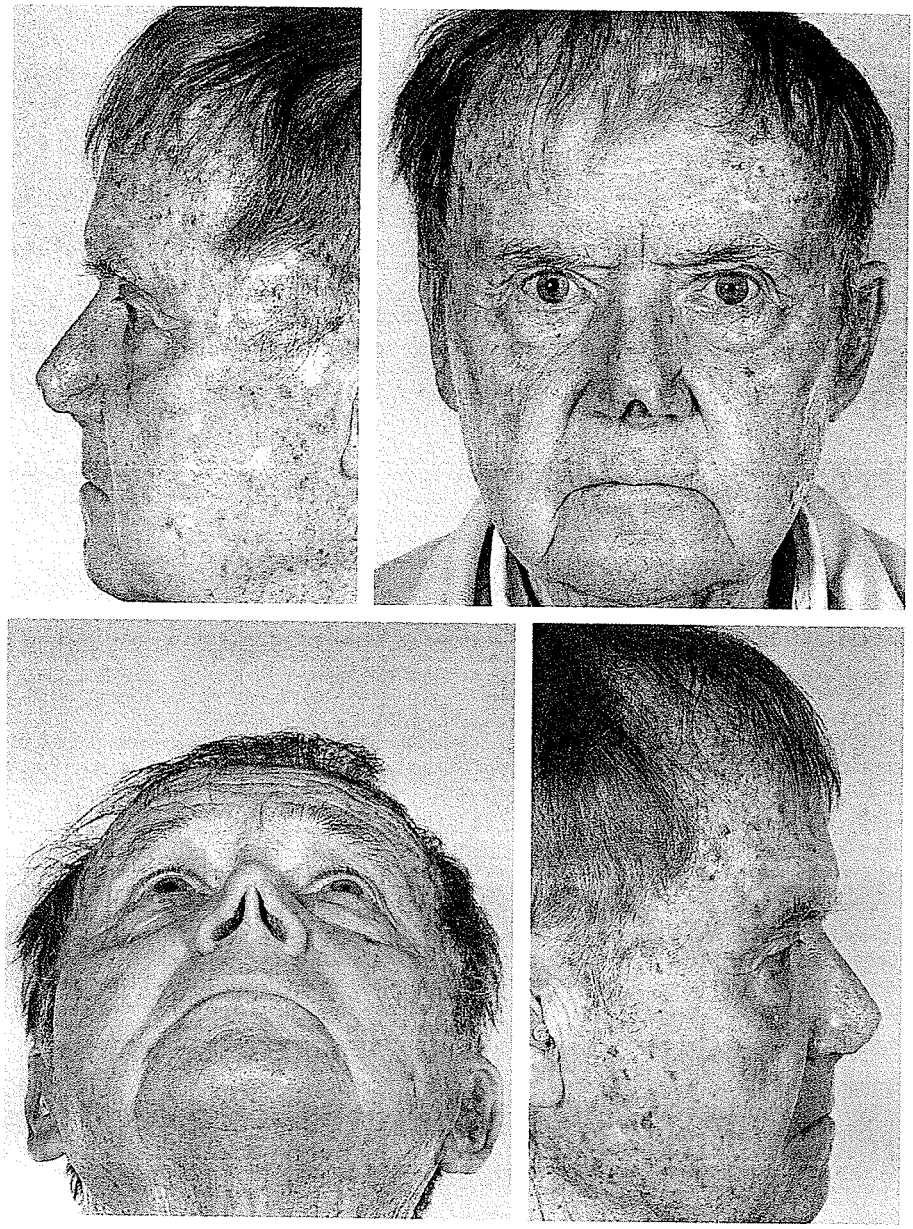
The skin and scar around the periphery of the alar notches were turned in for lining. Then a nasolabial flap, measured by pattern, was cut and tailored at the end. It was thinned specifically in the alar areas but left slightly thicker at the tip and sutured as cover. The amputated tip of the flap was used as a full thickness graft to the columella defect. This graft failed, leaving a deficient upper columella still demanding attention.

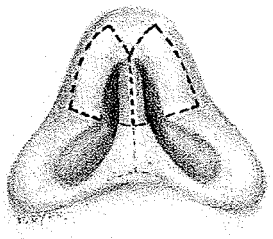


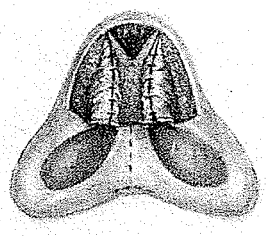
At the second stage, division of the pedicle and revision of the upper donor area was accomplished. Then a reevaluated diagnosis of the contours of the alae, tip, and columella called for adjustments. The flap was left attached to the main upper portion of the tip and left side for blood supply. The remaining flap was freed, thinned, and advanced, being let into the defect from posterior forward. This developed a distal overhang of excess skin which required trimming to match the lining along the right ala. Here was the excess needed! The trimmed portion was left attached as a flap based at the nasal tip. This little flap off the main flap was maneuvered 90 degrees. The columella defect, prepared by out-turning of small bilateral flaps of scar, received the tiny transposition flap. The "bleed" of the tip into the columella afforded a perfect camouflage.

MORE THAN A TIP

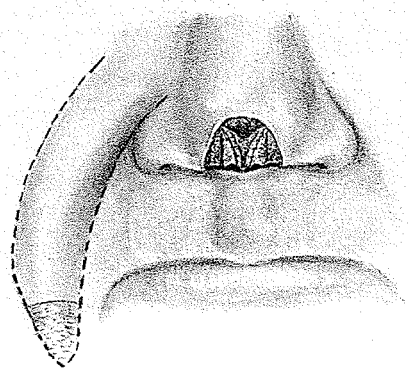
This 81-year-old male lost the nasal tip, bilateral medial alae, and anterior columella during cancer ablation.

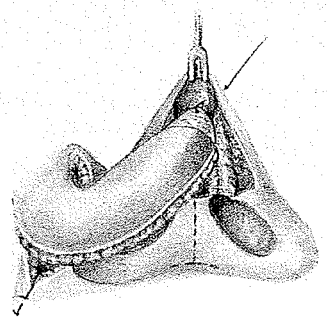




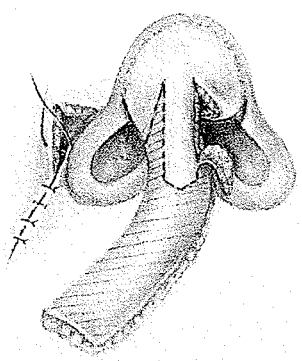


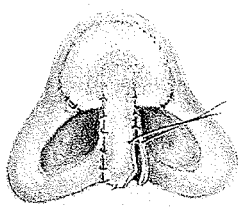
Alar lining was turned over on each side and sutured to the split skin of the upper columella to create the lining of the alar vault bilaterally. As the patient had a more generous nasolabial fold on the right, a 1.5-cm-wide superiorly based, right nasolabial flap was elevated and the donor area closed carefully. The distal end of the nasolabial flap was denuded of epithelium. It was then introduced by a deep suture under the skin of the dorsal tip, and as it was drawn in the flap filled the tip and also covered the alar vault lining. Due to the potentially precarious blood supply of this flap in the aged, skin sutures were placed but not tied until the following day.



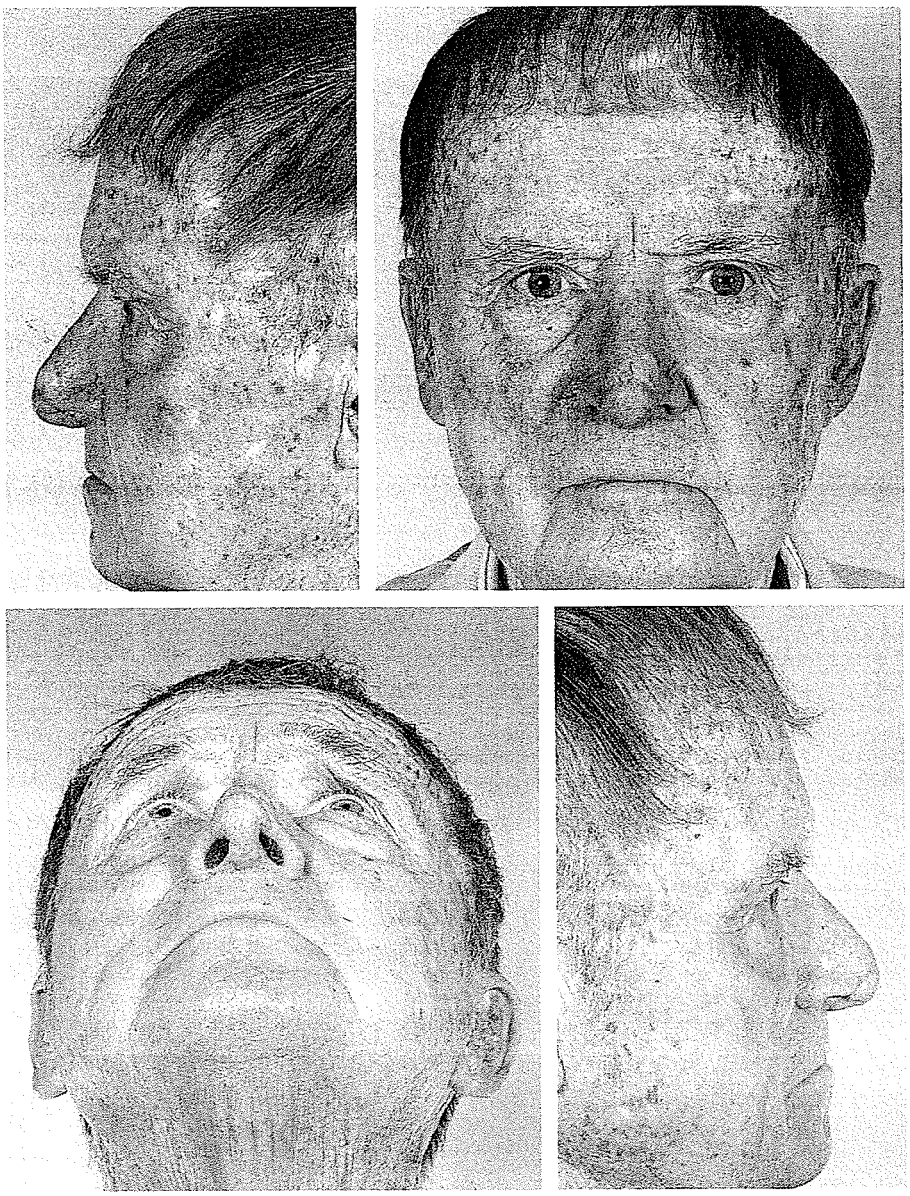


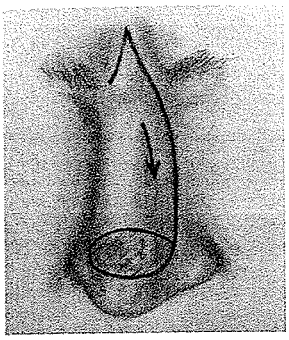
The flap was left in this position for three weeks. It was then divided from the cheek, thinned, and specifically tailored to reconstruct this 3-D defect. Small flaps were pared off the sides of the proximal flap to be folded under to reconstruct the margin of both medial alae. The remaining flap was then tailored to fold as tip and let in along a midline vertical splitting incision in the deficient columella.

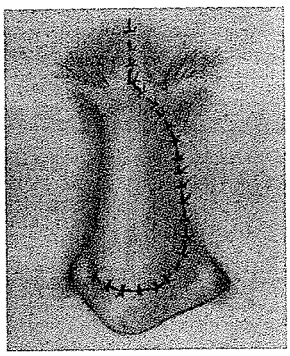




This 2-stage procedure produced a 3-D reconstruction, but the eventual minor scar refinements will be too late for inclusion in this book.







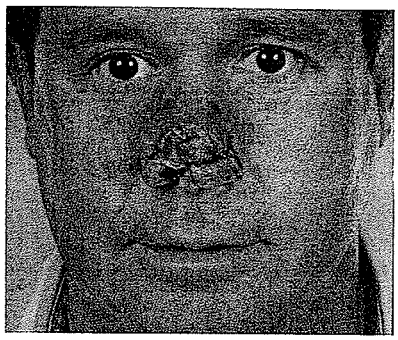
MORE HARM THAN GOOD

There was a period in the late 1980s when dermatologists were being taught to reconstruct cancer defects of the nasal tip with local flaps! There are several reasons that this was and is unwise. The skin of the nasal tip fits like a glove and cannot spare flaps of any size. In fact, the lack of extra skin makes local flaps of the tip difficult to create and often presents unacceptable scarring. As an experienced plastic surgeon I avoid these flaps and suggest that dermatologists, without true surgical training, do the same. There is, however, one flap of the nose which was used by H. D. Gillies in World War I that rotates the skin of the upper nasal bridge, with the aid of a back-cut in the glabella area, to defects of the distal bridge and tip. This flap can occasionally be useful and is re-invented every decade.

There is another factor in the ablation-reconstruction equation. When the dermatologist is doing the ablative surgery, his first responsibility is to excise all tumor and cure the patient. If he also has the responsibility for reconstruction there is a tendency to be conservative in the ablation to ease the difficulty of the repair. This is "throwing out the baby with the bath water." It is far better, particularly in the recurrent basal cell carcinomas of the nasal tip, for the dermatologist with his microsurgical excision to develop a clear margin and leave the reconstruction to the reconstructive plastic surgeon. Here is a graphic example.

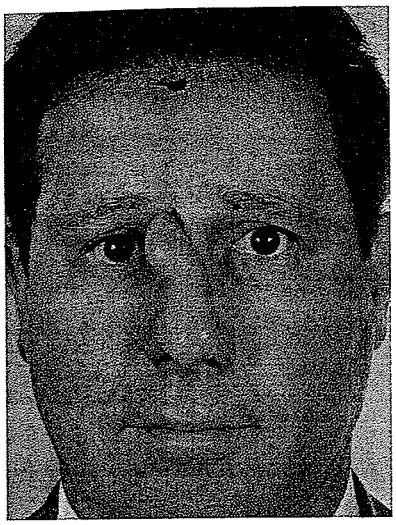
This 40-year-old male had multiple basal cell carcinomas of the nasal tip which were inadequately excised and reconstructed by a dermatologist, first with a local rotation flap and, after recurrence, with a right nasolabial flap which necrosed. The healed result distorted his nasal tip, deflected his columella, retracted his alae, and flattened his profile grotesquely.

DEFECT REQUIRES FOREHEAD FLAP



First stage of reconstruction involved excision of all nasal tip scars and other questionable areas which were sent for frozen sections. Once the entire area was clear a split thickness skin graft was applied to the raw area. This presented a defect involving associated units and subunits which included three partially affected units of right ala, columella and tip, and the adjacent uninvolved unit of the left ala. To camouflage this complex defect the reconstruction was required to provide one-piece coverage of the involved and uninvolved units of the entire complex.

A week later a vertical midline seagull forehead flap, with the columella extension extending to the hairline based on the right supratrochlear vessels, was delayed by incisions. Thirteen days later a portion of the normal right ala skin was turned over for lining and excess bridge septal cartilage was



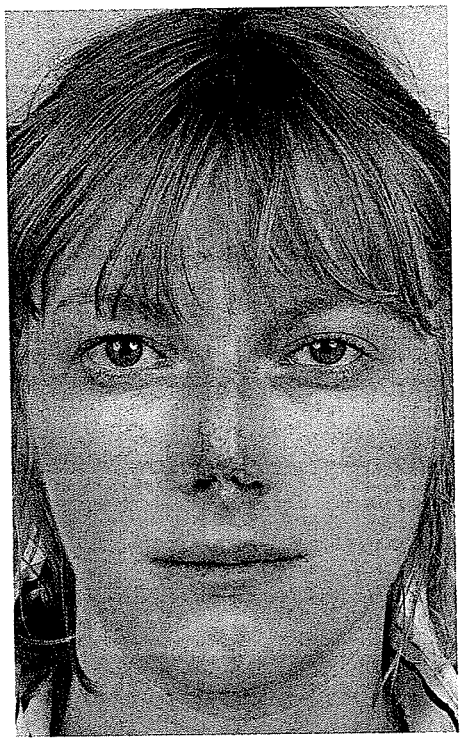
turned down for tip support. The remaining skin and skin graft of the tip and alae were excised and sent for frozen sections. Once reported clear the seagull flap was brought down to cover the defect and join the upper columella. The forehead defect was closed after wide freeing. Just over three weeks later the forehead pedicle was divided and replaced in the brow area. The upper pedicle was let into the nasal bridge to camouflage the flap inset by blending along the bridge unit. Thus the flap did not merely sit as a bulge in the tip but blended out into both alae, down into the columella and up along a good portion of the bridge. Six months later flap thinning and minor revisions were followed with scar revisions in another six months.

This 54-year-old female had reduction rhinoplasty nine years previously. She developed basal cell carcinoma of the tip of her nose which after four operations had Mohs surgery. She then had two attempts at postauricular skin grafts that failed, as did one graft from her arm. Without knowledge of previous grafts I applied one composite graft to the nasal defect which was only partially successful and thus unacceptable. The area was cleared and covered with a thin split thickness graft to achieve healing in preparation for a flap.

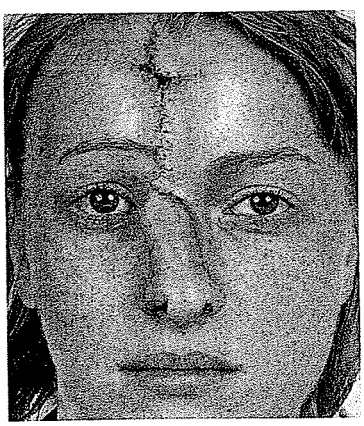
Three months later local lining flaps and a vertical short falcon-winged seagull forehead flap were delayed by surgical incisions. One month later the flap was transposed to the nasal defect and the forehead donor area closed. One month later the pedicle was divided and reset in the brow. Three months later scar revision of the nose and forehead and subsequent other minor revisions of scars and margins produced a reasonable result.

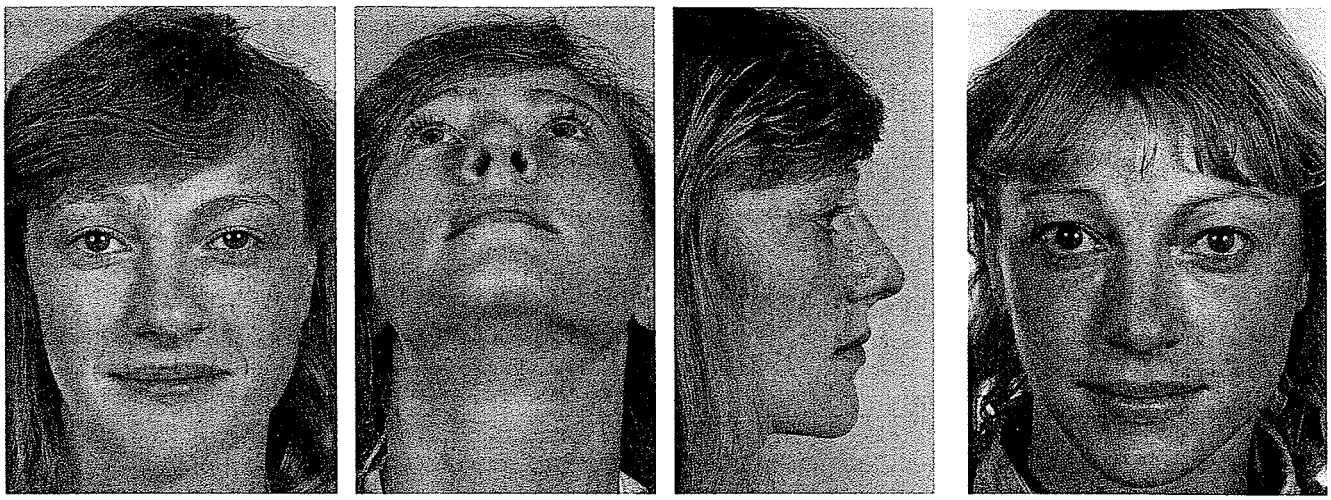
This 23-year-old female suffered the avulsion of the skin of her columella tip, alae, and bridge. An attempt to replace the avulsed skin evidently failed. She healed with contracted scar-

ring of the injured area. A midline vertical forehead flap of

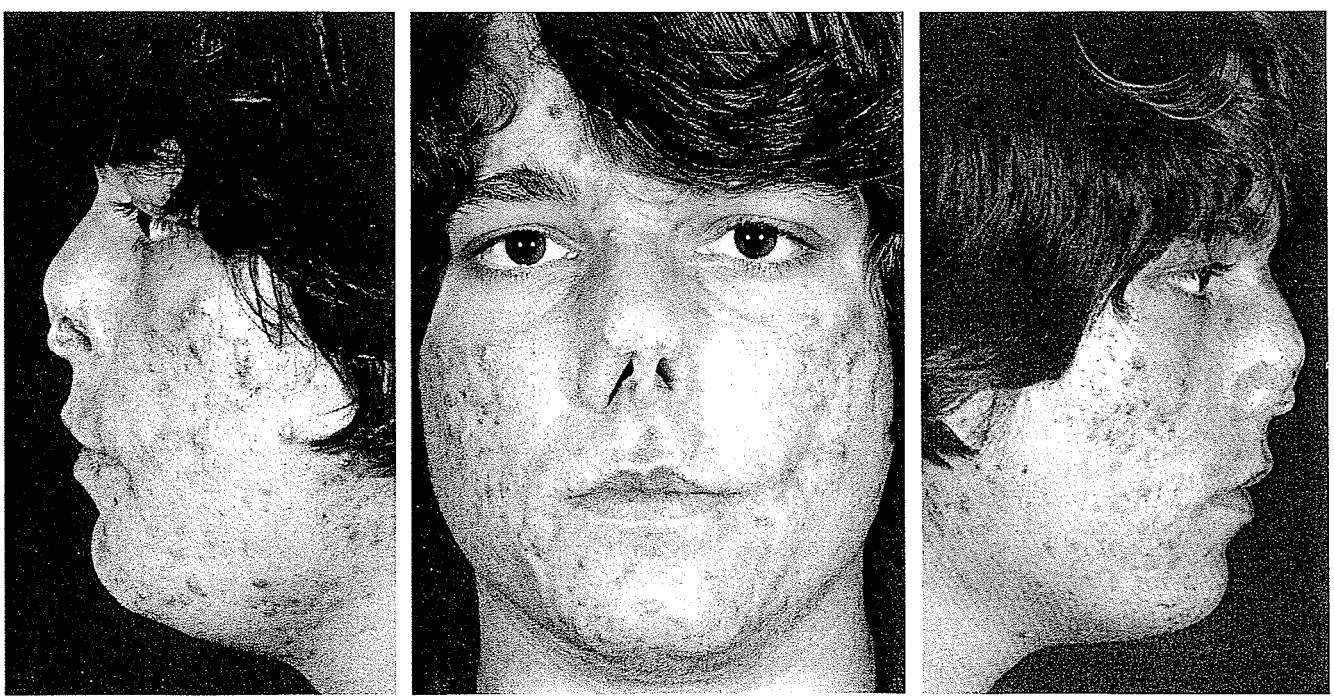


seagull shape with short falcon wings and based on the right supratrochlear vessels was delayed along with delay of the future lining. One month later the lining was turned down, the forehead flap transposed to cover the defect, and the donor area closed. Two months later the pedicle was divided and the base replaced in the brow area. Subsequent thinning of the flap and insertion of auricular cartilage for tip definition completed the reconstruction. She is seen 6 months and 7 years after surgery.

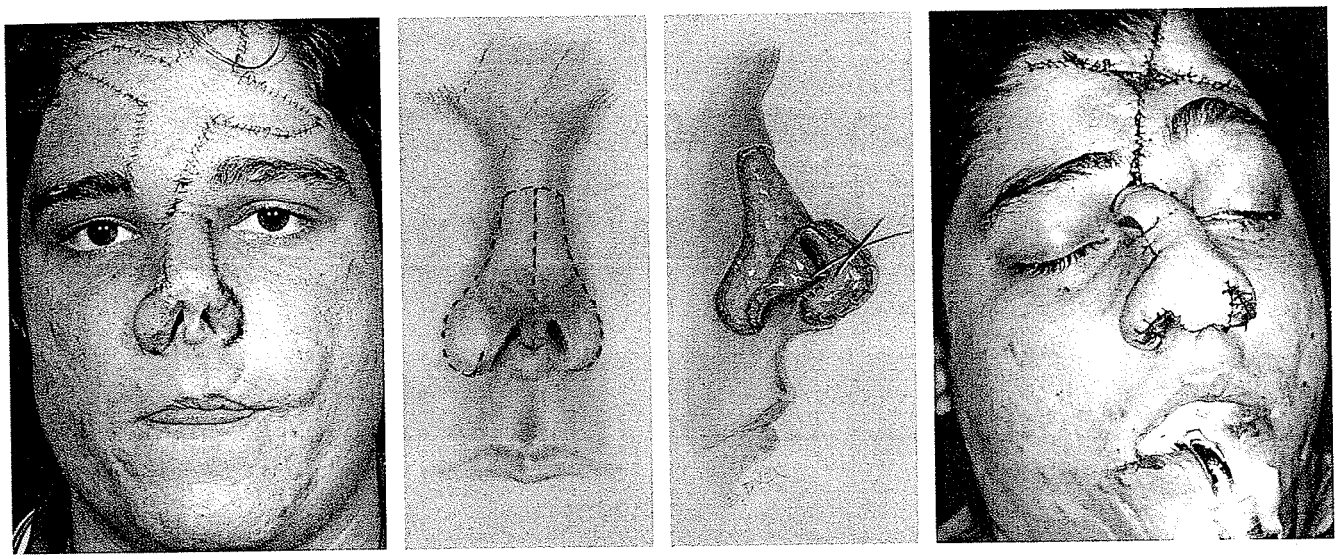




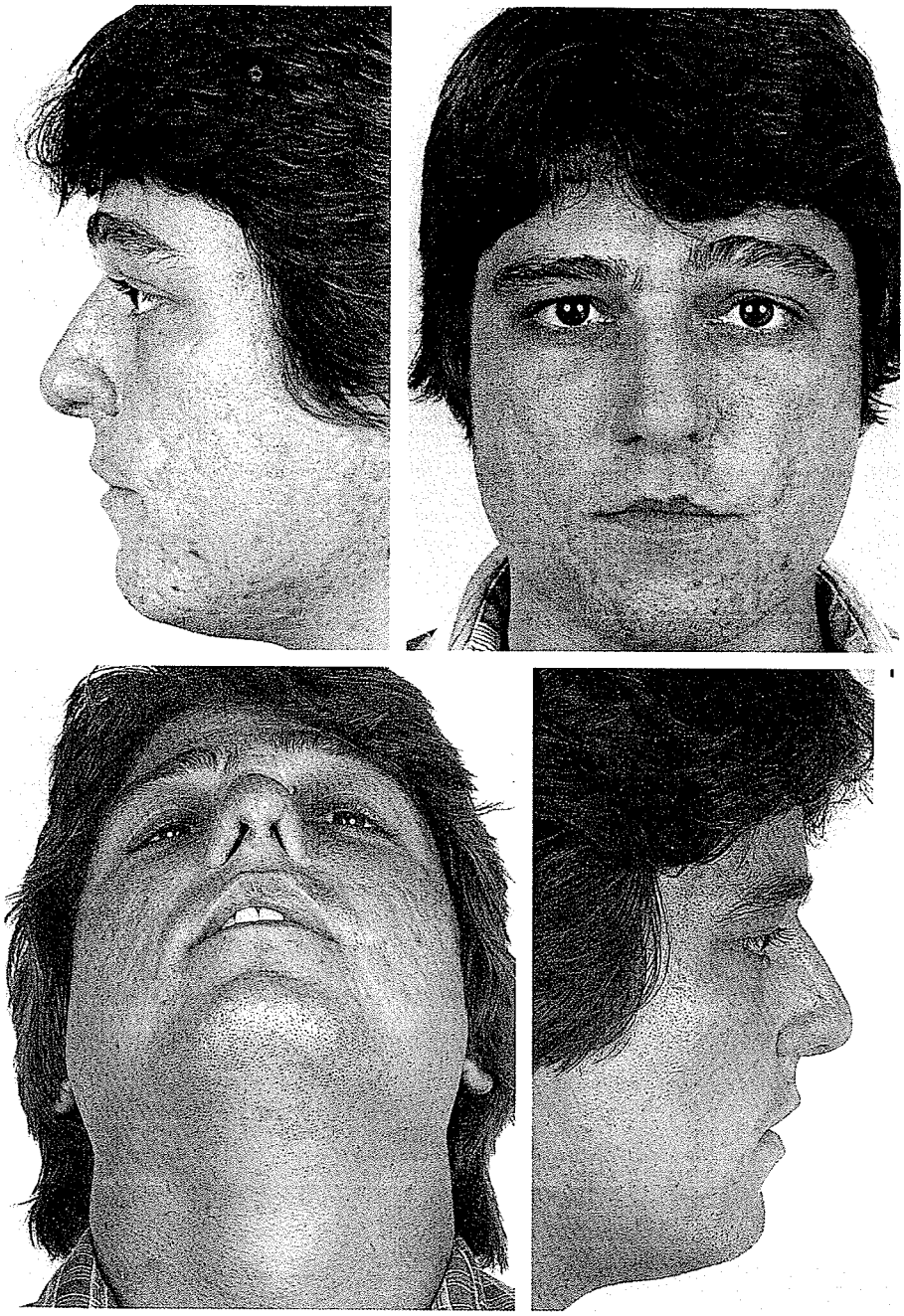
This 16-year-old high school football player suffered avulsion of his distal nose by broken windshield glass during an auto accident in Tampa. When first seen he had a healed wound of the left cheek and lip and loss of his nasal tip. Anterior septum along with portions of his alae and only a nubbin of columella were left. He also had a severe active acne on his face and forehead. To add to the complexity of the problem he had a narrow forehead.



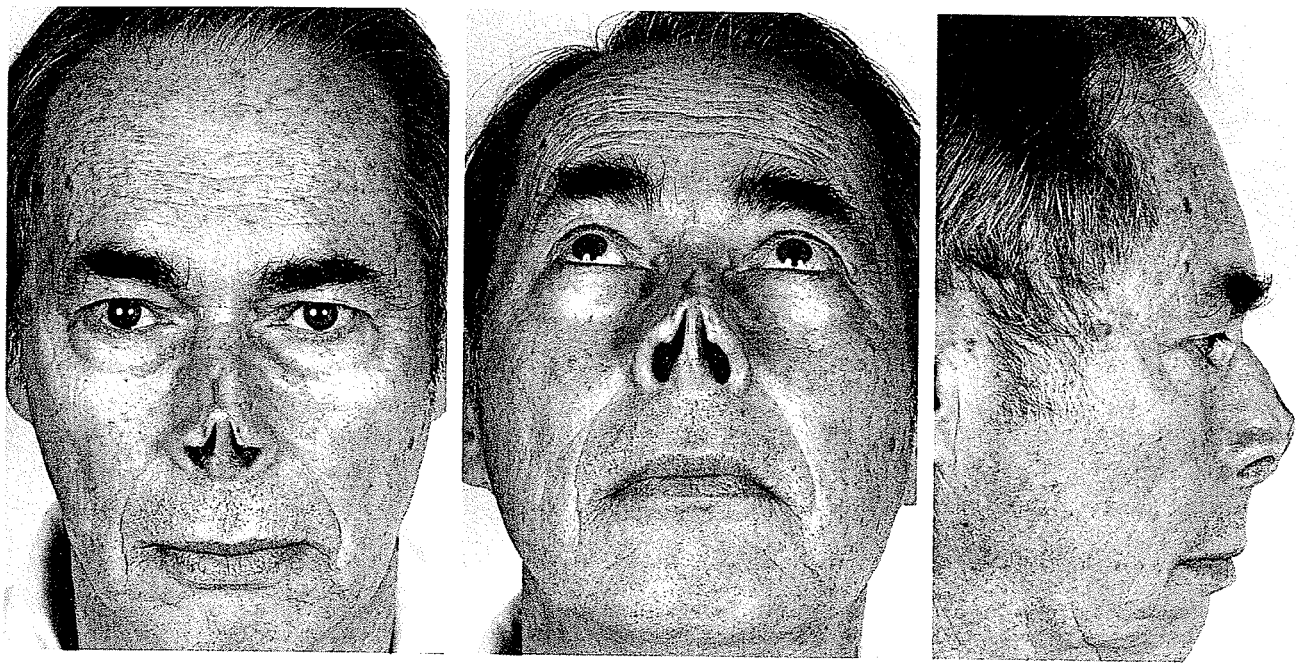
First he was referred to a dermatologist who treated his acne. Due to the narrow forehead it was necessary to design an oblique seagull shaped forehead flap which was delayed by incisions. Three weeks later the skin around the margins of the defect and part of the bridge were turned down for lining and fashioned as diagrammed. The seagull flap was used to cover the lower bridge, alae, tip, and columella. The pedicle was



later divided and returned to the glabella area. Several revisions with thinning of the flap created a reasonable result which was camouflaged by the flaps' conformity to units.

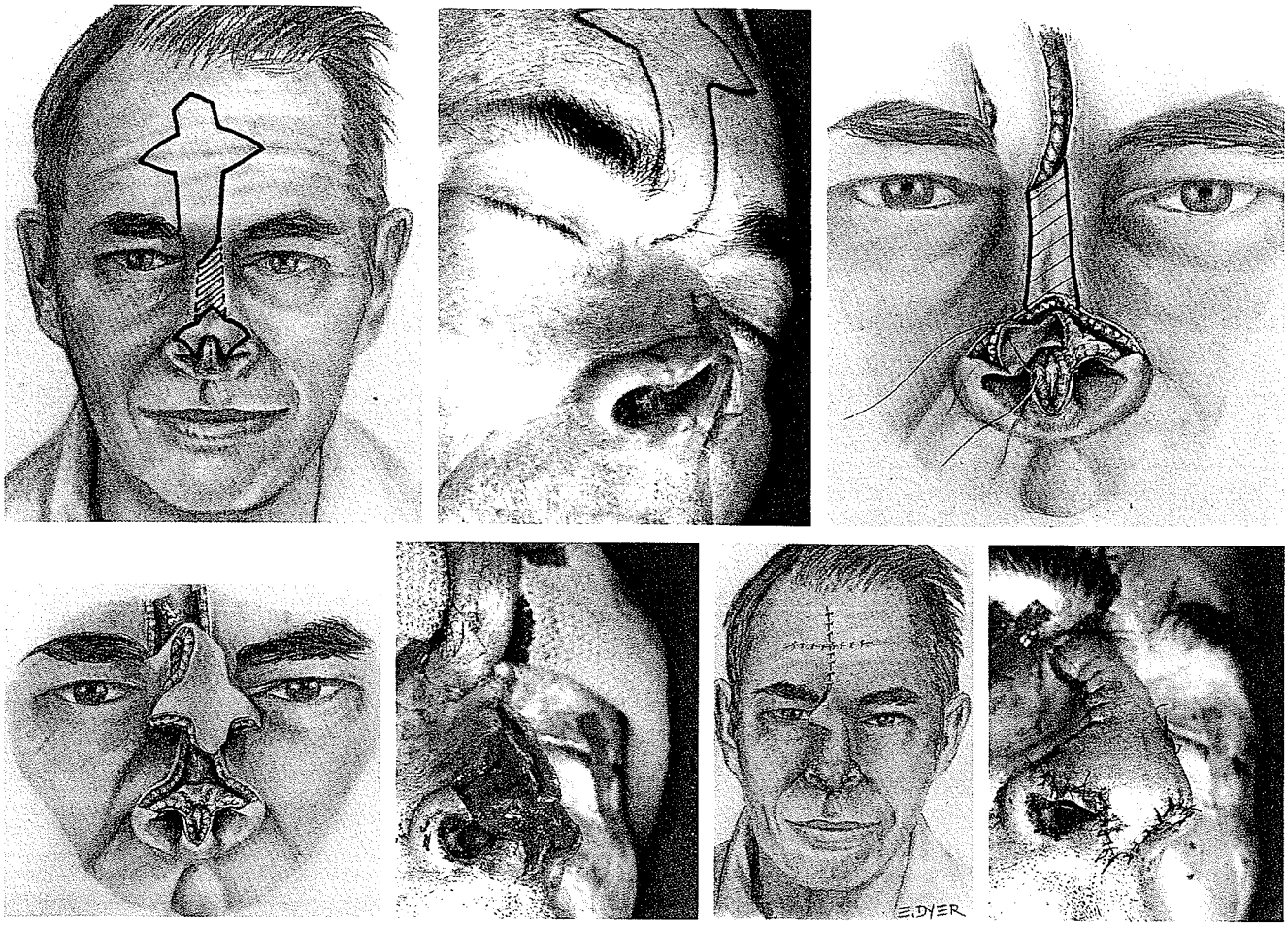


This 71-year-old man presented a nasal tip defect following chemosurgery for basal cell carcinoma. Besides a loss of the tip and columella, there were through-and-through defects of both medial alar rims and a scar of the nasal bridge. Turnover of alar skin could provide lining for the anterior vestibule.

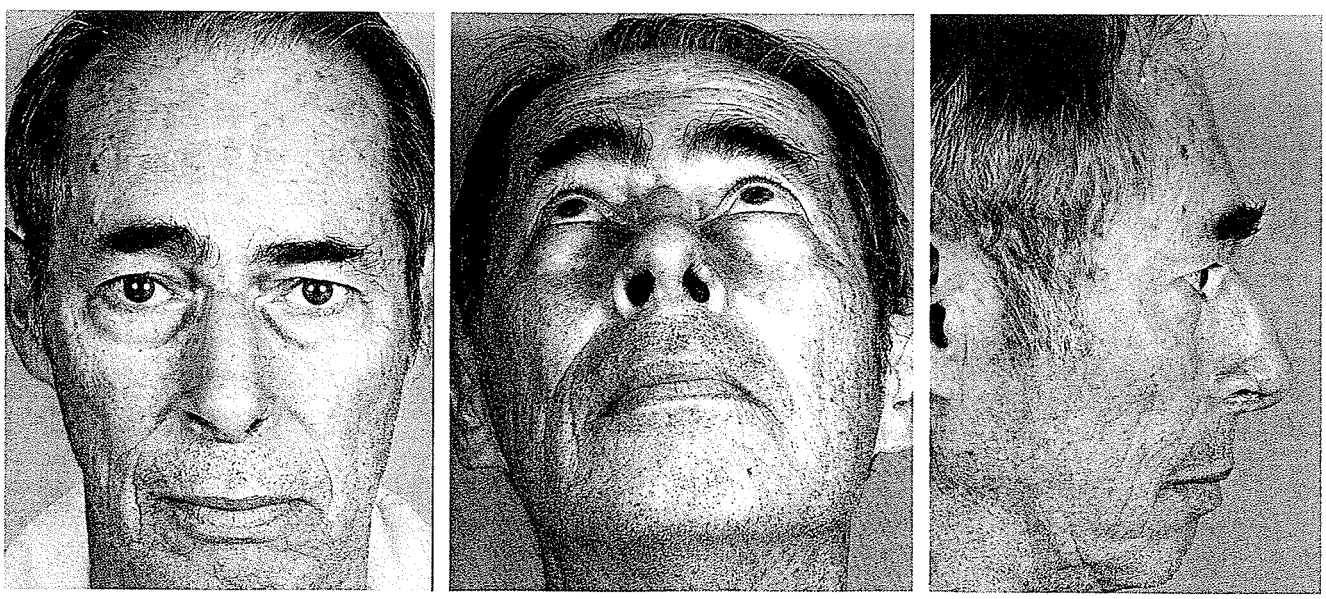


A composite antitragal graft shaped like a tricornered hat was considered because of the simplicity, lack of scarring, and previous success with the method.

More critical observation revealed a loss of tip projection of well over 1 cm which rendered the free composite graft slightly hazardous. Thus, with the tip and ala skin flipped over for lining and sutured to the skin of the split columella along with excision of the bridge scar, a suitable bed was presented. A safer but more elaborate solution for cover was found in a mini-seagull forehead flap brought in as a bridge tip—half ala, columella unit. This camouflaged the recon-



struction and produced a normal tip projection. The excess pedicle was excised and the bridge portion of the pedicle thinned for gentle inset. The midvertical and transverse forehead scars soon healed to near invisibility.



NASAL ALAR RECONSTRUCTION

In 1902 König described the use of an auricular composite free graft to the margin of the nasal ala. In the 1950s J. B. Brown advocated this graft for alar margin defects. The composite graft is white the first day, turning bluish after the second day, and when successful was a happy pink by the fifth to the sixth postoperative day. I remember Brown let me in to the treatment room in his private office in St. Louis several times when he unveiled the grafts on their fifth day of pinkness.

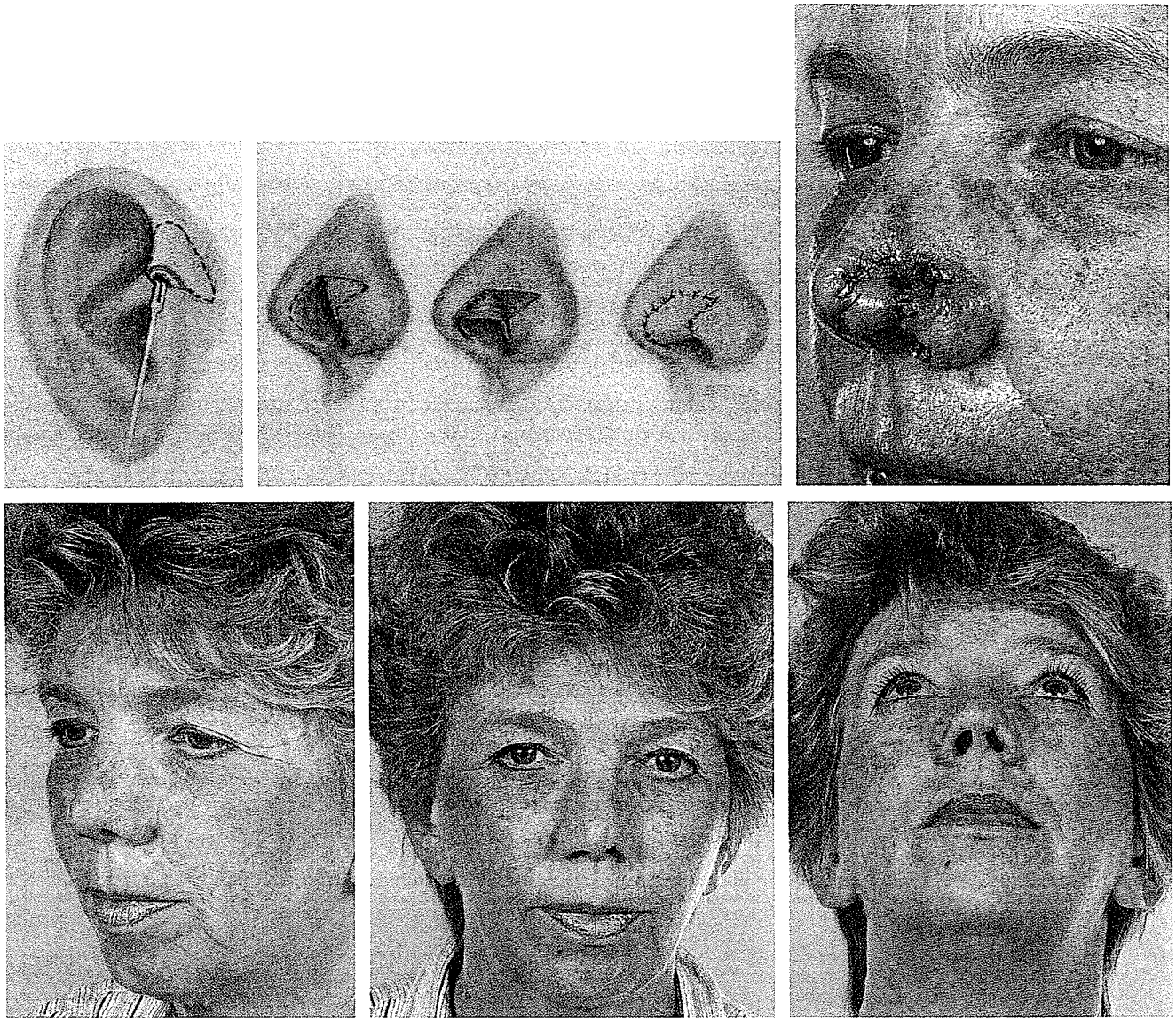
This auricular composite graft is as close to similar tissue in kind for a nose as can be found. It is suitable in color, texture, shape and in layers (skin, cartilage and skin). Brown limited the graft to 1 cm thickness and J. Szlazak later demonstrated survival of grafts of up to 1½ cm.

In 1957 Gillies and Millard advocated auricular composite grafts included on the edge of a larger full thickness skin graft to line the forehead flap ala. This is the principle that D. Baker has advocated for large marginal alar defects. Baker prepares the recipient site for his graft by cutting a flap from the skin adjacent to the defect and turning it over for lining. This exposes a large raw area to accept his large full thickness auricular skin graft with its 1 cm composite edge for the alar margin. Baker advocates an anterior upper helix full thickness edge of composite tissue attached to a large preauricular full thickness skin graft. This graft fits the defect well and gives Baker excellent results. The preauricular donor area is easily closed by a mini–face lift, but the anterior auricular helix offers a problem. I have used a postauricular flap to imitate the anterior helix.

Except for marginal alar defects of 1 cm or less in thickness I prefer flaps over free grafts. Then, too, a large free graft of skin on the side of the nose and the noticeable anterior helix defect have been deterrents for me. Nevertheless, Baker's design is sound and I use it occasionally in modified form.

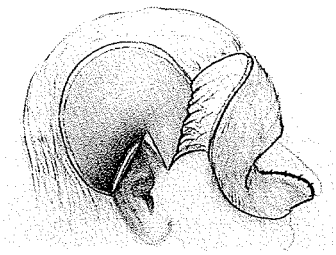
This 50-year-old female developed a basal cell carcinoma on the left side of her nose which was excised by a dermatologist and reconstructed with a nasolabial flap. It was found that there was still carcinoma present so Mohs surgery was used to clear the area. Again there are two reasons why dermatologists should not try to reconstruct. He who ablates often tries to save tissue to ease repair and leaves carcinoma in the area. Attempts at reconstruction by those not trained in plastic surgical technique often cause more damage than good.

This patient ended up with a left alar and tip defect, a scarred, swollen alar base, and a nasolabial scar. Specific modifications of the Baker design turned a lining flap to open more area for graft attachment. A composite anterior helix wedge with extension of preauricular skin provided replacement of missing tissue. The graft was successful and the depressed area along the upper border of the graft was enhanced by alar cartilage taken from the normal side, just a year after the grafting.

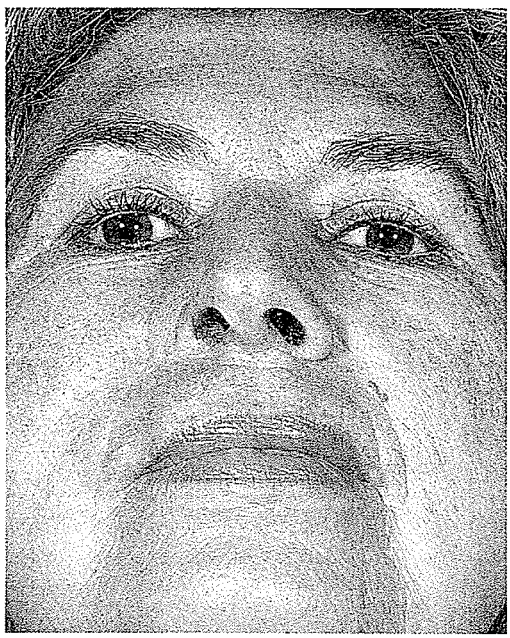


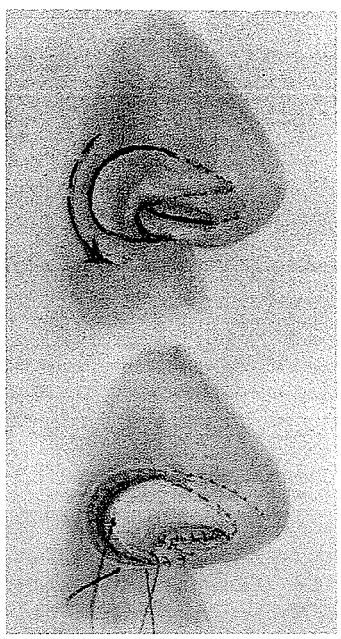
When a large portion of the auricle is required in nasal repair than can be safely free grafted, a flap vector can serve well. In 1967 A. Washio designed a semicircular scalp flap based anteriorly on the temporal vessels, which reached

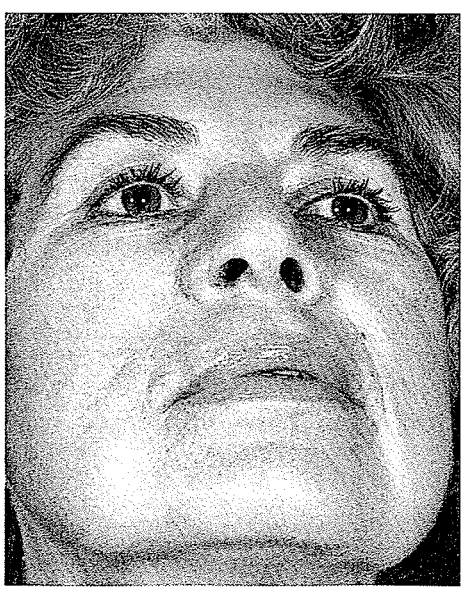
around to incorporate whatever auricular skin and composite tissue were needed. The flap carrying the auricular tissue was unfolded and extended forward to the nose. Once the nasal attachment was sound, the pedicle was divided and the scalp portion returned to its original donor area.

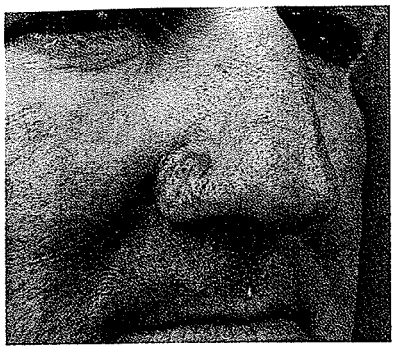


Occasionally defects involving the alar base and a portion of the ala can be reconstructed by a rotation incision around the alar base and completely through the lining with good release. The excess membranous septum can give up a chondromucosal flap which can be transposed into the lateral alar lining releasing gap. This gives better balance to the alae.

