20. The Open Approach for Repair of Septal Perforations

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Nasal septal perforations are difficult to repair because they require closure of three distinct yet contiguous layers. Multiple methods of repair have been described, but the one technique that produces the most consistent and physiologic results combines septal mucoperichondrial advancement flaps and a supporting interposition graft of connective tissue, such as temporalis fascia or mastoid periosteum. By using the open approach, the technical difficulty of nasal septal perforation repair is reduced. Septal flaps can be elevated much more easily and safely with the open approach because there is direct access to the usually undisturbed dorsal septum and full access to the caudal septum. In addition, the superb visualization, lack of distortion, and the open unencumbered field provided using this approach allow surgeons to close perforations that would be much more difficult to repair using the standard intranasal approach. Furthermore, the open approach provides access to the lower and upper lateral cartilages and the dorsum, allowing a secondary rhinoplasty to be performed simultaneously with septal repair if previous surgery caused the perforation.

Unfortunately, the most common etiology for septal perforations is previous nasal septal surgery [11]. Perhaps the most common surgical etiology occurs when fenestrations in the septal mucoperichondrium have been made in contiguous areas and the intervening cartilage or bone has been removed. These fenestrations go unnoticed and unrepaired, and because there is no cartilage or bone between these tears, a perforation ensues. An alternative etiology after previous septal surgery is the introduction of a very hard or tight nasal pack, which might compromise the blood supply of the septal flaps in the early postoperative period, causing necrosis and perforation. A third etiology from septal surgery can occur with too-aggressive postoperative suction of the nose, which causes direct trauma to the septal flaps.

Septal perforation repair in patients who have had previous septal surgery is usually more difficult because large amounts of septal cartilage have been removed beyond the area of the soft-tissue perforation. The septal flaps have then become adherent to one another, making dissection extremely difficult. Furthermore, when large amounts of cartilage have been removed, nasal support may be compromised. Unfortunately, an additional problem in my experience is that the septal perforation is not an isolated entity but is often accompanied by an inadequate previous septoplasty that may not have addressed deflections of the septum along the maxillary crest, the posterior perpendicular plate, or the vomer [11]. When such findings coexist, surgeons must not only dissect the septal flaps around the perforation, but also proceed posteriorly or inferiocaudally to complete the original septoplasty.

In contrast, septal perforations caused by the second most common etiology, cocaine abuse, are generally much easier to repair. Destruction caused by cocaine is limited to the area of the perforation, and most of the supporting cartilage and bone around the perforation are still present, making dissections much easier. Complicating factors with cocaine-induced perforations usually relate to adhesions that have occurred between the inferior or middle turbinates to the septum due to the same inflammatory process that caused the perforation. These adhesions, however, can be easily lysed. Repair of a cocaine-induced perforation should not be performed unless the surgeon is certain that the patient is no longer a cocaine abuser. Continued use of cocaine certainly would break down the repair postoperatively. Consideration should be given to obtaining cocaine levels at the initial visit for all patients with cocaine-induced perforations.

Septal perforation repair should not be performed until surgeons have done their best to identify the etiology of the perforation. Although

less frequent, there are several serious medical disorders and environmental hazards that cause perforations that must be treated prior to any surgery [4, 5]. If there is doubt as to the etiology of the perforation, a significant biopsy through the edge of the perforation might be accomplished preoperatively to help rule out some of the more serious etiologies, such as granulomatous diseases.

SURGICAL TREATMENT

Multiple methods have been described in the literature for surgical perforation closure [2, 3, 8, 9, 14, 15, 17, 19], but no consistently acceptable success rates were described until Fairbanks and Chen [5] combined Gollom's bilateral local mucosal flaps [6] with the interposition of a connective tissue autograft between the septal flaps (Fig. 20-1). Fairbanks and Chen [4, 5] reported a 95% successful closure rate with the use of either temporalis fascia, perichondrium, or bone. The same closure rate was accomplished by Wright [20] using the same method, but the interpositioning graft was mastoid periosteum [11]. Using sliding bipedical and unipedical flaps taken from the floor of the nose or the inferior turbinate, the mucosal portions of the perforation can be closed with normal nasal mucosa [11]. As Fairbanks pointed out, techniques that bring other tissue types, such as skin or mucosa, into the nose may be successful for closure but do not restore physiologic function to the nasal membranes [4, 5].

Most unsuccessful results occur because of poor exposure, inadequate mobilization of the septal flaps, incomplete or nontension-free closure at surgery, or poor approximation of septal flaps. Even the Fairbanks method can be technically difficult and may not provide adequate exposure. Fairbanks has advocated performing an alar crease rhinotomy for exposure in large perforations. No doubt that is why Strelzow and Goodman [7, 18] first described use of the open septorhinoplasty approach for closure of septal perforations. Because of that suggestion, Kridel and associates [11] used the Fairbanks method with the open approach from 1981 to 1983 and achieved a closure rate of 92% for perforations 3 cm or smaller in 12 patients. Since publication of those articles, other authors have also used the same open approach, no doubt because of its efficacy. Arnstein and Berke [1] described open approach repair in 9 patients in 1989, and Papay and co-workers [16] also used this method in 1990 in 1 patient. From 1985 through 1991, I have performed more than 35 additional septal perforation repairs using the open method with either temporalis fascia or mastoid periosteum with similar success [13].