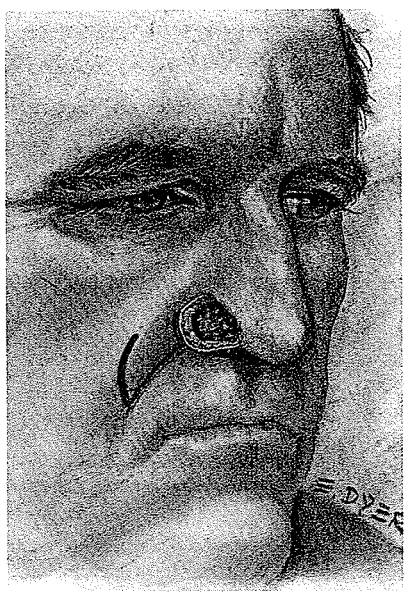


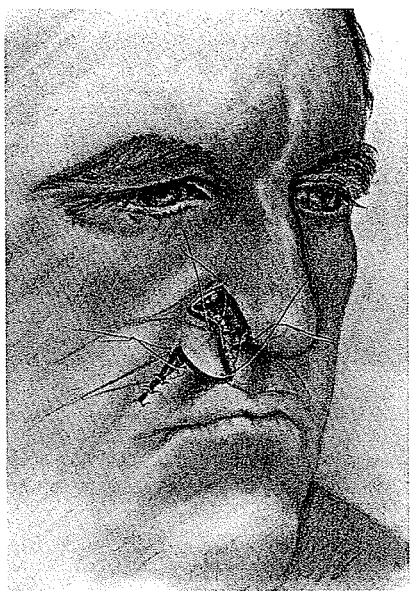


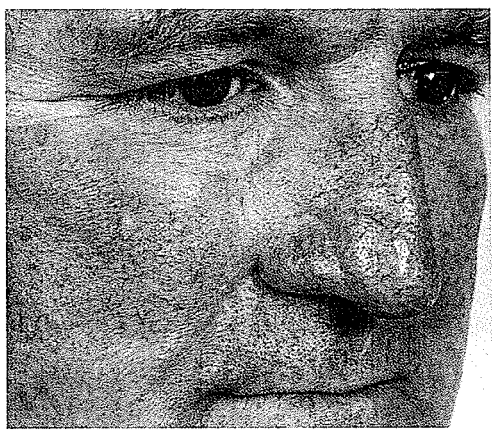




When the defect involves one complete unit or subunit, an aesthetic repair of that unit is straightforward. This 45-year-old Irish male with a basal cell carcinoma involving the skin of the right ala base required excision down to lining. The depth and location of the defect was perfect for a small flap taken from the adjacent nasolabial fold. When based superiorly the flap transposition required only one stage. The flap completed an alar subunit as it blended into the tip. The donor area of course closed along natural lines.

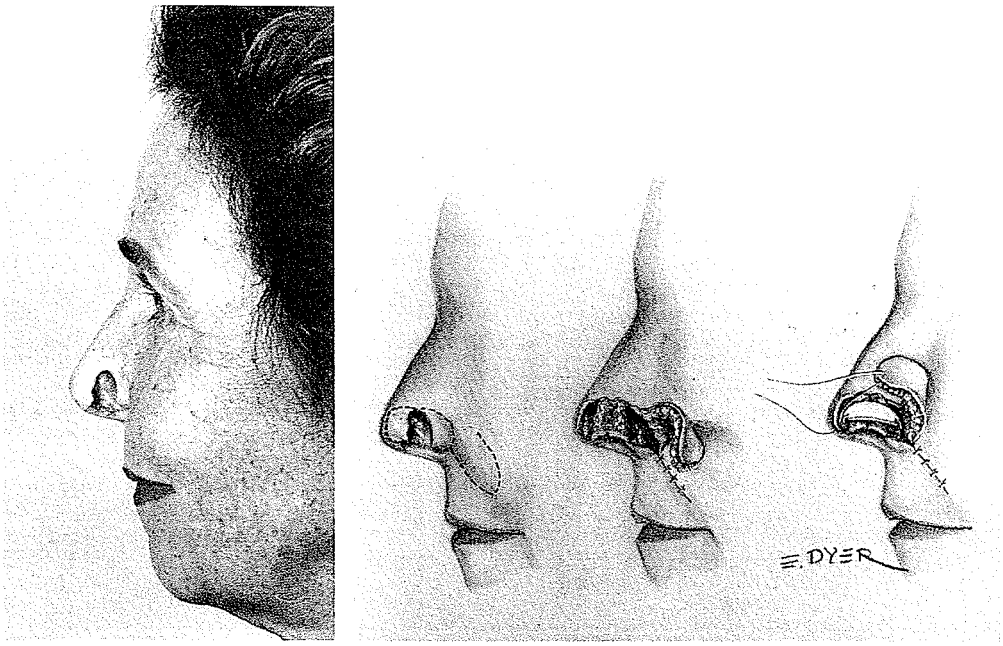






If the defect involves a major portion of a unit or subunit, the defect should be extended to include the total unit or subunit. The flow of a complete unit effects camouflage as the borders offer a hidden sanctuary for joining scars.

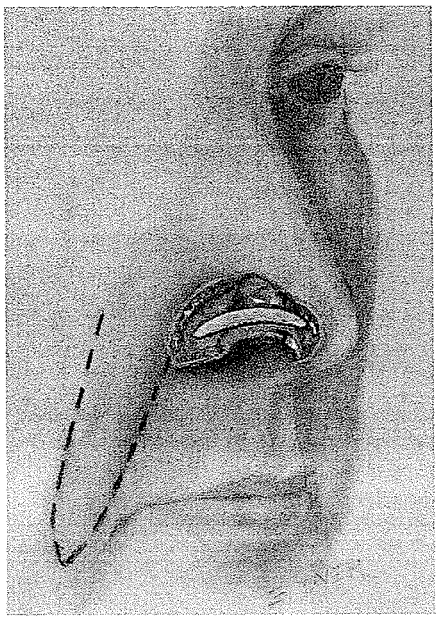
This patient had a basal cell carcinoma of the ala seven years before and had worn a Band-Aid over her full thickness loss all those years. As the defect was slightly large for a safe patching with an auricular composite graft, a three-flap repair was used. This required a surgical delay of the lining flaps. The central alar defect was made into a total alar surface defect by the in-turning of adjacent alar skin for lining. This was splinted with a strip of auricular cartilage and covered with a superiorly based nasolabial flap which extended from nasal tip to alar base as one unit. This blending by "bleeding"



of the ala into the tip avoids an interruption and hoodwinks the eye to the advantage of the camouflage.

This 73-year-old female developed basal cell carcinoma of her right ala. It was treated first by a dermatologist with radiation and excision. The recurrence was treated by a plastic surgeon by excision with clear margins. A healing phase of six months was respected.

Due to the history of radiation treatment and as the lining flaps were to be based on scar, precautionary circumscribed incisions provided a delay. These were designed on a line to fulfill a unit. The long nasolabial flap was also delayed. Two weeks later the skin edges of the alar defect were turned over and sutured to each other to create the lining. A septal cartilage strip was fixed over the lining. Then the nasolabial flap was transposed for cover with its base positioned in its final destination. The nasolabial flap became congested at the tip but eventually survived.



Subsequent revisions involved thinning and shaping the alar margin and thinning the nasolabial flap along the alar crease to create a natural aesthetic contour.

The use of a nasolabial flap as lining and then twisting it for cover of an alar defect was described by S. Spear. It requires secondary revision but has merit.

Alar Defect as Only Part of the Reconstruction

When the alar defect is only part of the total deformity, the alar portion of these reconstructions is still important. The standard approach for years has been, as in simple alar defects, the in-turning of adjacent skin for lining splinted with a strip of autogenous cartilage. In the more extensive defects cover is supplied by a forehead flap. G. C. Burget and E. J. Menick reaffirmed approval of this approach with minor refinements in 1986.

In 1942 H. D. Gillies advocated the auricular chondrocutaneous graft to line and support the ala in a forehead rhinoplasty. I first used this method in England in 1952 and continued to use composite grafts for years with reasonable success. In the last 10 years I have altered this method to advantage. For reconstruction of one or both alae, the nasal tip and columella, or a portion of each, when possible, a forehead flap should be involved. When the tip, columella, and both alae are missing, then the vertical seagull-shaped forehead flap as described in 1974 is the design of choice for cover, not only because the wing tips form nostril sills, but the double-axis forehead donor area closes more easily along natural lines. When the vertical height of the forehead is narrow, the base of the flap can be brought down through one brow to lengthen the pedicle. For extra length the pedicle can be slanted toward a bay. If only portions of this total tip-alae unit are absent, then the gull design can be modified to reconstruct specifically the units and subunits that are missing.

Prefabricating the Alar Unit

During a surgical delay of the forehead flap, gull-shaped or modified, incisions along the future alar margins should be cut on the bias, leaving a thinned distal edge of about 1 cm in width before becoming full-thickness forehead skin. Just proximal to this thinned edge but parallel to it, a narrow tun-

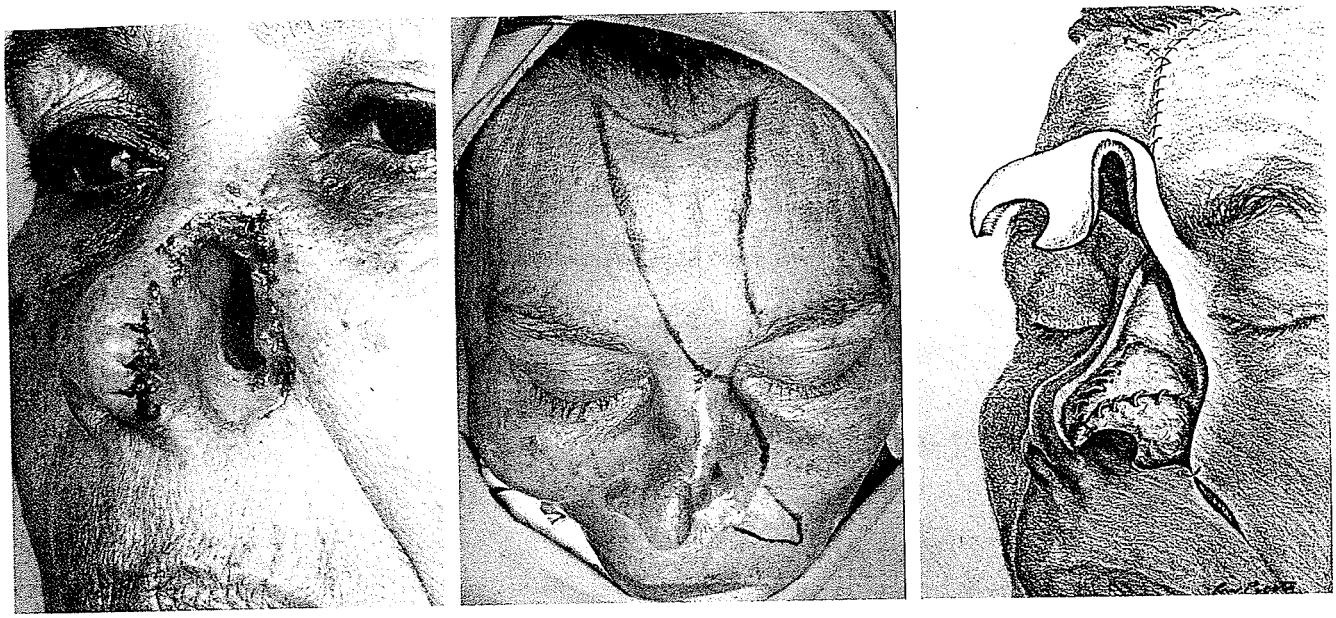
nel is burrowed just under the forehead skin. Into this tunnel is inserted a strip of cartilage, septal or auricular, shaped to give not only support but the rolling swell of a natural ala. It is important that this cartilage be placed not at the rim, but more proximal, where alar cartilages normally sit. The distal 2 cm of the future alae are lined with free skin grafts preferably of postauricular skin. The raw area on the forehead can be covered temporarily with thin thigh skin. The ear skin graft adherent to the sharp edge of the forehead flap will be visible as the delicate edge of a natural ala and the more proximal cartilage strip will provide the support and contour, leaving the rest of the forehead its natural thickness for safer vascularity. This design avoids the bulkiness and hazards of composite grafts. It ensures established lining to a thin edge and separate support to the alae in continuity with the forehead covering flap prior to transport, thus eliminating the need for bulkier and more vascular flap lining all the way to the edge or hazardous thinning of the forehead flap. One note of warning: Let the skin graft become established in its new blood supply for at least three to four weeks before transporting the forehead flap unit to its nasal destination. This technique is also described with diagrams and cases in the section on the losses of the distal nose.

HEMIRHINOPLASTY

Hemirhinoplasty refers to reconstruction of half a nose. The septum is usually intact and the missing parts are the skin, cartilage, bone, and mucosa of one side. I first became involved with reconstruction of this deformity in 1965 and published "Hemirhinoplasty" in *Plastic and Reconstructive Surgery* in 1967. At that time I noted that reconstruction of half a nose poses less than half the difficulties of a total reconstruction because the supporting septum is usually intact. Yet the aesthetic requirements of hemirhinoplasty are *uncompromising because the normal half stands forth disdainfully demanding comparison.*

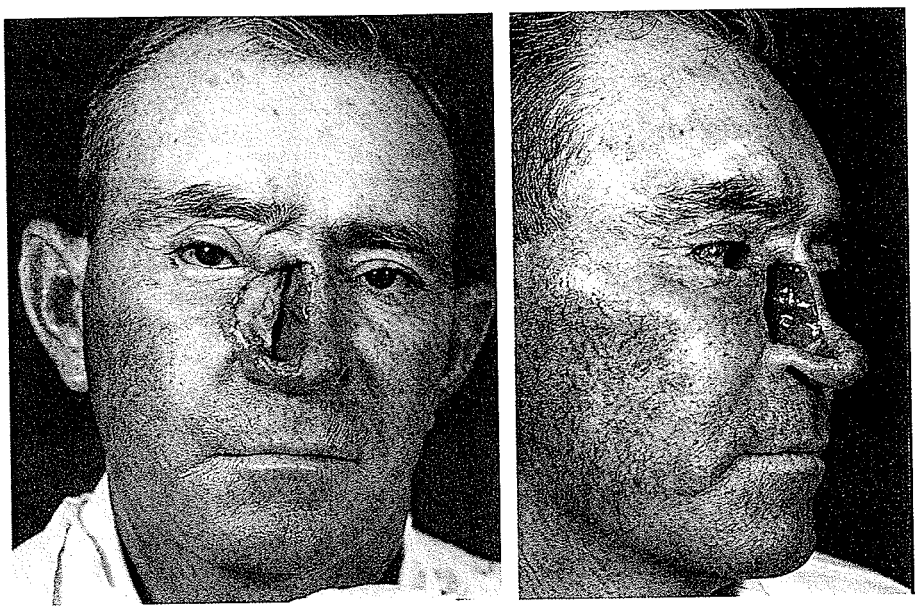
Over the past 30 years I have had the opportunity to carry out a number of hemirhinoplasties. Not all posed pure hemidefects, some slightly less, some definitely more. Yet they all required the judicious shifting of tissues to supply lining, support, and cover for the missing parts with as similar tissue in kind as possible and with the least cost to the donor areas.

My first example of a hemi-hemirhinoplasty was repaired in 1966–1967. It had been a rare and extensive basal cell carcinoma in a Black that had been excised by S. Williams of Jamaica and the skin sutured to mucous membrane around the margins of the defect in preparation for reconstruction. The nasal bone was intact, so its covering skin was available to turn down as lining. Only the lining of the alar rim and base was lacking, and this was supplied by a nasolabial flap cut reasonably thin except at its base. The distal end of this flap was sutured to a small turndown flap from the columella at the nasal tip. On to this three-flap lining was sutured a specially designed midvertical forehead flap with distal lateral extensions. One extension crossed the alar arch to blend into the columella at the tip. The other curved around the alar base, extending toward the nasal floor as a nostril sill. It was fashioned to match the normal side. Undermining and advancement facilitated direct forehead donor closure.

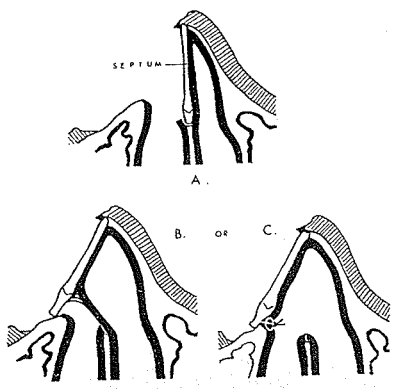


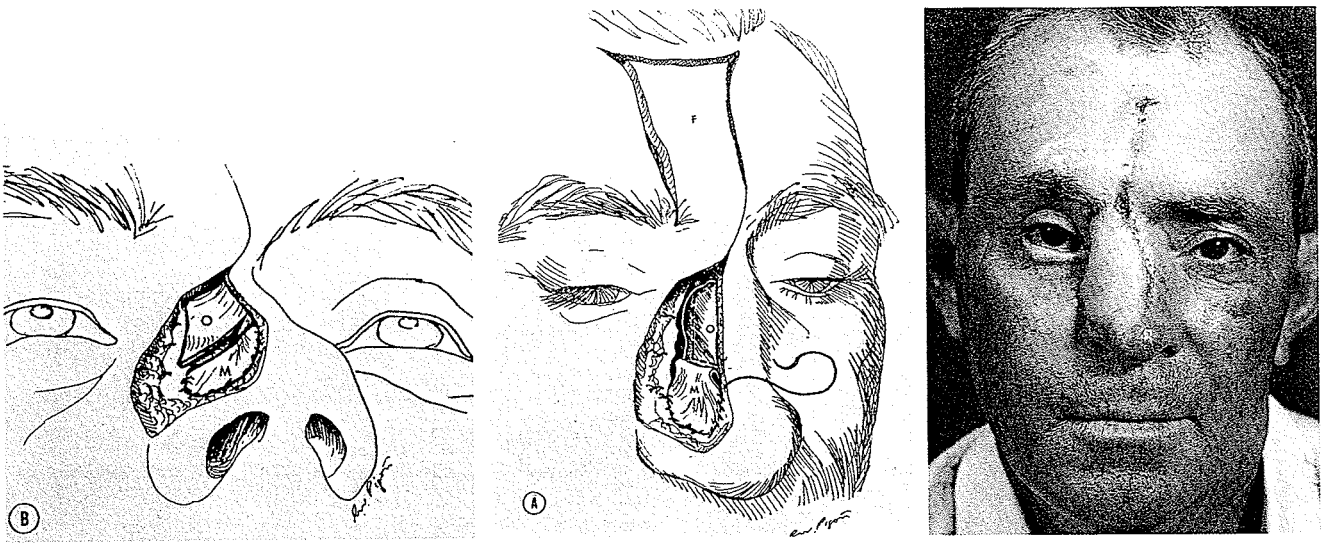
The formation of an alar crease, essential to a natural effect, was achieved by designing the covering flap slightly in excess. Then when the subcutaneous tissues were thinned in the area of the future crease, the excess skin was available for the indentation of the crease. Buried sutures ensured the permanency of this crease, as shown in a postoperative photograph taken several years later after a half day search in the mountains north of Kingston, Jamaica, to find the patient.

My second 1967 example was more extensive. Excision of the basal cell carcinoma removed the full thickness right half of the nose except for a small piece of skin at the root and a thick alar rim. Again the Robin Hood principle of shifting

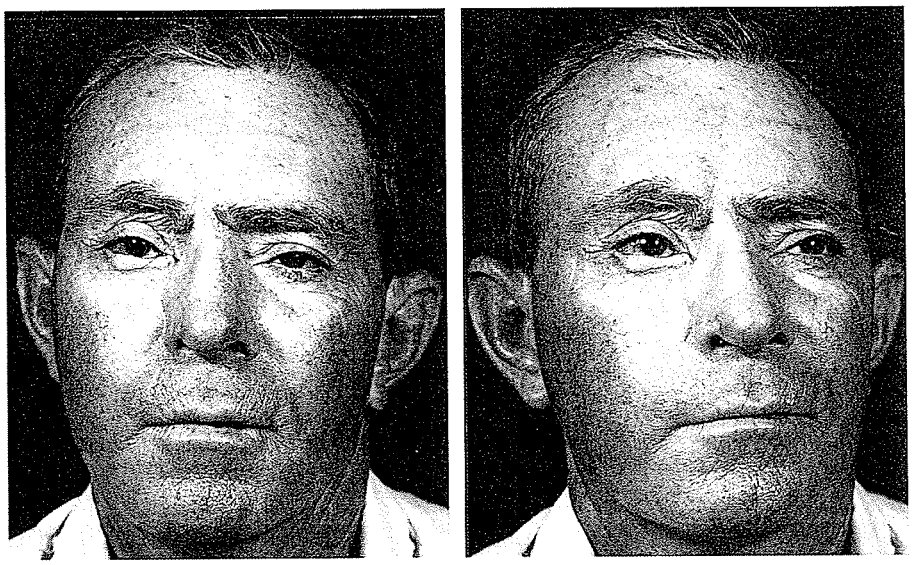


tissues was invoked. The mucoperiosteum of the upper septum (M) was turned down on an inferior base to line the missing lateral wall. The exposed osteochondral tissue (O), marked with an interrupted line, was cut as a hinge flap carrying the mucosa attached to its opposite left side. This septal osteochondromucosal flap (O) was swung out to rest on the maxilla at the edge of the nasal aperture. The cross-section design of the mechanics of this hinge flap simplifies its complexity and presents its effectiveness in reconstruction and airway maintenance. A midline vertical forehead flap based on the right supratrochlear vessels supplied the cover. After three weeks



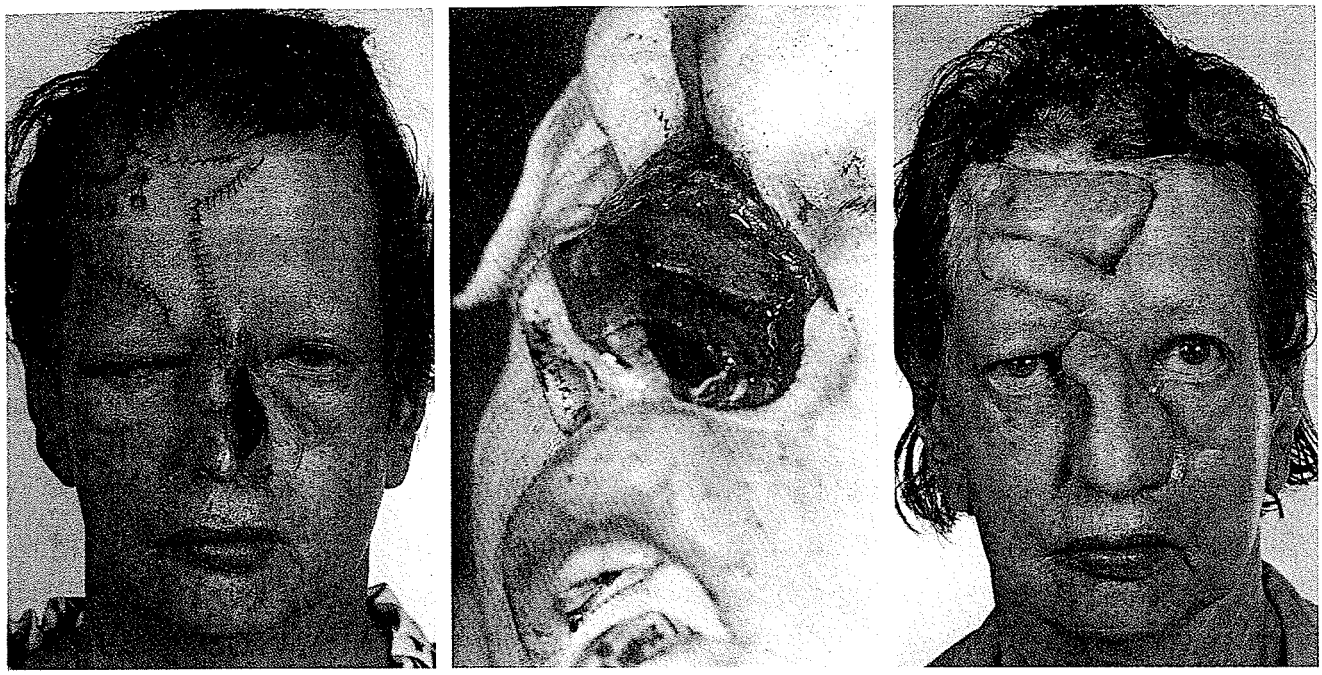


the pedicle was divided and replaced in the glabella area. This reconstruction served the patient well for 20 years.



A variation of this hemirhinoplasty design was demonstrated again in this 74-year-old female wig-wearer who had Mohs chemosurgery for basal cell carcinoma of the left nose and part of her maxilla. The marked asymmetry of the platform rendered the septal osteochondromucosal swing-out flap essential for skeletal balance. First, S. A. Wolfe transposed a temporal muscle flap to bolster the maxillary defect and covered it with a skin graft to present a better lateral platform.

In the first stage, a bizarre forehead flap was designed for unit reconstructive cover of a portion of the right ala, tip, columella, and entire left side extending into the cheek defect. The flap was delayed by incisions and the left ala was splinted by a cartilage strip and lined by a thick split graft. Three weeks later the exposed left proximal septal mucosa (M) based distally was turned down to provide lining for the side wall. This main lining flap was sutured along the septal bridge and laterally to an incision along the edge of the pyriform opening. It was then anchored anteriorly to a small turn-over skin flap at the nasal tip and another triangular turn-up skin flap at the alar base. With the left side mucosal lining turned off, the exposed ethmoid plate (o) and septal cartilage (c), backed by the natural mucosal coverage on the right side, which also offered vascularity, were cut as a trapdoor with its base along the bridge kept intact to maintain the L support. This osteochondromucosal flap was swung out laterally to the left to rest on the maxilla with mucosa sutured to mucosa to seal lining. This provided a stable nasal side in spite of the maxillary platform deficiency. Then the previously prepared forehead flap was brought in for cover with its skin grafted alar lining being sutured to the septal turn-down mucosal flap to complete this stage of repair. A midline vertical forehead flap based inferiorly was transposed across the lower portion of the forehead defect to present better contour and texture. Here her trusty wig covered the upper skin graft on the donor area.

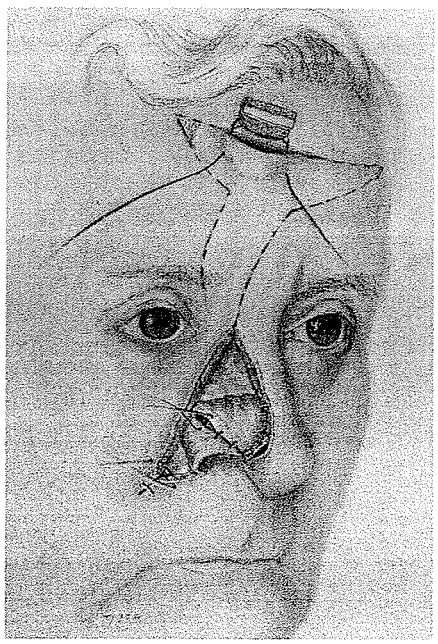


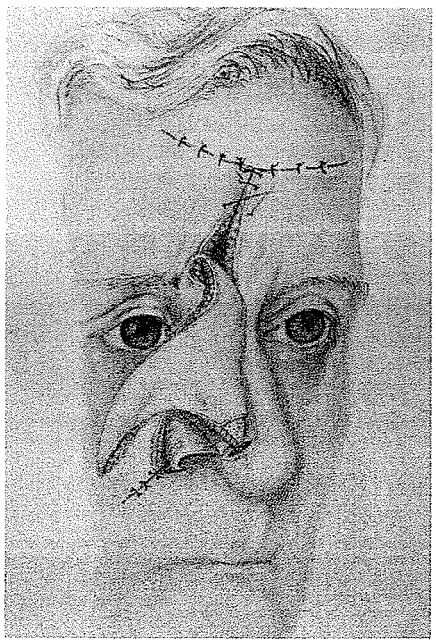
Two months later the forehead skin pedicle was divided, salvaging the neurovascular bundle. Only minor revision and flap thinning at the alar crease were necessary.

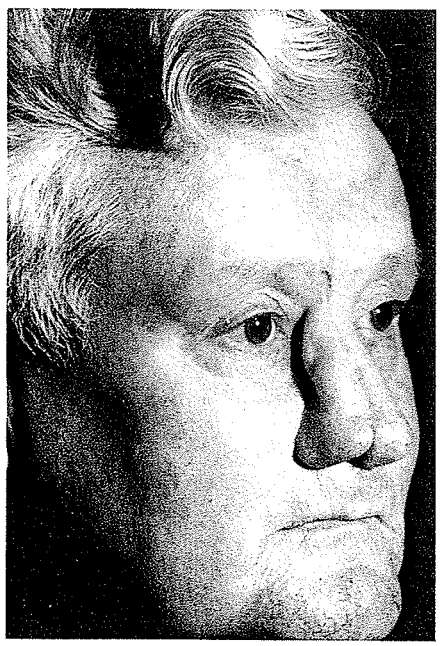
This 60-year-old male had Mohs surgery for basal cell carcinoma of the right side of nose and cheek. The raw defect was covered with a skin graft.

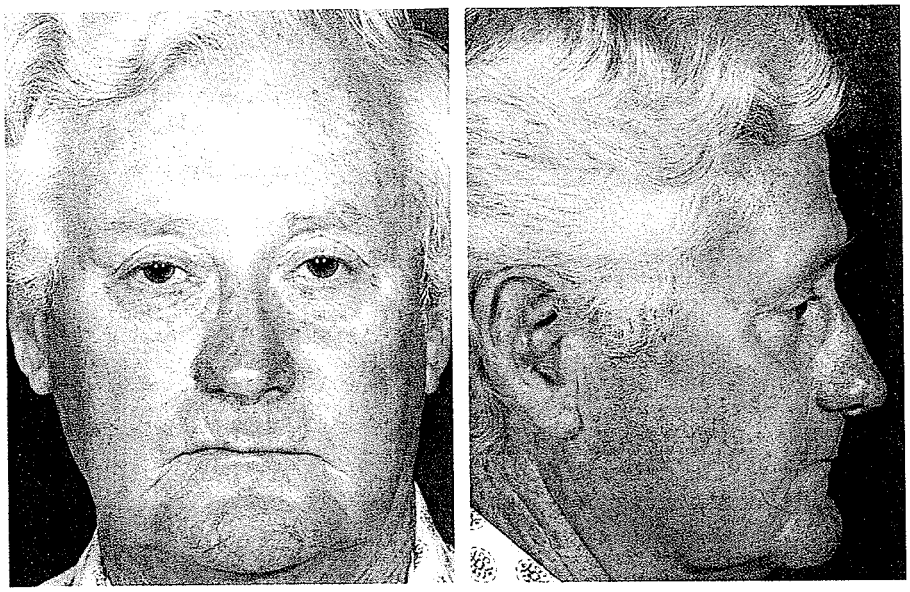
Four months later a pattern of the planned defect, including the inturning of adjacent skin for the main nasal lining, was marked on the forehead as a half seagull on a midline vertical pedicle based on the right supratrochlear vessels. This flap had to be placed between the scars of the excision of other basal cell carcinoma lesions.

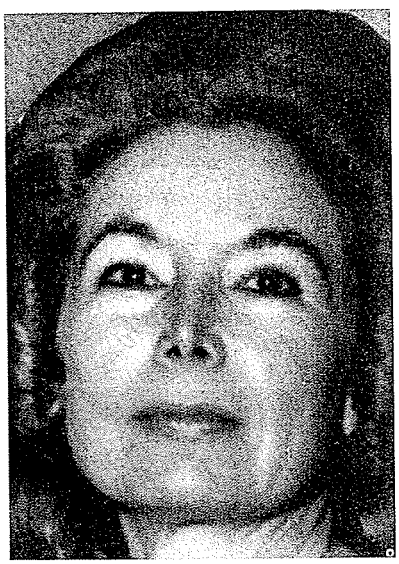
The upper edge of the flap, as the future alar margin, was incised on the bias to present a thin edge under which was grafted a chondrocutaneous graft from the ear. The lined and supported ala was allowed to establish a blood supply for five weeks. Then the skin edges of the nasal defect were turned in for lining and the prepared forehead was brought down for cover. The lateral alar wing swung into the nostril floor to recreate a natural alar base. The other extremity of the alar margin was denuded of epithelium and inserted into the nasal tip to blend the join as a subunit. The forehead defect was closed by advancement. The flap was left in this position for several months and then divided and the base returned to the glabella area. Several minor revisions over the next year to blend the flap joins to the nose were successful.









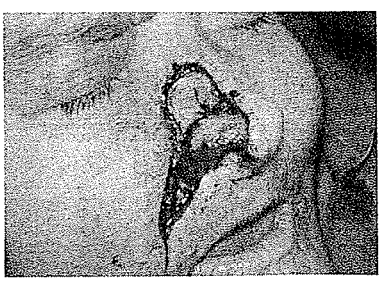


This 65-year-old female, five years earlier, had had almost half her nose removed for carcinoma along with bilateral neck dissections. A pre-ablative photograph revealed a nose that has undergone radical reduction rhinoplasty years before, resulting in a pinched tip, retracted alae, and general deficiency of nasal tissue. This specific circumstance rendered the hemi-rhinoplasty more difficult because flap repair of the missing half to simulate a normal opposite side would be more gratifying than trying to imitate a semi-deformed half. A compromised plan was adopted to reconstruct the missing half unit as similar as possible to the remaining side and then improve the pinched opposite side.

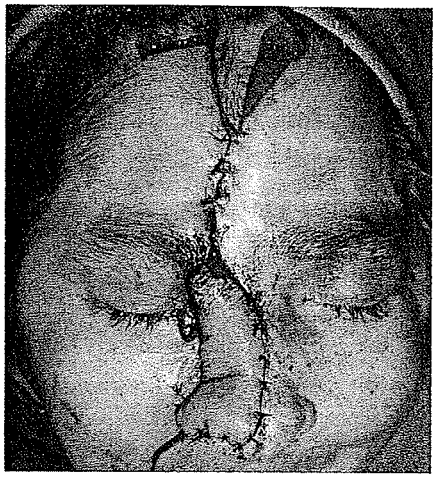
As the nasal bone was intact simplification of the design was possible. Delay by incisions prepared three skin flaps: a nasolabial flap for lining of the ala, an upper right half nasal bridge flap for lining the sidewall, and a modified midvertical hemi-gull-shaped forehead flap to cover both subunits in one general hemi-nasal unit. The upper turndown lining flap opened the way for the forehead flap to come in as a one-piece unit, and the extensions of the forehead flap allowed its blending and "bleeding" into the tip and its swing-around as an alar base into the nostril sill. Closure of the forehead donor area was achieved by direct advancement. Return of the base of the forehead flap released the brow.

Scooping out the subcutaneous tissue in the alar crease area divided the subunits. Thinning the flapped margins allowed near symmetry with the opposite side. Then a cartilage graft was inserted into the pinched normal alar crease for closer bilateral balance.

Extensive basal cell carcinoma involved the right side of the nose of this Latin female. Excision of the lesion with free margins presented a defect that required a hemirhinoplasty.

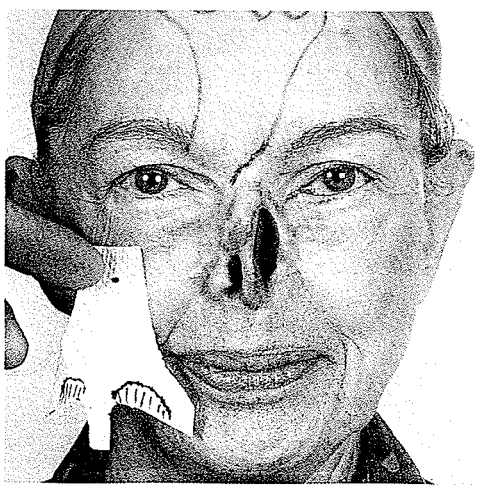
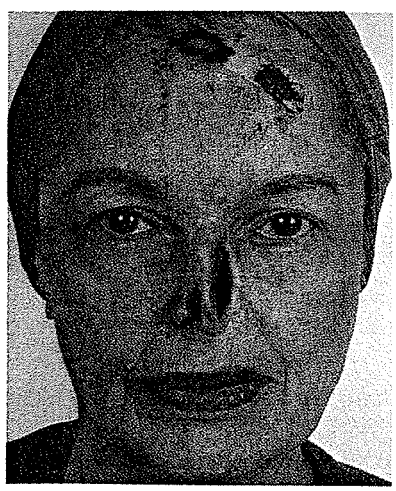


Lining was supplied by turndown of adjacent skin and turnup of a nasolabial flap for the ala. A forehead flap supplied cover and the donor area was closed directly, aided by a transposed scalp flap to form a widow's peak. This peak was reduced when the pedicle was divided and replaced. A final thinning of the flap achieved natural contour.

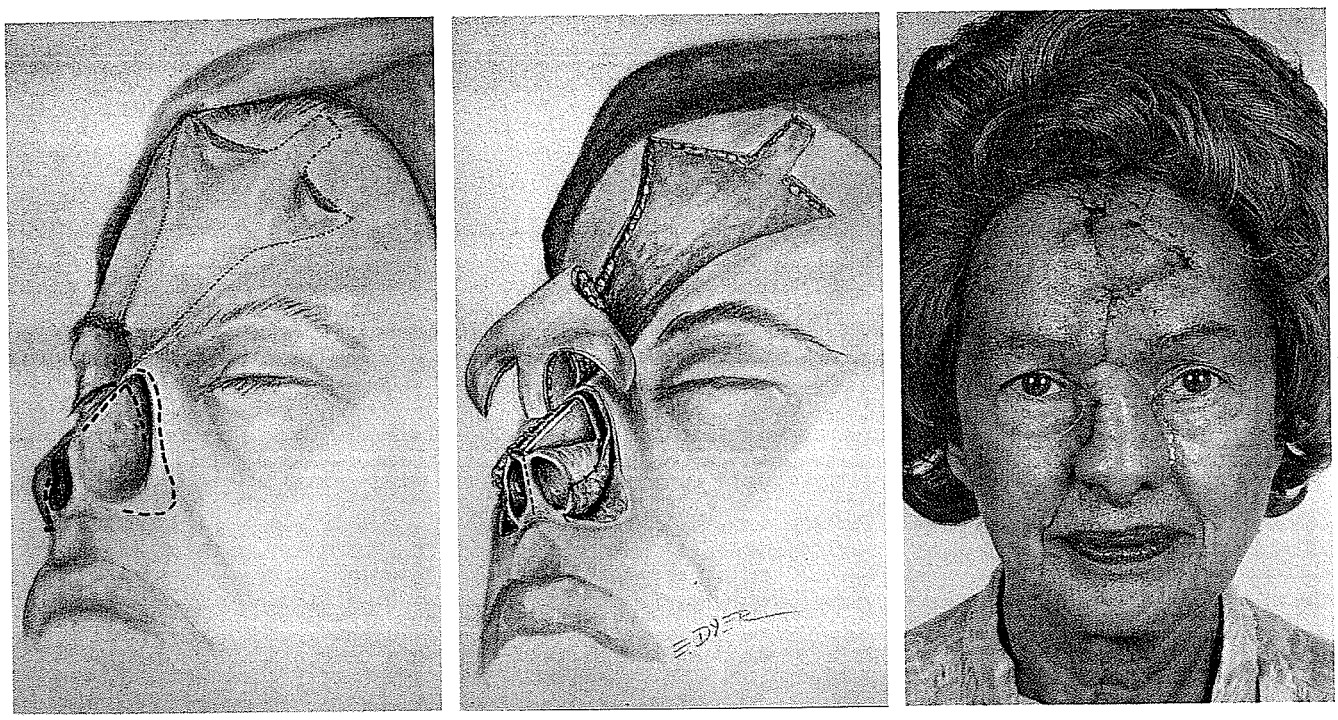


This 60-year-old female had a basal cell carcinoma of the nose for over five years which eventually required extensive ablation by Mohs surgery. Dermatologist H. Menn accompanied the referred patient with a map of a few residual areas still involved. These were cleared, a skin graft cover was applied, and observation and biopsies were carried out over a 9-month period.

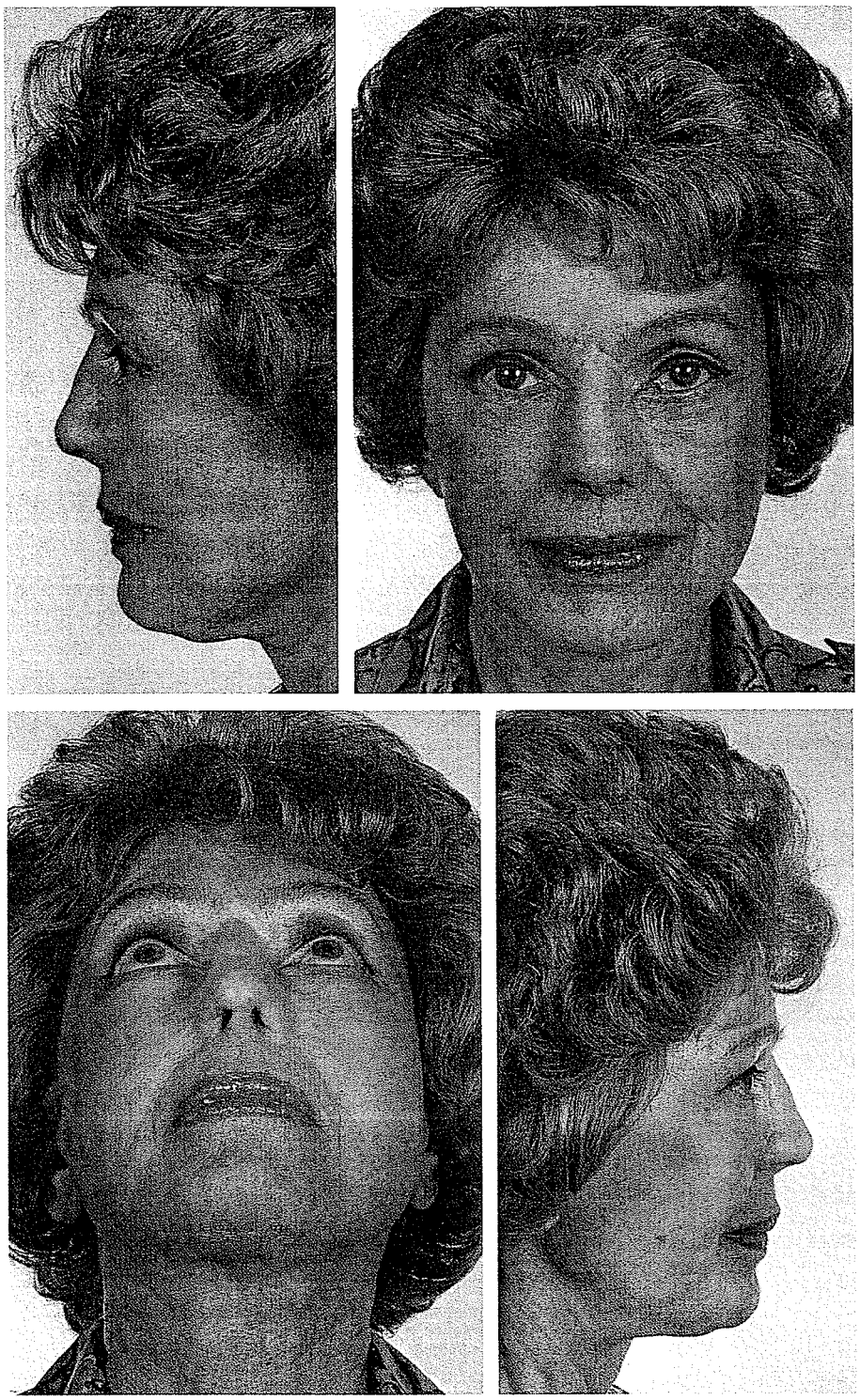
Since a good portion of columella and all the tip and the entire left ala and sidewalls, along with a good portion of the right ala, had been destroyed, a seagull forehead flap was planned. When the gull flap was delayed, both alae were supported by strips of cartilage and lined by skin grafts as previously described. A small cartilage graft was inserted just under the forehead skin at the future nasal tip for a *touch of class.* At the same time, the left cheek was advanced medially after excision of scar and skin grafts to define cheek and nasal units.

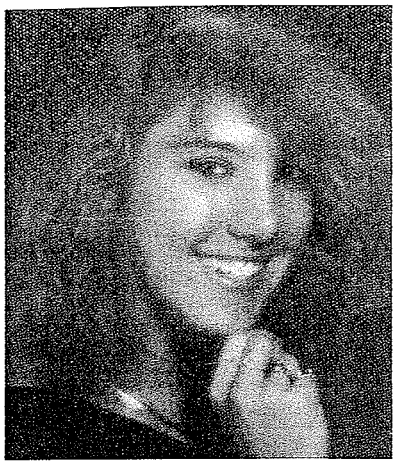




Three weeks later at the second stage, the septal mucosa was turned down in the usual manner to line the left distal sidewall and was sutured to turn-over edge flaps. A skin flap of residual alar base was turned up for lining on the right side. This patient had had a slender nose and did not require the septal osteochondromucosal hinge flap to swing out for support and contour of the upper left nose. Rather, the previously prepared gull-shaped forehead flap was transposed over the prepared base with the septum standing gallantly intact. The forehead donor area was closed except for a small full thickness graft which healed to near invisibility.

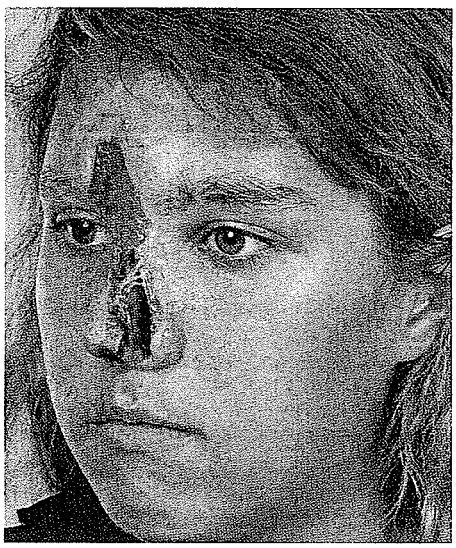


Two months later the skin of the pedicle was divided and replaced, saving the neurovascular bundle. One month later, minor revisions were performed, including subcutaneous scooping for the alar creases and a postauricular skin graft to the left lower eyelid for correction of the ectropion. This was only seven months from the start of the repair and in another three months the patient requested and received a face lift along with upper and modified lower lid blepharoplasty.





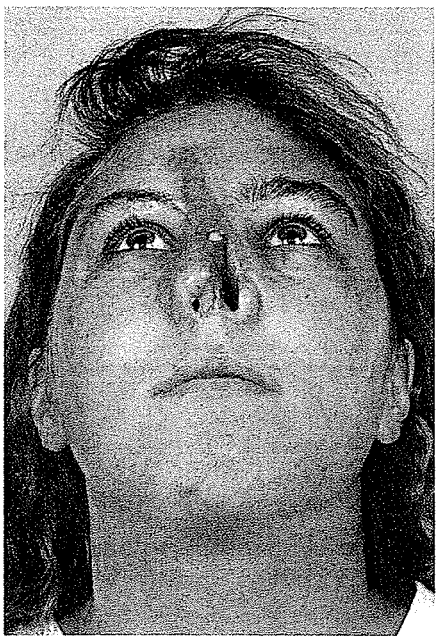
During an automobile collision this 17-year-old female, in the passenger seat without a seat belt, suffered avulsive injuries to her face. Attempts at replacement of the full thickness skin avulsions of the nose and forehead failed. When seen the patient revealed a raw area over the root of the nose extending into the glabella area and the right side of the lower forehead. She was missing the important part of the left side of her nose. She had the alar base and a residual ridge running toward the medial canthus and a scarred nubbing of the nasal tip without the anterior columella.

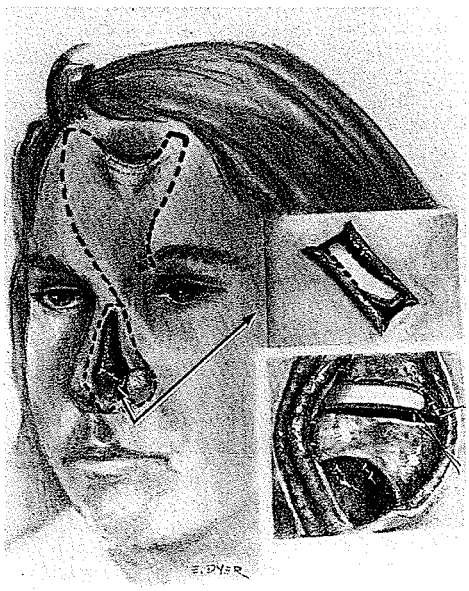


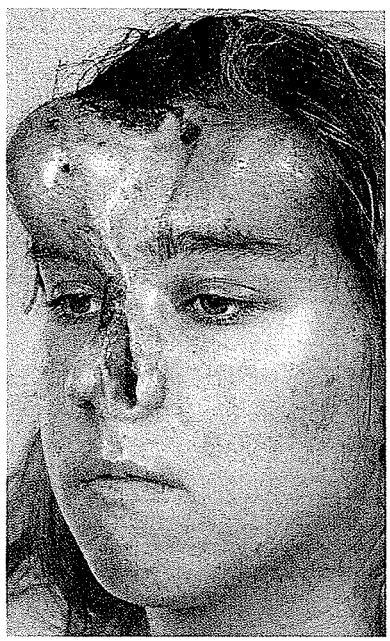
The surgeon who treated her original injury was requested to apply thin split grafts to the remaining raw areas of the forehead and nose to give time for better healing.

Two months later the contracted left nostril was released and lined with a mucosal flap from the upper buccal sulcus. A small local flap was transposed to cover the exposed nasal bone. Then the design for the cover of a hemirhinoplasty was marked and incised on the forehead based on the left supratrochlear vessels. The design included an extension for a col-

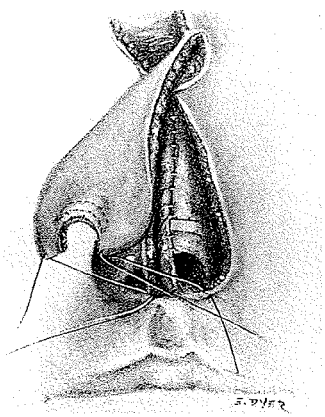
umella. The alar portion of the flap was incised on the bias as previously described and then supported by insertion of a strip of auricular cartilage in a subcutaneous pocket. The future ala was then lined with a thick split skin graft which was tucked into the alar pocket and applied also to the raw area under the forehead flap. Two 50-cc expanders were inserted under the remaining forehead on each side.

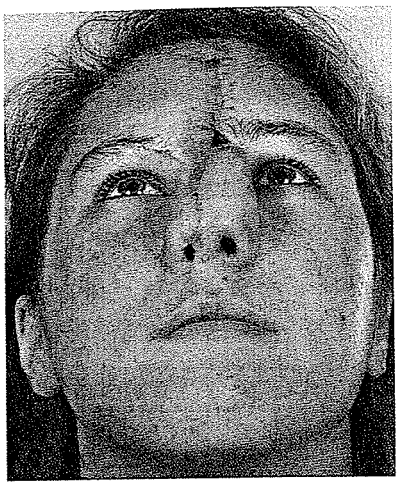






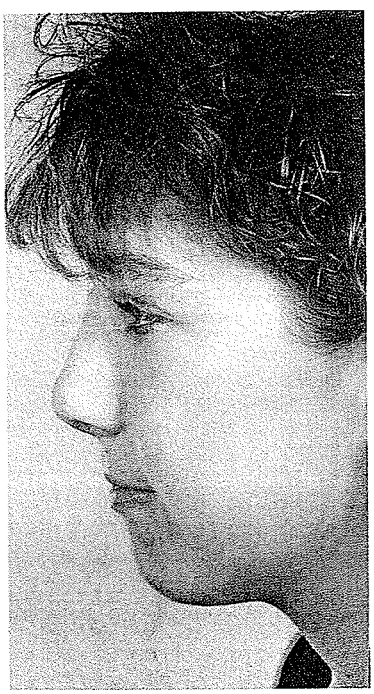
One month later the edges of the defect were incised to allow turnover for lining closure in the upper area. The turnover of alar skin supplied intermediate lining. Then a septal chondromucosal flap was developed to complete the lining and support the new sidewall, acting as a flap "spreader" for airway maintenance. This flap was created through a vertical slit in the exposed septal mucoperichondrium. Through this aperture, a chondromucosal flap based above, including septal cartilage and adherent right mucosa, was swung through the

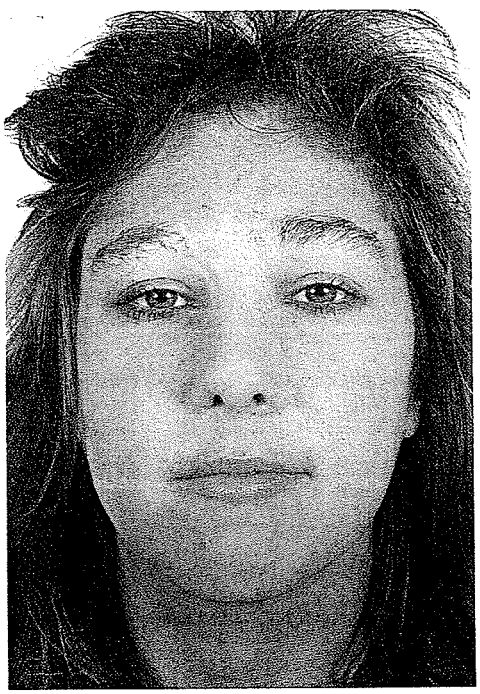


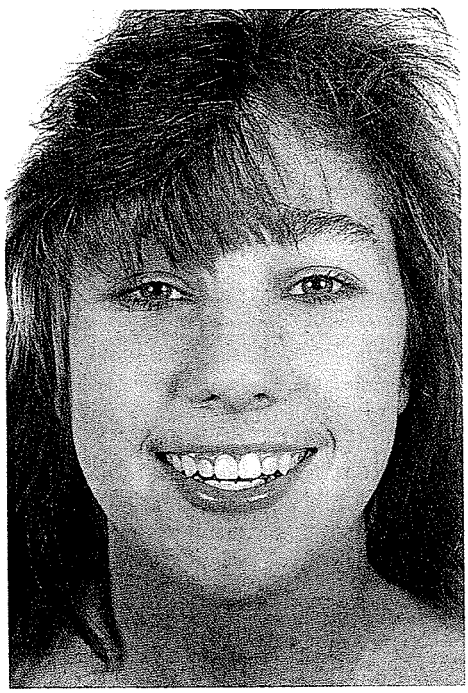


slit to enforce the lining of the reconstruction. It interdigitated between the turndown lining and the distal grafted ala of the forehead flap. The slit in the septal mucosa was sutured to prevent septal perforation. Onto this carefully prepared lining the prepared forehead flap was transposed to reconstruct the left side of the nose, including the tip, columella, and ala. The forehead implants were removed, the skin graft in the glabella area excised, and the forehead defect closed.

Three months later the forehead pedicle was divided and its base reinserted in the glabella area to release the brow. The forehead flap was thinned and let into the left upper side of the nose. Over the next year minor thinning procedures to the nose and scar revisions completed her repair. She became engaged to be married.

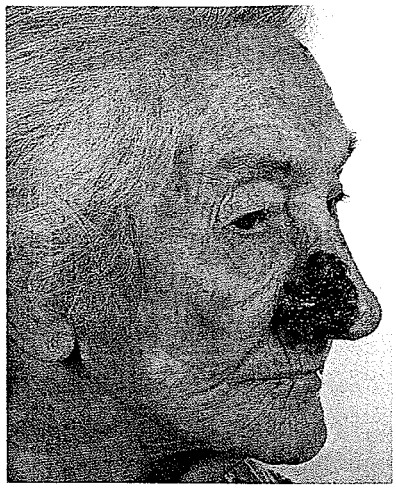






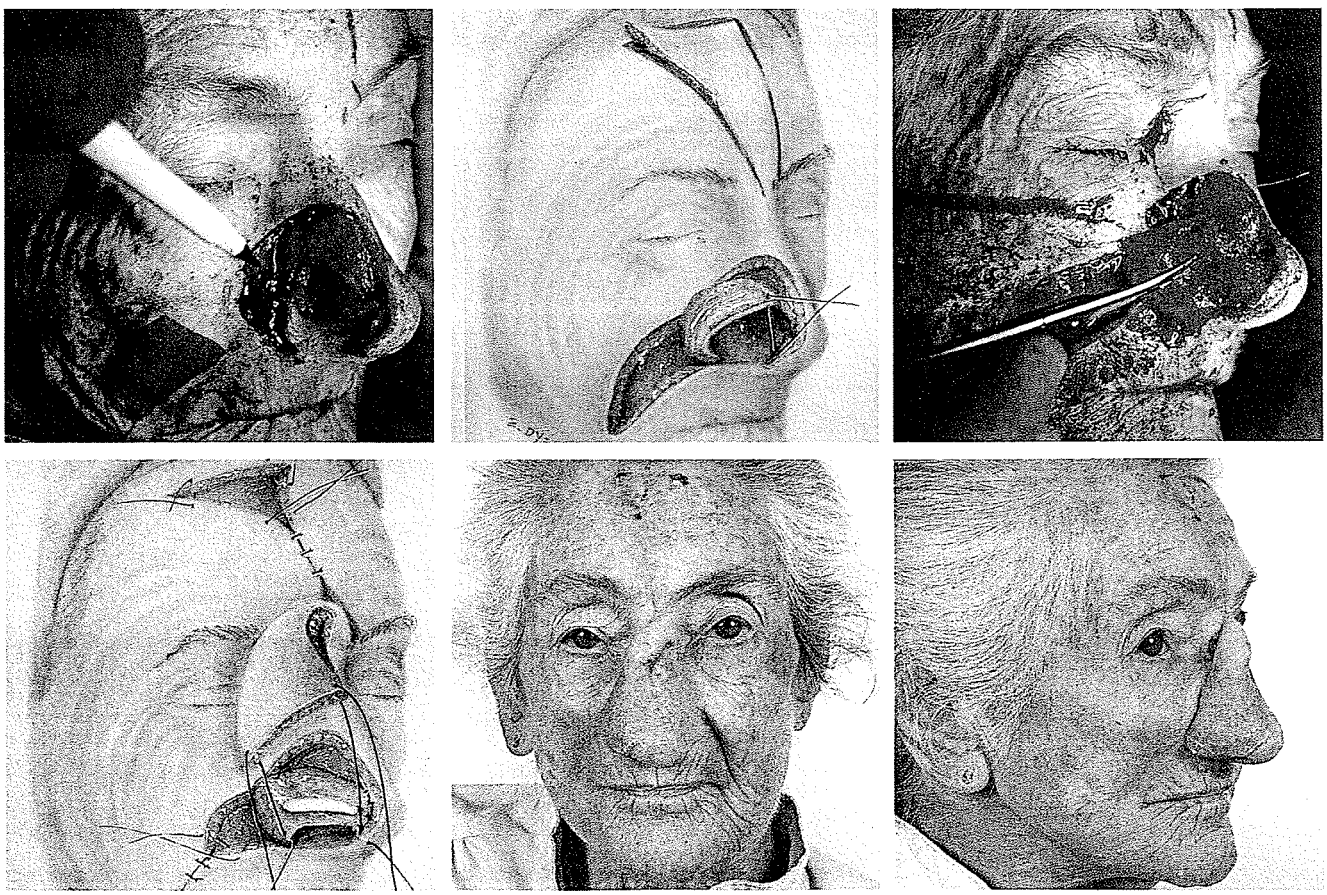
The goal of reconstructive surgery is not only to replace what is missing in the return to normal but to attempt aesthetic improvement, when possible, even beyond what would have ever been. Before her injury this patient presented a generous nose with a high bridge, bulbous tip, and hanging sidewalls. Her reconstruction gained aesthetic advances that blend better with her facial features.

Expedience over Aesthetics



This 91-year-old widow had had many basal carcinomas of her face and neck treated. Yet the one on her nose had been neglected for many years until it involved most of the left side. At the consultation she was advised to have the fungating lesion excised, followed by an immediate reconstruction.

Under general anesthesia the lesion was excised full thickness and the margins reported clear by frozen section. A nasolabial flap marked by a pattern 3 cm wide and based at the right nasal alar base was turned up to fill the lining defect. The cheek skin was easily advanced to close this defect along the nasolabial line. The accessible cartilage of the exposed septum was taken as a thin 3-cm strut to support the alar rim. It was scored on its outer surface to curl the cartilage to fit the ala. Then a midline vertical forehead flap based on the left supratrochlear vessels and patterned to fit the defect was brought down for cover. The forehead donor area was closed by advancement except for a small triangle which was covered with a postauricular graft.



Five weeks later the pedicle was divided and its base let into the glabella area to release the brow. The flap to be implanted was thinned and let in to the upper right side of the nose. Two and a half months later thinning along the alar margin join of the two flaps improved contour and airway.

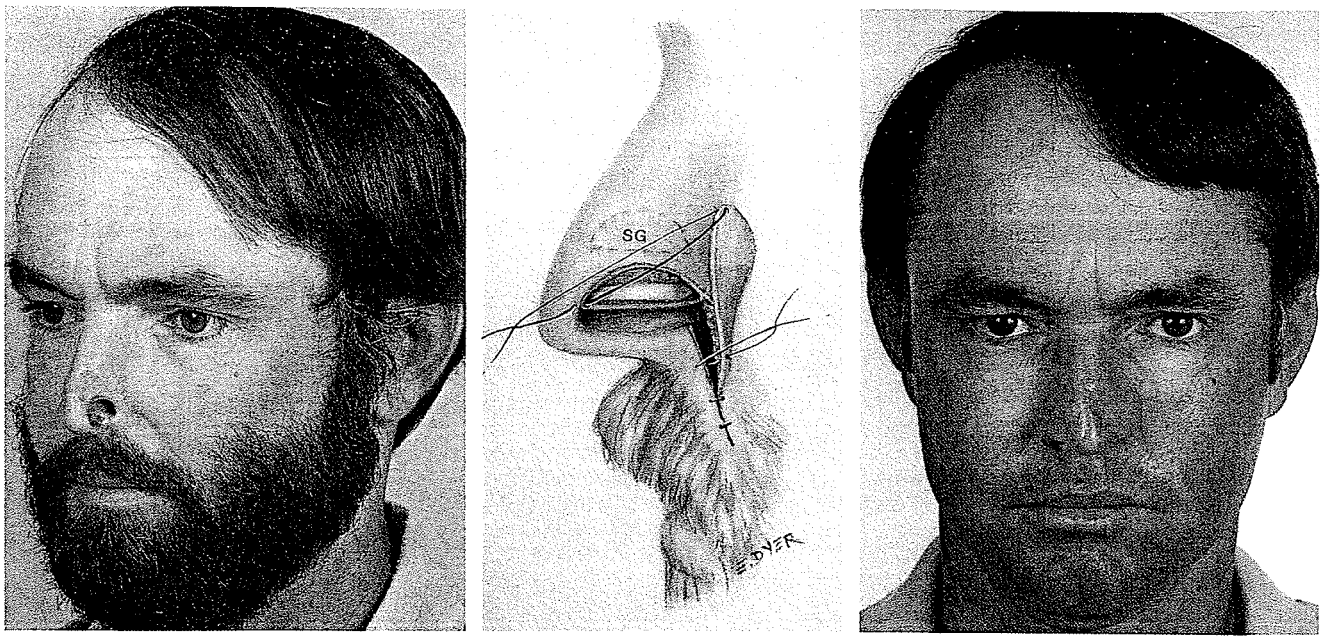
Due to the patient's advanced age and lack of aesthetic interest an expedient two-flap reconstruction without the trimmings was the choice. If she were younger I would have reduced her remaining nose and reconstructed the defect for an improvement of her nasal aesthetics. At the age of 94, after three years, she and her new nose are doing well.

A hemirhinoplasty may be associated with adjacent problems and when this involves nasal platform then this portion of the defect warrants priority.

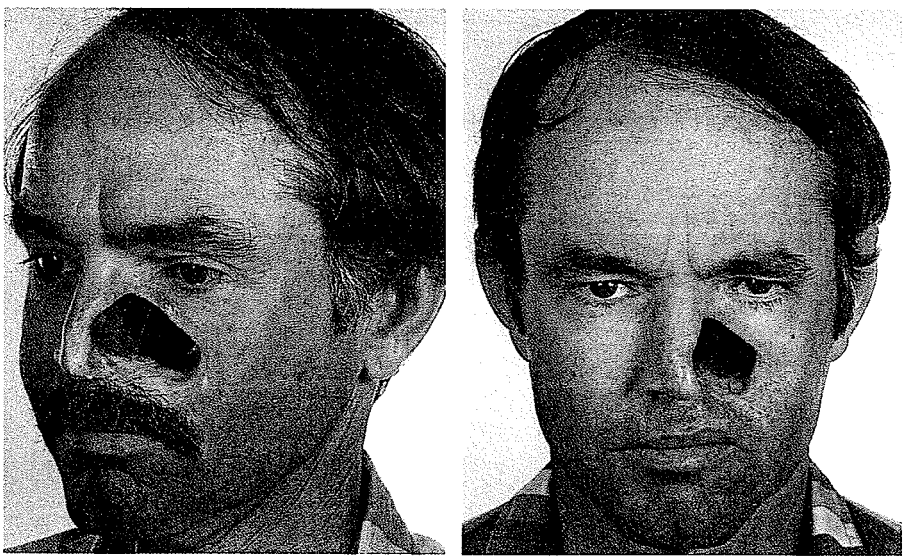
Hemirhinoplasty Associated with a Cheek and Maxillary Defect

This 33-year-old male came to me after Mohs surgery for a squamous cell carcinoma of the left nasal ala 1½ years before.

An incision along the alar margin defect allowed freeing of the nasal lining with some upper lateral cartilage which was released by a parallel relaxing incision in the vestibule. This defect was grafted with thigh skin. The raw surface of the advanced lining was covered with a superiorly based nasolabial flap. When seen two years later the patient had a suspicious lesion in the ala area which proved to be recurrent carcinoma.



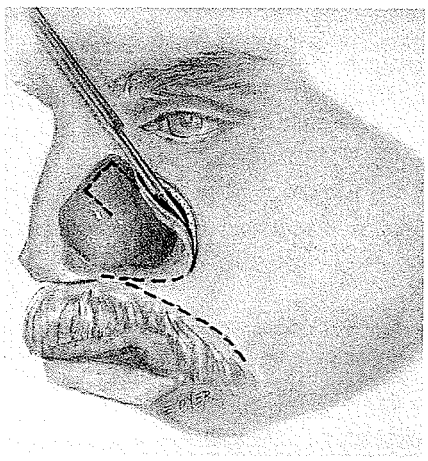
He was referred to A. Ketcham for complete ablation, which involved almost half the nose but also a good portion of the left maxilla, lip, and cheek.

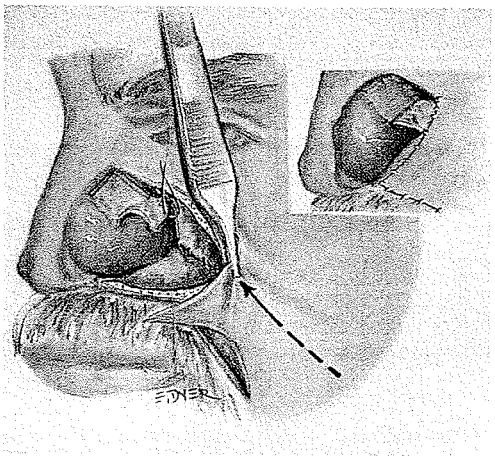


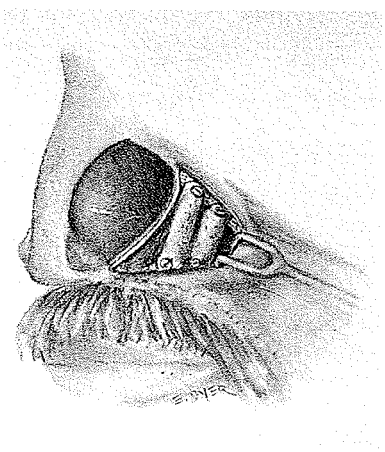
Six months later the patient was found to have Bowen's disease of the skin of two-thirds of the penile shaft. Excision and thick split skin graft cover healed with an excellent functional and aesthetic result. The patient was fitted with a nasal prosthesis and allowed to heal for two years.

Hemirhinoplasty, as already described, is a standard procedure but the associated defect of maxilla, cheek, and lip changed the order of priorities. Before the half nose could be

reconstructed it was necessary to reconstruct the platform and delineate the cheek and nasal units. An expander was inserted under the left cheek and as soon as the stretch of cheek skin had been achieved a lining flap was developed along the maxillary margin and advanced medially and attached to a septal chondromucosal flap turned over to aid in the closure. The septal defect was covered with a skin graft. The expander was removed and the excess cheek skin advanced to cover the cheek defect up to the nasolabial line. One month later the cheek flap was reelevated and two split rib bone grafts were screwed into position across the maxillary defect from the infraorbital ridge to the lower edge of the maxillary defect. The





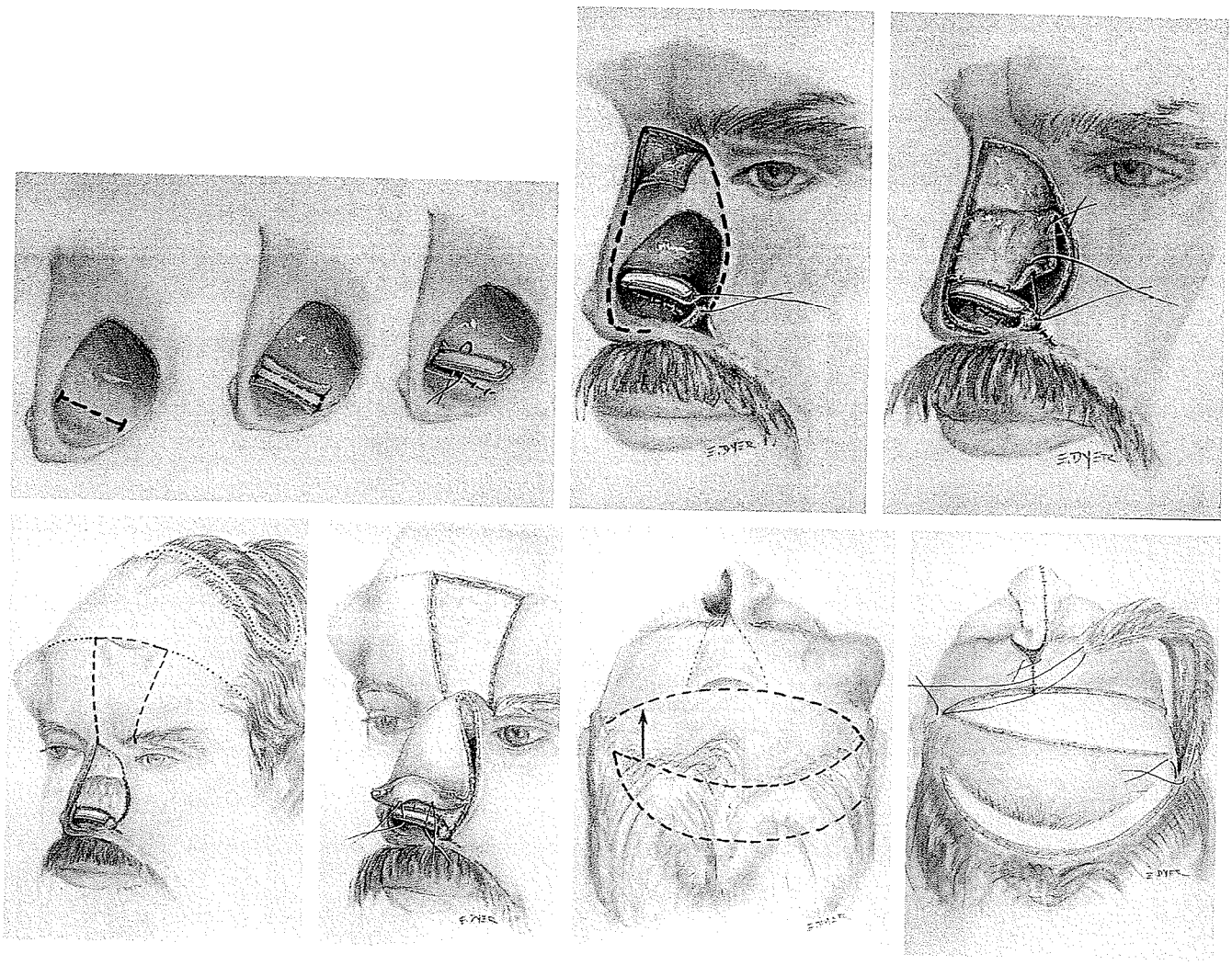


cheek flap was replaced. A vertical hemi–gull-shaped forehead flap was delayed by incisions and the alar margin prefabricated. An auricular cartilage strip was threaded into a subcutaneous tunnel proximal to the alar margin. Then a 2 cm × 4 cm thinned postauricular graft lined the ala, and split skin from the thigh covered the forehead defect temporarily. Bilateral 50-cc expanders were inserted under the uninvolved forehead skin on each side through the delay incisions. The patient was allowed to heal for six months which gave time for observation of the nasal area.

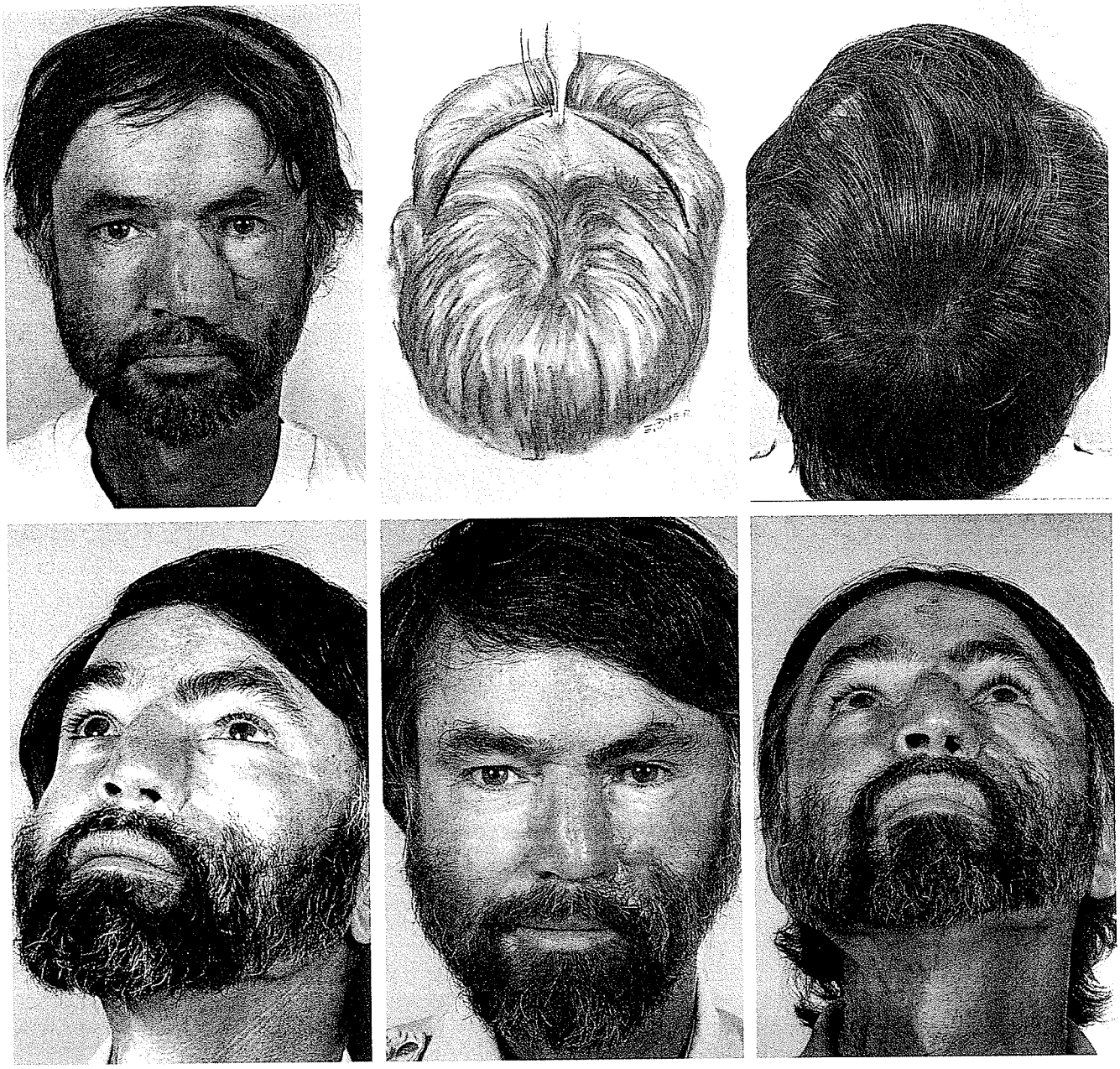
Cognizant of what this patient had been through with two assaults on his nose and one on his penis, and appreciative of his tenacity to be reconstructed, I asked him if he had any special requests. He informed me that he despised his reced-

ing hairline. So during one of the minor procedures a posterior hairbearing scalp flap was delayed.

In June 1989 the expanders were removed and all the flaps were shifted. The local lining flaps were turned, the septal chondromucosal spreader flap was swung out to line and support the distal ala, the prefabricated hemi-nose on the forehead was brought down, and the hairbearing scalp flap was



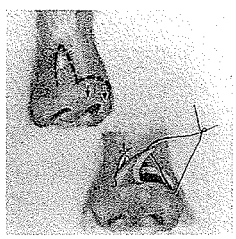
transposed forward to advance his hairline. Three months later an expander was inserted under posterior bald scalp at the same time the forehead pedicle was divided and replaced in the glabella area. Three weeks later the expander was removed and much of the alopecia excised. Refinement of the forehead flap with thinning along the alar crease completed the repair. He is well after six years.



THE SHORT NOSE

The short nose, following over-enthusiastic corrective rhinoplasty and/or postoperative complications, is usually of limited degree and is discussed in the secondary surgery section.

When the shortness is unilateral and not excessive, local flaps may be of benefit. This 51-year-old female had excision of a basal cell carcinoma of her left tip and bridge inadequately repaired with a nasolabial flap. The shortness of skin hiked the tip up and out, opening the left nostril grotesquely. A vertical transposition of excess skin on the right inserted into a releasing incision on the left, along with bridge straightening, relieved the lifted tip and symmetrized the nostrils.



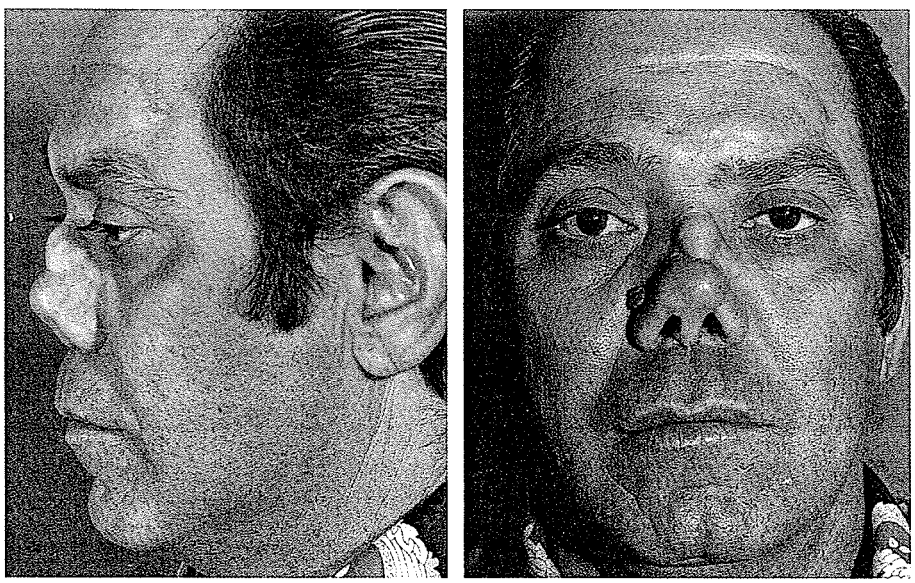
The Severely Short Nose

The pathologically short nose which resembles a pig's snout is eye-catching. Most short noses are missing central tissue, which causes normal structures to be drawn up out of place. The anterior tripod, columella, tip, and alae are usually intact but displaced upward out of normal position exposing the nostril entrances to direct view. The key to correction of this deformity is the release of the anterior tripod, swinging it back down into normal position and filling the gap to retain the correction.

Here are two short noses with different etiologies requiring variation in treatment but ending with similar results.

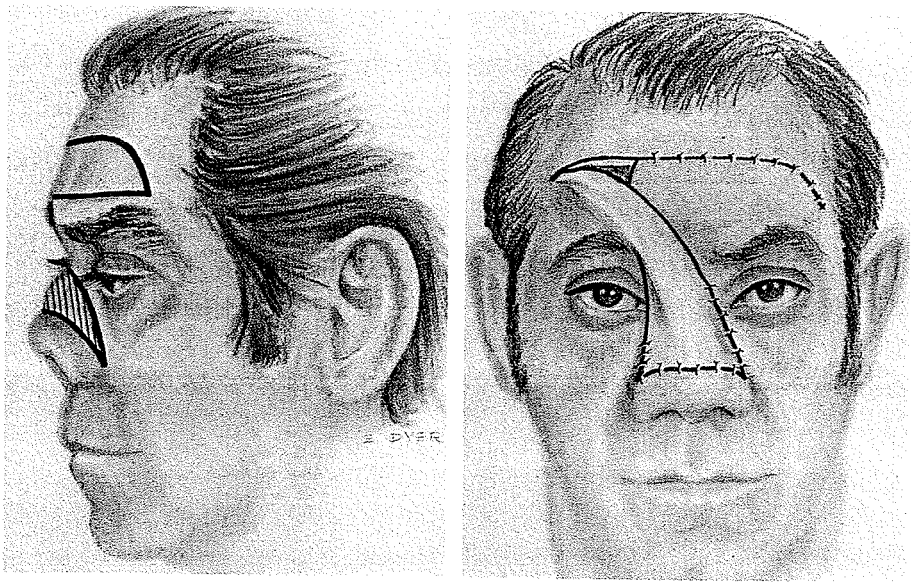
Surgery and Infection

This patient had a submucous resection of the septum at age 17 years in Cuba. He suffered infection resulting in skin loss and tip retraction. He had one unsuccessful attempt at forehead flap reconstruction. When seen at the age of 43 the patient presented severely snubbed nose with a blob of forehead skin on the bridge and scars on the forehead.

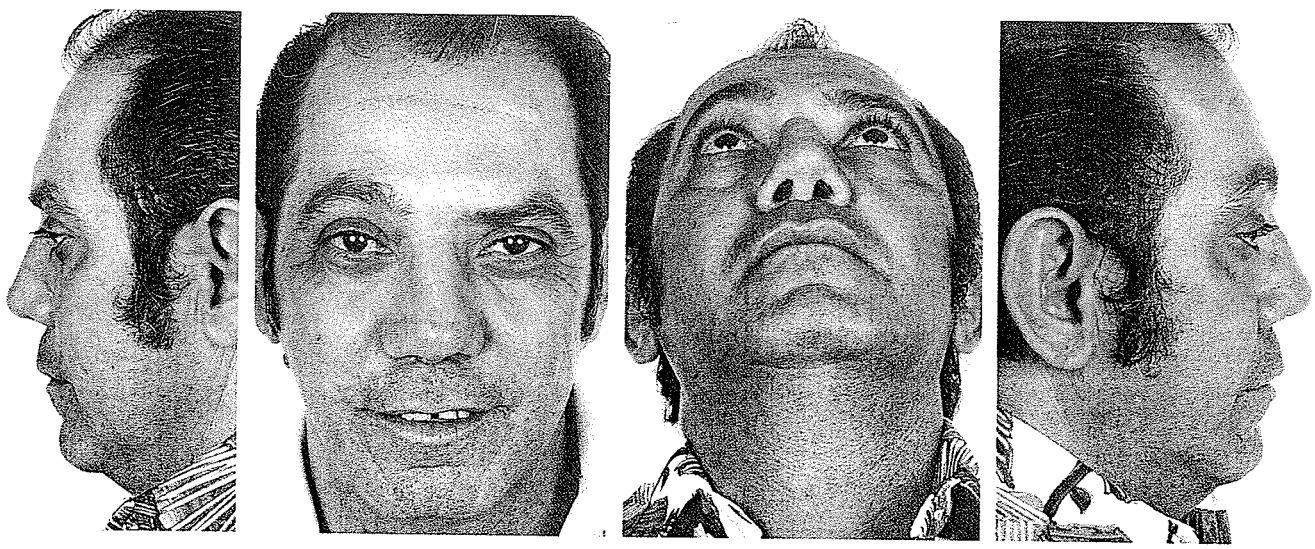


A horseshoe-shaped incision just proximal to the tip, from alar base to alar base, through skin, subcutaneous tissue, and scar, allowed the nasal tip to turn down without need to di-

vide the lining. The residual forehead flap hump, scar, and bone graft were excised as seen in the cross-hatching. The previous forehead flap was re-elevated on the right frontal and supratrochlear vessels and transposed into the cover defect and the donor area closed directly. After three weeks the pedi-

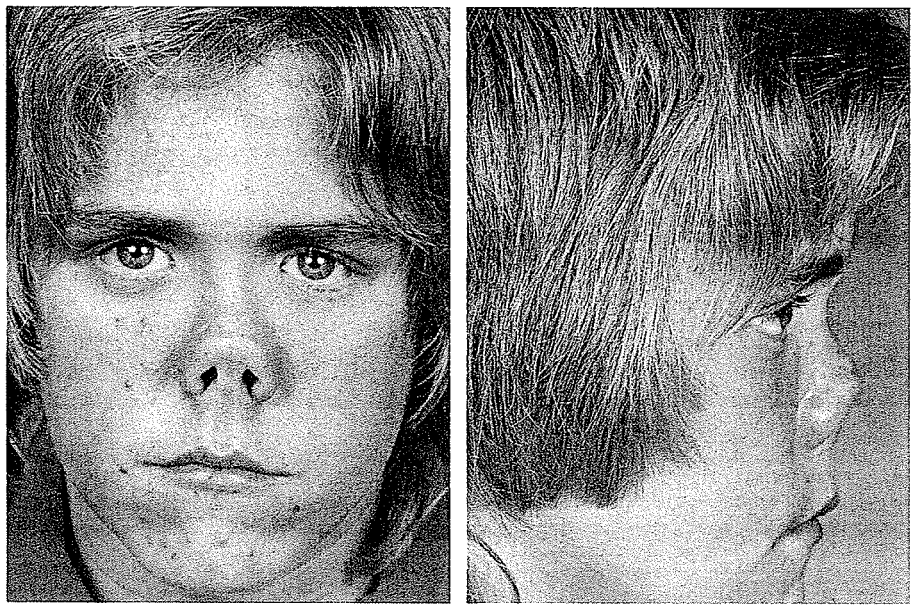


cle was divided and at six months costal cartilage struts were inserted along the bridge and into the columella. Scar revisions completed the reconstruction.

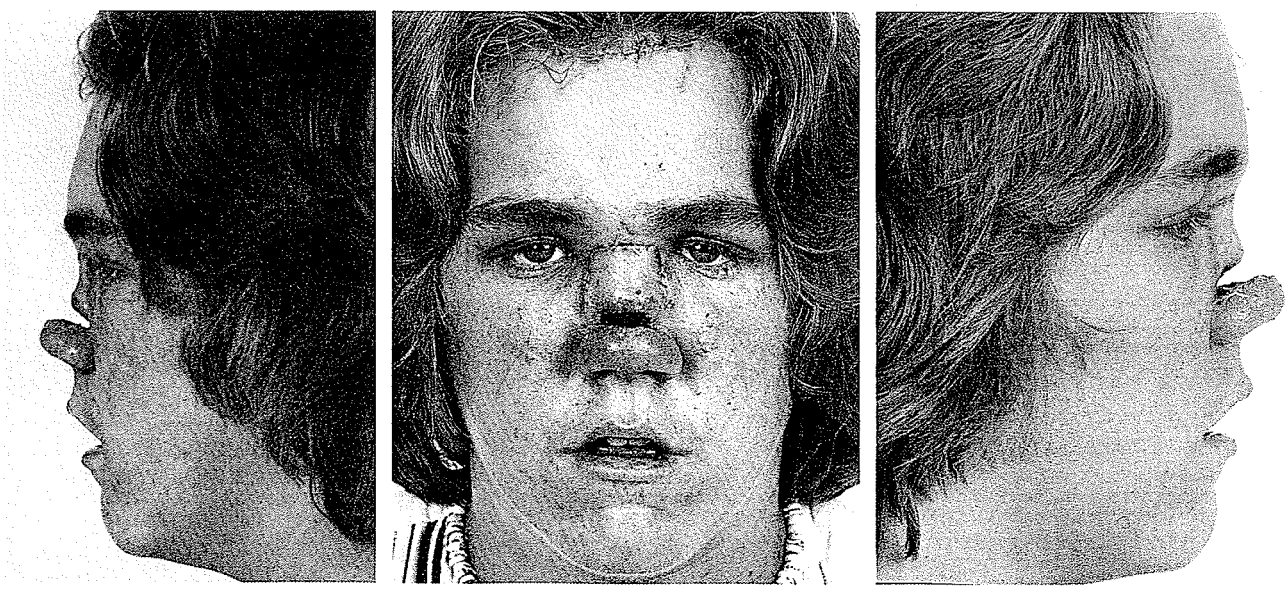


Blunt Trauma

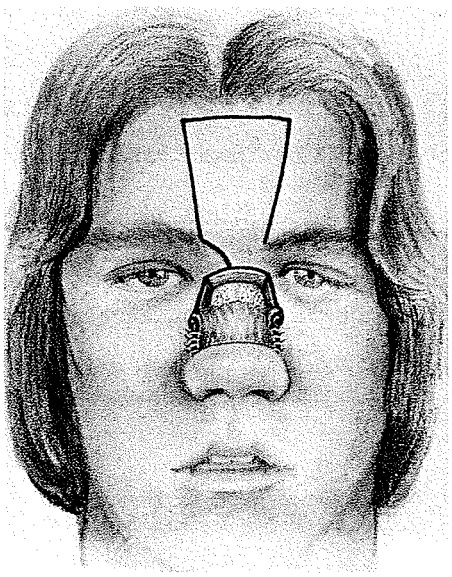
This male at the age of two years was in an automobile collision in which his nose was smashed flat, shattering his nasal bones and septum. This early injury affected his nasal growth so that at the age of 13 years he had the face and body of a man but the nose of an infant. Lack of growth in the nasal bridge allowed the nasal tip to be severely snubbed and the shortness of tissue was in all layers, cover, support, and lining.

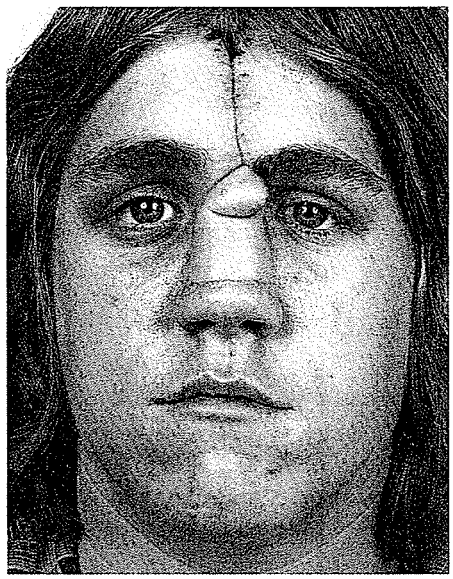


A total release, like a guillotine chop, just proximal to the nasal tip, carried through all the three layers and including the distal septum, which allowed a strut of septal cartilage to



remain with the tip section, released the retracted tip. Skin was sutured to mucous membrane around the margins of both sides of the defect. The residual dorsal nasal skin was outlined with incisions as a surgical delay for lining turndown. One month later the lining was indeed turned down and attached to the released tip. A costal cartilage strut was set on the bridge and a midline forehead flap was transposed for cover of the midsection of the nose. One month later the pedicle was





divided and replaced in the glabella area. Several minor flap and scar revisions completed the reconstruction, achieving an adult nose for this young man.

CENTRAL OR UPPER TWO-THIRDS DEFECTS

In major full thickness losses of the center or even the upper two-thirds of the nose, which maintains a supported tip in front of the defect, the reconstruction should be less complicated. It requires lining and a supporting strut of cartilage or bone to span the bridge gap from the tip tripod to any remaining nasal bone or to the frontal bone itself and skin cover. This defect is a double subunit extending from its join with the alar creases anterior to the join with the nasal base or frontal bone posteriorly. This section, nestling between the tip and the head, is reasonably well camouflaged purely by its position. It will even accept skin cover other than forehead.

HEMICENTRAL DEFECT

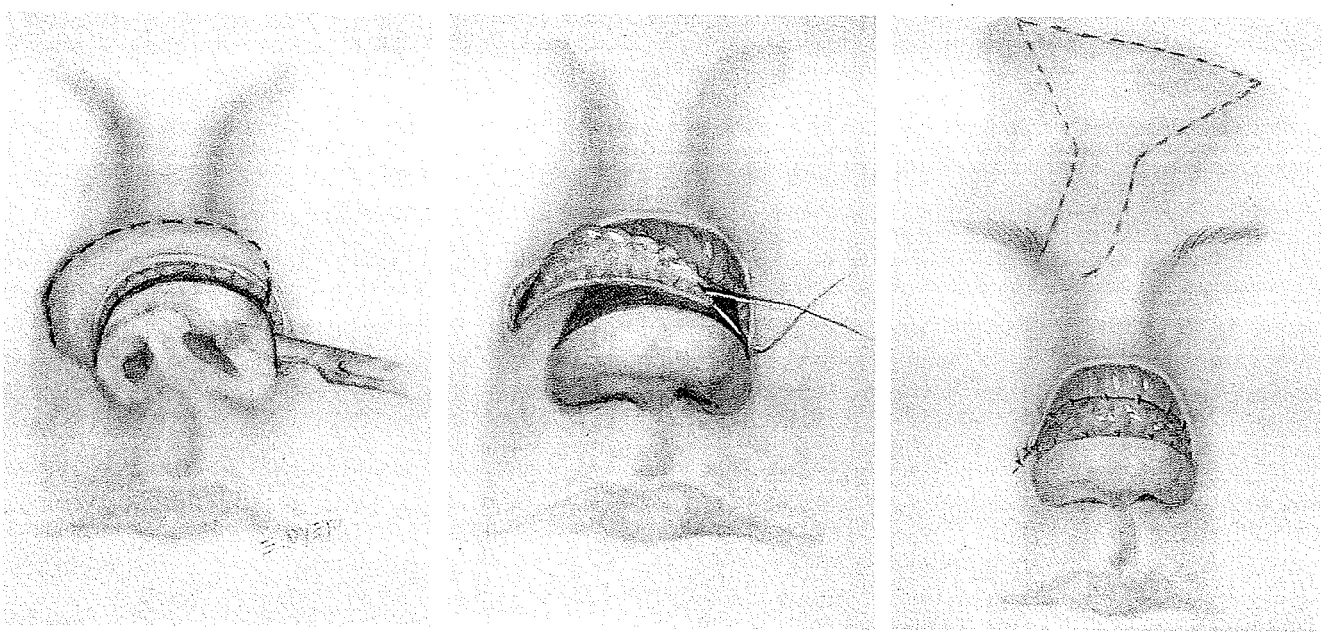
This 48-year-old female with basal cell carcinoma of the right nose and medial canthus was treated with Mohs surgery resulting in loss of the right central nose, tear system, and deformity of her medial canthus.

A year after ablation a probe was passed through her lower lid puncta out to the skin so that a skin flap continuous with a puncta could be cut and rolled on itself and sutured with 5–0 catgut to create an inverted skin tube. A hole was drilled through the frontal process of the maxilla and the skin tube passed through the bone and into the nasal cavity so that tears could flow normally. The medial lower eyelid was freed, lifted and fixed at the canthus. Lining was later turned across the nasal defect and a vertical forehead flap based on the left supratrochlear vessels was transposed to cover the nasal defect. Split rib grafts replaced the lost bone in a final stage.

A CENTRAL TRAUMA LOSS

This 31-year-old female suffered a crushing facial injury in an auto crash. She lost her left eye along with avulsion of the right tip and center of her nose. There were also multiple fractures of her maxilla. She had been treated with a right nasolabial flap transposed inartistically across the bridge and tip of her nose which did not deter the tip retraction.

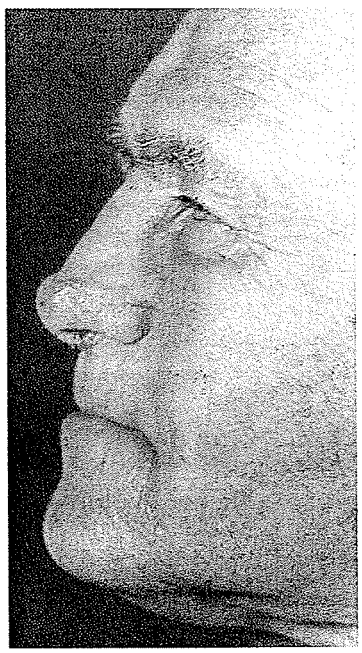
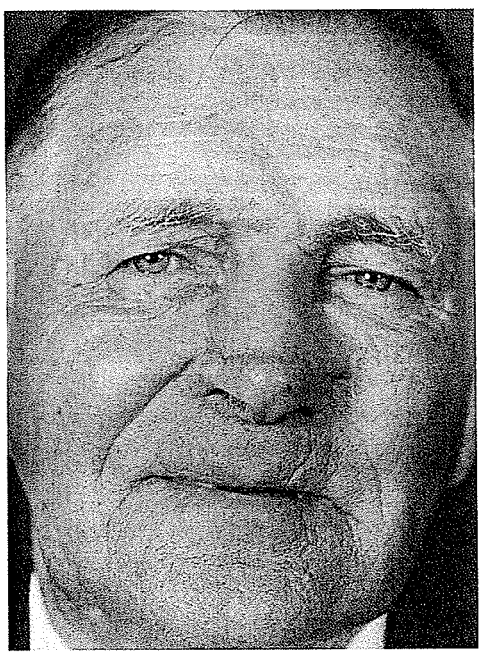
The nasolabial flap was split longitudinally, leaving the lower third on the tip. Along this cut the usual transverse U-shaped chop through all layers released the retracted tip into normal position. Then the remaining upper two-thirds of the nasolabial flap was re-elevated on its original base and turned over to fill the lining defect left in the wake of the release. A



bridge rib graft was placed on the lining in the midline and a vertical forehead flap based on the right supratrochlear vessels was brought down for cover. Iliac bone onlay grafts applied to the maxilla improved contour and an artificial eye was of ben-

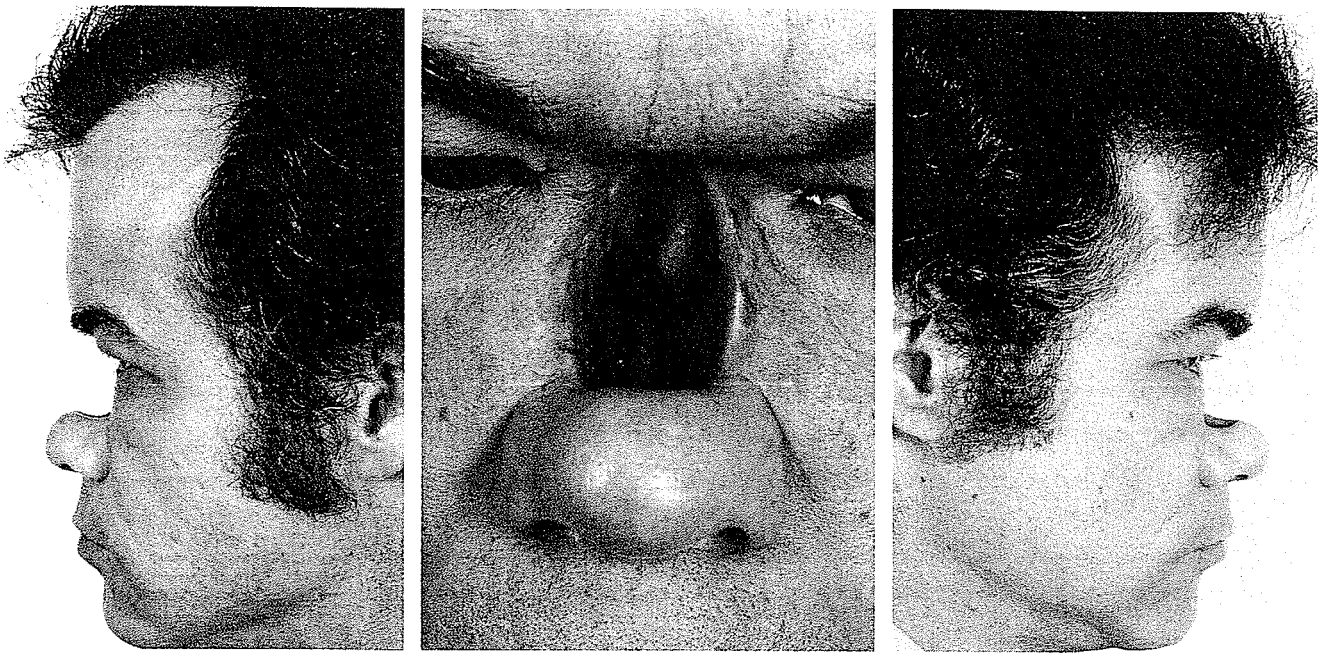


efit. Another middle-third loss from carcinoma ablation was treated by a turndown of lining followed by a forehead flap for cover.