Although Fairbanks' method is highly successful, it is extremely difficult, especially in large or posterior perforations, or in patients with naturally small nostrils or who have undergone previous alar wedge excisions. The open approach has multiple advantages. It allows access to the anterior, superior, and posterior aspects of the perforation; it increases surgical exposure; it provides a field without the distortion that normal intranasal retraction causes; it allows binocular vision for surgeons and assistants throughout the operation; and it allows use of both hands [11]. A transfixion or hemitransfixion incision is avoided, preserving the anterior columellar blood and lymphatic supply and drainage, and improving flap viability.

In the past, some authors have complained that the scar from the columellar incision after an open rhinoplasty is a noticeable problem; however, in most patients it is much less noticeable than the scar from an alar crease incision, and if routine principles of closure and scar reduction techniques are followed, the scar fades quickly and becomes imperceptible. Most noticeable scars from columellar incisions are those that are not closed in layers and with less than strict attention to detail.

One of the most significant lessons learned over the last 10 years of using this technique has been that the medial crura are totally splayed apart and their supporting attachments to the septum, each other, and the soft tissue are interrupted. Simple reapproximation of the medial crura does not provide enough tip support. Unless a columellar strut is used, tip drop will almost invariably result postoperatively, causing a cosmetic deformity that was not present prior to repair of the perforation [13].

SURGICAL TECHNIQUE

Because the operation requires meticulous and tedious dissection, and because it requires two operative sites (i.e., the nose and the donor site for the connective tissue graft), general anesthesia is preferred but not a necessity. After intubation, placement of an oropharyngeal throat pack helps prevent postoperative nausea and vomiting by keeping blood out of the stomach. Prior to injecting the nose, it is helpful to measure the septal perforation, which is easier to do with the patient asleep under anesthesia. These measurements are often difficult to accomplish in the office because of patient discomfort.
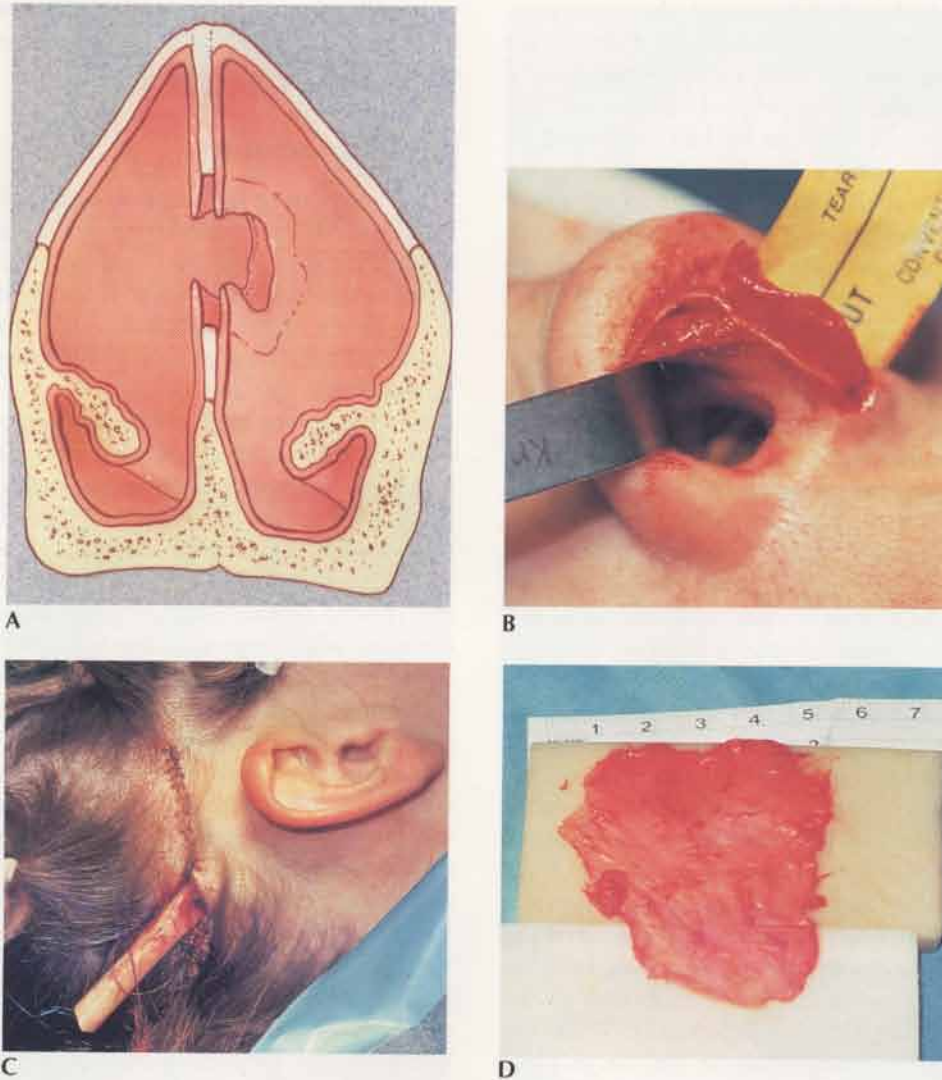
Figure 20-1