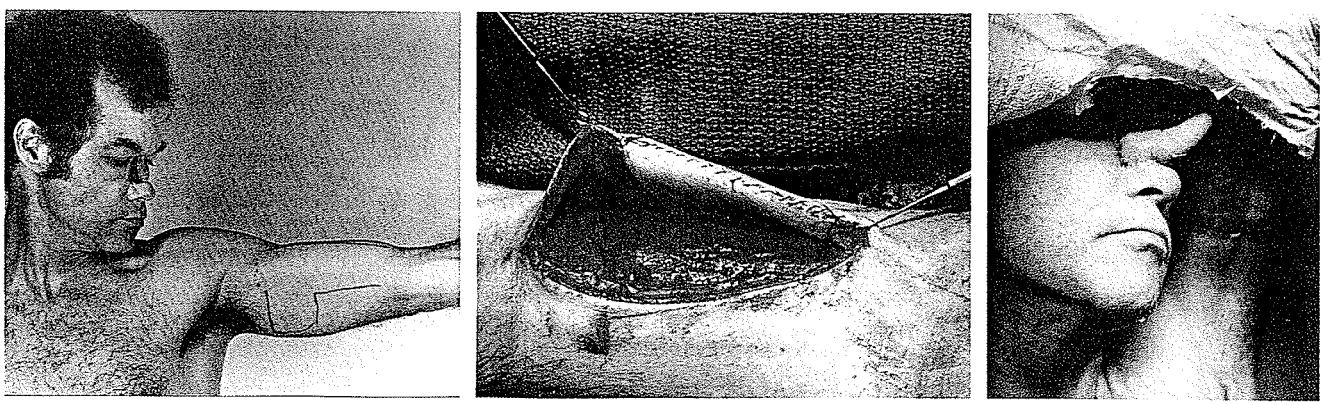




TOTAL UPPER TWO-THIRDS LOSS

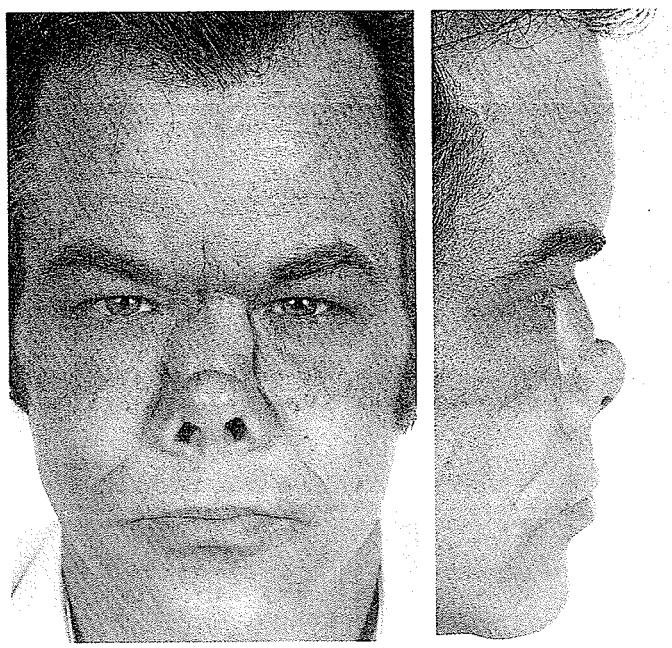
This 36-year-old male had an en bloc resection of the total central upper two-thirds of the nose and septum for squamous cell carcinoma. This was followed with radiation treatment and chemotherapy. Two years later he was without recurrence.



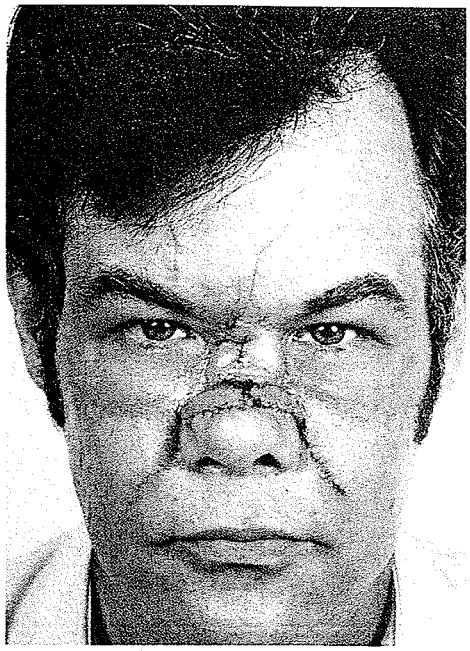
To supply both cover and lining for this defect would have destroyed his forehead. Thus a flap, designed on his left upper arm, was tubed distally and lined proximally with an inturned flap while the donor area was covered with a split skin graft. Seven weeks later the edges of the nasal defect were freshened and incisions around three edges of the folded skin paddle made it possible to plunk the lined flap into the nasal defect and suture the three sides in two layers. Twenty days

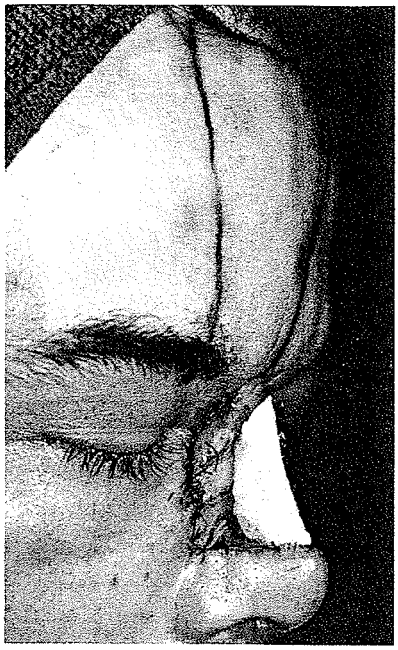


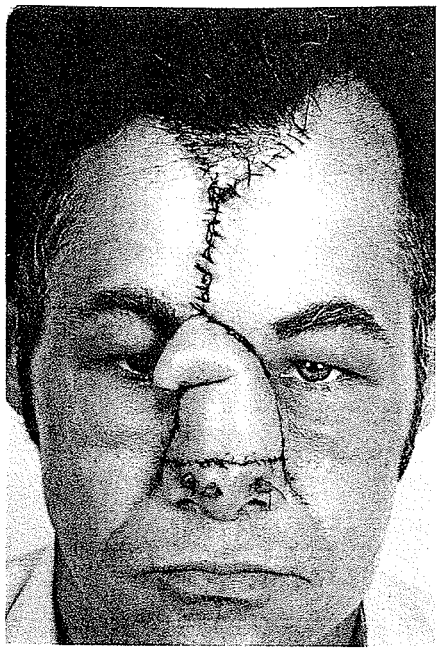
later the pedicle was divided releasing the arm and the free end of the pedicle was inset. It was evident by the multiple tiny fistulas around the join of the flap to the nose that healing had not been vigorous, probably due to the avascularity of the recipient bed following radiation. These fistulas were closed but the lined arm flap, being totally dependent on its blood supply from the radiated edge of the defect, was in question. Two months later a costal cartilage graft was inserted for bridge support but, probably due to poor blood supply, became infected and had to be removed. This was followed by contracture. It was then necessary to release the re-



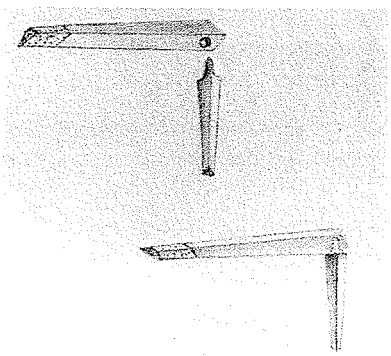
tracted nasal tip, and turn down the arm covering skin for extra lining. Bilateral nasolabial flaps were used to help to cover this lining flap and stabilize the tip release. A midline forehead flap was delayed. After two months of stabilization of the tip position, a cartilage graft for the bridge was fixed in position and covered with the forehead flap which brought in its own blood supply. The healing was without incident. Five weeks later the skin pedicle was divided and replaced but the supratrochlear vessels were kept intact to maintain adequate blood supply to the area. Later a two-piece costal cartilage was inserted through a columella splitting incision and mortised tip under tip to enhance the bridge and tip support.

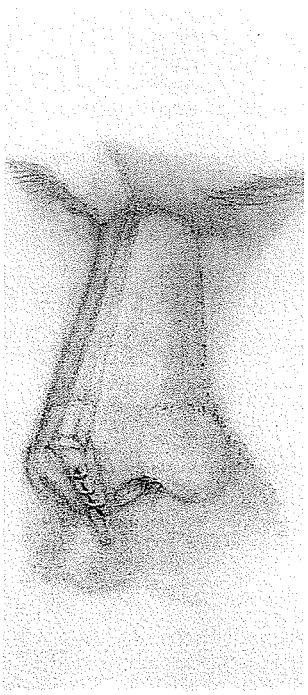


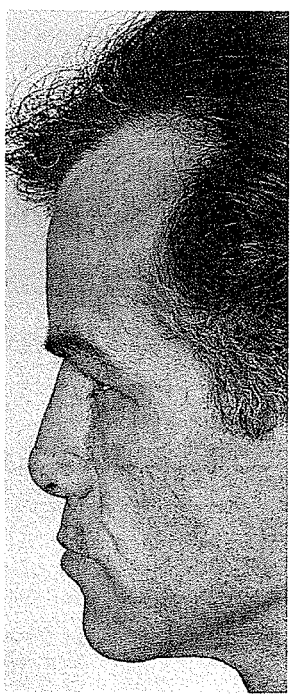


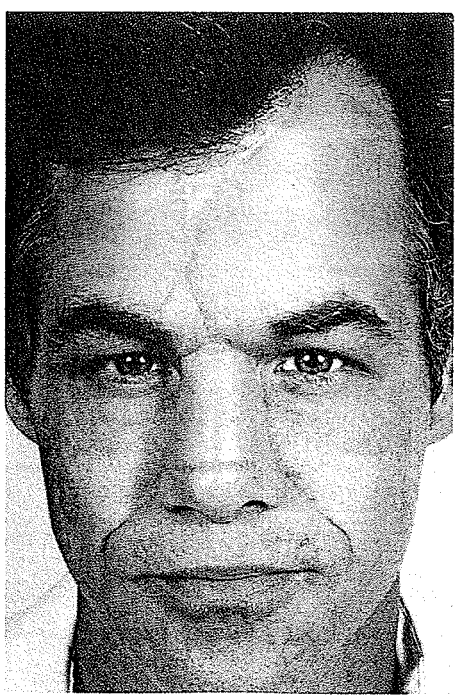


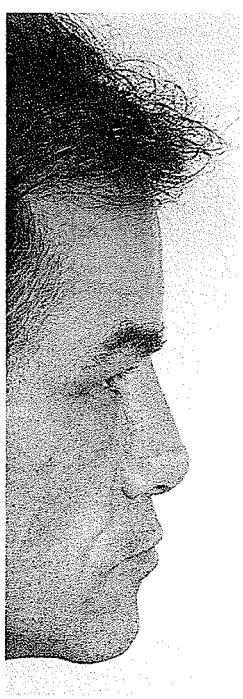
Ten years later I received a letter from the patient stating, "The reconstruction of my nose is about the only thing that has not changed over the years. A year ago bone cancer was found in my left maxilla which required removal of my cheek bone and half of my palate. They followed this with neutron radiation therapy and fitted me with a prosthesis which allows me to eat and talk."









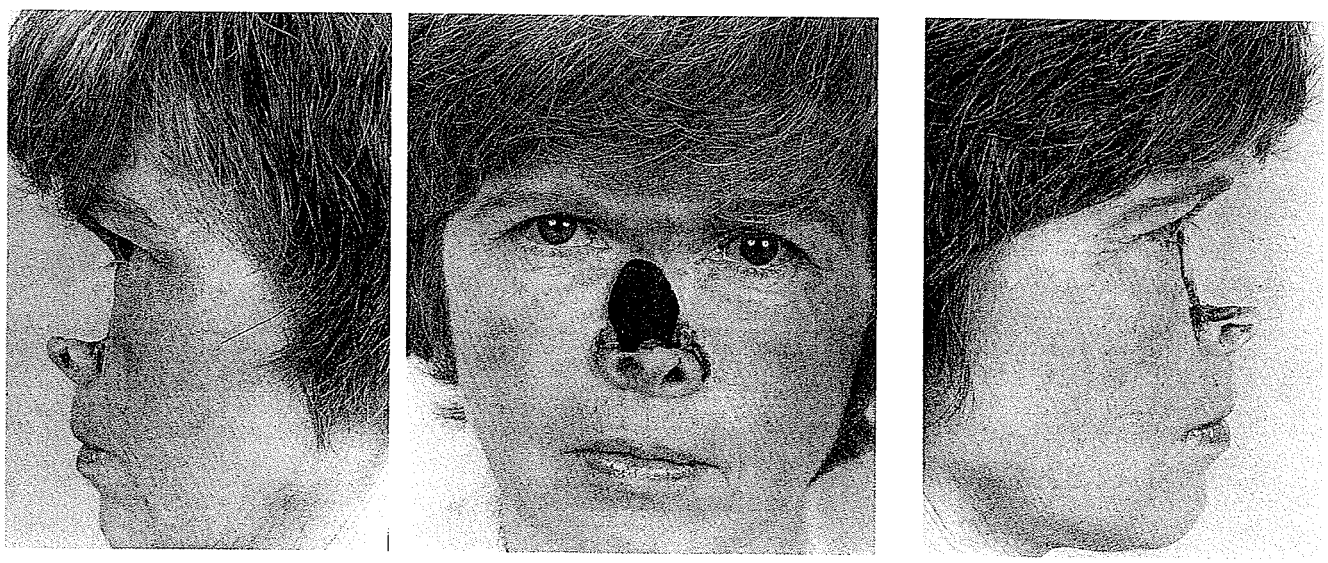


A MORE THAN UPPER TWO-THIRDS LOSS AND A LESSON

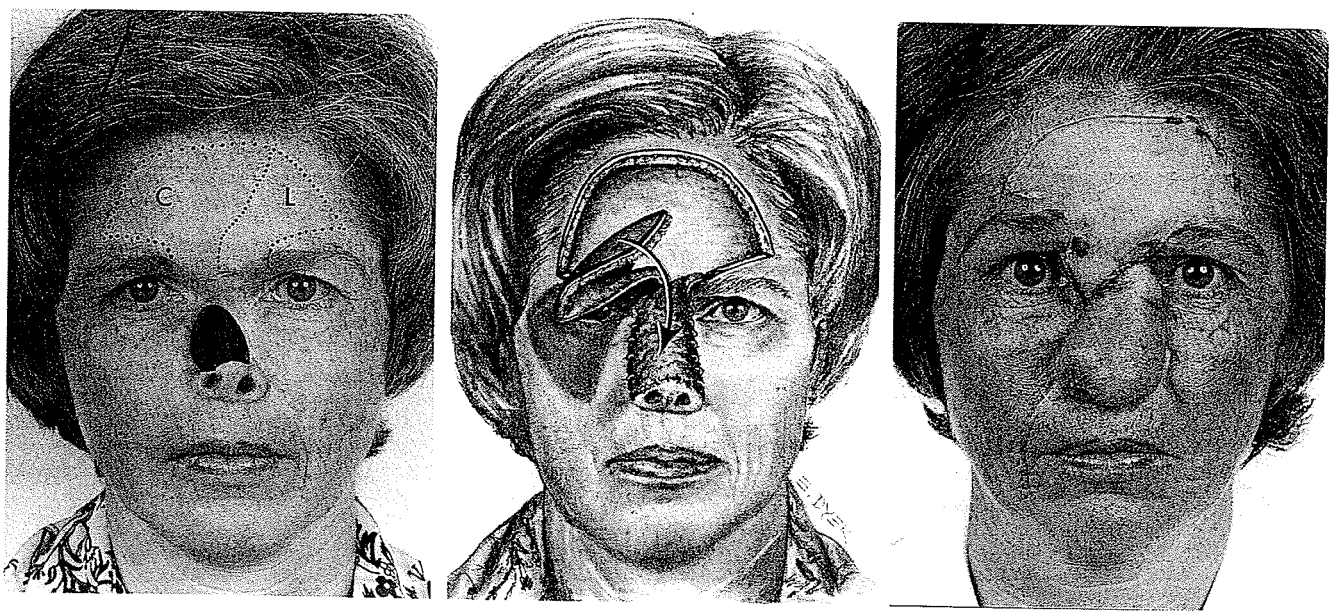
This 45-year-old female had had radical excision of almost her entire nose and septum. There was a residual of columella, a sliver of septum, and thin alar rims which had retracted back

into the defect. The ablation surgeon declared the patient ready for reconstruction after one year.

The first step in reconstruction was to bring the residual columella and alae out and down into normal position taking excess mucosa from the vestibule to wrap around as a closed unit. Skin grafts were applied to the raw areas in the vestibule.

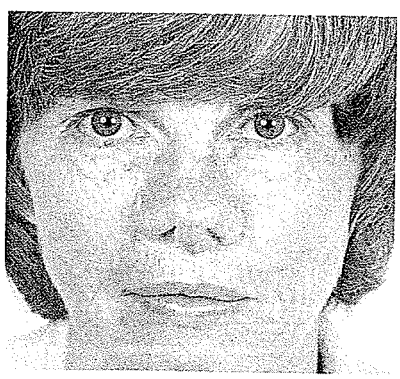


The forehead, being too small to supply either lining or cover and get primary closure, was divided into two flaps by surgical delay. Two months later the lining was brought down on the left supratrochlear vessels and sutured to turned up edges around the nose hole and to the superior edge of the residual tip. This flap was then covered with a right forehead flap based on the right supratrochlear vessels. The total forehead was covered with a one-piece skin graft as a single regional unit. Two months later a rib cartilage graft was



inserted for bridge support, but infection forced its removal. Eight months later a second rib graft also failed due to infection. Following these complications the nasal lining began to shrink and the shrinkage caused shortening of the nose and contracture of the covering flap, creating severe irregularities and some collapse. There was no more forehead available for a second try so I stalled for time.

By eight more months the tissues had softened. It was then possible to lift the covering flap, stretch it smooth, turn up nasolabial flaps to lengthen the edge of the contracted lining, and bring the covering flap back down in corrected position. Ten months later a new cartilage graft to the bridge seemed to be successful. The alae were rotated medially with a cinch procedure and the nose tailored by alar margin excisions and thinning of the alar crease areas.



A Residual Tragedy

Three years after completion of her nasal reconstruction recurrence was found which was diagnosed again as morphia-like basal cell carcinoma of the nasopharynx and oropharynx. On November 25, 1985, resection of the reconstructed nose, both nasolabial folds, a portion of the left upper lip, and, through a left Caldwell-Luc procedure, sinus mucosa of the left maxillary antrum was removed. All margins were free by frozen section. Permanent sections revealed residual tumor, so on February 26, 1986 resection of the right posterior 2 mm of alveolar ridge was followed by maxillary resection and application of a skin graft to the partially excised upper lip.

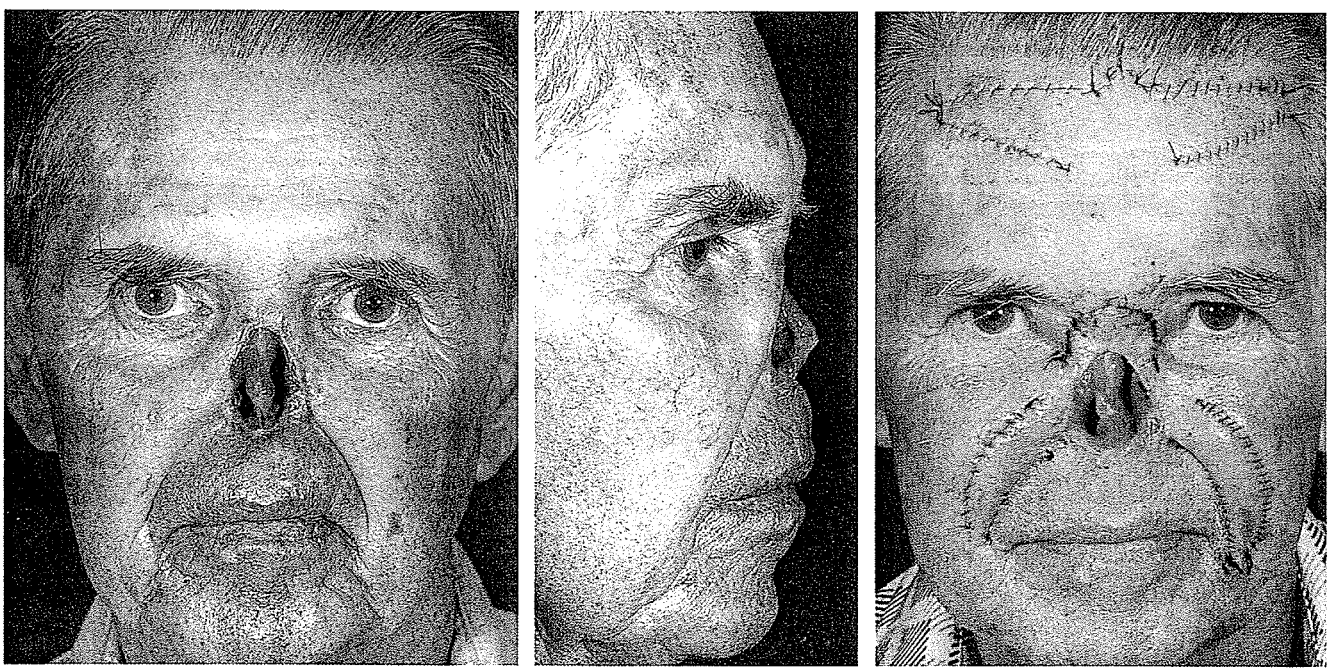
The patient healed well, was fitted with a three-piece prosthesis that closed her palate hole to make speech and eating possible, and was covered with a nasal prosthesis which provided reasonable camouflage of her deformity.

Oncologic surgeon D. S. Robinson in retrospect feels that the green light might have been given too soon for reconstruction. He prefers to observe this type of case for at least two years after resection before reconstruction is begun.

LOSSES OF THE DISTAL NOSE

In losses of the distal nose where the tip, columella, alae, and anterior septum are missing, the key to reconstruction lies in the anterior septum. It is in great part responsible for tip and alar support. When there is loss of anterior septum with only inadequate residual septum remaining, then support must be introduced into the columella and even the alae. This requires the old method of double flaps, lining and cover, having struts of cartilage inserted into the center of the various sandwiches. The obvious bulk of these layers prevents simulation of the aesthetic slimness of a normal columella and alae.

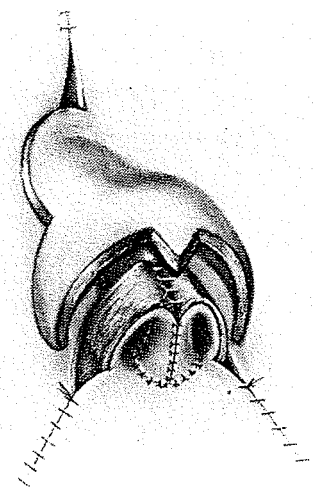
Here is an example of this approach which only after several thinning procedures presented an acceptable aesthetics. This 69-year-old male had a 40-year history of recurrent basal cell carcinoma of his nose treated by radiation, cautery, and local excisions. Wide local excision to clear margins removed two-thirds of his distal nose including most of his septum.

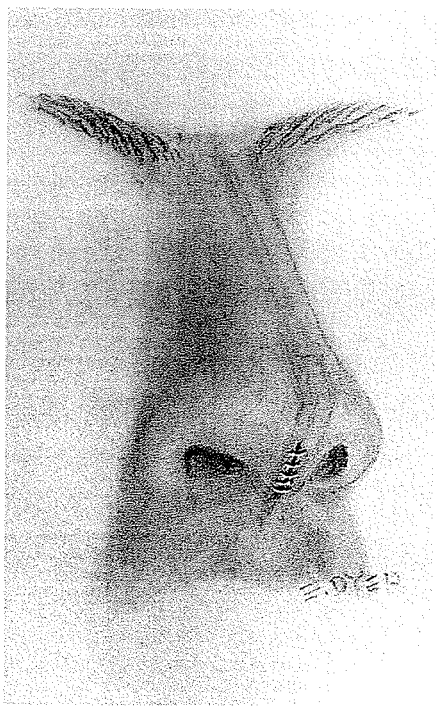
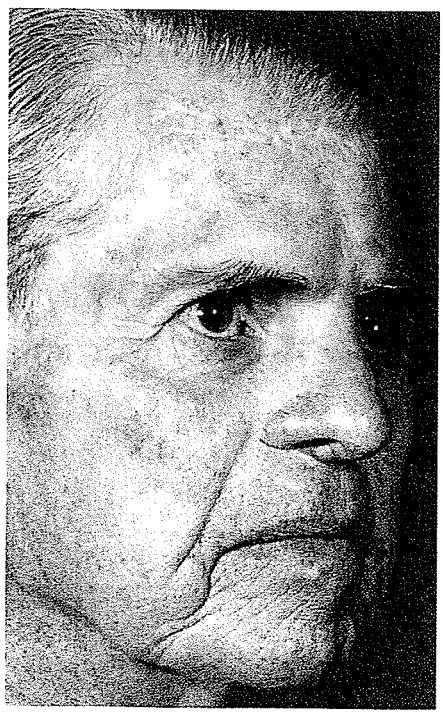
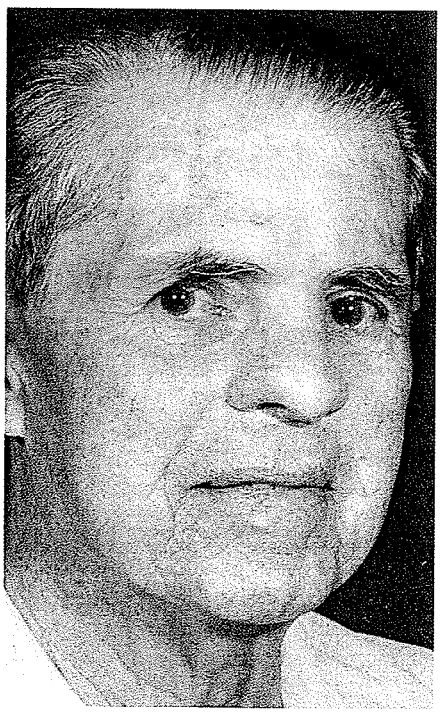


After 6 months' healing, a local upper bridge skin flap, bilateral nasolabial flaps, and a headless gull-shaped forehead flap were delayed with incisions. Two months later, the local lining was turned down, the nasolabial flaps were turned over

into a back-bend to form a columella, and the pointed-neck gull-shaped forehead flap was brought down for cover blending the tip into the columella. The forehead donor area was closed by direct advancement.

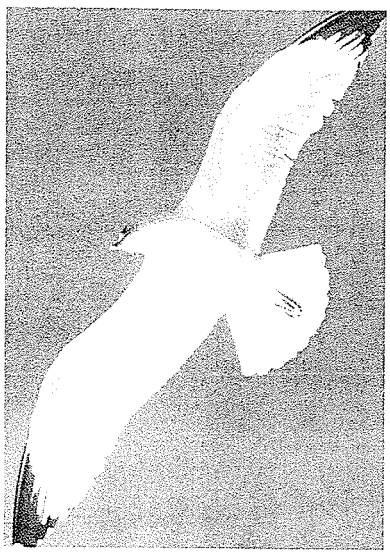
Four months later the forehead skin pedicle was divided while preserving the neurovascular bundle. Later a costal chondroperichondrial hinge graft was inserted to give a finer bridge and better tip support. It required several sidewall thinning procedures through marginal incisions to shape the nose and open the airways.

The Seagull Flap

In 1974, in *Plastic and Reconstructive Surgery,* I first presented the seagull-shaped forehead flap which is reminiscent of earlier flaps but the subtle variations make the difference. When the height of the forehead is near three inches and the size of the defect is less than the total nose, a forehead flap design can be made in a shape and with aspirations not unlike Jonathan Livingston Seagull. The svelte body usually little more than one inch (but can be wider) is poised in the vertical axis with its tail based on the medial aspect of one brow to include the supratrochlear vessels. The wings are spread out along the natural transverse lines of the forehead, tapered at each end, and shaped wide enough to construct alae and long enough to curl as alar bases across the anterior nasal floors as nostril sills. The neck-head-beak end is destined for the tip and columella. At the first operation this flap is delayed by interrupted incisions circumscribing the gull.



This specific gull pattern supplies ideal cover in regional units for the bridge, tip, alae, and columella. Designing the flap both in the horizontal and the vertical axis reduced the amount of forehead taken in any one plane; this facilitates primary closure in an inconspicuous midline "T" scar.

Lest you get sucked into the routine of cutting all seagull flaps with cookie cutter identical similarity, remember the spirit of Jonathan Livingston Seagull: Any old Miami Beach seagull can glide gracefully under the sun. The discontent Jonathan, with persistence and adaptability, achieved the impossible in gull speed by varying with trimming the width of the wing spread to the shorter, faster falcon proportions.

Bach's words are still inspirational:

> He climbed two thousand feet above the black sea . . . brought his forewings tightly to his body . . . and fell with a vertical dive . . . The wing-strain now at a hundred and forty miles per hour wasn't nearly as hard as it had been at seventy and with the faintest twist of his wingtips, he eased out of the dive and shot above the waves, a gray cannonball under the moon.

In other words, fit the pattern of the gull shape to the specific nasal defect—half a gull for a hemi-nose, short falcon wings for reduced alar coverage requirements, and other variations for the specific deficiencies.

The forehead flap is usually incised through full thickness and then peeled off the galea leaving the cranial periosteum intact. If a thin flap is desired for a special cover the galea and a thin layer of adipose tissue can be shaved from the undersurface. Remember that the main vessels run just under the dermis and thus are safe.

OTHER PEDICLE ADAPTATIONS. When the forehead is narrower than ideal to supply a vertical seagull flap, then it may be necessary to slant the axis of the flap toward a bald bay. This donor area loses the value of a midline vertical axis and causes some asymmetry to the height of the brows, but careful juggling at the forehead closure and combing the hair forward often renders the sacrifice justifiable.

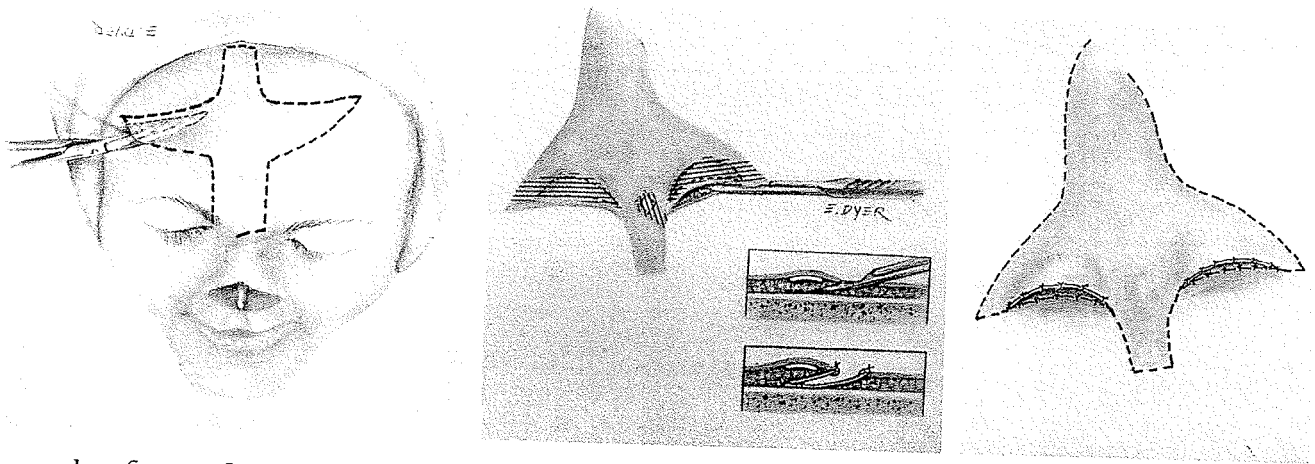
It is also important to know that it is possible to get an extra inch or more of maneuverability by extending the base of the flap down through the eyebrow, making certain to preserve the supratrochlear vessels safely in the base. It is far better to extend the flap and ease the tension than force a too short flap tight against the kink of its turn. Understanding this one principle can make the difference in the success of your forehead or any other flap transfer.

As G. C. Burget was a plastic surgery resident at the University of Miami while I was developing the seagull forehead flap, he was taught how to plan a forehead flap, shape it, thin it, implant it, and revise it. F. J. Menick was a fellow at the University of Miami, and their book *Aesthetic Reconstructive Rhinoplasty* teaches sound principle and careful detail.

Alar Prefabrication

When one or both alae are part of the deformity, then special need to achieve splinted, lined alar rims calls for prefabrication. In 1943 H. D. Gillies advocated auricular chondrocuta-

neous grafts to line and support the future alar rims on the forehead flap. I first used this procedure in 1953 and continued with it for many years. In 1988 I published a modification which increased the effectiveness and safety of alar reconstruction. During surgical delay of the forehead flap, gull-shaped or modified, incisions along the future alar margins should be cut on the bias, leaving a sharp distal edge slightly under 1 cm in depth. Just proximal to this thinned edge, but parallel to it, a narrow tunnel is burrowed just under the forehead skin. Into this tunnel is inserted a strip of cartilage, septal or auricular, shaped to give the effect of the narrow roll of the alar rim and alar base. The distal 1.5 to 2 cm of the future alae are lined with free grafts, preferably of postauricular skin. The skin graft adherent to the sharp edge of the forehead flap will be visible as the delicate rim of a natural ala, and more proximal cartilage strip will provide the support and contour, leaving the rest of the forehead its natural thickness for safer vascularity. A split skin graft from arm or thigh is used to cover temporarily the forehead raw area to reduce infection. This new design avoids the bulk and the



hazards of a perfect take with the thick composite grafts and reduces the need for thinning the distal forehead flap to dangerous proportions.

Expanders

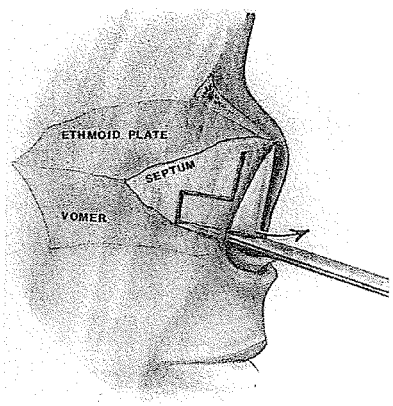
At the time of forehead flap delay, the lateral forehead on each side of the flap is elevated and a 50-cc expander inserted.

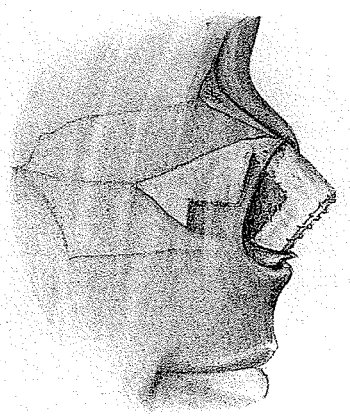
It is well to leave the lined flap 3 to 4 weeks for the skin graft to become well vascularized before transporting it to its final destination. This also allows time for adequate expansion on forehead skin.

THE L-SHAPED SEPTAL CHONDROMUCOSAL FLAP

In distal nasal losses with absence of the anterior septum the ideal reconstructive goal is to erect a septal-like scaffold for tip support. The normal septum is composed of strong, thin cartilage covered snugly on each side with thin mucous membrane, presenting a slender, compact but sturdy framework. It is impossible to duplicate the intricate structure of a septum; but if enough septum remains in a case at least it can be used.

Since in many cases much of the septum is still present, getting a tip support similar in kind to the normal, in principle, calls for moving what septum there is out into a new, normal position and maintaining it there. Thus the remaining septum often can be advanced out of the nasal cavity as an L-shaped superiorly based chondromucosal flap so that its inferior limb can be set up on the nasal spine area. The inferior edge of the septum destined to be the anterior strut of the L is incised along the mucosa on both sides and then freed from the vomer with a chisel. The rest of the L is cut through and through the septum to create the right angle.





This method was first published in 1974. It is important to keep the L more than 1 cm wide along the bridge base and around its right angle to ensure vascularity of the distal chondromucosal flap. Cartilage can be trimmed along the cut edges to allow closure of mucosa of the underside without tension. Careful subperichondrial release, which cuts the cartilage at the upper base in a "back-cut," is usually necessary to facilitate the delivery of the L-shaped flap out of the vestibule so that its distal prow can be planted firmly up on the nasal spine and the raw front area of the prow is temporarily skin grafted.

It is indeed remarkable that septal flaps have not been used more in reconstructive rhinoplasty. In 1917 J. L. Amyard, a crafty surgeon in Gillies' unit in World War I, described an anteriorly based straight septal flap which had no support at its free end and thus was ineffective. H. D. Gillies described a small septal flap based at the nasal spine which offered only modest value. M. Orticochea in 1975 presented a similar flap for expedient lengthening of the columella in bilateral clefts. This radical interruption of the septal bridge and perforation and isolation of a large portion of the septum on the nasal spine in the growing nose pose major hazards to growth and development. G. C. Burget and F. J. Menick in 1986 and again in 1993 presented a huge septal flap based distally at the nasal spine, which, after discarding much of the septal cartilage, was used for distal support.

There may be a rare instance where a distally based septal flap offers an advantage. I have used it on occasion. Yet in my experience, the simpler proximal base is superior: It is less awkward and more dependable, has better vascularity, and enjoys the engineering efficiency of a propped cantilever capable of carrying a substantial weight. The only problem I have encountered with this flap has been when previous surgeries have violated the septum in the area of the proximal base, although this is quite rare.

Local Lining

Simultaneous with the outward advancement of the L-shaped septal flap, preparation of local lining flaps is indicated. Turn-over of local skin for lining should be designed to present raw areas along natural nasal units. As these skin flaps must be based on scar they deserve a delay by specific surgical incisions. When the skin of the nasal bridge is turned down it opens a direct path for the covering flap to ascend along the bridge into the tip and columella. Turn-up of alar skin or the use of nasolabial flaps for lateral lining presents raw area units easily covered by the wings of the seagull. By design it is not necessary for the lining flaps to reach to the margin edge of

the alae. The skin grafted margins of the forehead flap extend slightly ahead of the lining flaps for aesthetically chiseled sharpness.

A WARNING. When using adjacent skin for local lining, make certain in the carcinoma cases that this skin is clear. Biopsy questionable areas, excise lesions, and skin graft the defect. Once the area has healed it can be used as an inturned flap for lining. If this precaution is not taken after the lining is turned in and covered by the forehead, potential carcinoma of the lining skin can progress undetected and eventually could cost the patient loss of his new nose or even his life.

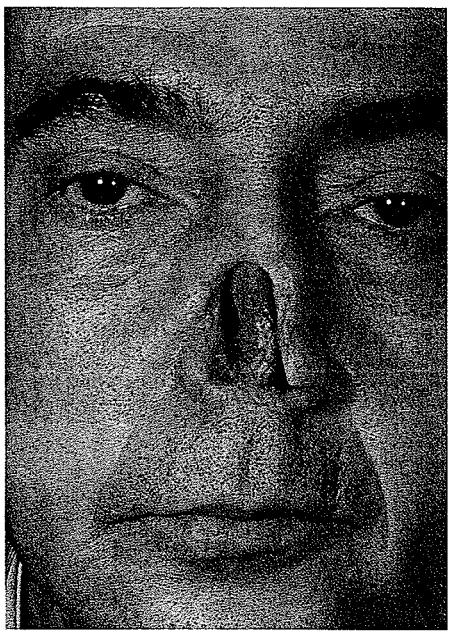
Layer Assembly

Once the septal flap is established in its forward position, the lining flaps have been delayed and the skin grafted lining of the alae of the delayed forehead flap have become well vascularized, it is time to assemble the reconstruction. This usually takes three weeks.

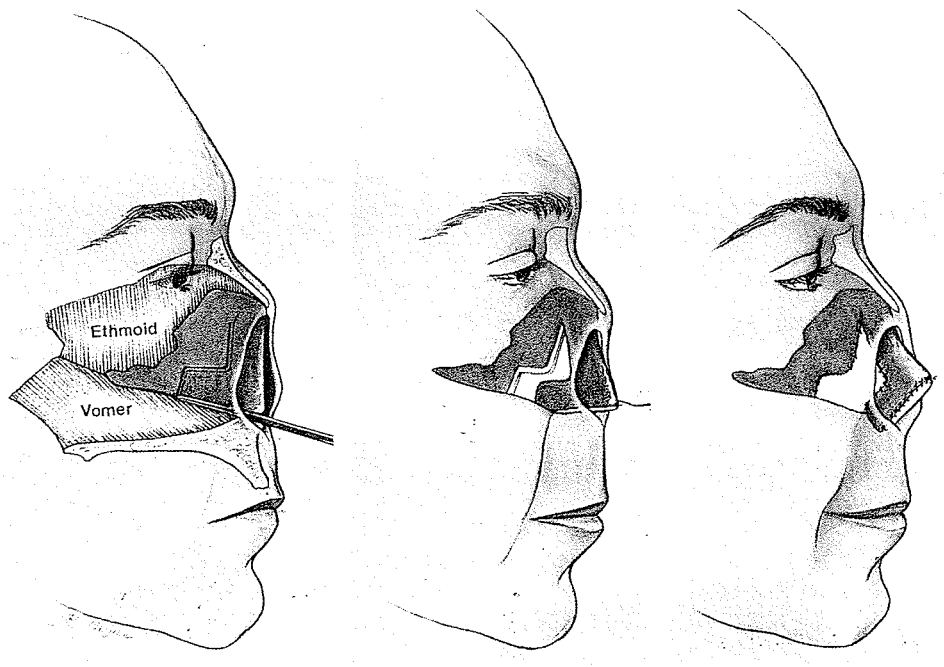
The mucosa along the entire peripheral edge of the septal L flap is incised and the edges turned out. The lining flaps are turned over and sutured to the mucosal edges of the septal bridge. Then the prefabricated forehead flap is brought down to cover the septum and lining. The upper edges of the alar skin grafts are sutured to the lining flaps. The wings of the forehead flap cover the alae, swinging around the alar bases and creating the nostril sills. The distal projection of the forehead flap flows over the tip and is sutured to the septal prop to form the columella. The expanders are removed and the forehead donor area closed by simple advancement. After three weeks the skin pedicle is divided and the neurovascular bundle preserved. The triangle base is re-implanted in the glabella area to realign the brow. The flap is thinned and inset in the bridge.

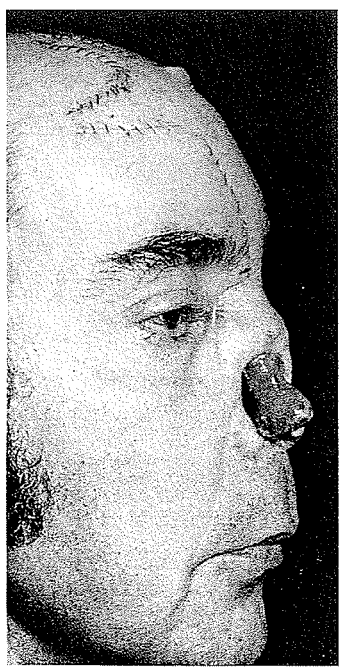
The first case in which I used a seagull-shaped forehead flap and an L-shaped septal chondromucosal flap was a 49-year-old Cuban tailor. His nasal squamous cell carcinoma

involving the tip, columella, anterior septum, and right vestibule was radically excised by J. J. Zavertnik in 1969, followed by a radical right neck dissection for positive nodes in 1970. One and a half years later the patient was referred to me for reconstruction.

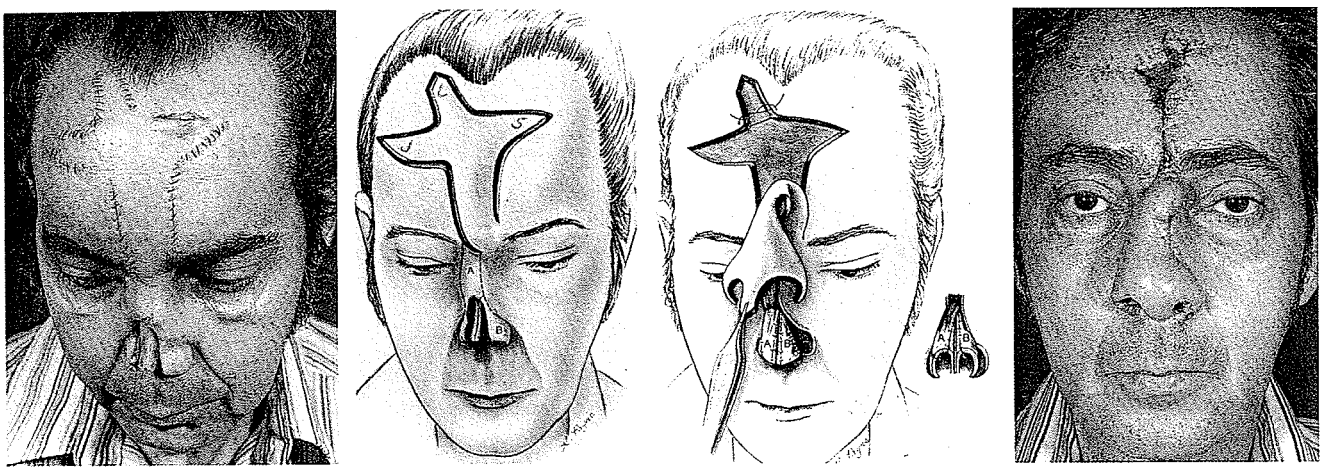


A paper model of the proposed septal flap was used in the dress rehearsal. In April 1972 an L-shaped septal flap was lifted out and wired to the nasal spine. As soon as the septal

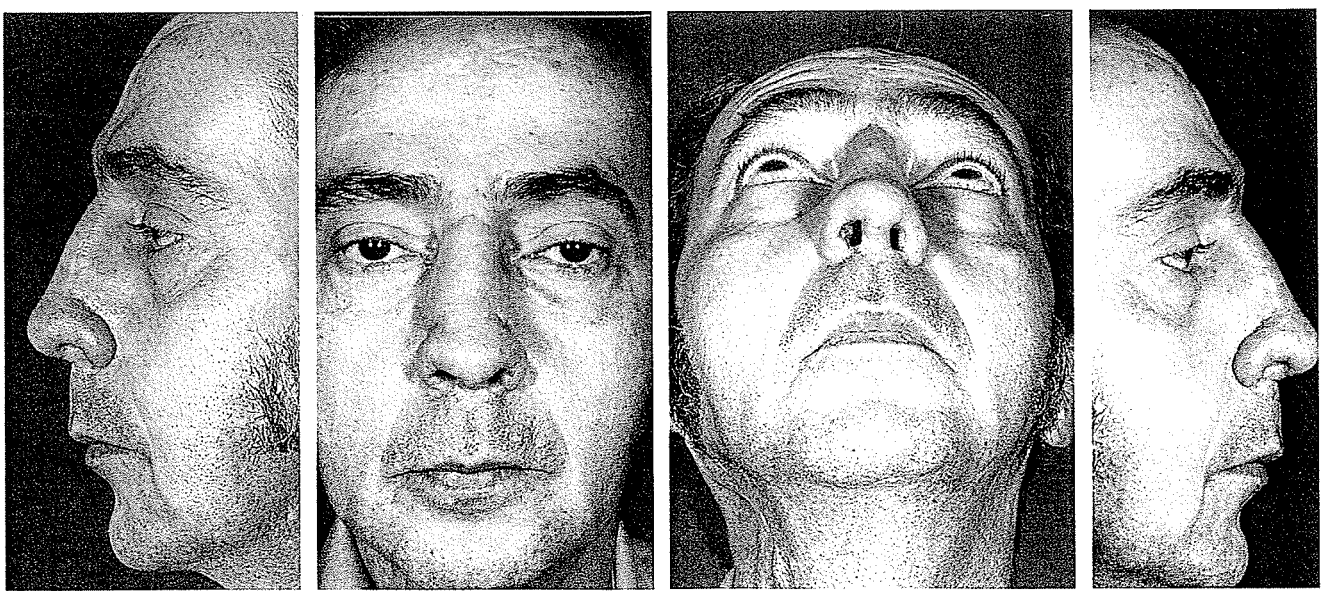




flap was well established in its new position, the seagull-shaped forehead flap was delayed. An auricular chondrocutaneous graft was used to line the future right alar rim, and a small piece of septal cartilage was inserted under the skin of the future tip. The local lining was also delayed. After three weeks the lining flaps were turned up and attached to the septal scaffold. The prefabricated forehead was brought down for cover.

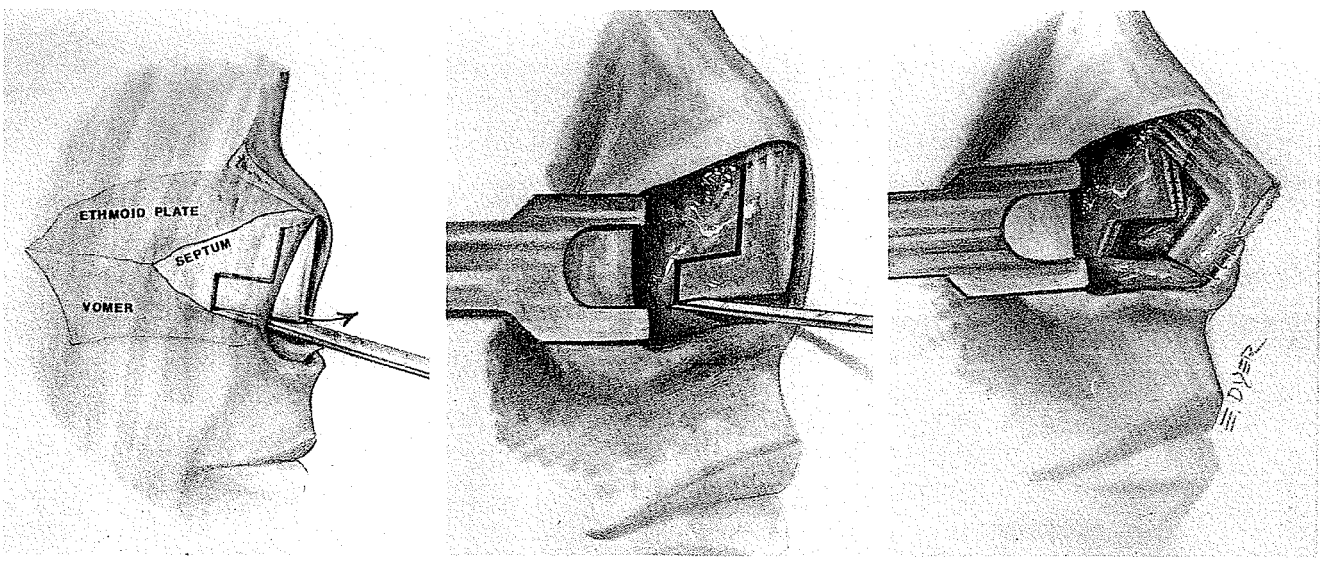


After a month the skin of the pedicle was divided and replaced in the glabella area, preserving the vascular bundle. Three months later the tip and alae were thinned. He is seen one year after repair with excellent profile and airway.



This 47-year-old female, who had radiation treatment for acne at 18, developed basal cell carcinoma of her nose. This was treated with Mohs chemosurgery. There was absence of the distal half of the nose on the right, distal third on the left, upper two-thirds of the columella, as well as loss of anterior septum and a septal perforation.

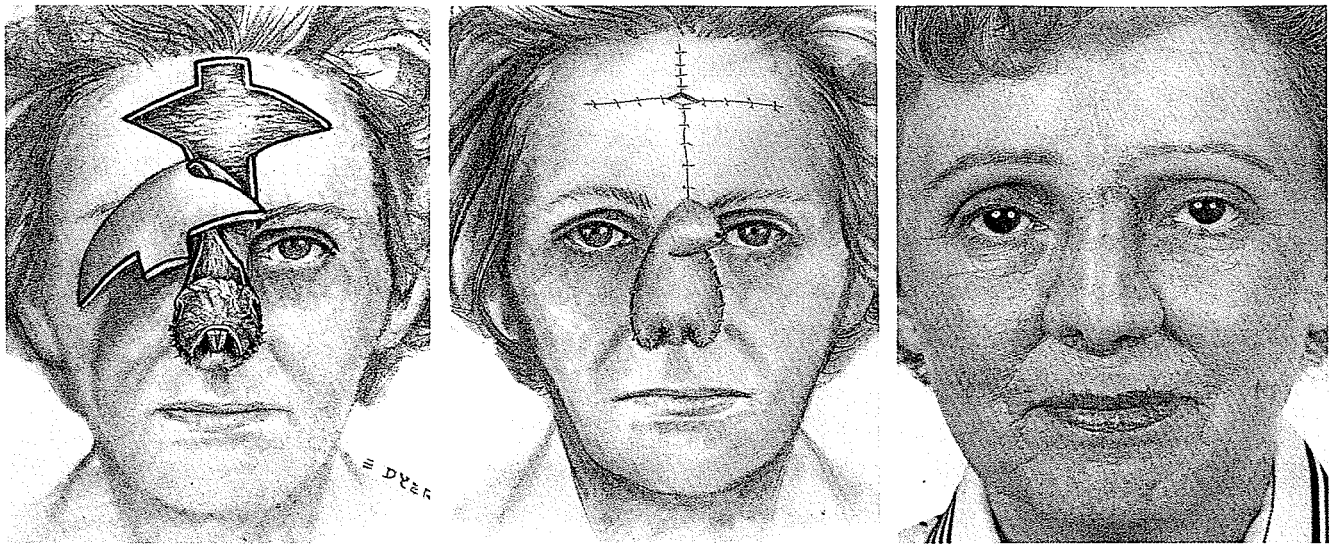
The remaining septum was advanced out of the nasal cavity as an L-shaped chondromucosal flap so that its distal limb could be set up on the nasal spine. A careful subperiosteal release cuts the stiff cartilage of the upper base to allow the L-flap to step up on the nasal spine. It is wise to advance the septal flap prior to reconstruction so that it stabilizes safely in its position as the keystone of the tip scaffold.



Simultaneous with advancement of the septal flap, the lining and covering flaps should be prepared by surgical incisions. Lining flaps should be designed along unit lines, and the covering flap should be a modified vertical seagull shape.

Two months later an incision was made down the center of the dorsal bridge of the septal flap extending over the tip and along the front of the anterior prow of the septal L, so that small mucosal flaps could be turned out on either side to receive the lining. In order to portion more skin for the lining on the right than the left, an oblique strip was denuded of epithelium across the lining flap. As the lining flap was turned down, its raw strip was approximated to the raw area prepared along the septal bridge. It is important that the vestibular lining be reconstructed in natural, symmetrical, sweeping webs at the tip from alae across to columella. The seagull flap then glides over to cover the entire raw area with its wings curling under to create nostril sills. The forehead donor area was closed in a T with improvement on its original wrinkling.

Two months later the skin portion of the base of the forehead pedicle was divided at an angle, leaving the neurovascular bundle intact. The nose portion was set in the upper bridge and the original base was returned to the glabella area to re-separate the eyebrows. Six months later refinements in-



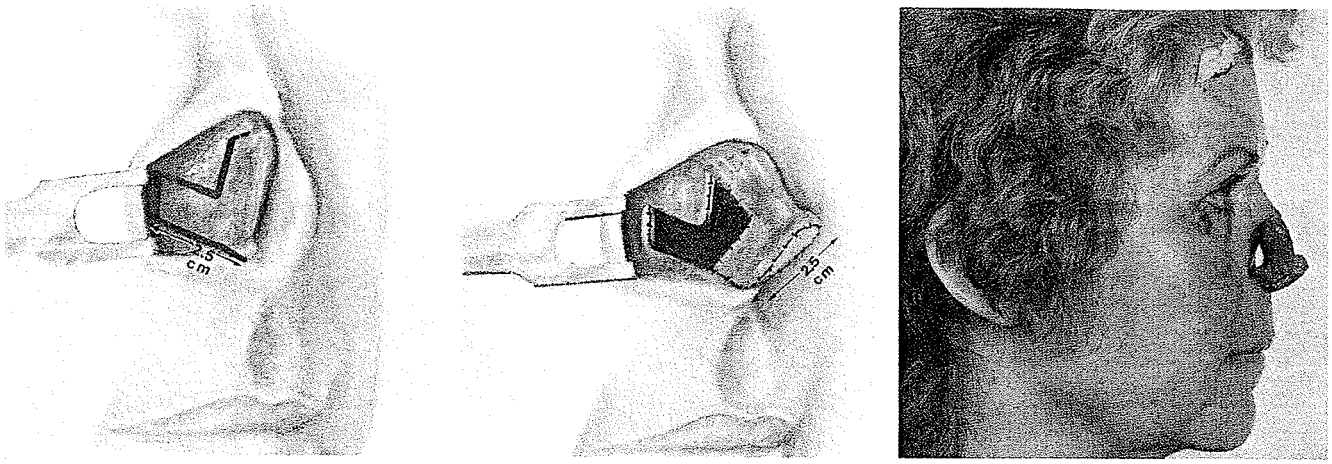
cluded shaving the bony bridge straight and sculpturing the alar creases after augmenting the alar rims and tip with auricular cartilage strips.

The patient is seen three years after reconstruction showing natural-looking and functioning nose.

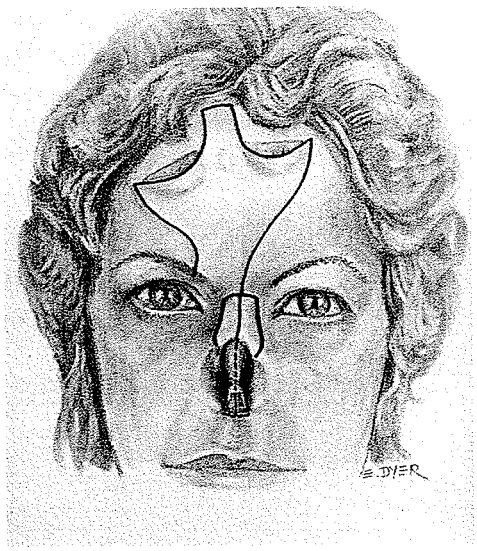
LOSS OF DISTAL TWO-THIRDS OF THE NOSE

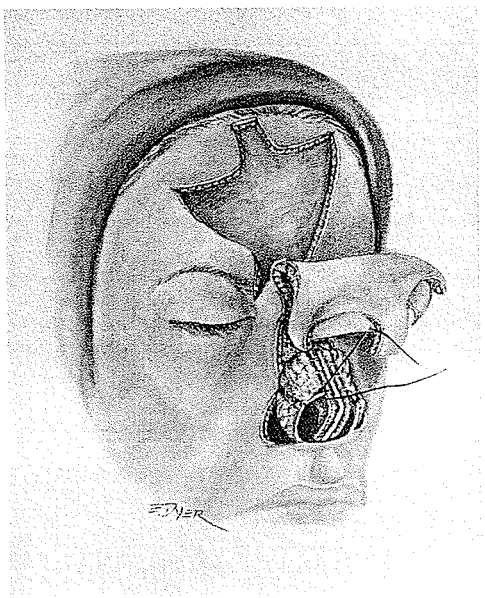
Basal cell carcinoma in this 49-year-old female required excision of the distal two-thirds of her nose, leaving the septum flush with the pyriform opening. All that was left besides the posterior septum were the nasal bones and their covering skin. The key to this reconstruction was tip support and this case offered a true test of the method.

During the initial reconstructive stage, the proximally based L-shaped septal chondromucosal flap was advanced up and out of the vestibule. This required the subperichondrial nicking of the rigid cartilage at the base of the rotation. The slight excess cartilage along the underbelly of the L was trimmed to allow easy suture of the mucosa for a closed unit. The front limb of the L was placed and fixed on the nasal spine as a propped cantilever. The advancement of the L flap, of course, leaves a septal defect which is large enough to avoid whistling but of no further significance except as an aid to the airway. The ENT specialist consulted mentioned that crusting could be a postoperative problem. After the first few weeks of healing this has not occurred.

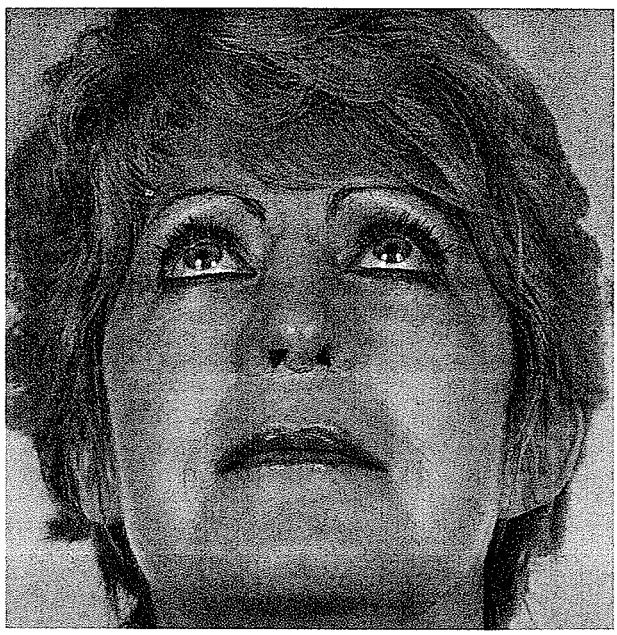


The seagull forehead flap was delayed, as was the future lining. The tip and alae were prefabricated on the forehead. The alar margins were sliced on the bias and these thinned alae were lined with skin and supported with auricular cartilage strips threaded subcutaneously just proximal to the future alar edges. The future nasal tip was defined with a small diamond-shaped cartilage graft. A month later, the mucosa of the septal flap along the periphery of the L, bridge, and front prow was incised and the edges turned out bilaterally. Then two turnover skin flaps from the upper bridge, based distally, were used for lining, being sutured to the flaps along the L and to the inside of an incision along pyriform aperture, as well as to a small triangular turn-up flap at each alar base. The prepared gull-shaped flap was brought down and set in for cover of the entire raw area, including the columella along the front end of the septal L. The forehead defect was closed under tension by undermining and advancement.





After two months, the proximal skin pedicle was divided and replaced, preserving the neurovascular bundle. Minor revisions for flap thinning and alar crease contouring completed the nasal repair. The forehead scar was unacceptable, so two 50-cc expanders were inserted on each side and after three weeks they were removed. The scar was revised and the skin approximated without tension, producing an excellent scar.

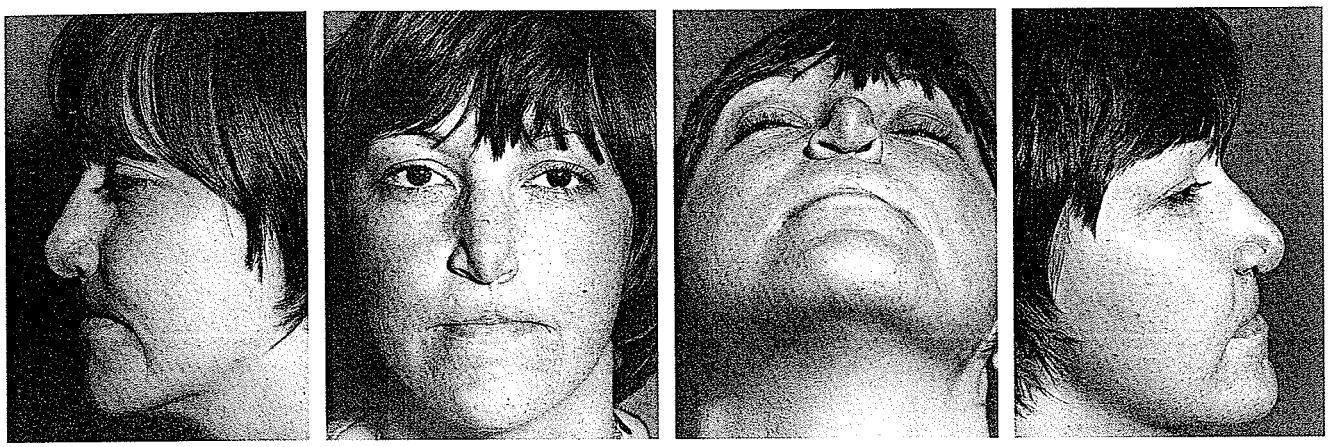


Following this case it has been routine to insert 50-cc expanders at the time of forehead delay under unused forehead skin on both sides. This is important only if the flap is over an inch wide in its body. While the delayed forehead flap is healing the forehead skin is stretched. This eases the execution on "D" day.

Near the end of this patient's reconstruction she volunteered that her new nose was better than her original one and then requested and received upper and lower lid blepheroplasty.

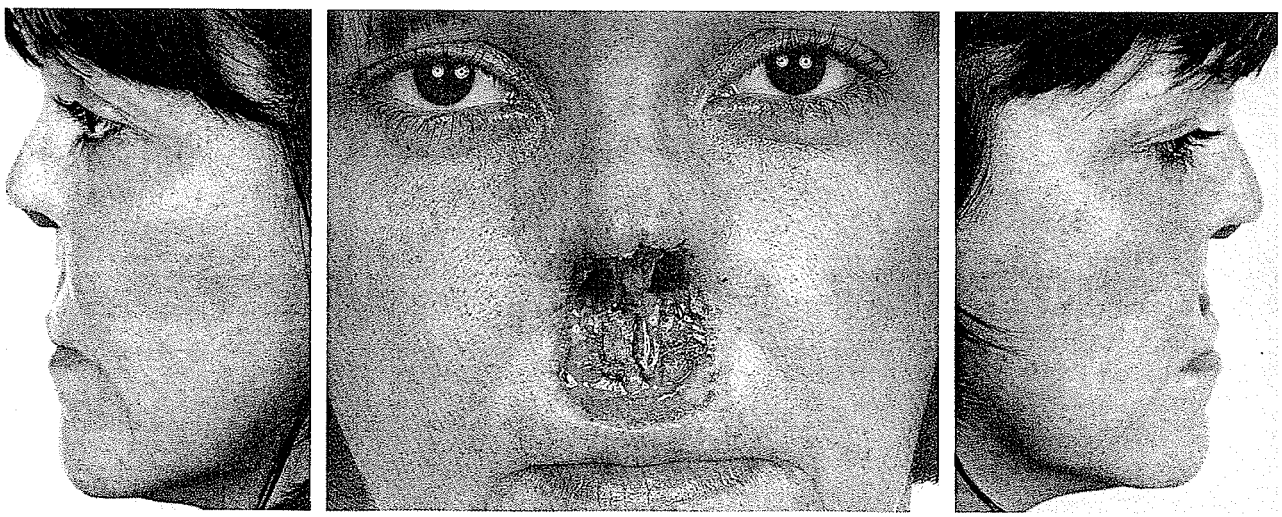
A SEVERE DEFECT OF NOSE, SEPTUM, AND LIP

A 31-year-old female had a history of trichoepithelioma of the upper lip at the columella base. She had had Mohs chemosurgery and one surgical reconstruction. She had a depressed nasal tip, absence of columella, and tight upper lip. Release of



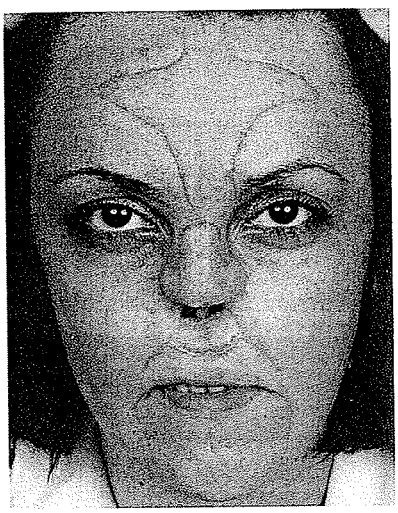
the nasal tip developed the true columella defect which was filled with an auricular composite free graft. The philtrum-less tight upper lip was released with a shield-shaped lower lip-switch flap. Two years later on a follow-up visit, the patient was noted to have a firmness in her nasal tip and upper

lip. Biopsy revealed residual trichoepithelioma. A. S. Ketcham carried out a wide resection of the distal half of the nose, septum, and upper half of the upper lip. When the margins were clear, skin was sutured to mucous membrane around the margins of the defect and any residual raw areas were covered with split skin grafts.



Re-evaluation of the defect revealed loss of the distal half of the nose and septum with only the nasal bones and dorsal skin covering left. The upper half of the upper lip was missing along with loss of the upper half of the lip-switch flap. Bilateral nasolabial flaps were transposed to fill the upper lip defect. The remaining dorsal nasal skin was available for lining and the forehead offered a potential seagull covering flap. There was not enough remaining septum to develop an L-shaped chondromucosal flap advancement. Yet some septum was present deep in the vestibule and its ideal qualities and proven assets served as a challenge. This sparked the use of the "crane" approach to get the L-shaped septal support.

L Septal Flap on Crane

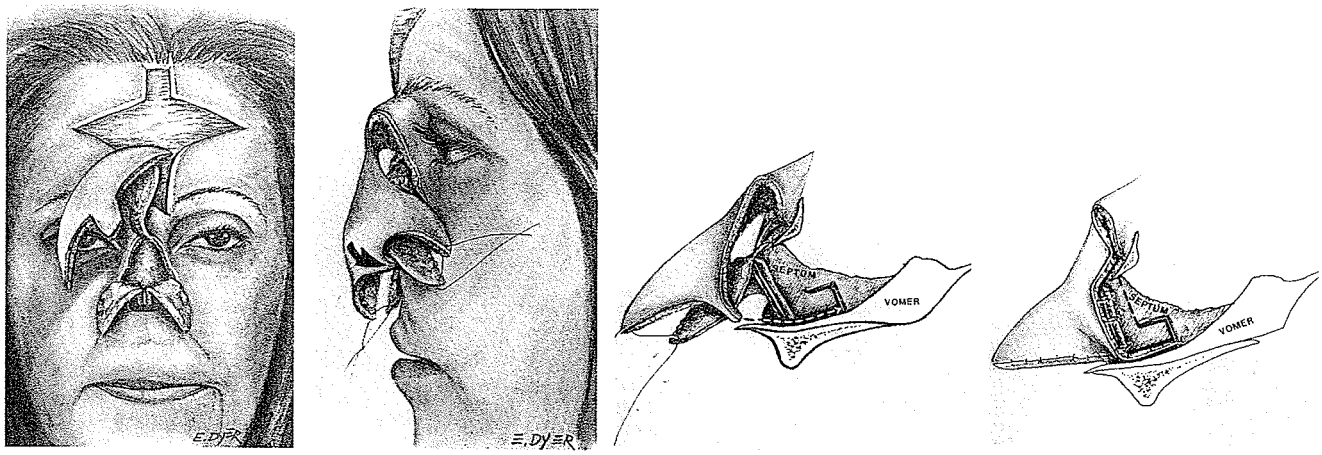


Nine months after resection, a trough under the septum the thickness of a forehead flap was resected along the vomer and a portion of the L-shaped septal chondromucosal flap was delayed by through-and-through incisions. The nasal dorsal skin was delayed for lining. A seagull pattern was fitted in the standard midvertical position on the forehead and delayed by incisions. It was essential to plan the pedicle long enough to allow the flap to enter deep into the vestibule with the distal columella portion sliding into the groove above the vomer, turning at an angle at the future nasal tip and coming in apposition to the anterior cut edges of the septum. This maneuver was planned to give enough forehead flap attachment to the desired L-shaped chondromucosal component to vascularize the unit and allow its usual base to be cut free. Then the L-septal component could be carried on the forehead crane up into normal nasal bridge and tip supporting position.

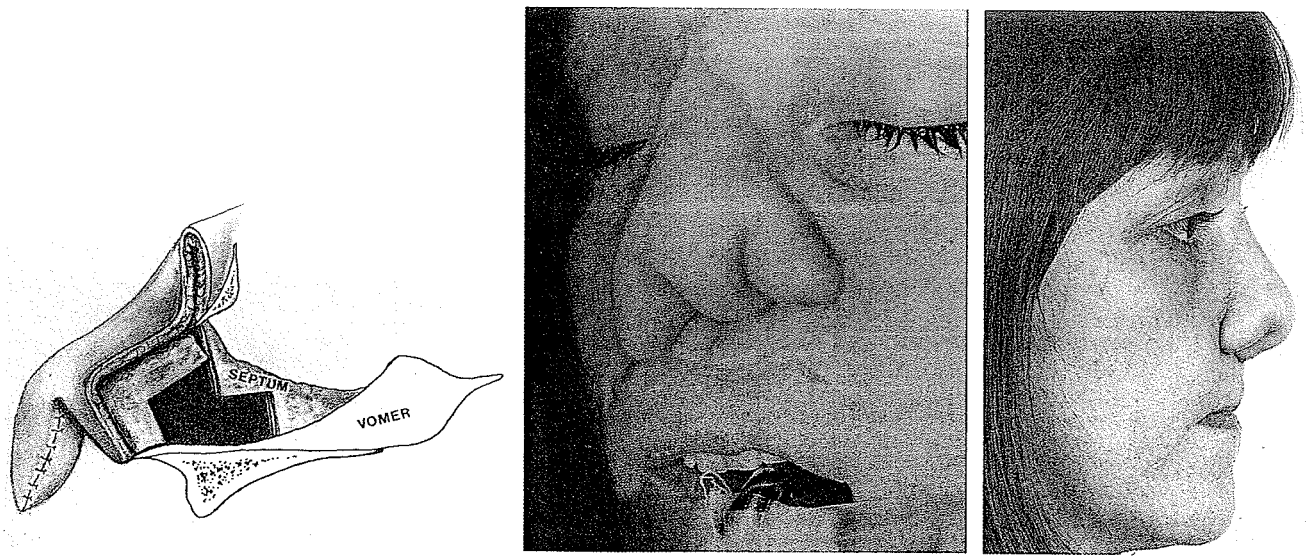
Flap Calisthenics

Three weeks later the dorsal skin cover was turned down; two flaps were used to line the raw undersurface of the forehead gull wings, while the columella tip was guided by a suture

back along the vomer and the forehead flap was approximated to all the other raw septal edges.



In two months the forehead flap had attached itself to the septum so that it could be cut free from all its posterior attachments, be craned out into the desired position, and have its front prow implanted on sturdy ground at the nasal spine. The bulky lined alar wings were whirled in toward the nostril sills.

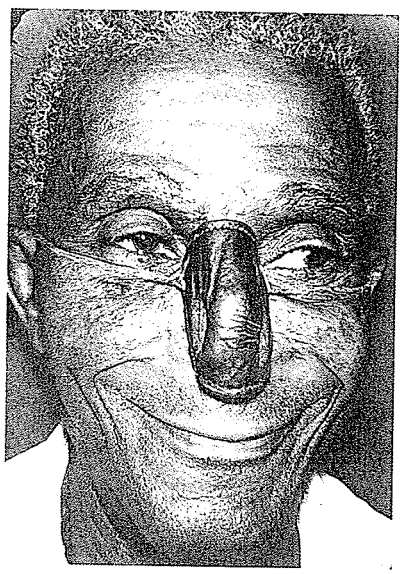


In another month the forehead skin pedicle was divided, retaining the vascular bundle, and returned to the glabella and brow area. Thinning the sidewalls by radical marginal

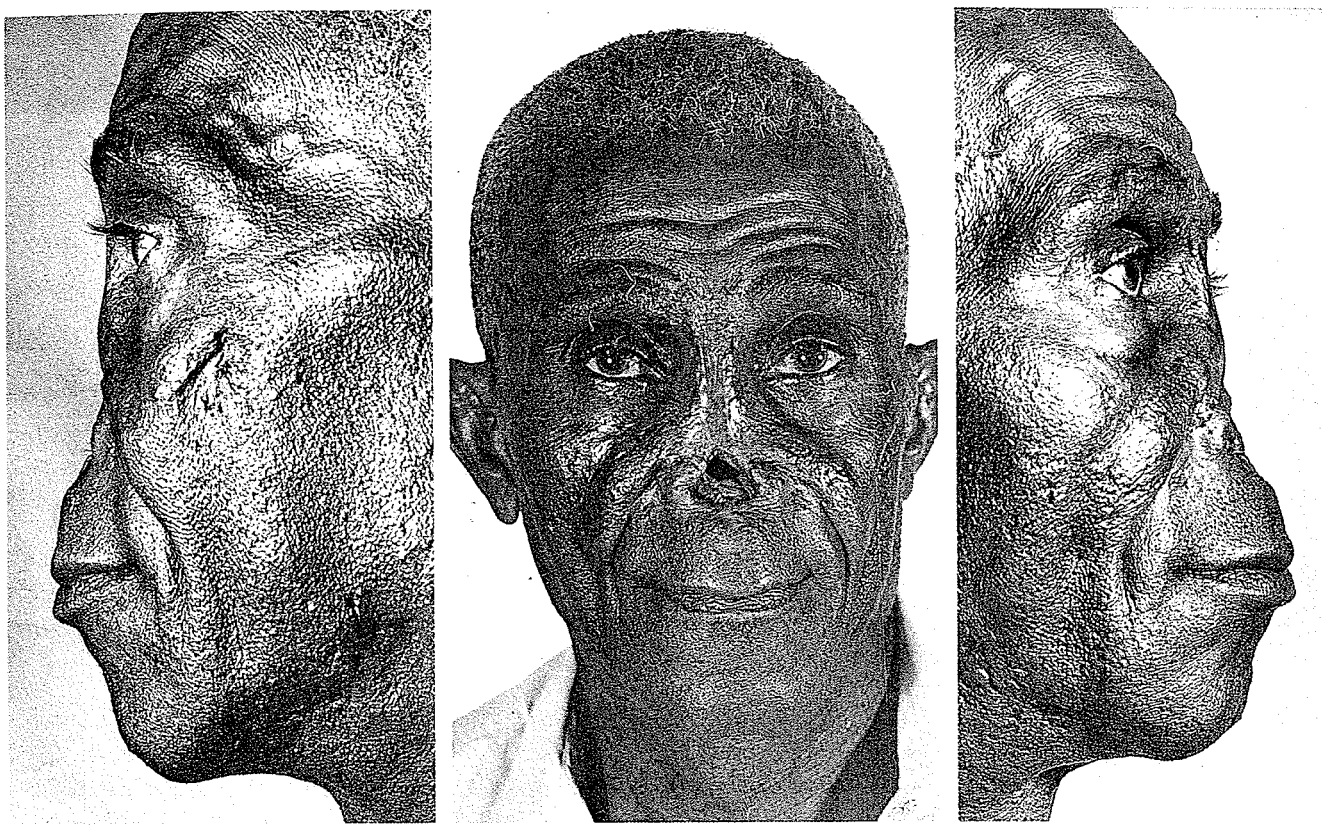
wedge excisions opened the airways and improved the aesthetic effect. Midvertical thinning of the columella achieved similar sculpturing. The forehead, in spite of the generous size of the flap it donated, healed with reasonable scars easily covered by her hairstyle.

SUBTOTAL NASAL LOSS

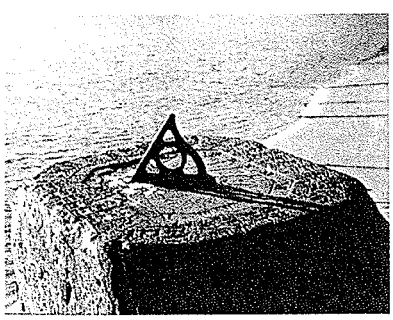
A subtotal nasal loss is one that has at least some part of the nose remaining. When the nasal bones are still present, they can serve as a fulcrum in which to wire a bony cantilever. This is fairly efficient except at the distal nasal tip. A semblance of a nose can be created over the cantilever with a forehead flap which, if infolded at the distal end, can form alae and columella. This infolding was first advocated by Petrali as described by Calderini in 1892. This method was still popular with J. Joseph in 1931 and J. B. Brown in 1951. The infolding technique by its very nature (double-thickness forehead) tends to produce a bulky entrance to the nose. Even when the folded flap is thinned severely, if support must be added, there is encroachment on the airways.

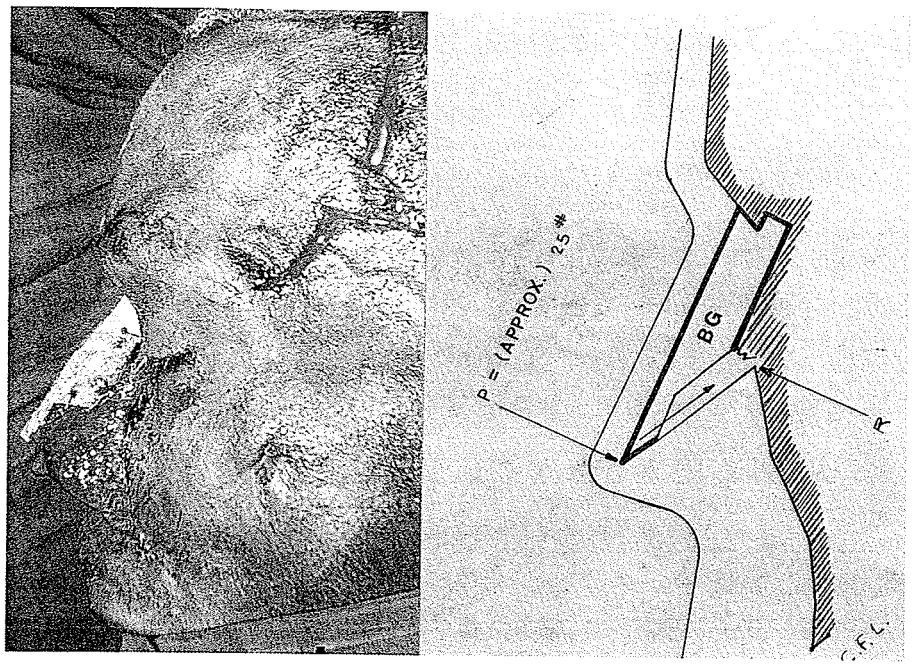


This 65-year-old Jamaican cultivator had suffered subtotal nasal destruction and facial scarring from yaws. For years he had worn a black leather nose cap attached with strings to his ears, fashioned by his shoemaker. At Kingston Public Hospital I offered him a real nose.



First the airway was improved by scar excision and closure. The standard method of cantilever and fulcrum design for primary support in the subtotal nasal repair involves autogenous bony rib fitted with a notch in the frontal bone and resting in a slot between the remaining nasal bones and fixed with wires. By calculations the tip of this cantilever can support a 9.95 pound load. A specific modification in this case increased the efficiency of the cantilever principle with the nasal bones still used as the fulcrum. To lengthen this fulcrum, a turn-down flap of nasal skin was used, incorporating a portion of the nasal bones on the flap with a greenstick fracture near the distal end. This created an oblique prop for the cantilever not unlike the propped cantilever seen on this sundial marking time on a Scotland cove. By fixing the rib graft into the frontal bone and lashing it with wire to the frontal processes of the maxilla, as well as the nasal bones, a truly formidable cantilever beam was produced, capable of supporting approximately 25 pounds at the tip.

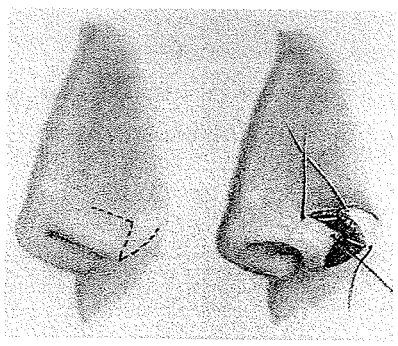


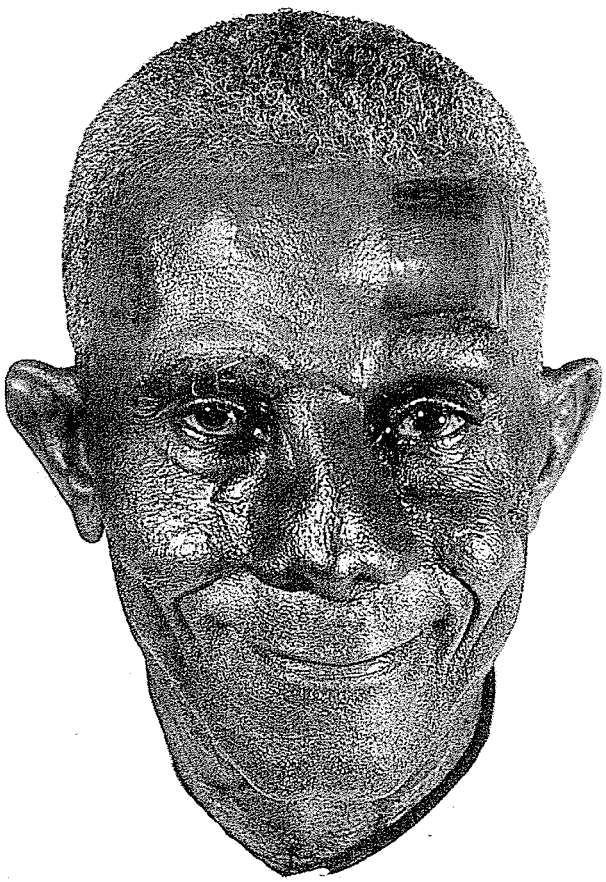


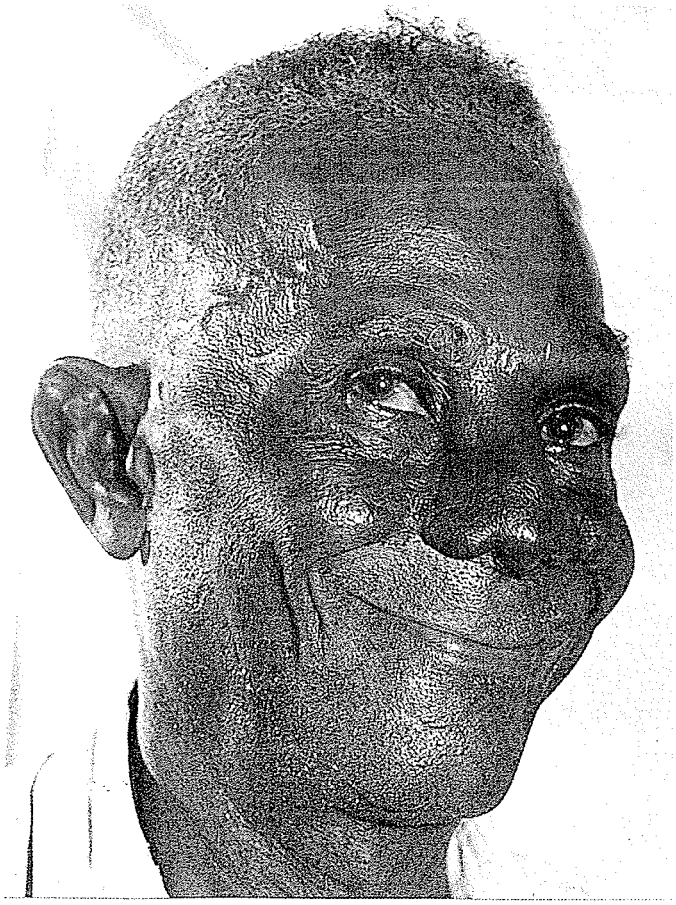
The extensive facial scarring by the treponoma of yaws and the resultant laxity of skin after nasal support loss allowed nasolabial flaps to be turned up for lateral lining. These were turned in and sutured to the flap attached to the underbelly of the nasal bone prop. A flap with the columella cut to pattern took the entire left forehead with its base on the opposite supratrochlear vessels. This flap draped across the bony gnomon. A profile xray through the flap of the bony framework a year later revealed the oblique prop formed by the turn-down nasal bones and the onlay rib cantilever.

Supported by the thin rigid bridge beam this nose could have been thinned to almost any desired degree, but the shape achieved initially seems best fashioned to fit his face and race.

A method of creating an alar crease used a triangle flap from the cheek adjacent to the alar bases on each side. These little flaps were transposed into releasing incisions on the flat new nose at the usual position of the crease. Note that the color of the skin graft on the forehead was darker than his normal black skin. This is usual in the black race.







A TRUE TOTAL LOSS

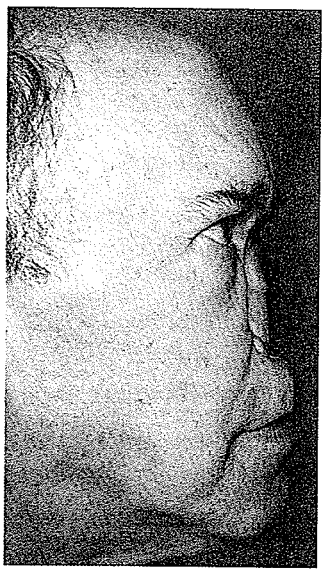
A true total loss of the nose which refers to loss of the entire nasal structure flush with the pyriform opening in the maxilla, including all septum into the depths of the nasal cavity. Total nasal losses fortunately are rather rare. Reconstruction of the total nose, if the goal is a normal appearance and function, is one of the great challenges in reconstructive surgery.

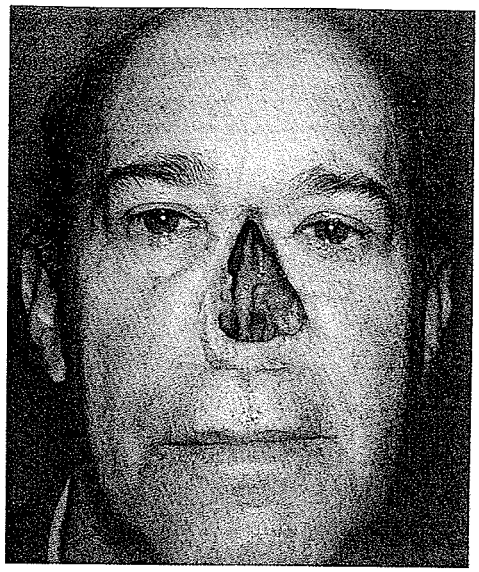
A thorough investigation of the world literature in 1965 revealed relatively few total or near total nasal reconstructions. V. P. Blair in his 1925 comprehensive review gave the forehead flap priority for nasal cover with local flaps for lining and cartilage for framework. Yet when it came to reconstructing the true total nasal loss, he side-stepped by using a vulcanite prosthesis! In 1931 J. Joseph presented two near total losses which still had the skin and bone of the radix. In both cases local lining and the German oblique forehead flap were used. In one, no support was supplied; in the other, an ineffective cantilever of ivory was inserted secondarily to fill out the bridge. Both nasal reconstructions achieved adequate profile by mere bulk of the soft tissue, but in the absence of all effective framework, the alae collapsed, rendering the airway inadequate. F. Smith in 1950 wrote, "Certain extensive losses of supporting bony structure and soft parts of the nose may preclude a satisfactory reconstruction. A permanent prosthesis is supplied in these cases." Other near total loss cases published, including those by W. W. Carter in 1913, H. D. Gillies in 1920, K. Schuchardt in 1955, and H. D. Gillies and D. R. Millard in 1957, although an improvement over the original condition, fell short of ideal in color, shape, or form and especially in patency of the airway. G. C. Burget and F. J. Menick in their 1993 book labelled one small chapter "Total and Subtotal Nasal Reconstruction," but by no figment of the imagination could the one case presented be labelled a total loss. The American Board of Otolaryngology in one of their recent exams had a question on the treatment of total nasal loss. Their correct answer was: a nasal prosthesis. This is a good thing.

In the true total nasal loss the absence of the bony radix removes the chance of this fulcrum for a cantilever. Thus the construction of a fulcrum in these defects could supply the missing link. How this can be accomplished depends on the case.

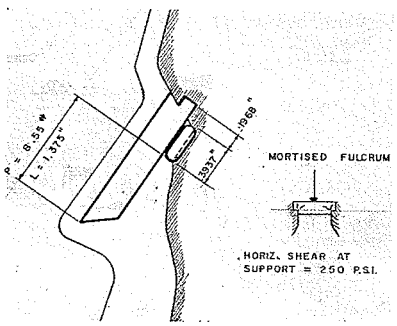
In *Plastic and Reconstructive Surgery* in 1966 "Total Reconstruction Rhinoplasty and the Missing Link" was presented. The key case was a 62-year-old elevator operator who developed extensive basal cell carcinoma of the nose. The lesion required excision (by J. Zavertnik) of the entire nose, septum, medial wall of the left antrum, ethmoid sinus, and portions of the cheek and upper lip along with a radical neck dissection that revealed negative nodes. He was then fitted with an arti-

ficial nose attached to lensless spectacles and left for observation for one and a half years. After this time with a prosthesis the patient expressed willingness to undergo reconstruction. This was not a "no sooner said than done" event. A plan and preparation were essential.



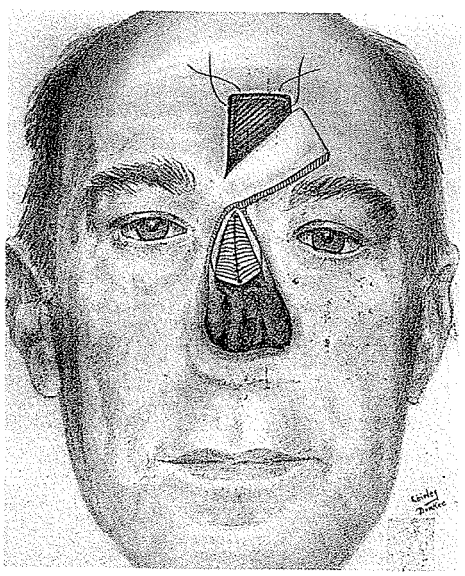


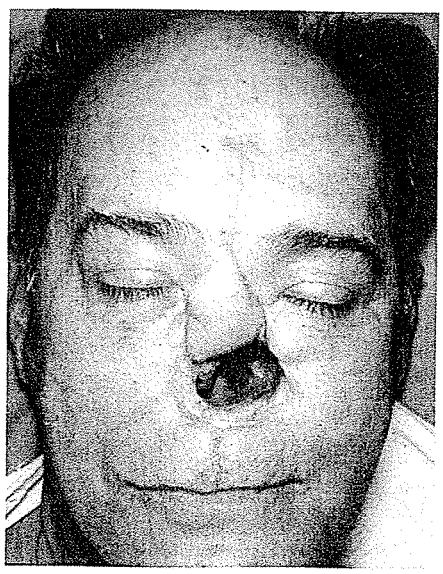
Specimens of the human bony rib were tested under bending stress in the laboratory to determine by calculation the strength of three variations of the cantilever fulcrum system. By supporting the bridge and tip, this framework ensured a proud profile and slender shape with the potential for thin alar rims and columella as well as a patent airway. Yet there could be no cantilever without a fulcrum.



Constructing a Fulcrum

Mucosal flaps turned in from the side of the upper bony vault were sutured together to provide lining for the fulcrum. A small vertical forehead flap was transposed over this lining temporarily, the plan being to use it for future distal nasal lining.



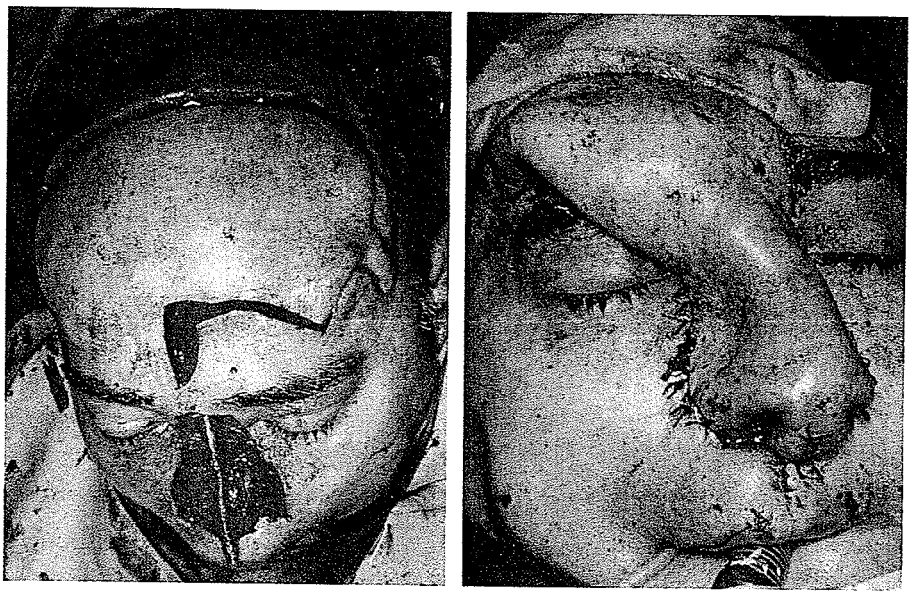


Two months later the pedicle of the flap was divided and the flap turned down to allow the mortising of a strut of bony split rib across the upper vault fixed by wires to the maxilla on either side. The flap was returned temporarily to cover the fulcrum. The future alae and columella were lined with thick split grafts on the forehead.

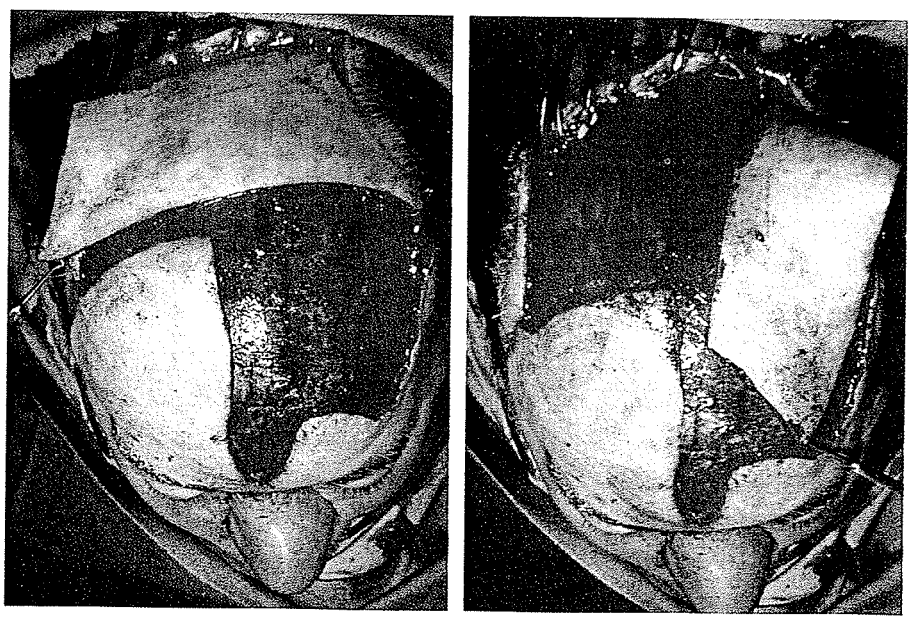
Insertion of Cantilever

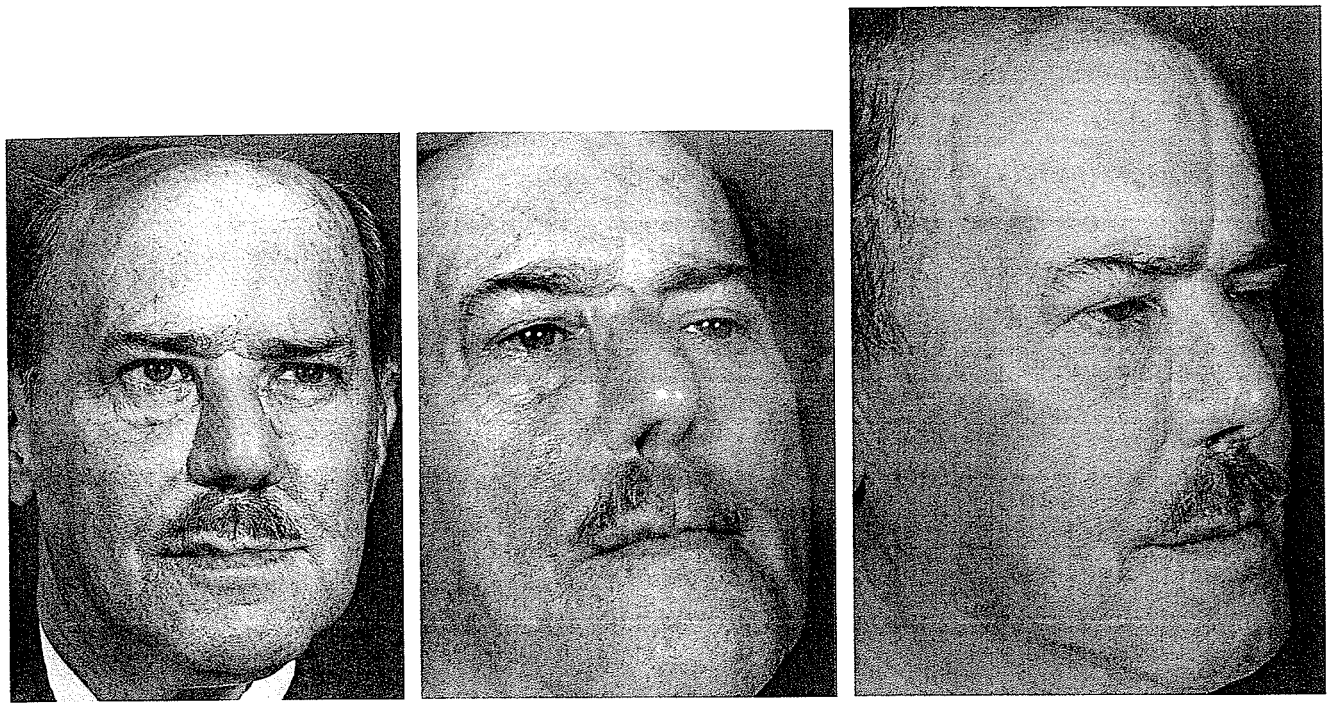
Two months later the small forehead flap was turned back down into lining position, exposing the bony fulcrum. Being impressed by J. J. Longacre's advocacy of split rib encouraged my use of it for the entire fulcrum and cantilever. The remaining bony rib banked under the chest skin after the previous rib resection was fashioned as a cantilever, fitted into a notch in the frontal bone, set at a suitable angle to produce a fine profile, and wired with No. 28 stainless steel to the bony fulcrum. Confidence in this maneuver was enhanced by R. Mowlem's 1941 report that the bone graft superimposed on another bone graft will acquire bony union with it. The support thus produced was calculated to withstand 8.55 pounds at the tip. The forehead flap hanging under the bony platform and cantilever was hoisted snugly to the undersurface of the rib gnomon with sutures looped over the cantilever. To this lining flap was sutured turnover edge flaps from the sides of the nasal vault to seal off the support by lining.

Onto this lined framework was draped a forehead flap with its alar rims and columella previously lined with skin. The flap was pivoted on the right supraorbital base, taking the entire left forehead. A mucosal flap from the upper labial sulcus was brought through a midline buttonhole in the upper lip to help receive the raw backside of the columella tip.



DONOR CLOSURE. At the time of the return of the base of the forehead flap, a bald scalp flap was transposed into the residual forehead defect to supply like tissue in a visible area while a split graft was supplied to its donor area more or less out of view on top of the head.



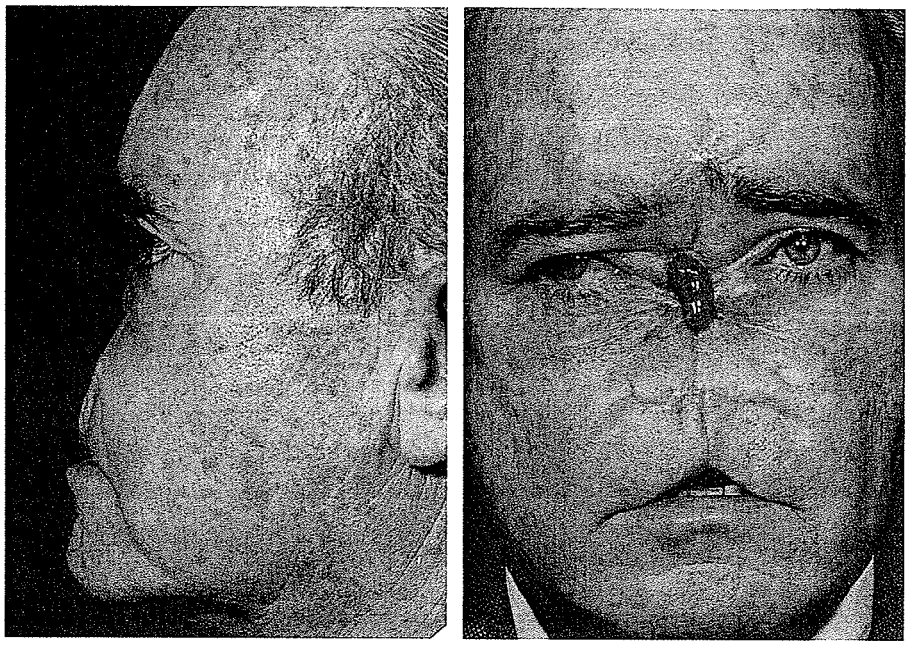


Challenged by a Flaw

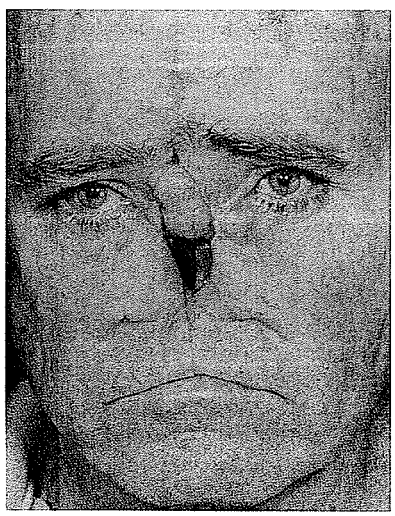
This method of reconstructing the total nose created and maintained a good profile with reasonable thinness and grace of shape, and a generous airway capable of blowing smoke rings. The long-term follow-up of this "fulcrum and cantilevered" total nose continued to be encouraging over 15 years, except in one point—the nasal tip. In time the tip of the bony cantilever, probably more by absorption than contracture, allowed the nasal tip to round over into a slight curve, which, although not displeasing to the patient, bothered the surgeon. This eventually led to the conception and development of the advancement of the L-septal flap for tip support in all but the total nasal loss.

Since the first total nose, I have had the opportunity to take part in two other total losses. Both defects were the result of suicide attempts, and besides the total nasal loss there were other associated facial losses. One was a case involving an indigent patient treated by the residents. A fulcrum and cantilever resulted in an excellent profile but follow-up has been nearly impossible. The second case was under my direct care and is interesting.

A 46-year-old depressed maritime lawyer inflicted on himself a shotgun blowout of his mid–upper lip, entire nose, anterior maxilla and glabella area while also blinding his right eye. Emergency surgery included closing the severe facial defect. Lithium improved his state of mind to the point of requesting reconstruction.

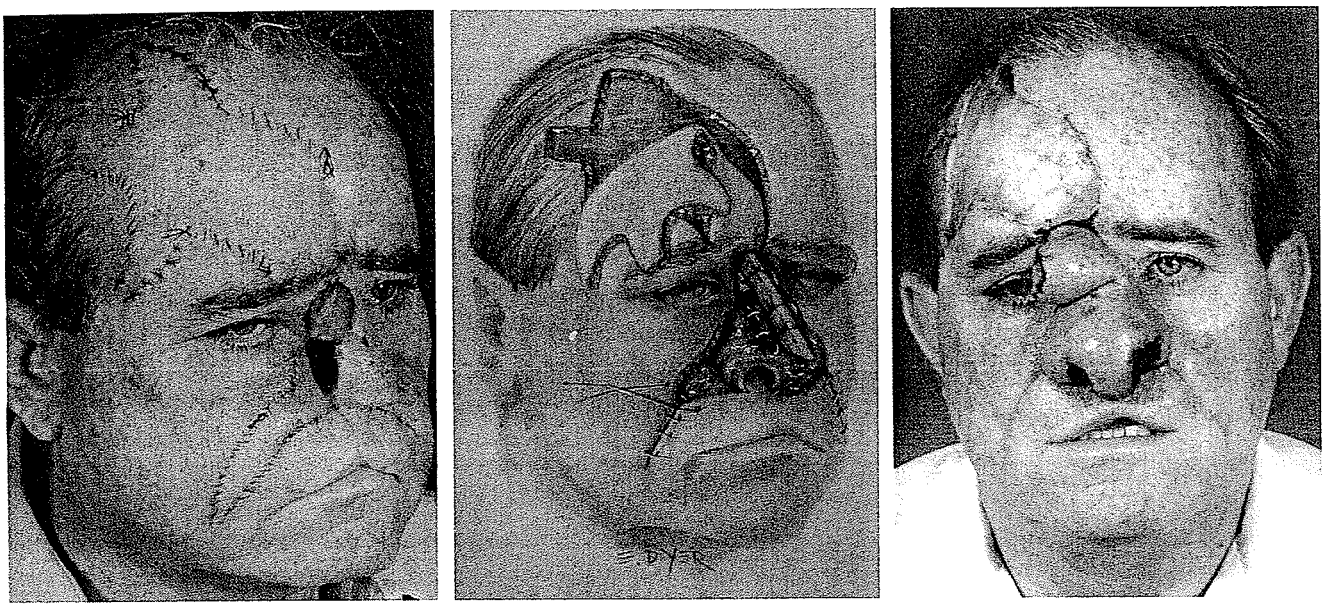


The first step in reconstruction, as developed by H. D. Gillies in World War I, was opening the defect to replace what normal tissues were present into their normal position and retaining them there while maintaining an airway by suturing skin to mucous membrane around the margins of the defect. During this process the granulation tissue was excised, exposing bone at the nasal base, and over this area the previously described (1965) glabella flap was transposed. Unfortunately, due to the original extent of the trauma, the glabella flap was taken smaller than ideal and eventually was not sufficient to effectively line the distal nose.

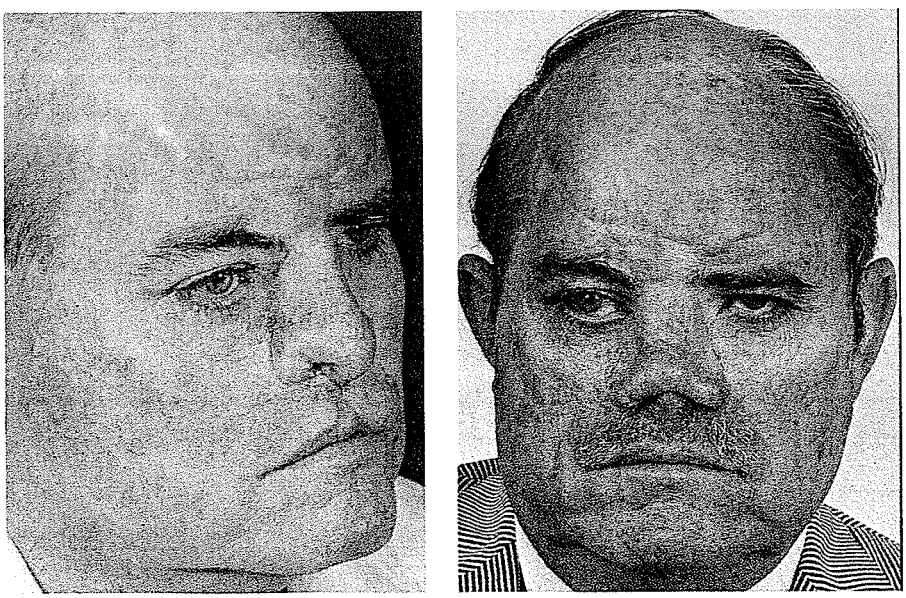


After four months the glabella flap was delayed and elevated so a portion of rib bone graft could be wired across the defect to create a fulcrum. The nasolabial flaps and a right seagull forehead flap were delayed by incisions. One month later the banked autogenous rib graft was split and wired as a

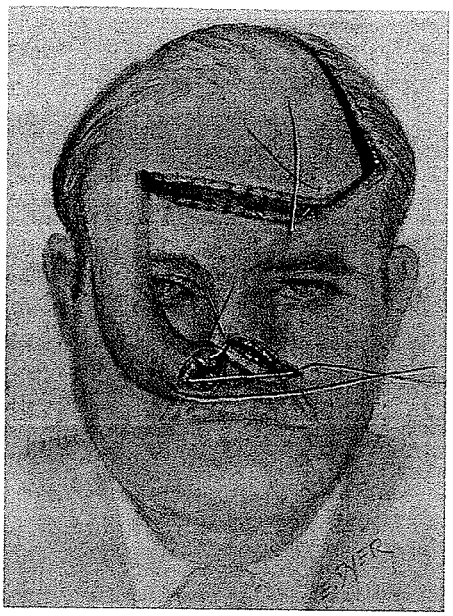
cantilever to the fulcrum. The nasolabial lining flaps were turned up and sutured to each other to form lining of the alae and backing for the columella. The forehead flap was brought down to cover the reconstruction and the forehead defect was temporarily skin grafted. Eventually the forehead donor area

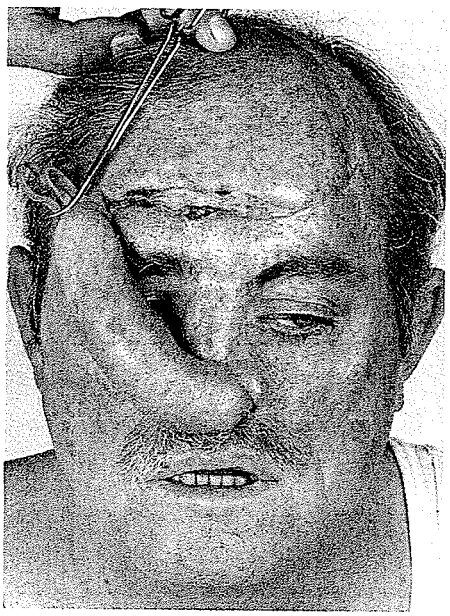


was closed with a left based scalp rotation flap. When the forehead pedicle was divided, a satisfactory nose was created; but eventually the shortness of distal lining under the tip led to exposure of the bone graft, infection, and loss of tip support.

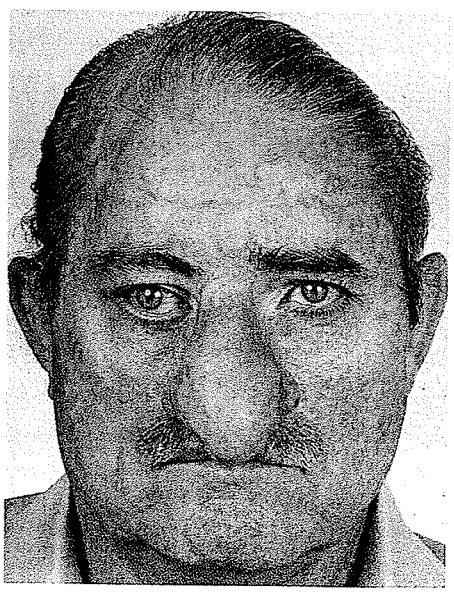


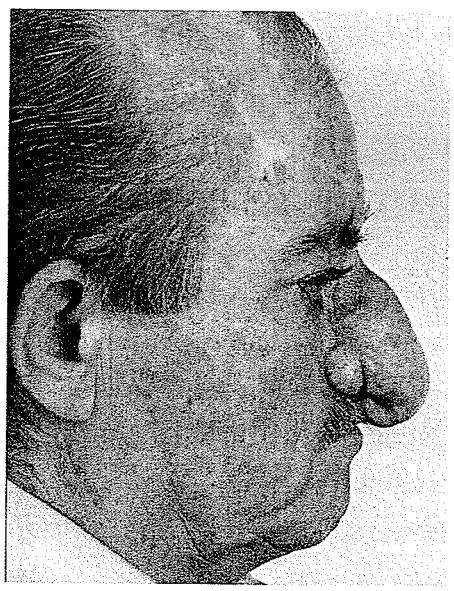
This required a further reconstruction. A delayed horizontal forehead flap based on the right was tubed, swung down, and attached to the nasal base. The scalp was advanced into the defect with skin grafts to the releasing area. Six weeks

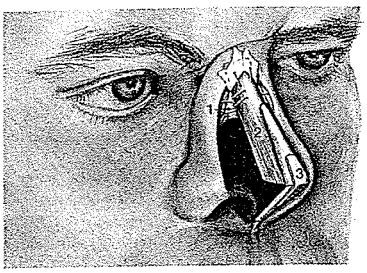




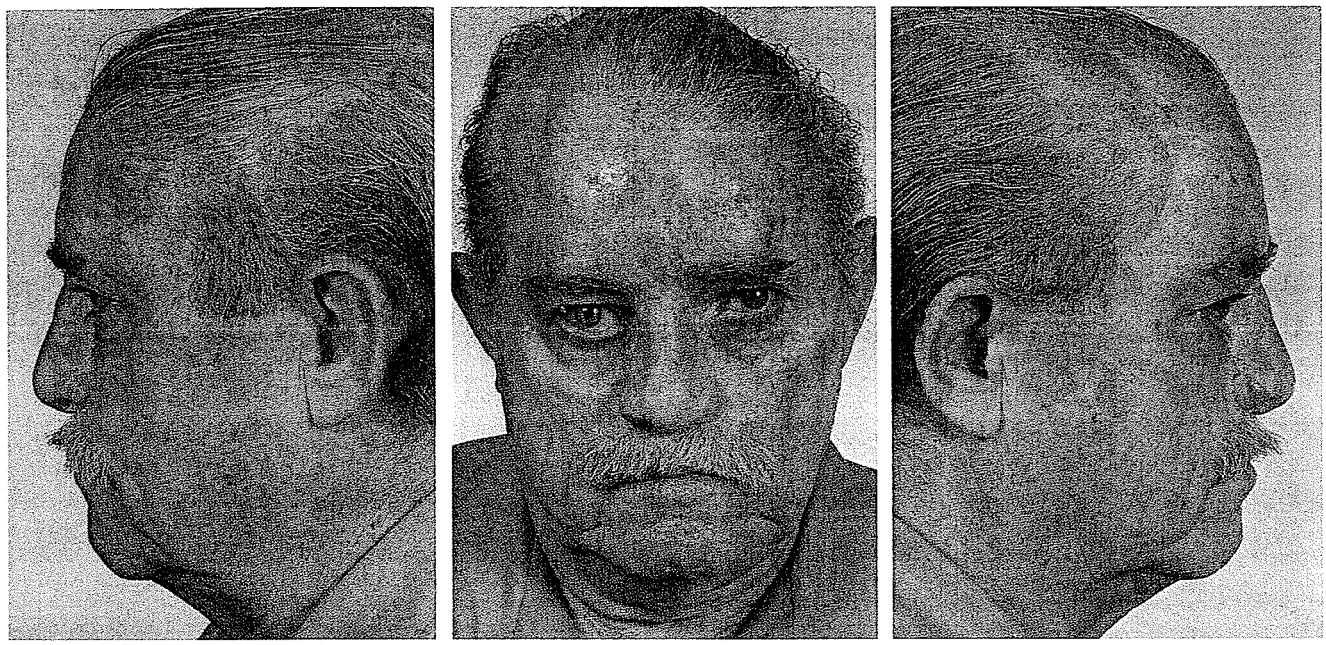
later the proximal end of the forehead tube pedicle was divided, opened, and let in over the nose to the glabella area. The patient had continued to work and his office staff followed his progress with cheer-leader enthusiasm. They saw his nose shrink with infection and later rebuilt into the largest nose in the state!







Through it all the patient, with the aid of Lithium, remained undaunted. When the nose was reduced to reasonable proportion and a cartilage hinge graft was inserted as an adjunct for tip support over the bony cantilever. The office proclaimed it a miracle. Finally revisions in the columella and alae provided airway and aesthetics.



Years later the patient died of a coronary thrombosis. He left a request that in lieu of flowers, donations be sent to our Plastic Surgery Trust Fund.

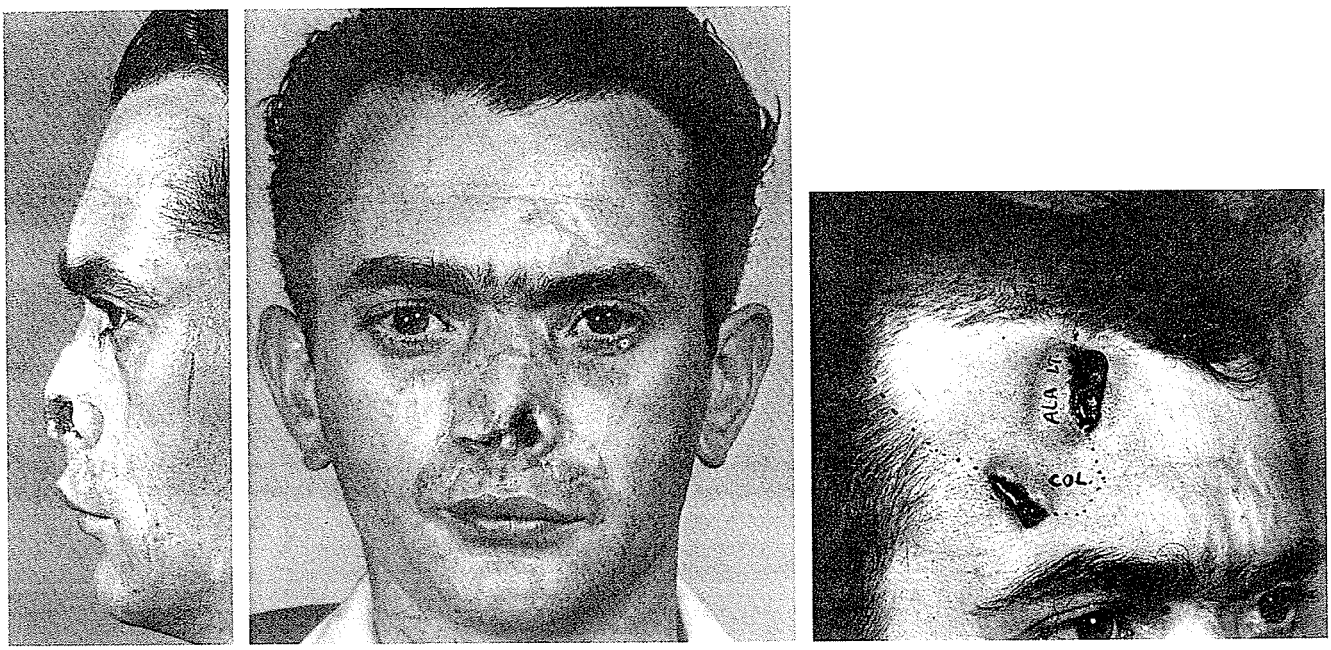
A NOTE ON FLAP CRAFTSMANSHIP

The technique for shaping a huge nose made of flaps has many similarities to thinning the usual thick nose except that it is vital to respect the established areas of blood supply to the flap. In general, in the large flap nose it is wise to leave the original pedicle intact and reduce and shape the distal nose with the aid of this more robust blood supply. When the original pedicle has been divided, areas that have been implanted for a month or two will develop a new blood supply that will allow distal areas of full thickness skin with a thin layer of subcutaneous tissue to be elevated, thinned of scar and excess subcutaneous tissue. Most of these thinning proce-

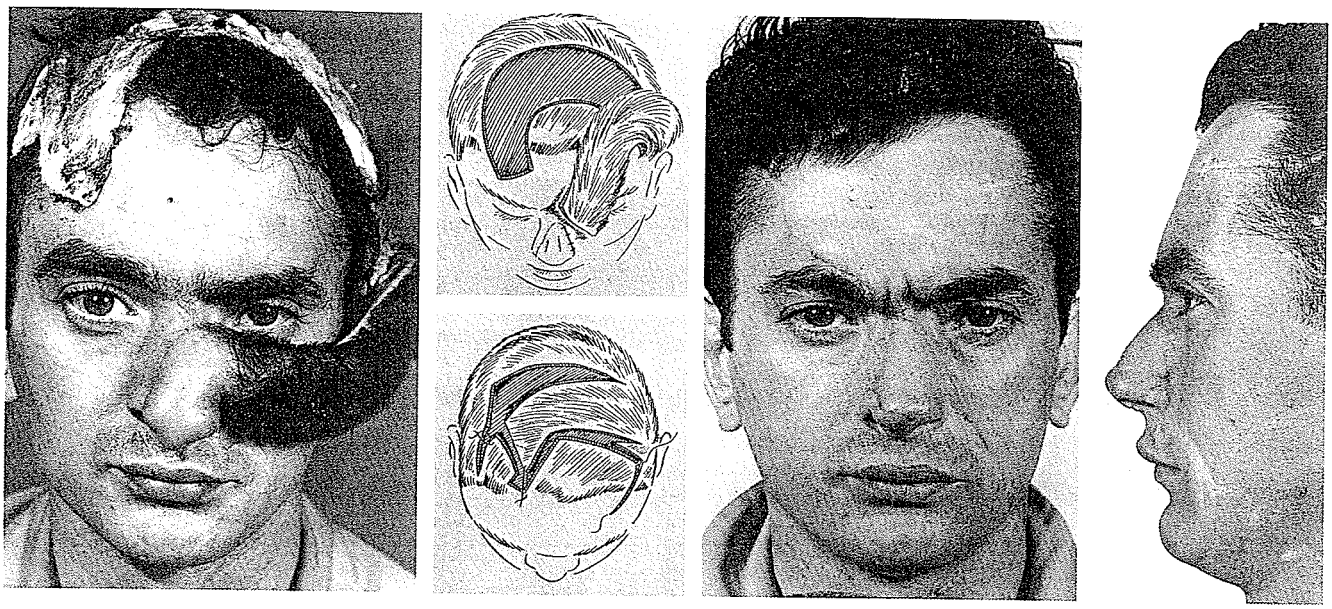
dures can be carried out through alar margin incisions. Access is also possible through the flap join to the cheek. Here the scooping out of excess subcutaneous tissue in the alar crease area will sculpture this region to a remarkably natural contour. When the original pedicle is divided and let back into the glabella area to realign the brows, it is important to thin the remaining flap still attached to the nose so that its final inset will blend and further camouflage the reconstruction.

FOREHEAD FLAPS BASED ON SUPERFICIAL TEMPORAL VESSELS

A British navy casualty from Tokyo arrived with nasal injuries at Rooksdown House in England in 1953 and was admitted on H. D. Gillies' service. I designed a forehead flap to take the right bay on a scalp flap based on the left superficial temporal vessels. Prefabrication of the left ala and half the right ala was achieved by introducing auricular composite grafts under the forehead skin in the future alae sites.

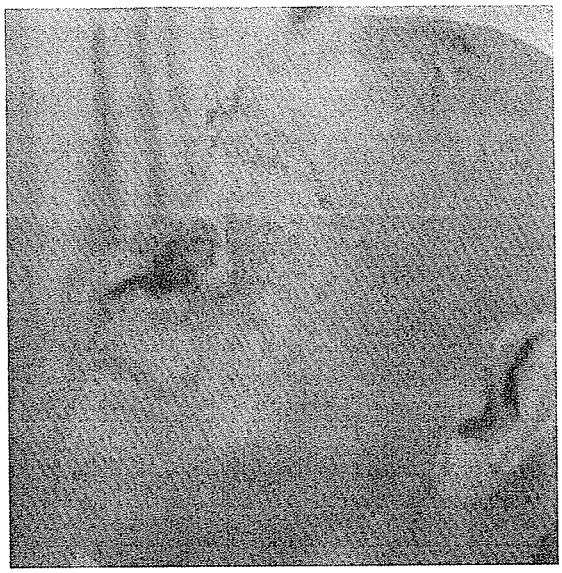


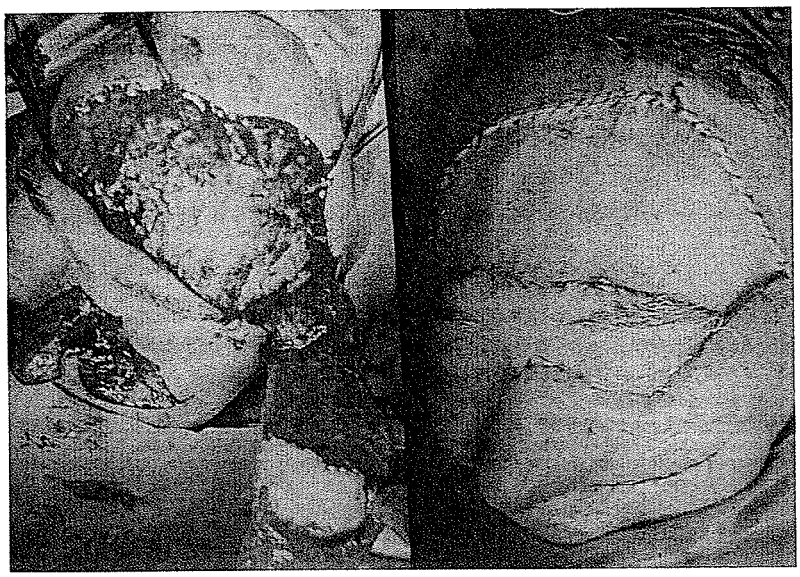
After attachment of the flap to the nose and later division of the pedicle, the forehead skin was rotated to close the donor area and the scalp flap reintroduced to cover the remaining defect.

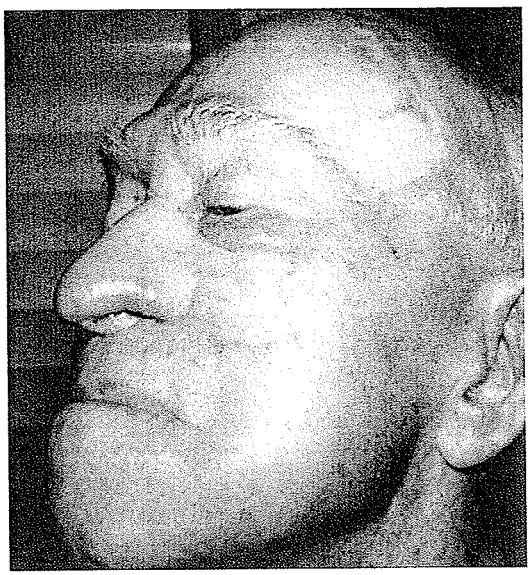


In the 1960s I was by-passing the Andy Gump mandibular deformity, caused by carcinoma ablation, with immediate bone grafts covered with a forehead flap. I found that I could take the total forehead skin as a flap on a unilateral pedicle without surgical delay when the superficial temporal and postauricular vessels were included in the base. For this reason most of my forehead scalp flaps included both vessels.

Here is a 70-year-old male with loss of more than half his nose but with septum intact. A large transverse forehead flap based on the left superficial temporal vessels was partially lined with a split skin graft. It was brought down to reconstruct the nose. The total forehead, as a donor area, was covered with a one-piece split skin graft which as a single unit was well camouflaged. The temple portion of the flap was replaced to complete the repair.

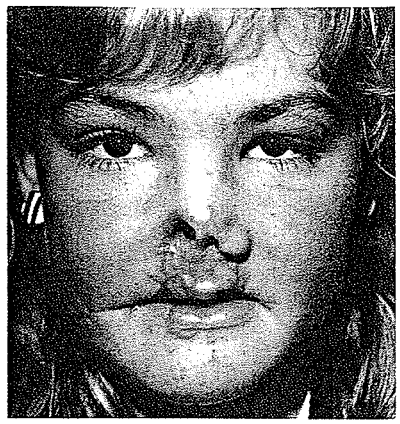


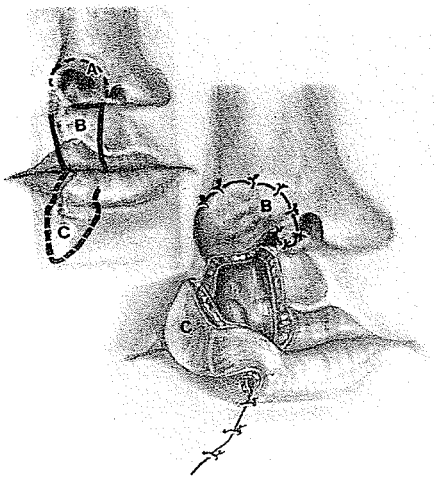


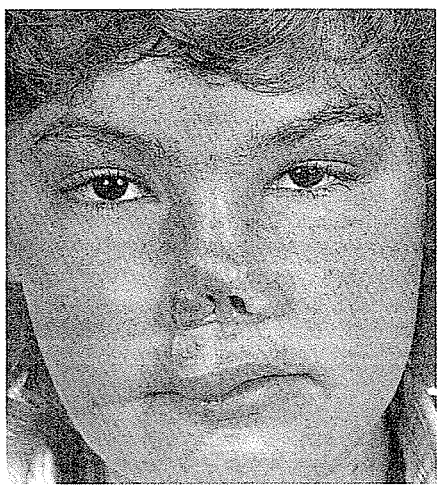


When, for whatever reason, a midvertical forehead scar is undesirable, or not feasible, it is possible to design the use of forehead skin in a high horizontal flap to be based laterally on the superficial temporal and posterior auricular vessels. This horizontal flap, bordered above by the hairline and incorporating the upper half of the forehead skin, leaves the lower expressive forehead and brow unscarred. A split skin graft to the donor area can be covered by the hair especially in the female and even in the male. This long horizontal flap can supply enough tissue to cover a heminasal defect and other areas if indicated.

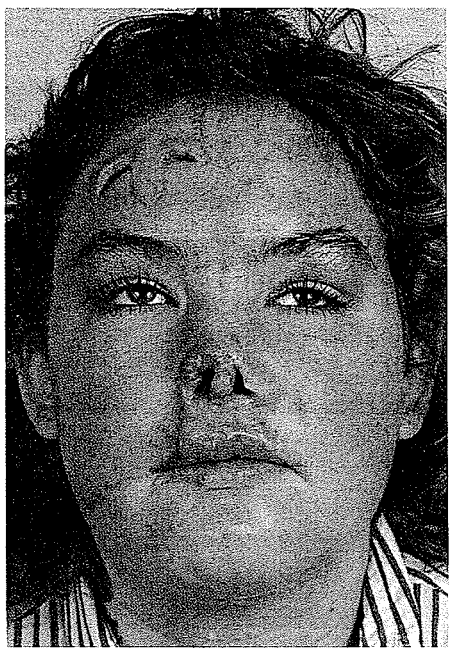
This 16-year-old schoolgirl's nose was lacerated and avulsed in an auto accident. She was seen six months after injury revealing absence and scarring of the entire right ala, anterior columella and septum, and the medial portion of the left ala. There was loss of the nasal tip projection and support. The avulsion of one-third of the skin of the right upper lip, which had been grafted, presented firm, hypertrophic scar with lip contracture. The cheek scar had multiple Z plasties. The reconstruction plan was formulated with a domino effect. The scarred right lip was turned as a flap with the mucosa inside to line the right nasal defect. A lower lip-switch flap was transposed to reconstruct the upper lip. The remaining septum was advanced forward as an L-shaped chondromucosal flap for tip support.





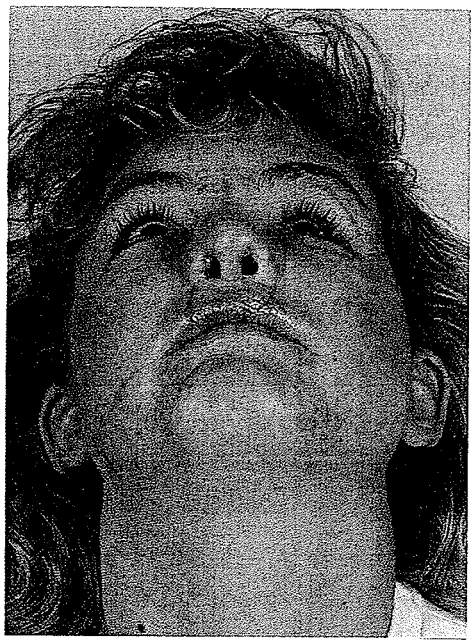


As the young patient's natural hairstyle left her central brow exposed, and because of her tendency toward hypertrophic scarring, a midline vertical forehead flap was bypassed. It was kinder, even if more complicated, to use the upper forehead easily covered with her hair. The nose was prefabricated high on the right forehead, with cartilage to the alar rims and skin graft to line the alae. This component was delayed on a scalp flap based (Doppler) on the left superficial



temporal and postauricular vessels. Two and a half weeks later the local lining was turned and the forehead scalp flap attached to the nose. Three weeks later the pedicle was divided

and replaced. Further revisions and sculpturing produced a reasonably good result and her hair covered the donor area well.


Another High Horizontal Forehead Flap

When the defect involves several planes, a transverse forehead flap can better supply the varied cover.

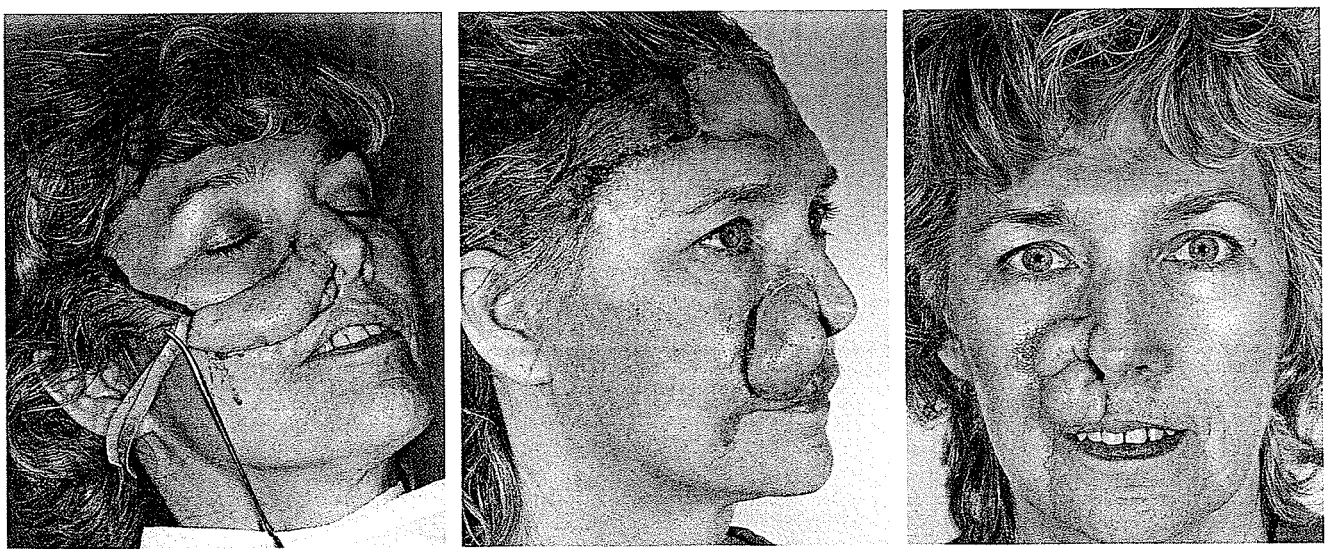
This 55-year-old female developed basal cell carcinoma of the right nasal ala which eventually involved the surrounding upper lip and cheek. This ala-cheek area is notoriously dangerous for invading deep and must be treated radically. Expert dermatologist M. Iriondo cleared the carcinoma with Mohs surgery. He referred the fresh wound so that a skin graft could be applied for early healing.

The high horizontal forehead flap was delayed by incisions to incorporate the right superficial temporal and the posterior auricular vessels. During the delay a branch of the superficial temporal artery was divided, which raised the flag for caution. The distal end of the forehead flap was prefabricated for alar reconstruction by inserting an auricular cartilage strip to support the future alar rim, and the distal flap was lined with a skin graft which also covered the raw donor area on the forehead.



One month later the 30 × 5 cm lined forehead flap was brought down and attached to the nasal defect. At this time an attempt to tube the temporal portion of the flap threatened to endanger the blood supply so that only a loose tube was constructed.

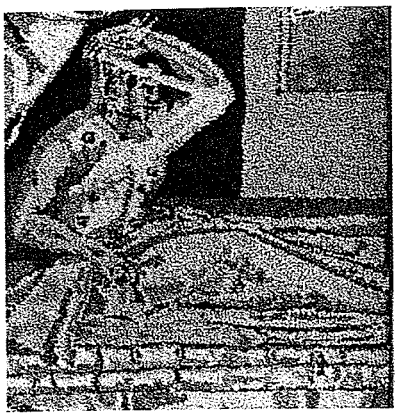
From my experience it was obvious that this flap did not contain an important vessel; thus progress was cautious. Finally an elastic band was used to constrict the pedicle at the site of planned division. When the nasal attachment revealed adequate blood supply, all hairless forehead flap was divided along the constricted line. The temporal pedicle was unrolled and the temporary temporal skin graft was removed so that the pedicle could be replaced in the original site. The extended pedicle, attached to the nose, was unfolded on its end. The retracted right upper lip was released and brought down into normal position, and the forehead flap inset to maintain this correction. After two months the bent pedicle was divided to leave enough flap attached to the nose to complete the repair. The remaining forehead flap, attached to the lip, was advanced up into the cheek defect. After a two-month delay the edematous pedicle in the lip-cheek area was elevated, thinned, and let into its final cheek and lip destination. A month later the nasal portion was thinned and inset.



This reconstruction will require time to settle, and then, about the time this book is published, there will be another revision and thinning procedure.

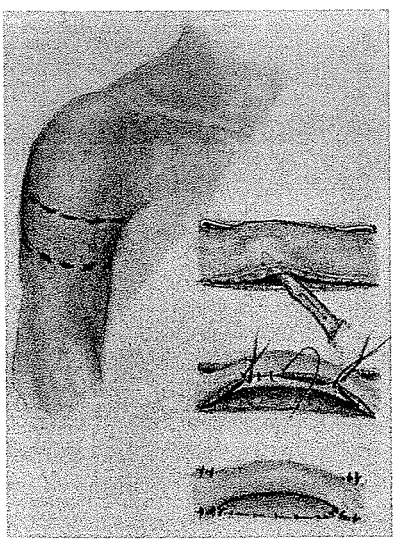
OTHER COVER. There are circumstances where a forehead flap may not be the first choice for nasal cover. This is rare but does occur. In a burned face the forehead may be scarred too severely to be used or it may have been the only expressive area on the face that survived unscarred. Then it is needed more for expression than nasal cover. In such cases the skin tube pedicle from the upper arm may be extremely useful.

THE ARM FLAP



In the fifteenth century in Sicily, Antonio Branca used flaps from the arm in his attempts to reconstruct the nose. By late in the sixteenth century an Italian, Gasparo Tagliocozzi, had written a book on arm flap rhinoplasty. He fixed the arm to the head for the implantation stage, as shown in this tapestry created for me by my brother, Hamilton. It is interesting how plastic surgery came into disrepute about this time. Nobles of the royal court were losing the tips of their noses during sword play or in more serious losses from the late result of syphilis. As there was no anesthesia these royal patients conceived the plan to let their slaves supply the arm flap for their nose. This necessitated the master to go for several weeks attached to his slave with what was left of his nose in his slave's axilla. Consequently when the flap was divided the master immediately sold the slave. Of course upon severance of the pedicle the flap attached to the nose turned white, cold, and soon dropped off. It is reported that the masters sent messengers to find their slaves and discovered that the slaves had died on the same day the flap necrosed. Of course the truth of the matter is that full thickness skin could not then and still cannot be cross-grafted. These failures aroused suspicion about plastic surgery which caused it to suffer neglect and ridicule for over two centuries.

SKIN TUBE PEDICLE



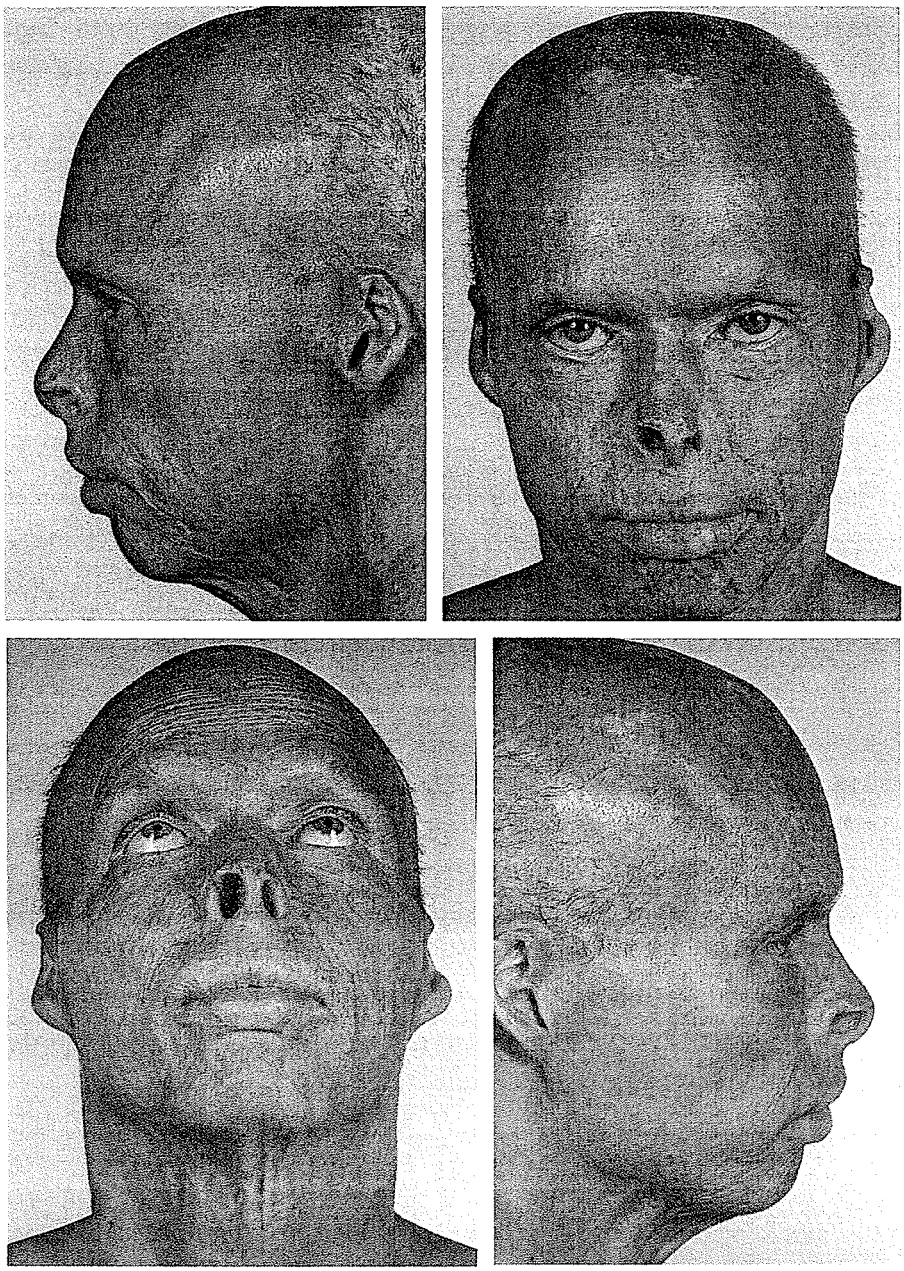
Although the musculocutaneous flaps and microvascular anastomosis have reduced the need for the cumbersome tube pedicle, there are definitely occasions when the skin tube is the best choice. It is interesting that three surgeons conceived the skin tubing principle independently and almost simultaneously. So often the state of art reaches a point where the next step is inevitable. F. Burian in the Balkan War, Frumpkin in 1916, and H. D. Gillies in 1917 all used skin tubes. Gillies proceeded to develop the technique and popularized it. He certainly taught it to me.

Two parallel longitudinal incisions in the skin and subcutaneous tissues, where the vessels run more or less in random direction, define the pedicle. Elevation of this strap carrying subcutaneous tissue on its underbelly allows tubing of the flap with sutures into a closed skin unit. This reduced drainage, infection, and increased mobility. The flap was designed with the future pedicle base strategically positioned to enable transfer of the distal end to the site of a carrier or the final recipient area.

There are certain circumstances in nasal reconstruction where microvascular anastomosis can be used to transfer a bulk of tissue to the area, later to be shaped into a nose. This is seldom aesthetically successful. In similar situations the tube pedicle can be used to advantage. It requires a couple of weeks of awkward attachment of pedicle to the nasal area but this can be made reasonably comfortable with a headcap fixed to an arm splint.

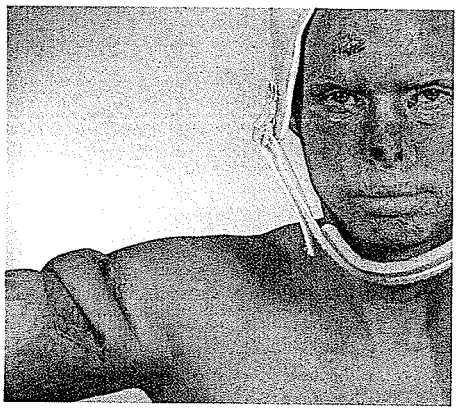
A Burned Nose

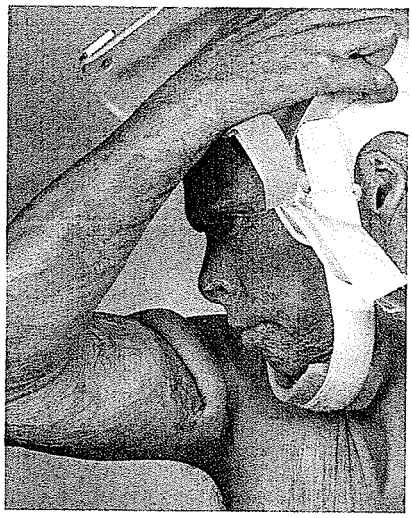
This 44-year-old male received burns on 70% of his face, body, and upper extremities in a 1966 airplane crash. He received multiple skin grafts which served reasonably well. In 1985 his presenting condition revealed healed burns of his forehead with baldness, except for hair in the postauricular areas, absence of eyebrows, ectropion of his lower lids, skeletelization of his nose with asymmetric retraction of his alae, neck and upper and lower lip scarring, and loss of the circumferential areas of his auricles.

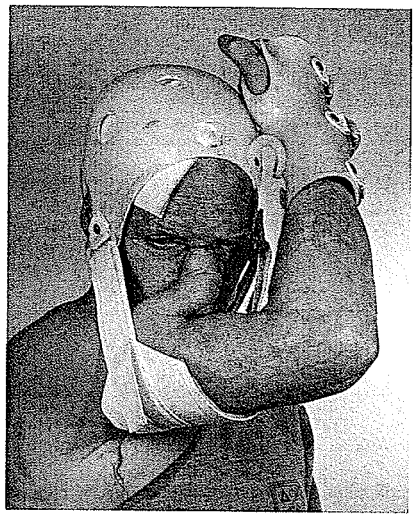


This type of injury was quite common in World War II, as this was the war of burns. My experience at Rooksdown House at Basingstoke, England in 1948, helping to rehabilitate the war wounded, had prepared me for such a case. As this patient's forehead, although partially burned, was one of his most normal features I decided not to scar it with a forehead flap. Rather I created a transverse 14 cm × 14 cm tube pedicle on his right upper arm and split skin grafted the donor area. At the same time he had postauricular hairy scalp

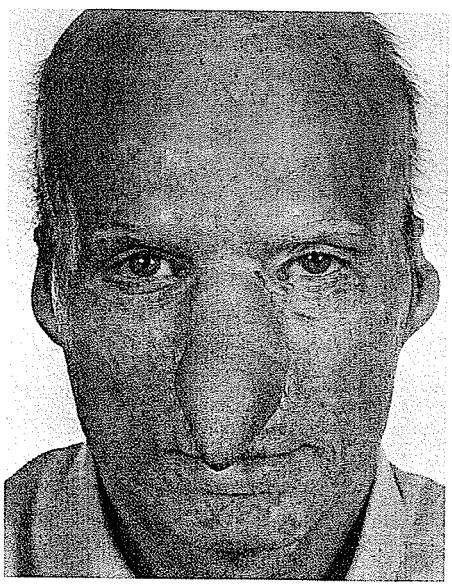
grafts applied to his brows, full thickness skin grafts to his lower lids, and a thick 15 cm × 5 cm graft to his submental neck area. One month later the scarred skin above the alae was turned down for lining and the remaining scar cover of the nose was excised. The medial end of the tube pedicle was divided from the arm, opened up, and thinned of excess fat. It was then attached to the nose and the arm fixed to a special headcap.

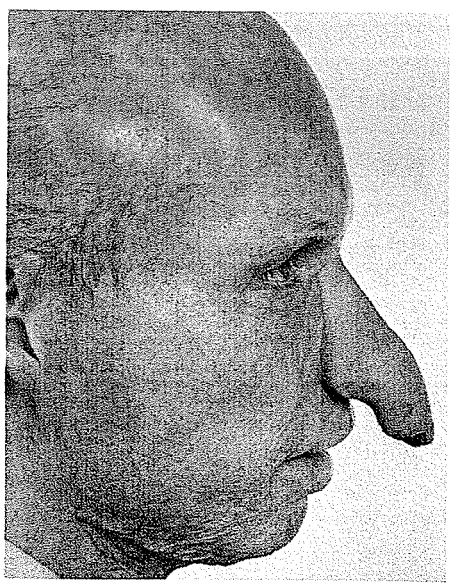






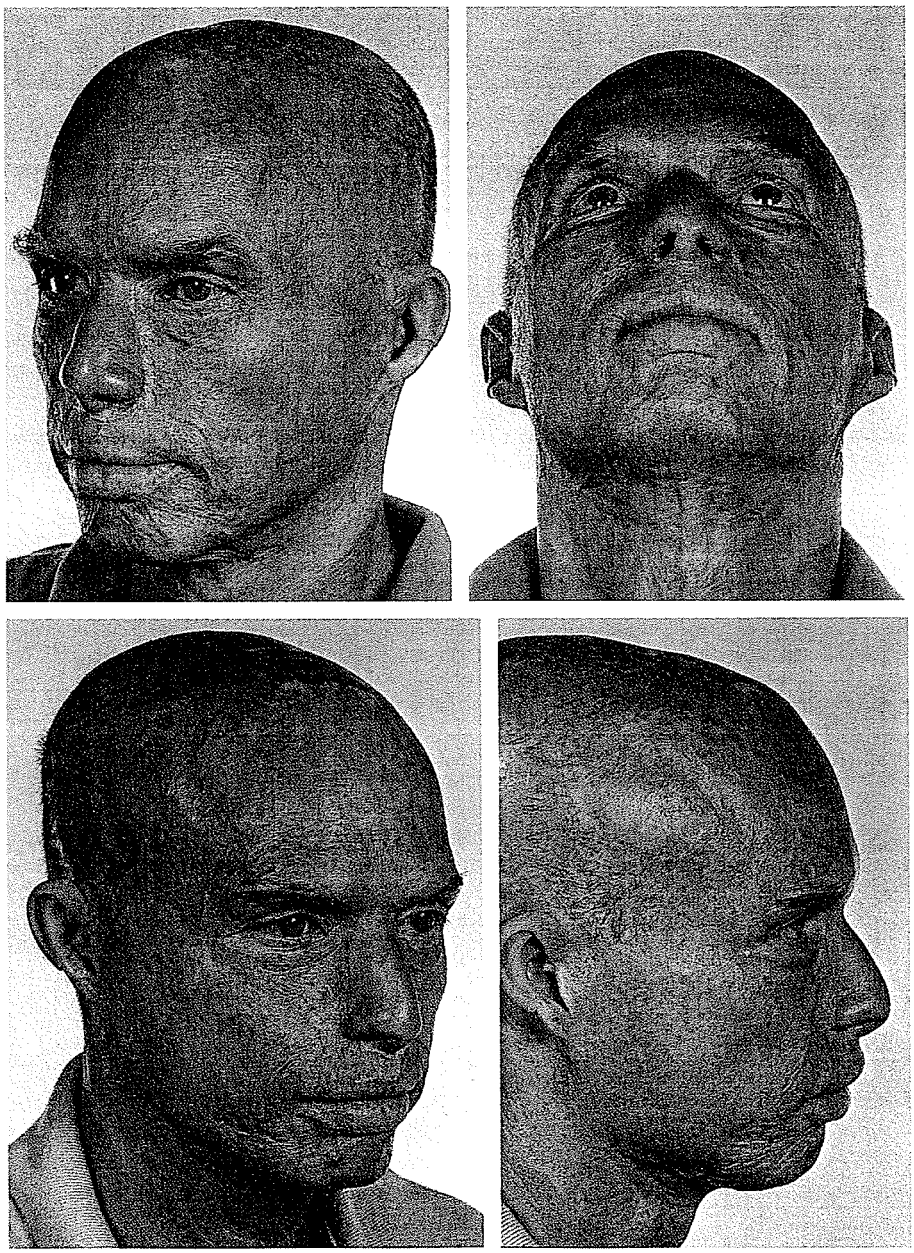
After three weeks the pedicle was divided to set his arm free and the excess pedicle was left dangling to delineate the blood supply of the distal pedicle for future tip and columella reconstruction.



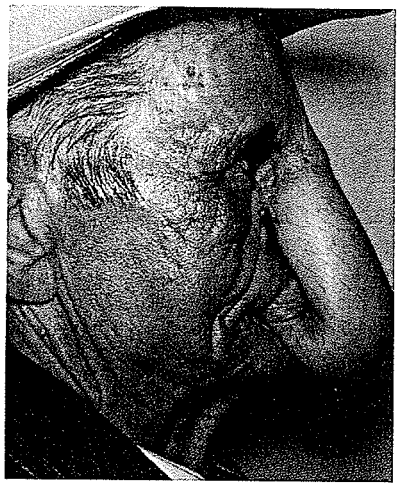


In between stages of the nose reconstruction the patient was sent to Burt Brent for consultation about bilateral ear reconstruction, but it was decided liabilities outweighed assets with surgery in this case and artificial ears were used.

After three weeks of dangling, the distal pedicle was trimmed, thinned, and let into the nasal tip, adjoining alae and the columella. Subsequent thinning of the flap and creation of alar creases were coordinated with skin grafts to the upper and lower lips.



This case is reminiscent of a patient named George, treated by H. D. Gillies during World War I. George had had a pedicle attached to his nose. Word came from the front that a battle was brewing and 200 casualties were expected at the Plastic and Jaw Center at Sidcup, England. All ambulatory patients were discharged temporarily to make room for the new casualties. George's pedicle was divided from his arm and left dangling from his nose. He was told to return after the acute cases had been treated. Instead of 200 there were 2000 face casualties from the Battle of the Somme, and George was forgotten. Fifteen years later George drove up to Gillies' plastic surgery center in a fine car and strolled into the clinic. Gillies recognized the fellow as his elongated tubed nose swung from side to side. "George!" he asked, "where have you been all these years?" Whereupon George explained, "Sir, I have been an elephant man in a sideshow in the circus, have made my packet and would like to retire now with a fine little nose." No sooner said than done.



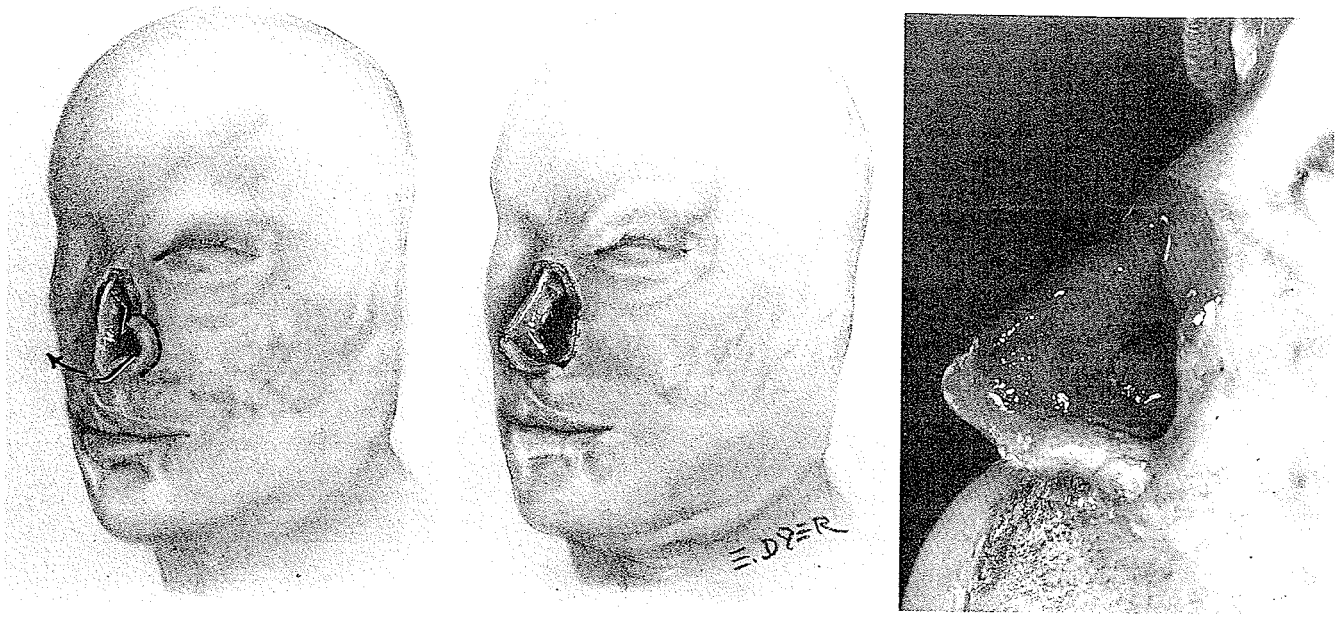
An Extensive Burn

This 39-year-old male was pinned under his burning pickup truck for an extended period, resulting in third degree burns to 45% of his body surface, including the total forehead, scalp, face, nose, auricles, right eye, left eyelids, entire right arm dessicated, neck circumference, anterior chest, abdomen, and thighs. When he arrived in Miami he was well grafted in all areas. He specifically requested nasal reconstruction and was referred to our microsurgical team for a possible one-stage transfer of soft tissue to the nasal area. They referred him back to me!

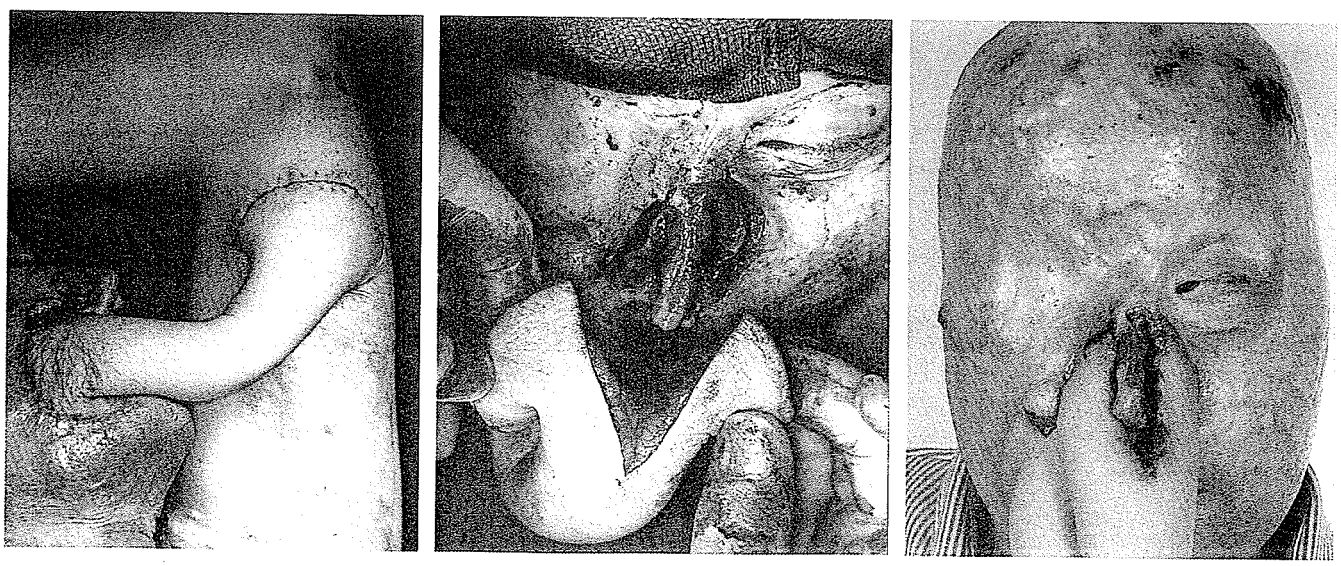
The remaining septum was the ace in the hole, an oasis in a desert of skin grafts and scar. The only easily transferable soft tissue was the skin of the left arm. Since the area around the nose was mostly skin grafts adherent to bone, the only practical area for first attachment was the lip, which had just enough contracture from the skin grafts to warrant replacement with a flap.

A tube pedicle was made on the inside of the left upper arm and the defect grafted. The L-shaped chondromucosal flap of the remaining septum was brought out and its front prow fixed to the nasal spine area, presenting an impressive scaffold for a nose. The left contracted ala was used to cover the raw area of the front prow.

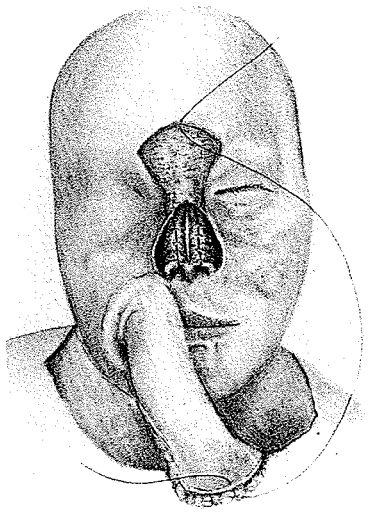
After a rest of several months the superior hairy axillary end of the tubed flap was used to replace the skin of the right subunits of the upper and lower lips.

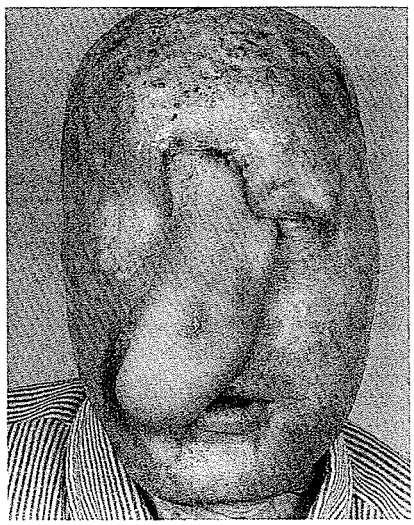


The standard area for attachment of the opposite end of the arm pedicle would have been the glabella area but this was mostly skin grafts over frontal sinus and bone with little chance of adequate blood supply. Also, nasal lining was needed. Three weeks after the lip inset and one week after delay of the base, the remaining arm attachment was divided, its distal end split like a lobster claw, and attached on either side of the septum down to the freed lateral mucosa of the vestibule. Seven weeks later the pedicle was divided, leaving enough lining attachment to be unfolded, and turned up and sutured to the upper edge of the septum bilaterally. The glabella was denuded of skin graft to increase the area for

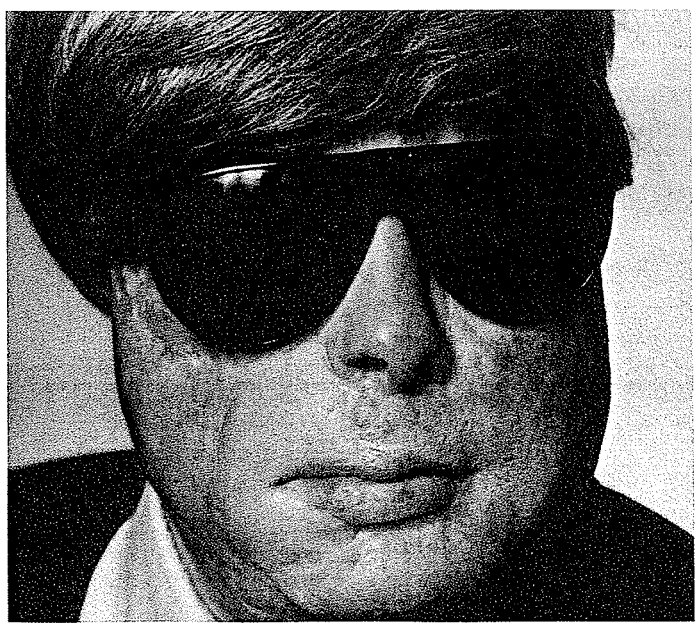


pedicle attachment. The freed end of the pedicle was opened, thinned, and inset in the frontal area but also allowed to encompass the entire lined septal scaffold. One month later the





tube was divided from the lip attachment and trimmed so that the cover could join the nasal lining on each side to form alar margins and advance as nostril sills to open the airway, leaving an excess at the tip for columella. Subsequently the excess tip was fashioned as a columella and marginal thinning and alar crease sculpturing completed the nose. A skin graft released the tight left upper lip to set the stage for a corneal graft. Here he is today ten years later. His tube pedicle nose supports glasses and a wig covers the bald scalp.



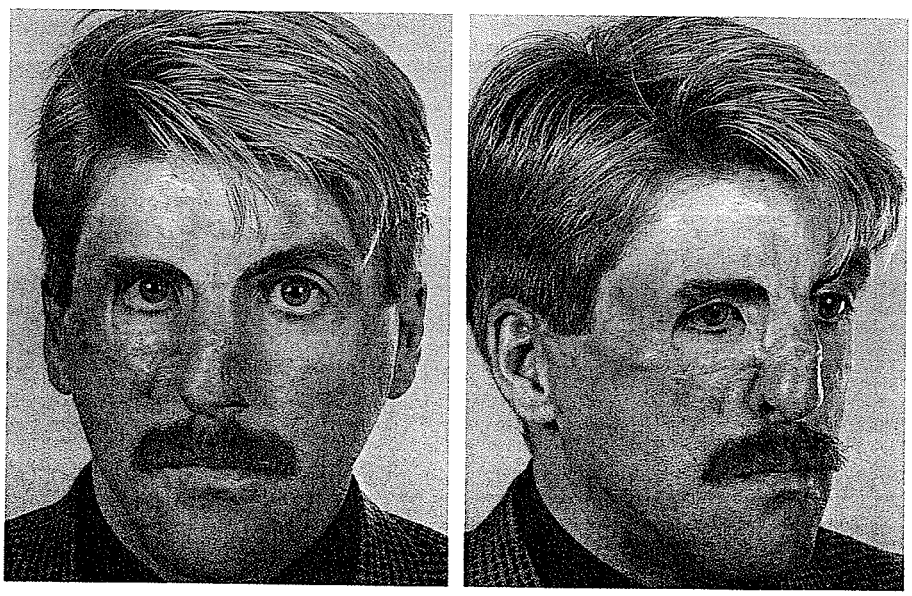
SKIN GRAFTS

During the Battle of Britain, in the heat of an air fight, the British pilots, against regulations, would pull off their gloves and shove their goggles up on top of their heads in order to see and work more efficiently. When their plane was hit and burst into flames, there were a lot of burned hands and faces. A. McIndoe at East Grinstead Plastic and Jaw Unit in England favored expedient free skin grafts for coverage of the nose, face, and hands.

There are circumstances where, although the burn was third degree and the scar deforming, excision of the scar can be satisfactorily repaired with a thick split skin graft. Here is an example.

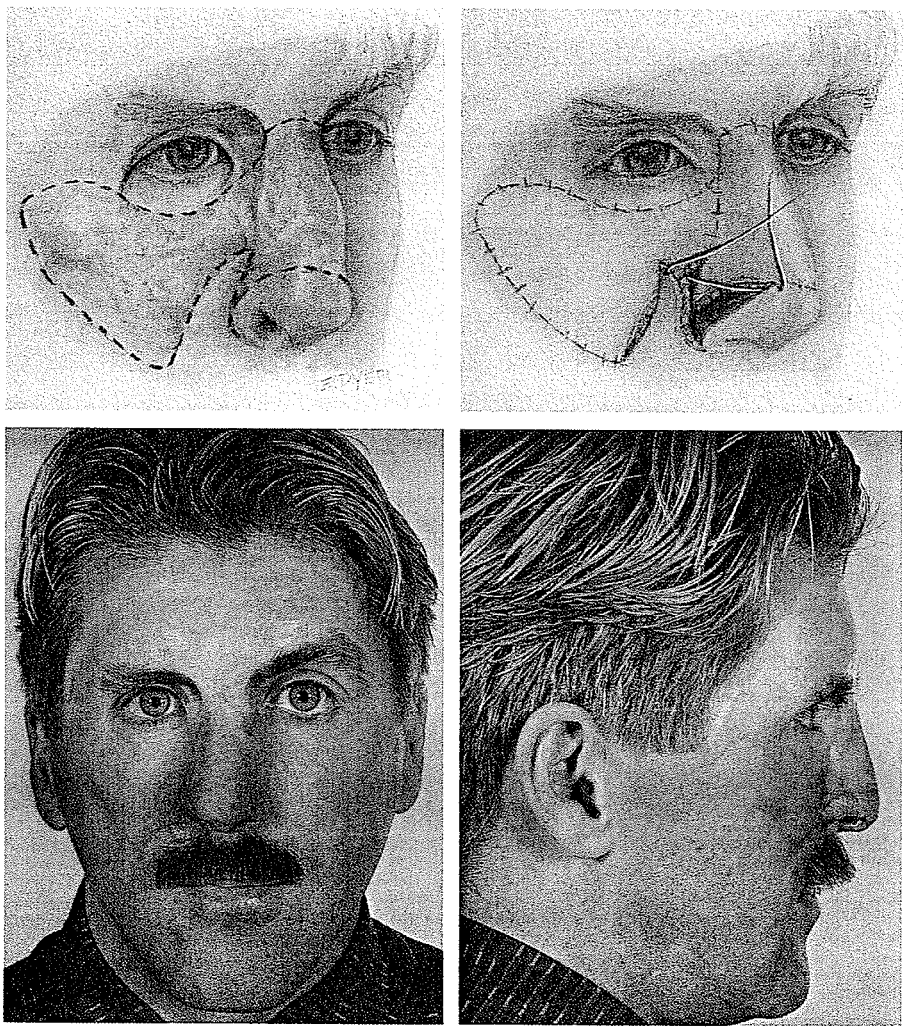
Secondary Skin Grafts to Burn Contractures

This 33-year-old male had suffered deep burns on his right cheek and the right side of his nose. The heavy scarring around his orbit rucked the skin into bands and webs but left the lower eyelid unaffected. The right side of the nose was severely scarred and retracted, causing deviation of the septum and a snarling retraction of the ala.



The reconstruction was divided into two unit parts, as the patient was a Jehovah's Witness and blood replacement was unacceptable. Excision of the cheek scar with release of the contractures allowed replacement with a thick split skin graft

from the right hairless supraclavicular area. After a healing phase, the scarred skin of the right side and dorsum of the nose were excised, and the retracted right ala released and the deviated septum corrected with submucous septal resection and cartilage scoring. The remaining unburned skin of the right nasolabial area supplied a flap to the alar release and the remaining nasal defect was covered with a thick split skin graft from the left supraclavicular area. The swell of the nasolabial flap imitating the alar contour pleasantly interrupted the flat expanse of the skin graft.



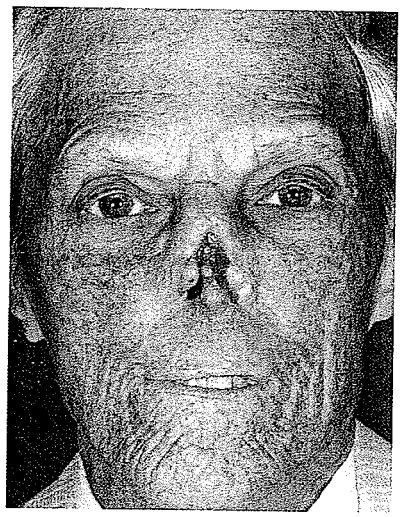
RADIATION

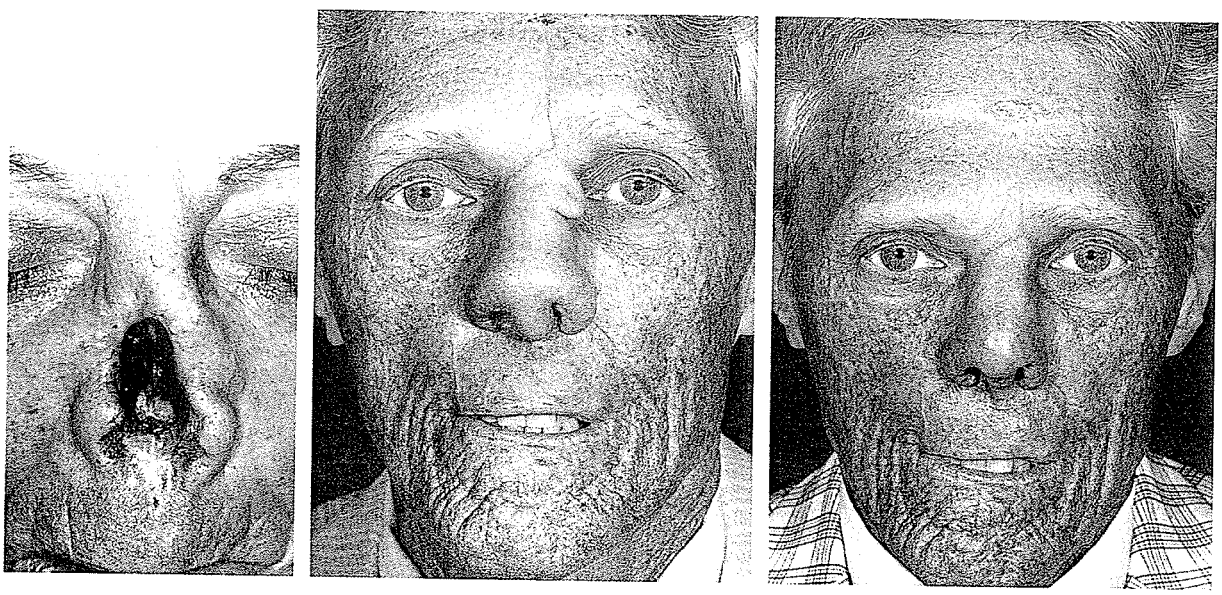
Patients who have suffered severe irradiation burns of the facial skin have a long-term problem. The injury causes insidious, persistent, and progressive breakdown of the skin, eventually becoming basal and squamous cell carcinoma. These

cases deserve early excision and skin replacement. Fortunately such cases are rare today. There are still occasional cases, however, due to exposure to radiation 20 years ago. During this exposure the prominent nose received the most damage and became a common area for the occurrence of carcinoma. I have treated several of these patients.

Double Disintegration of a Radiated Nose

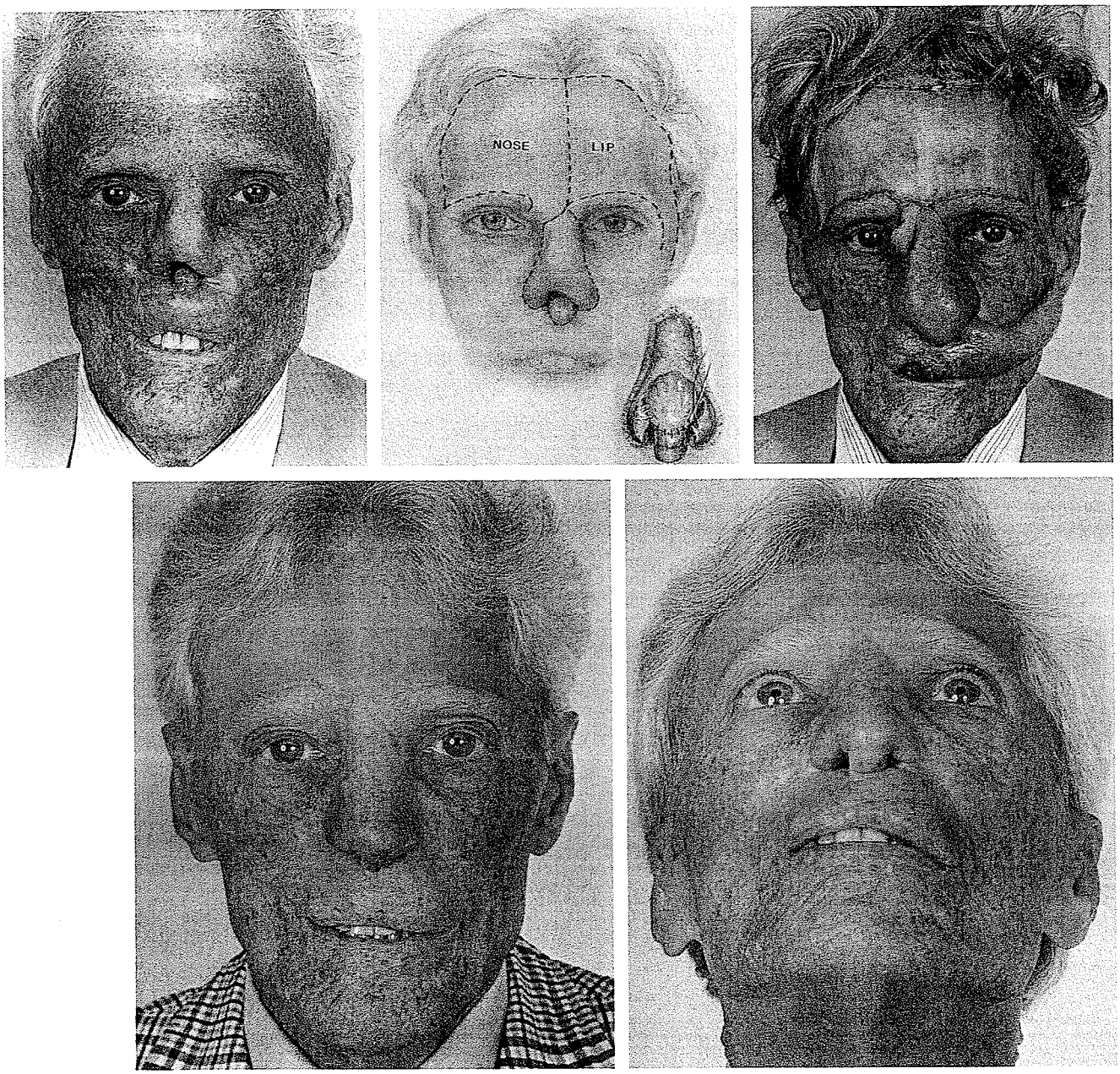
This 67-year-old male had had radiation treatment for acne of the face at the age of 20. The ensuing radiation changes were eventually exaggerated by exposure to strong sunlight. The patient began developing basal cell carcinomas which were first treated by a dermatologist with excision and later by a plastic surgeon with skin grafts. Eventually the excisions removed full thickness areas of the nose and septum. He was then referred for reconstruction. The remaining healthy nasal dorsal skin was turned down for lining of the tip and columella. This was covered by a midvertical forehead flap based on the left supratrochlear vessels.





This nose served well for 9 years but eventually revealed basal cell carcinoma of the distal nose and upper lip. This required wide excision. For reconstruction a double forehead flap was planned on either side of the midvertical scar. The right pedicle based on the right supratrochlear vessels was used to cover the nose after the previous residual forehead flap

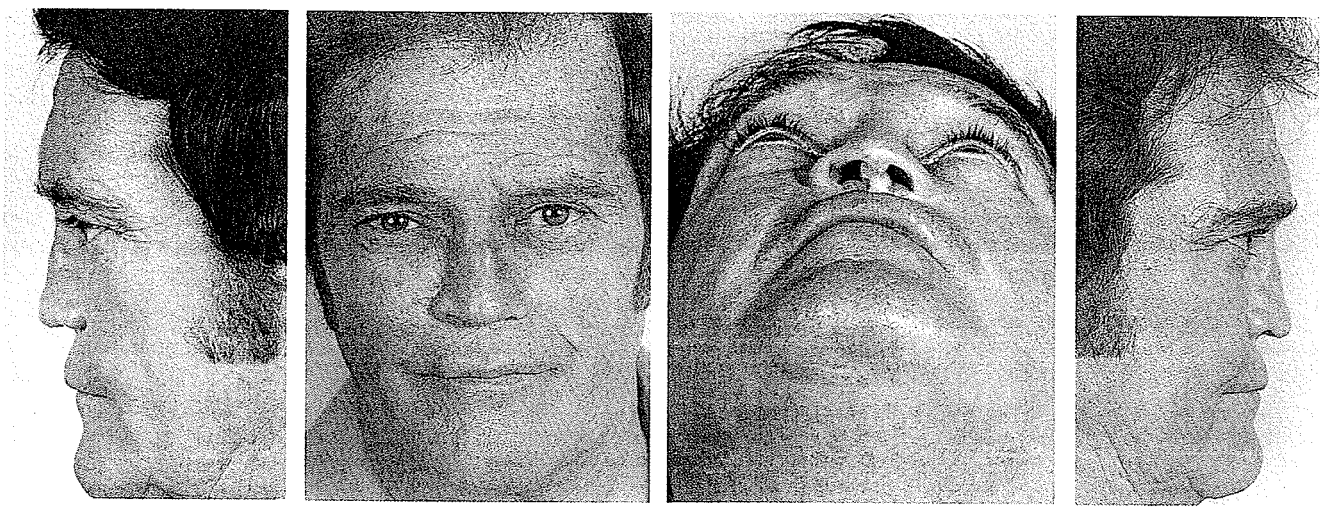
on the bridge was turned down for lining. The remaining left forehead was transferred as a tube pedicle based on the left superficial temporal vessels to supply new cover to his lip. The forehead was covered with a one-piece split skin graft as a total forehead unit. The forehead flap was thinned to reasonable proportion during several revisions. This patient went on to



develop other areas of basal and squamous cell carcinomas of the irradiated skin of his face which were treated by excision and even radiation. He is 91 years old and functioning reasonably well.

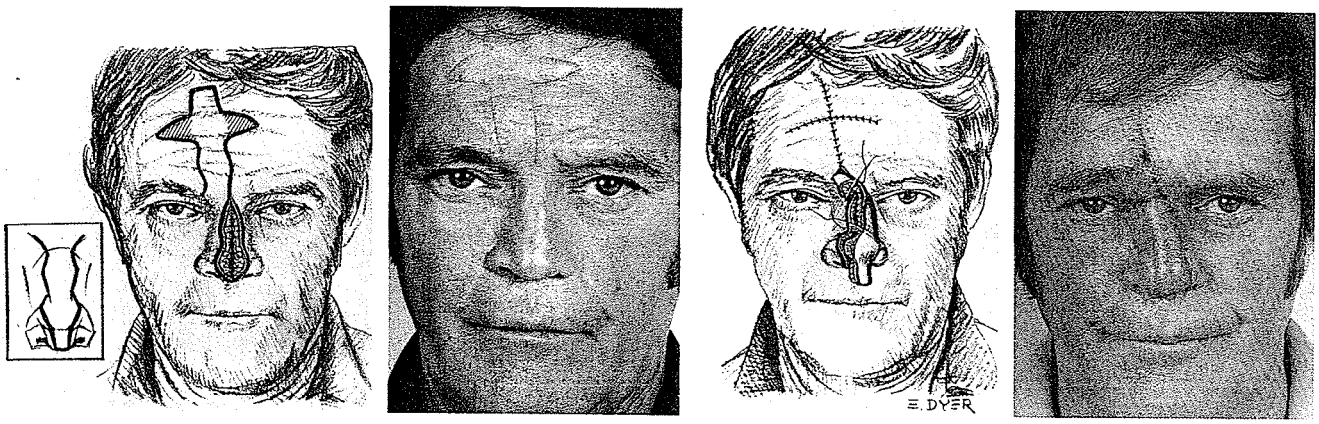
A Retracted Radiated Nose

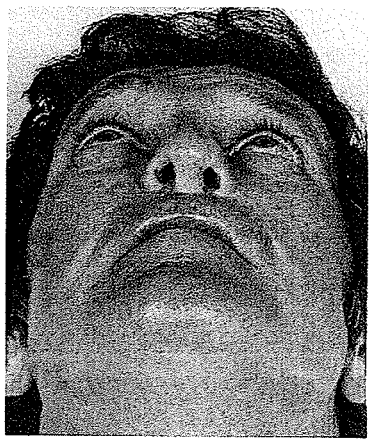
This 50-year-old male had had 5,500 rads radiation for an inverting papilloma of the nose. Over 12 years later multiple surgical procedures were carried out, including nasolabial flaps as well as columella and dorsal bridge grafts. The thin, atrophic, tight nasal skin was stretched over a bone graft, presenting lack of profile and substance, an inadequate retracted columella, and a reentrant nasolabial angle. When the physical findings were matched against the history of radiation and multiple surgeries, a diagnosis was evident. The tight skin stretched tautly over the bone offered no chance of profile enhancement by simply shoving in more bone. The tight skin begged release. The flat profile needed elevation by soft tissue inset because the atrophic tissues demanded more substance.

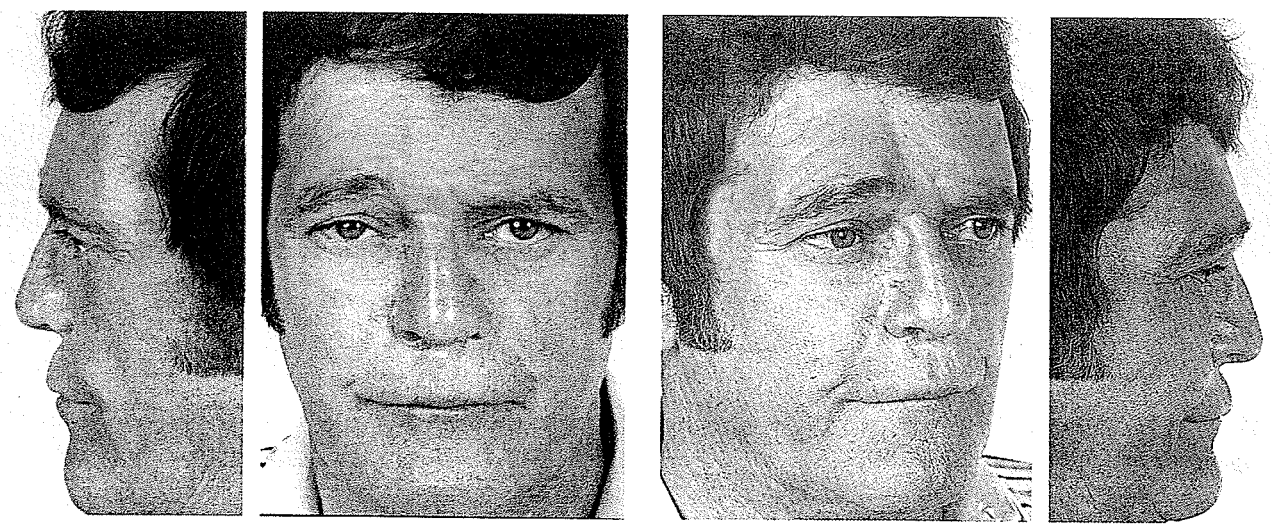


As the forehead was wrinkled and scarred, it could be improved by giving up a modest seagull-shaped flap. When an artist roughly sketches the front view outline of a nose, the highlights of the bridge stand out as an angulated double line running in continuity from the root along the bridge to the ball at the tip and dipping over into the columella. This is a central, longitudinal series of subunits forming one long unit. The forehead flap was incised for delay in a pattern to fit the desired central inset. The seagull wings were incorporated not only because of the ease of donor closures but because when denuded they could be used to add to alar substance in this

atrophic nose. Three weeks after delay, the flap was let into the midline release along the nasal dorsum with the de-epithelialized wings tunneled into the alae and the tip extension used to onlay the retracted columella. The pedicle was divided at one month and the donor area revised.







SPECIFIC RECONSTRUCTION OF DESTRUCTION BY DISEASE

Through the ages diseases have selectively chosen to attack the nose. Long before Christ's time leprosy was a disease with nasal destruction as one of its sequellae. In Christopher Columbus' time, syphilis began to appear in Europe and one of the sequellae of its third stage was nasal destruction. It has been said that Columbus' men brought the disease back to the royal courts of Europe from the New World. There are others who suggest it was vice versa.

Whether the blood supply of the nasal mucosa lining the vestibule and covering the septal cartilage is destroyed by the bacillus of leprosy, the spirochite of syphilis, the treponema of yaws, the leishmania braziliansis of leishmaniasis, or crystals of cocaine, the result can show the same devastation. Destruction of the mucous membrane exposes the cartilage framework and the resultant chondritis melts the cartilage and eventually even the bone.

In spite of all his experience with mutilated noses during World War I, H. D. Gillies admitted being baffled by the luetic nose. There was obvious loss of bone and cartilage but the nasal skin was intact. Attempts by surgeons to implant bone and cartilage had failed. After further investigation Gillies discovered there was complete loss of mucous membrane lining which, with loss of skeletal support, allowed nasal collapse with the skin becoming adherent to the bony rim of the pyriform opening. This prevented the alar base from being pulled forward normally if tested by the finger and thumb. This nostril test has become applicable in diagnosis of nasal lesions which destroy the mucosal lining. Replacement of the lining was the first step in reconstruction.

Skin Graft Lining in the 1930s

J. F. S. Esser used the split graft inlay to line the labial sulcus. Gillies adopted its use as a postnasal epithelial inlay in the syphilitic nose.

Through an upper buccal incision from one canine fossa to the other, with the scalpel hugging the bone, the skin and soft tissues were freed from the bony attachments. The crumpled nose will then pull out like a concertina into normal position. A split thickness skin graft was applied to the raw undersurface of the nasal skin and eventually the dental surgeon made small removable cap splints for the upper teeth onto which was attached an upright wire. Impinged on the wire was a gutta percha mould which fitted up under the skin graft to apply pressure and support. Once the graft had taken, the mould was replaced by a nasal prosthesis which could be changed at will for cleaning. In some cases after several months a cartilage graft was inserted between the skin graft and the skin for bridge support and the prosthesis discarded. This was not the usual occurrence.

It was predicted that intranasal skin grafts would be advantageous in other conditions such as lupus vulgaris, yaws, and leprosy.

Leprosy

N. Antia of Bombay adapted the skin graft inlay supported by a simple acrylic prosthesis for the similar nasal deformity in leprosy.

Forehead Flap

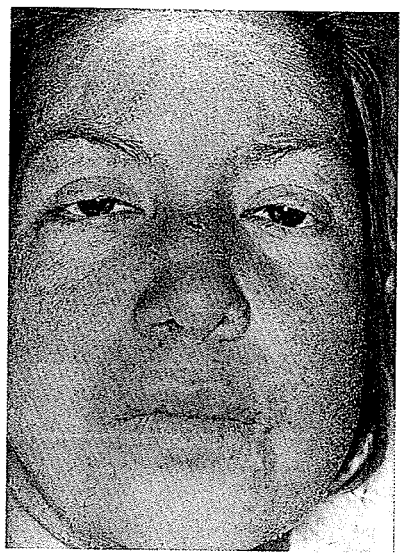
Although it seems a shame to use valuable forehead skin for nasal lining as it is out of sight, the results may justify the action. A vertical forehead flap based inferiorly is tucked under the nasal skin to provide lining destroyed by disease. R. Farina, in 1957, used forehead for nasal lining in leprosy. Several Chinese surgeons have also used forehead on an island flap for lining. The latest in 1993 were Zhou Liyun, M.D., Shi Chongming, M.D., and Hu Gunyin, M.D.

THE NASOLABIAL FLAP

I was primarily stimulated to find an alternate method to the skin graft which required a nasal prosthesis. Not only was

there a problem with constant need for cleaning the epithelial pocket, but many of these patients neglected or lost their prosthesis, allowing the pocket to contract irreversibly.

When the skeletal support of the nose is withdrawn, the normal nasal tenting flattens and the nasal skin spreads out into the cheeks, exaggerating the nasolabial folds. In a Robin Hood maneuver I began using nasolabial flaps to supply lining to nasal deformities of leprosy and syphilis. This not only provided thicker, more vascular lining enabling easier insertion of cartilaginous support, but at the same time produced a desirable nasolabial face lift. I believe N. Antia was also using a nasolabial flap in some leprosy cases.

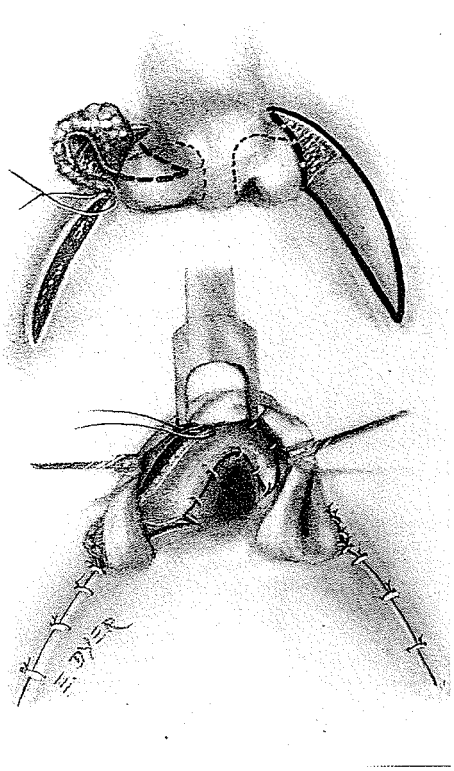


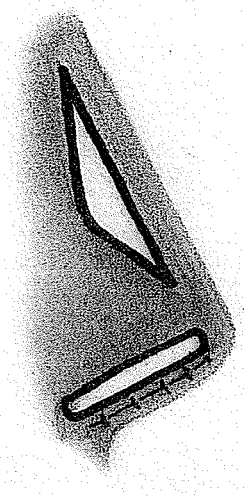
Leprosy

This 48-year-old female developed Hansen's disease in Cuba. She is seen in the early stage of the disease. Gradually there was loss of her nasal lining which was followed by destruction of the supporting structures of her nose. She was treated with Cortisone and later with Dapson and Prednisone. She was

pronounced under control by her dermatologist, N. Zais, who continued her treatment. The difficulties encountered with skin graft inlays stimulated me independently to turn to na-

solabial flaps. First, bilateral vestibular incisions in the constricted lining followed by skin undermining released the nasal skin contracture. Then bilateral nasolabial flaps based at the sides of the alae were denuded of epithelium for 1 cm at the base. They were tunneled under the sidewall into the lining defect on each side and carried forward to back the raw surface of the released columella. The nasolabial donor areas were easily closed along natural lines, removing the ugly stigmata of leprosy. After 3 months a two-piece interlocking au-

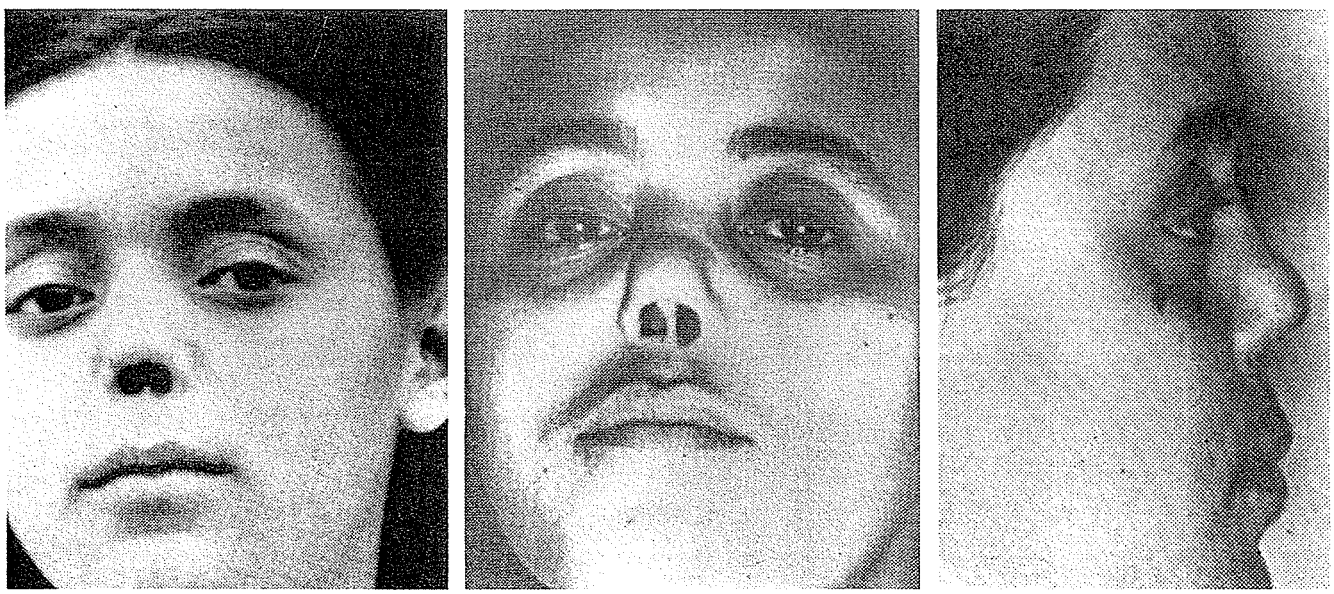




togenous cartilage graft was inserted through a columella splitting incision. Steroid dependency with depression of the immune system caused infection in spite of oral antibiotics. The cartilage grafts had to be removed. After three months, with the aid of prophylactic antibiotics, banked autogenous costal cartilage was fashioned as two pieces, one to support the bridge and the other to strut the columella, each in its own separate pocket to improve the odds of success. The healing was uneventful.

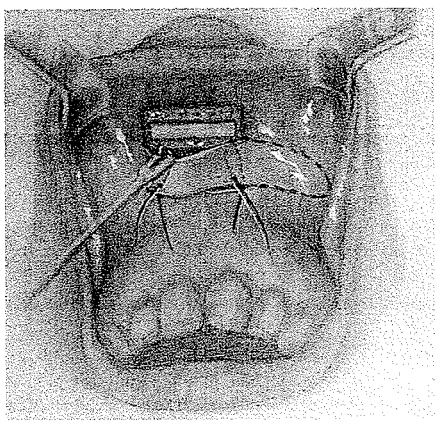
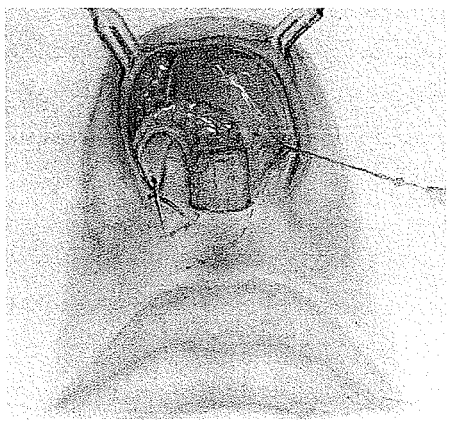
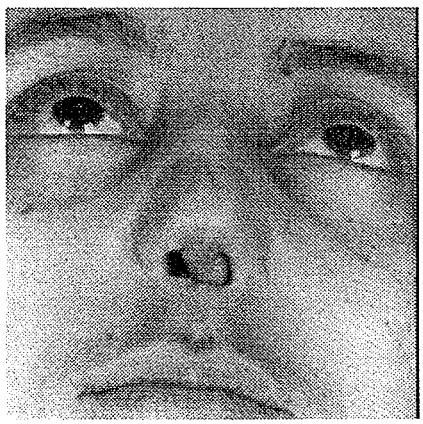
Leishmaniasis

This young female from Brazil had suffered with leishmaniasis which destroyed her columella and septum, along with loss of nasal lining, resulting in contracture of the distal nose. The shortness of this nose was shocking, yet elaborate methods to lengthen it were eliminated one by one, for scars from forehead and nasolabial flaps seemed quite undesirable in this young woman. A mucosal strap flap in the upper buccal sul-

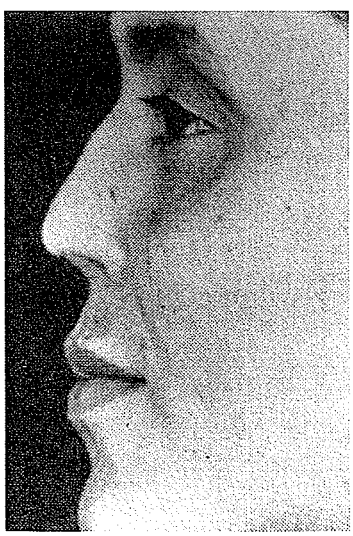


cus was lined with a chondrocutaneous graft from the postauricular area. As a second stage the distal end of this flap was delayed. When the mucous membrane flap was ready for

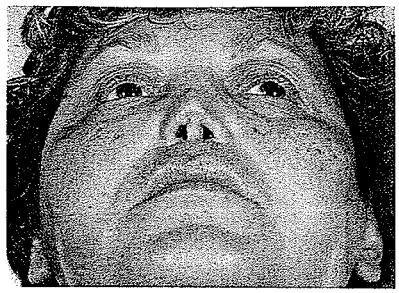
transport, the nasal skin was freed from its tight nasal lining by wide undermining and the bulbous alar cartilages were reduced. This allowed the nasal skin to advance one-half inch beyond the lining. The lining was then incised along the right side and rotated forward and to the left to maintain nasal length on the left. This presented a lining defect on the right. The distal end of the mucous membrane pull-through flap was let into this lining defect. A uniform lengthening of the entire nose had been achieved but at the cost of insetting the columella off center. It was merely reset at another stage

and finally the base of the new columella was set into the lip. Thus the nose had been lengthened by shifting the old lining and adding new lining, as well as reconstructing a columella—and all from lip mucosa and postauricular skin and cartilage without a single visible facial scar. A small cartilage strut was inserted along the bridge.




Here is the patient 35 years later. She reported that her reconstruction enabled her to marry and enjoy a normal life.



Yaws

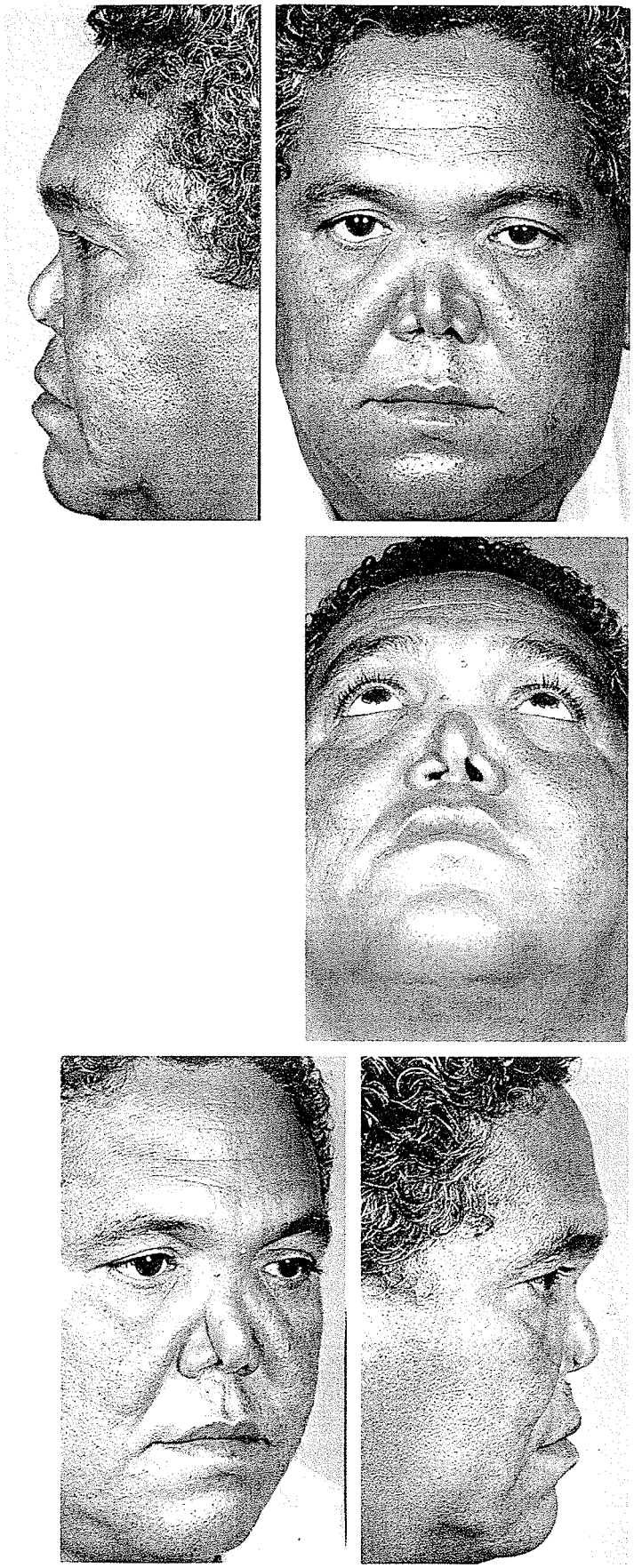
My experience with the nasal deformity of yaws is limited to only a very few cases in the Caribbean area, and in these cases the skin of the nose was also attacked.

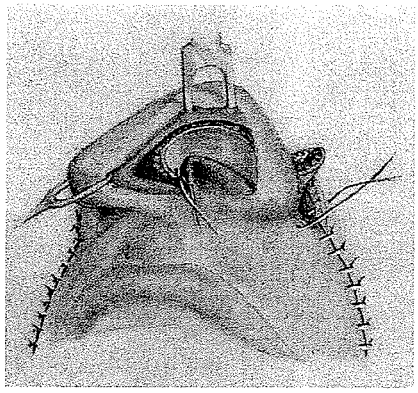
One entire island which had a great number of cases was reportedly cleared of the disease with house-to-house calls with a syringe of penicillin.

An example of reconstruction following yaws is presented in the subtotal nasal reconstruction section.

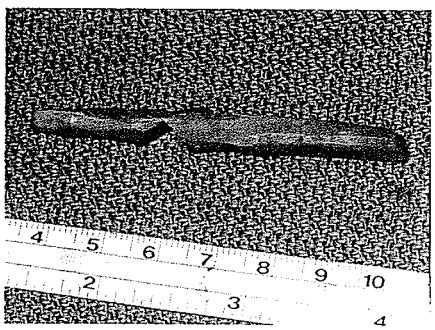
Syphilis

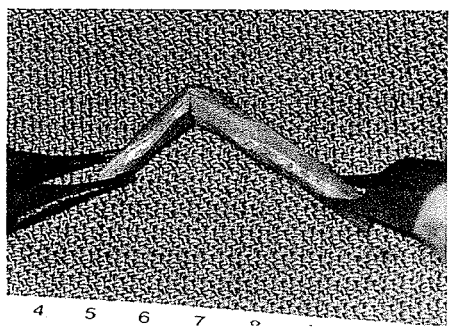
This 52-year-old Latin male presented the late stage of a luetic nasal deformity. The usual exaggerated nasolabial folds were taken as flaps with their base at the ala on each side. A 1½ cm denuding of the epithelium of the base prepared each flap to pass into a through-and-through incision under the alar base. An incision in the vestibule on each side at about where the intercartilaginous line used to be and carried forward into a through-and-through membranous septal incision not only allowed freeing of the nasal skin from the bone, but enabled advancement of the nose out and forward. Into these bilateral vestibular lining releasing incisions the nasolabial flaps were introduced, joining each other in the membranous septal incision behind the columella. Of course the thickness of these flaps and the postoperative edema caused the nose to swell.

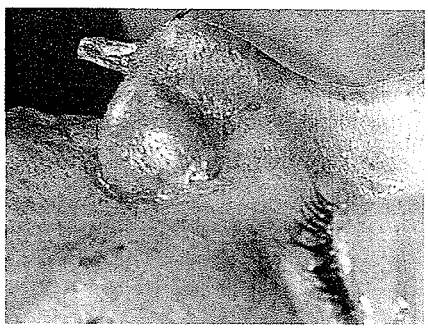




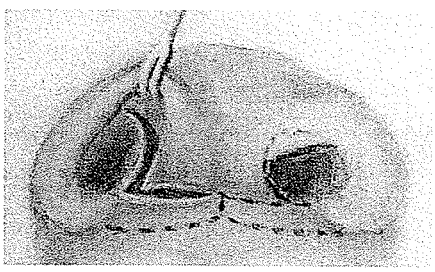
Eventually the swelling subsided, presenting the opportunity of fashioning and introducing a costal cartilage hinge graft for nasal support.

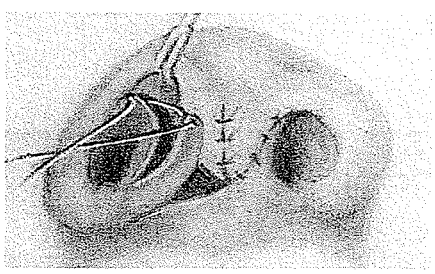


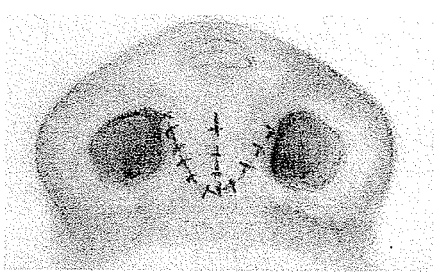


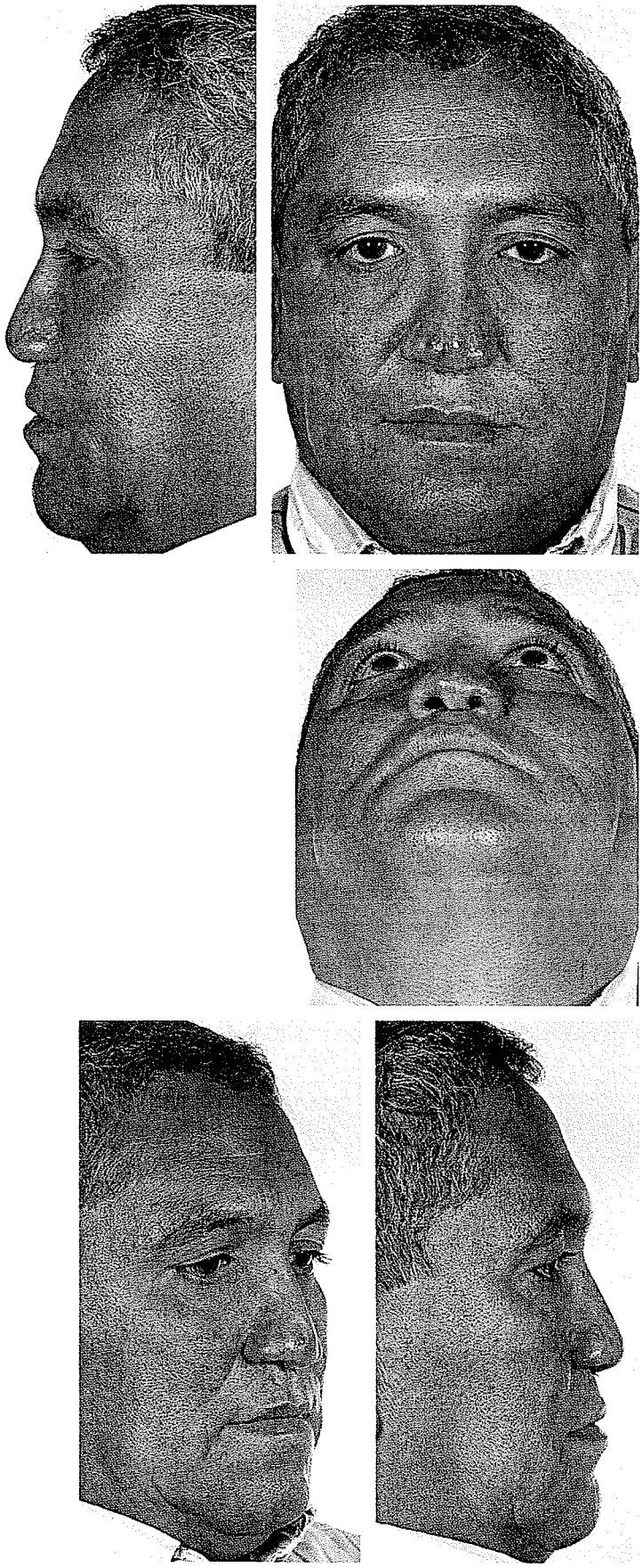


Later, through vestibular incisions, the excess subcutaneous tissue was excised which allowed a better airway. Finally advancement of the columella and transposition of lip flaps into membranous septal releasing incisions tailored and lifted the tip.









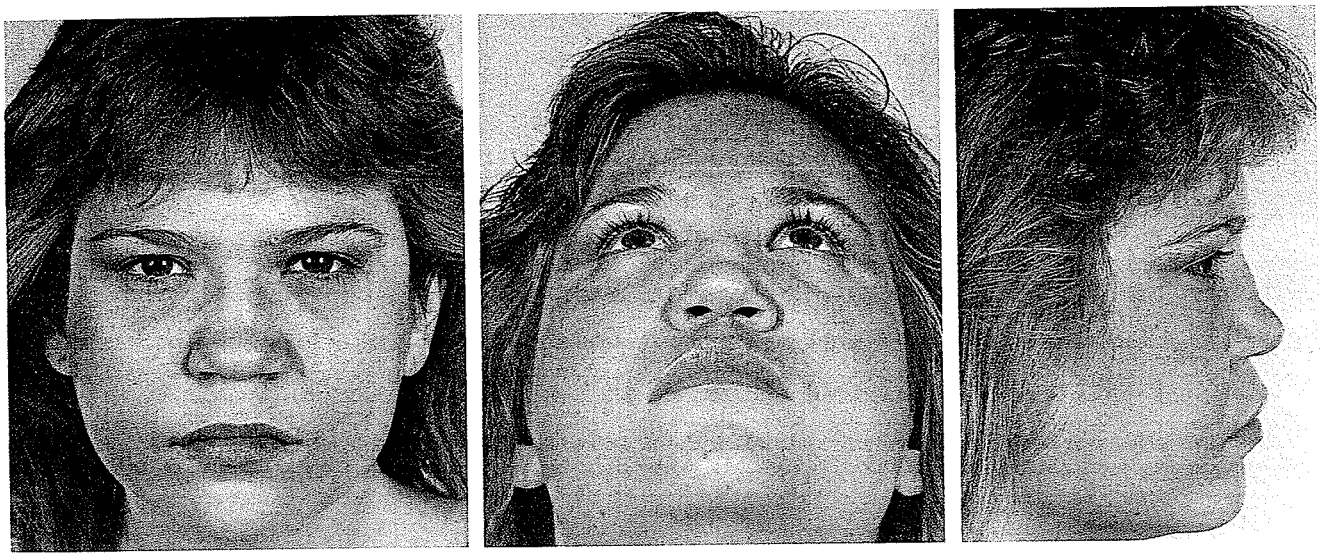
The Cocaine Nose

By stretching the term *disease,* but more because the ultimate nasal result is the same, the cocaine nose will be presented in this section. Introduction of cocaine powder into the nostrils is the latest scourge aimed at the nose. When cocaine is snorted repeatedly it causes constriction of the blood vessels of the lining mucosa, evidenced by severe blanching. If this is continued for any length of time the mucosa dies permanently, exposing the cartilage of the septum which serves as the central partition and supporting structure of the distal two-thirds of the nose. When the septal cartilage is exposed it soon becomes infected and the subsequent chondritis, if left untreated, will eat a hole through the septum, leaving a perforation of varying sizes. This is a common finding in cocaine snorters.

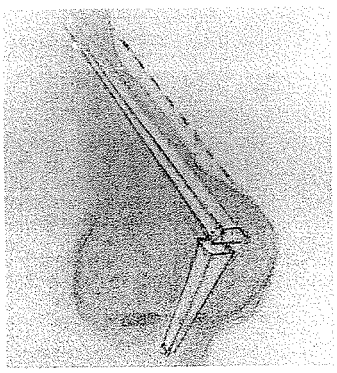
FIRST DEGREE COCAINE NOSE DEFORMITY. When the perforation is small and anterior it can cause a disconcerting whistle with breathing. A one-sided mucosal rotation flap can be advanced to close this hole and stop the music. When the hole is larger and more posterior, as in most cases, if the use of cocaine is discontinued the hole probably will not cause a problem. Use of larger local mucosal flaps or even flaps from the labial sulcus are available, but they are usually more trouble than they are worth.

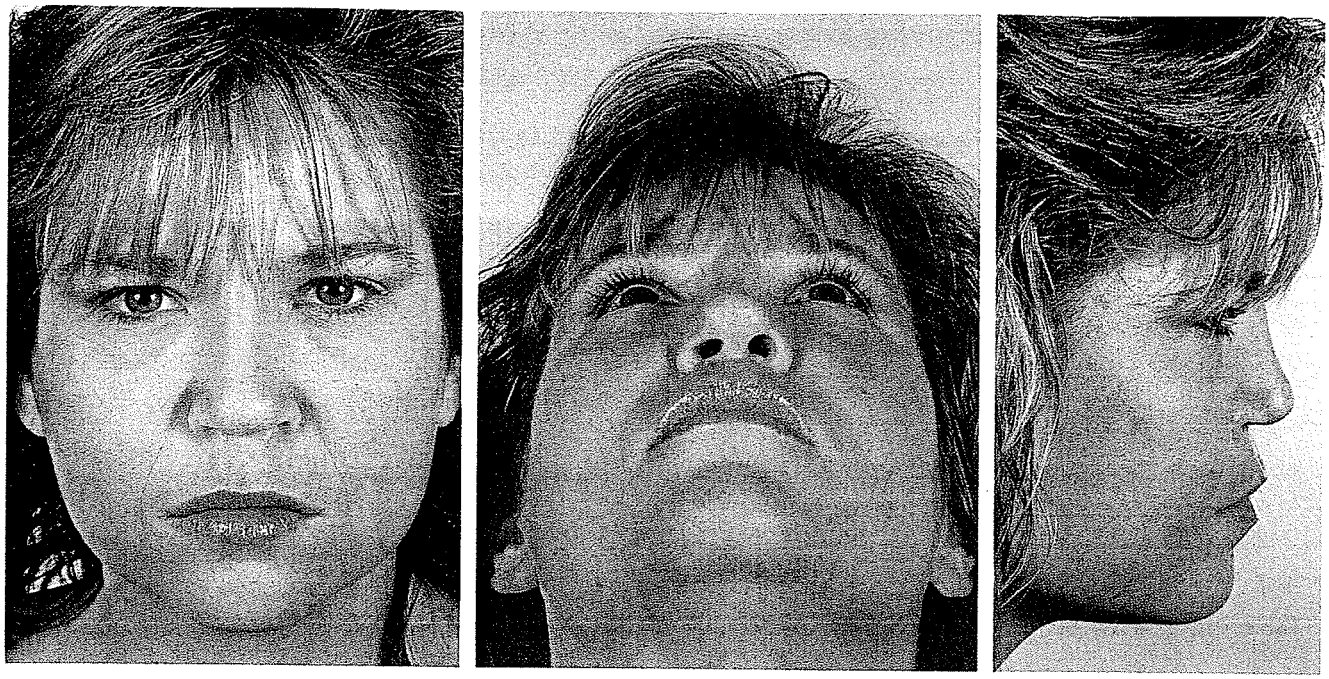
If cocaine abuse is continued, it will gradually destroy all the septal cartilage. Like pulling the front center pole from a tent, the nose will collapse and contract into the face. Thus the nasal ravages of cocaine can vary from a pinhole perforation to varying degrees of mucous membrane lining ulceration with destruction of septal cartilage and even nasal bone destruction. I have had to reconstruct various cocaine noses: the flat depressed nose, the asymmetric collapsed and constricted nose, and the actual sunken, shrivelled, retracted nose, as seen in the worst deformities of syphilis and leprosy.

SECOND DEGREE COCAINE NASAL DEFORMITY. This 25-year-old female reveals the importance of the septum of the nose in serene beauty. Cocaine use over a three-year period caused the formation of a huge septal perforation and the subsequent chondritis allowed the gradual flattening and spreading of the nose. In her case the ulceration extended from the nose into the palate and pharynx, causing loss of a portion of her soft palate with destruction of her speech. This rare deformity caused by cocaine was reported by H. Deutsch and D. R. Millard in 1989.



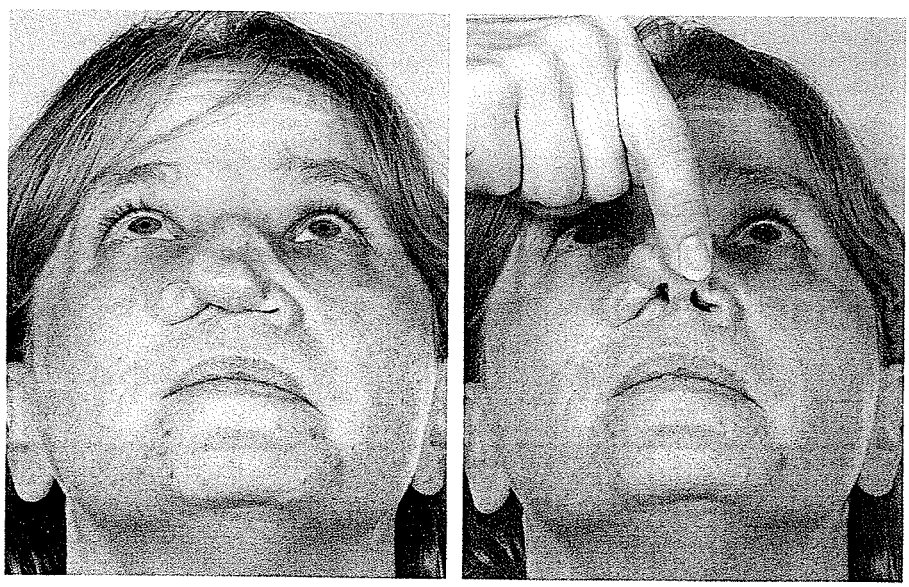
The patient was allowed to heal her ulceration for two years. A corrective rhinoplasty then included alar cartilage reduction and bilateral osteotomies with in-fracture. The membranous septal incision was carried bilaterally, releasing the contractures in these areas. Flaps of upper labial sulcus mucosa were transposed into the defects. Nine months later, through a columella splitting incision, a two-piece costal cartilage graft consisting of a 5-cm bridge support with a hole under its distal point was fitted into a pointed 3½-cm columella strut.



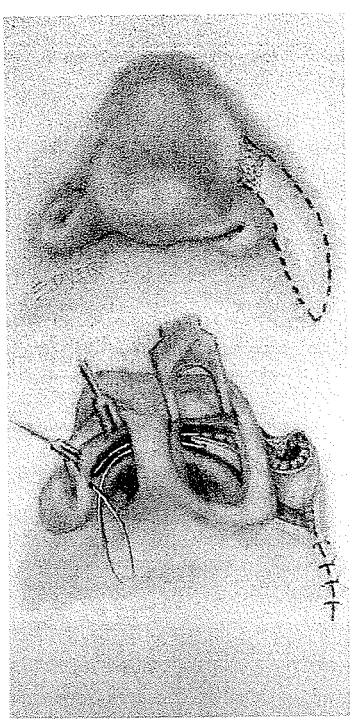


A superiorly based pharyngeal flap filled the soft palate cleft resulting in correction of speech.

THIRD DEGREE COCAINE DEFORMITY. This 36-year-old female had destroyed the skeletal support and lining of her nose with cocaine, which resulted in tip collapse and contracture of the lining and airways. She had had a right nasolabial flap applied as an alar blob.



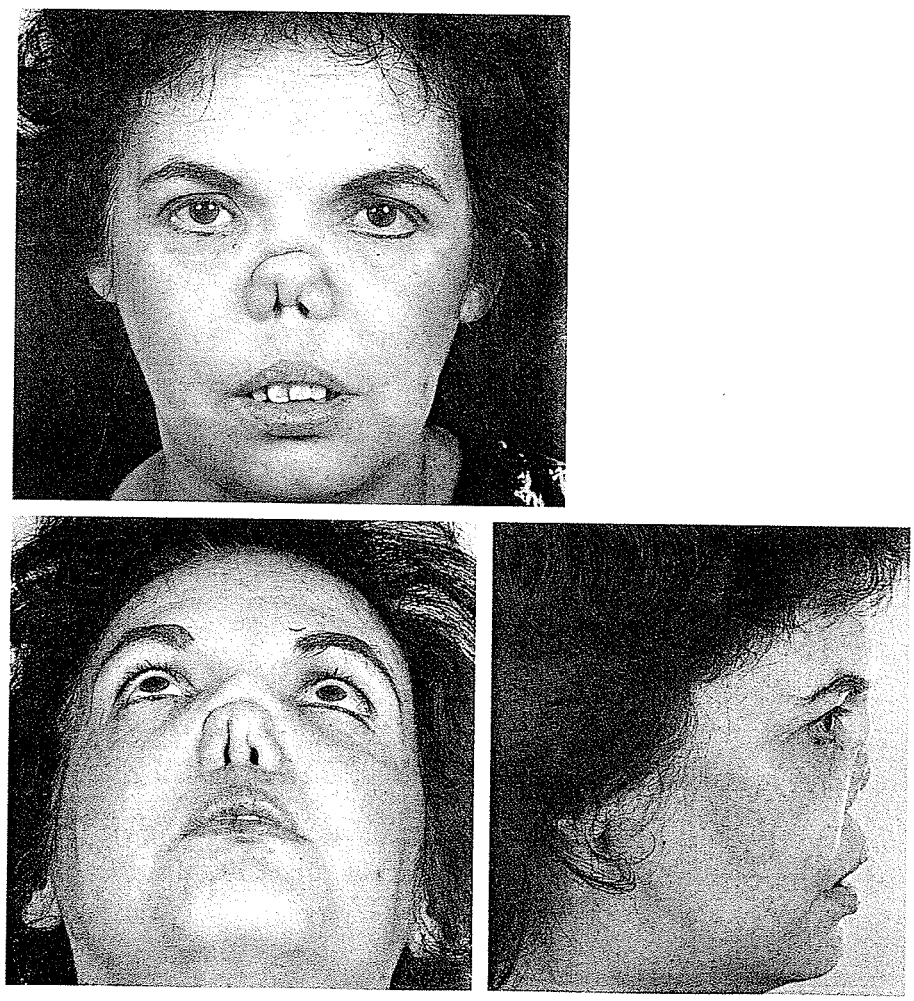
The patient was severely lacking in nasal lining. Nasal vestibular incisions allowed freeing of the nasal skin attachment to the bone in the area of both alae and the columella base. This opened a wide defect which was filled with a left unilateral nasolabial flap denuded of epithelium at the base as previously described, but extended to touch three bases. This flap was tunneled into a through-and-through incision under the base of the flap on the left which came out in the vestibular defect. The flap was sutured into position to free the left ala and then across the back of the columella base, and even to release the constriction inside the right ala.



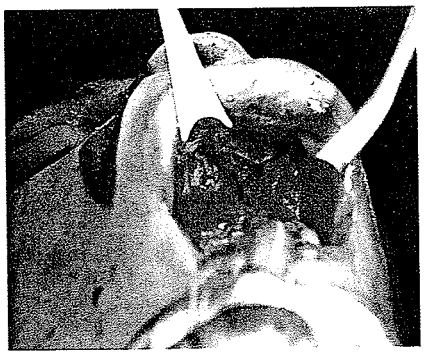
Five months after the lining had thus been reconstructed and through a columella splitting procedure, an osteochondrial perichondrial hinge graft was inserted to support the bridge, tip, and columella.

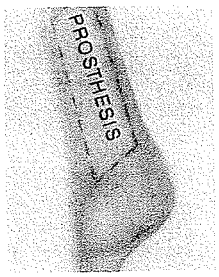
Subsequent alar margin trimming bilaterally, along with a right alar base transposition and vestibular Z plasties to open the airways, created a reasonable aesthetic and functional result.

FOURTH DEGREE COCAINE NOSE DEFORMITY. This 44-year-old female had a history of cocaine use which had resulted in destruction of her nasal framework and contracture of her nasal lining until the nose had shrunk and retracted severely. Her deformity was strikingly reminiscent of those seen in syphilis and leprosy.

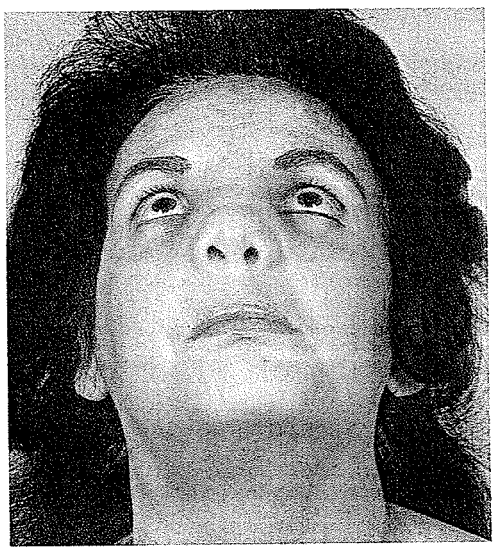


The Gillies approach through the upper buccal sulcus allowed the skin of the nose to be dissected off its tenacious attachments to what bone was left.

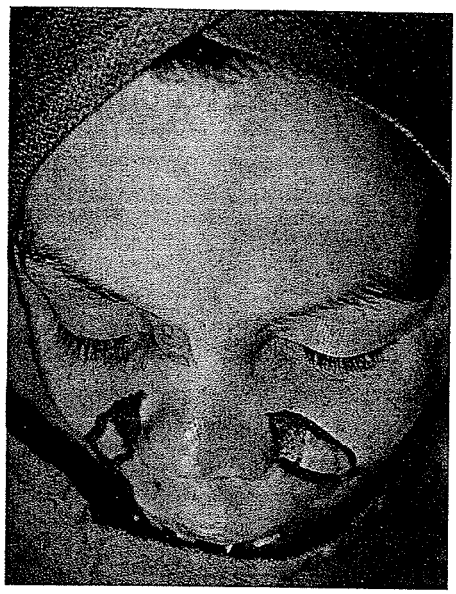
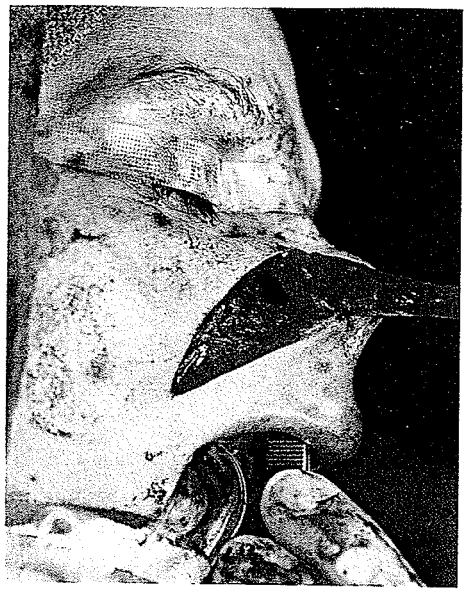
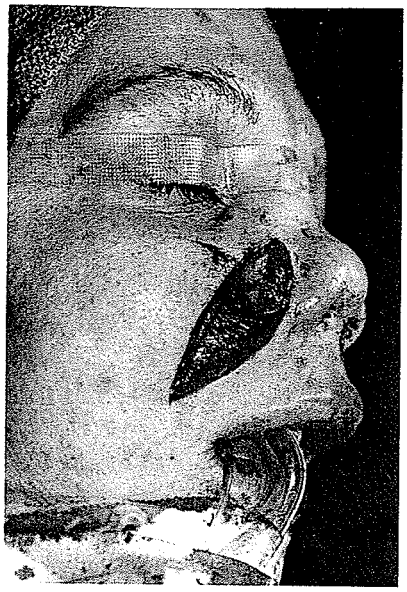
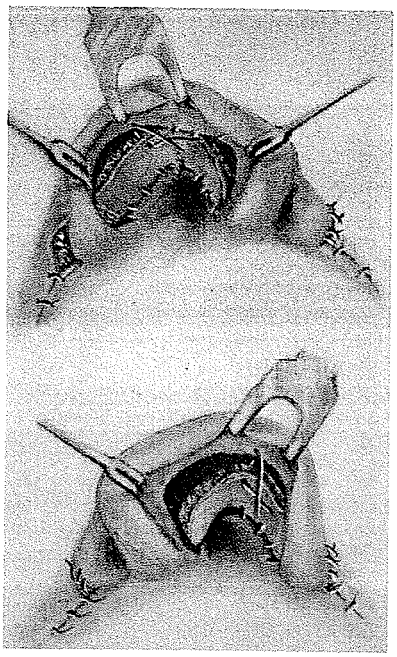
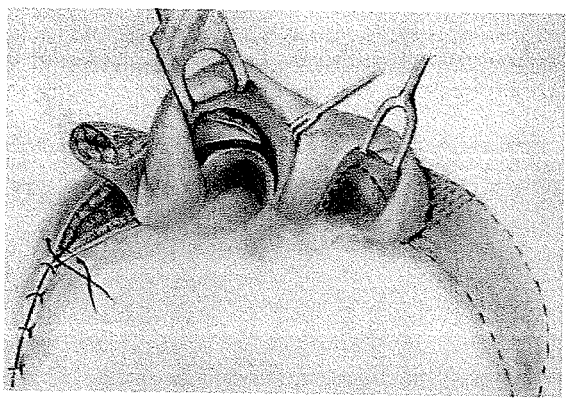
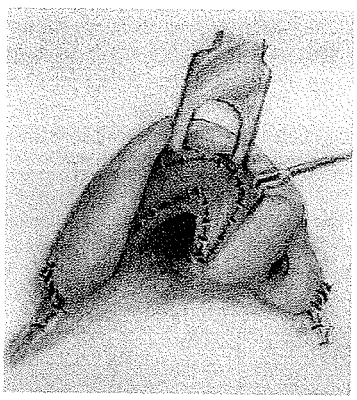




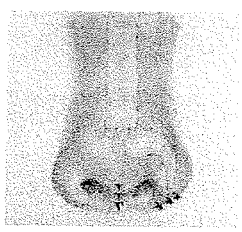
A skin graft was inserted up under the raw surface of the nasal skin and the pocket was maintained by a methylmethacrylate prosthesis which expanded the nasal area and produced a profile.

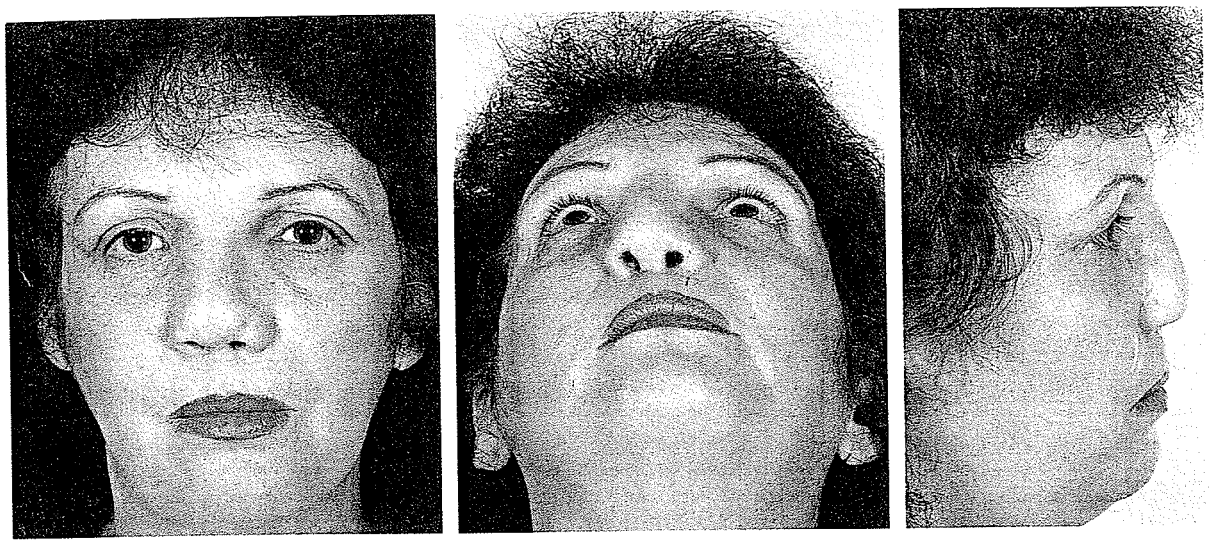


The patient was lost to follow-up; when found again the prosthesis was out and the nose shrunken. At this point it was decided that bilateral nasolabial flaps introduced into releasing incisions in the lateral sidewalls and brought together behind the released columella would eventually supply lining that could cover rib grafts.

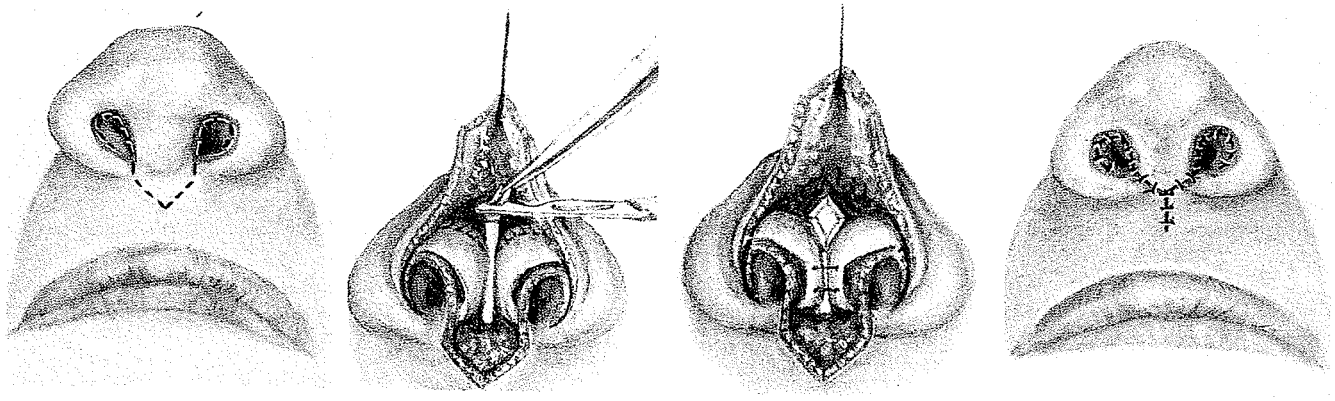







Finally a 4-cm costal cartilage was grafted onto the bridge extending into the tip, and a second angled costal cartilage graft was inserted obliquely in the slumped left ala to balance the tip and alae. The buried framework should eliminate a need for a prosthesis.



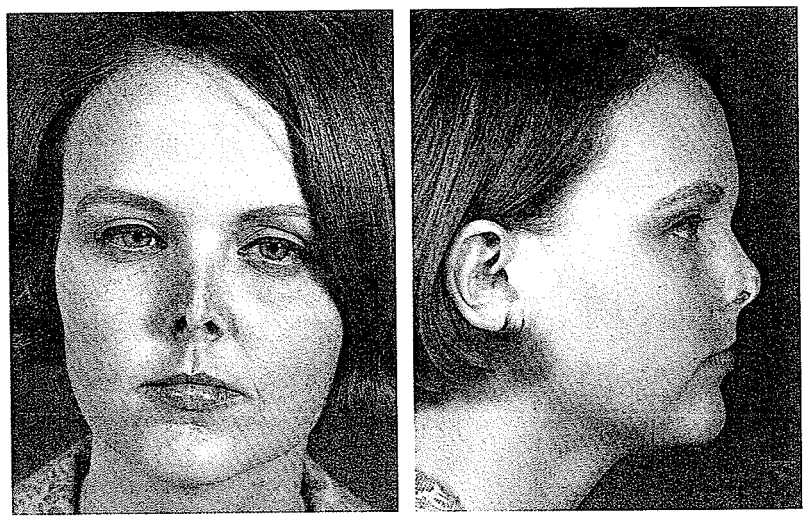


The contracted nasal tip exaggerated by the excess height of the bridge was finally corrected by an open rhinoplasty approach which extended 3/4 cm into the mid-upper lip to give length to the columella. The open exposure allowed shaping of the excess costal cartilage in the tip and on the bridge. Then a special tip graft of this excess cartilage was constructed for raising the tip and this was accomodated by the modest advancement of the columella out of the lip in a V-Y fashion.

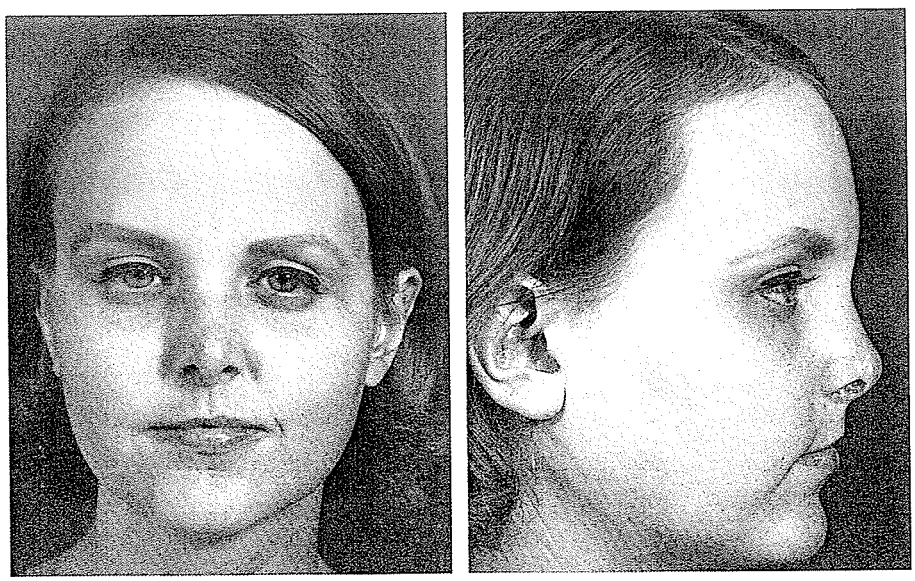


Scleroderma

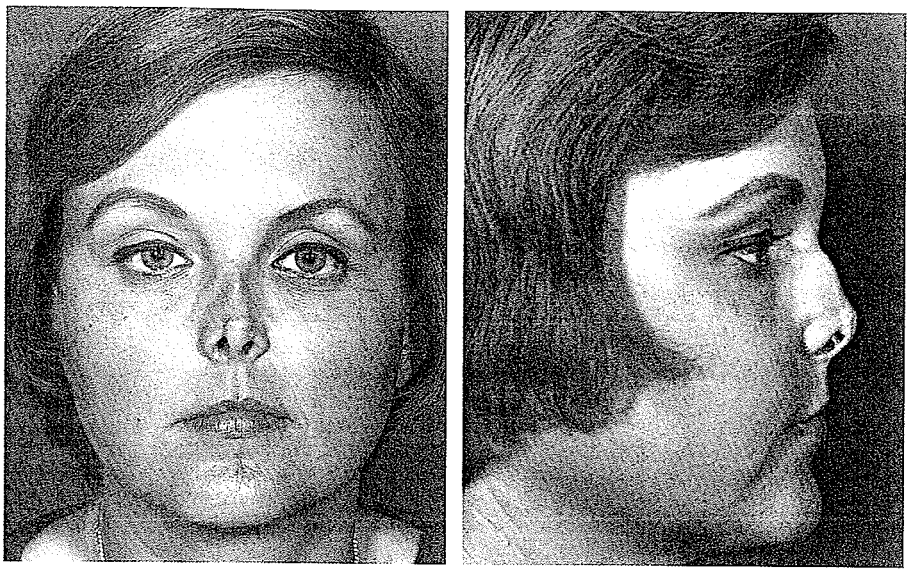
A 23-year-old married school teacher who had had a small nose underwent a rhinoplasty that resulted in shrinkage and scarring of her nose. She was referred by another plastic sur-



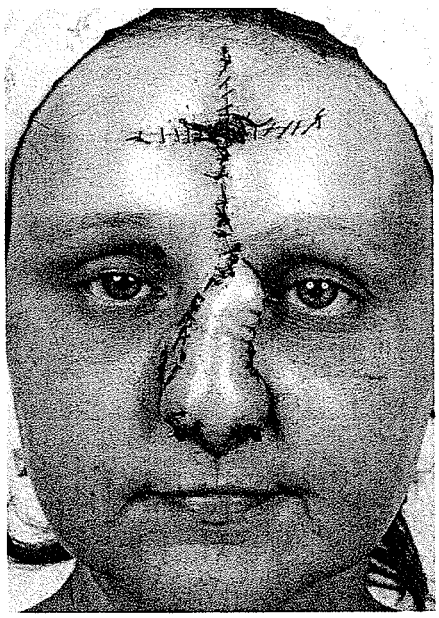
geon. In 1968, release of the retracted lining of the nasal vestibule was achieved by releasing incisions in the intercartilaginous line, which, along with a membranous septal incision, allowed the nose to extend to more normal position. An auricular composite graft to the septum and full thickness skin graft to fill bilateral lining defects resulted in early improvement.

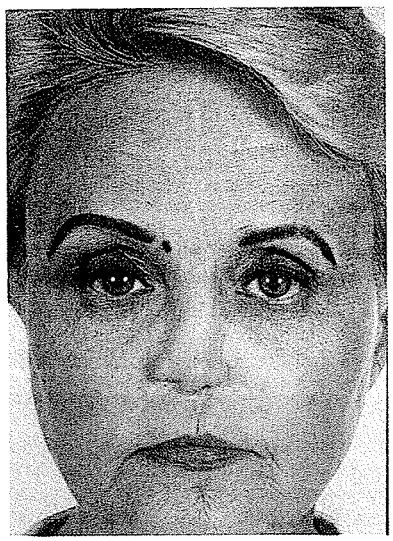


By six months, abnormal shrinkage was noted and diagnosis of scleroderma was made. More dermal grafts were used to



try to improve contour, but by 1975 the shrinkage was such that the patient, ridiculed by her students, begged for further surgery. In 1977, a through-and-through release of the nasal tip and later delay of local lining flaps, as well as a seagull forehead flap based on the right supratrochlear vessels were carried out. Two months later the lining was turned down, the forehead flap transposed, and the forehead donor area closed. The forehead pedicle was divided and inset after three months. The patient progressed well for several years and in 1982 seemed to be satisfied.





Gradually the shrinkage began to appear again and attempts with auricular cartilage and silastic and rib grafts were all to little avail. The patient's complaints began to focus on restricted breathing, so nasolabial flaps were transposed to open the airways. This is the patient in 1993.