A. A septal perforation is a perforation through not one but three layers—two mucoperichondrial septal flaps and the actual septal cartilage or bone itself. In patients who have undergone previous septal surgery, the cartilaginous perforation is often larger than the apparent membrane perforation. B. Intraoperative view showing the open approach to a septal perforation. A suture wrapper is placed intranasally so the perforation can be visualized from the opposite side. C. Temporalis fascia is a very convenient and easy-to-harvest connective tissue autograft. The donor site is closed in layers and drained, and a mastoid dressing is placed for pressure for the first postoperative day. D. The actual temporalis fascia is laid out on blocks to dry prior to placement between the resewn septal flaps. A large enough piece should be harvested to account for any increase in size of the perforation during surgical manipulation.

For most right-handed surgeons, the right temporal scalp is used for the temporalis fascia graft donor site. A horizontal incision, approximately 1 cm above the root of the superior helix posteriorly, is outlined. A small amount of hair is shaved in that area. If the patient has long hair, it can be held out of the way during harvesting of the fascia by placing Collodion on the surrounding hair prior to donor site preparation. Approximately 10 mL 1% Xylocaine with 1:100,000 epinephrine is used for infiltrative anesthesia in the temporal scalp. The volume of the injection also helps create a nice plane for dissection. At the same time, injection of the nose can be performed using 20 to 30 mL 1% Xylocaine with 1:100,000 epinephrine mixed with 1 ampule hyaluronidase. The hyaluronidase helps dispersion of the local anesthetic, which is useful in previously scarred and operated tissues. The injection technique should be the same as for a septorhinoplasty, with the addition of the local anesthetic injected into the floor of the nose and underneath both inferior turbinates. Four-percent cocaine on intranasal cottonoids is also helpful for vasoconstriction. While waiting for the local anesthetic with its attendant vasoconstriction to take effect, surgeons can trim the nasal vibrissae, and both the temporal and the nasofacial areas can be thoroughly, sterilely prepared and draped.

The temporalis fascia should then be harvested. The horizontal incision in the temporal scalp is initially beveled to parallel and protect hair follicles. The scalp is then retracted, and dissection is carried out to the deep temporalis fascia. Wide undermining is accomplished, and a very large piece of temporalis fascia is usually obtained. The dimensions of the fascia graft must be significantly larger than the size of the perforation, because this interposition graft must have a large enough diameter so its edges go far beyond the perimeter of the original perforation. In difficult cases where the septal flaps are scarred together, it is very possible to enlarge the perforation at the time of surgery [11]. If a too-small fascia graft has already been obtained, it may be necessary to harvest another graft from the opposite temporalis fascia. Therefore, harvesting a large graft initially is wise and does not increase patient morbidity.

After this circular piece of temporalis fascia is harvested, hemostasis is maintained with cautery. Because of the size of the graft and the extent of the dissection, a Penrose drain is usually placed. Using a 5-0 vicryl or chromic suture for the deep layer and a 5-0 or 6-0 Prolene suture on the scalp itself, the scalp is closed in layers. A sterile Ace bandage may be temporarily placed circumferentially around the head and over the incision to prevent collection of fluid during surgery. At the end of surgery, this bandage will be replaced by a mastoid pressure dressing.

Opening Incision

Prior to opening the nose, surgeons should examine the airway. If there are any adhesions between the turbinates and the septum, they should be lysed at this time. It is important to cut such adhesions closer to the turbinate than the septum to prevent formation of any further septal perforations. If the concha of the inferior turbinate is quite prominent and obstructs the airway, a lateral outfracture can be accomplished at this time.

A low transcolumellar incision with an inverted-V in the middle is outlined on the columella (Fig. 20-2). The initial incision, however, is first made laterally, either on the right or the left, at the caudal or marginal edge of the lower lateral cartilage with tenotomy-type scissors [21]. To avoid cutting into the cartilage, it can be palpated as the incision is made. Use of a single hook to retract the adherent underlying vestibular skin is helpful, especially when approaching the nasal dome where the lower lateral cartilages become the middle crura. The incision should proceed vertically down along the columella just at the cartilage edge; caution is necessary to not violate the anterior columellar skin. The incisions continue down to the level of the transcolumellar incision. Once incisions are completed on both sides, Joseph scissors are placed through the lateral columellar incisions, anterior to the medial crura but deep to the still-intact columellar skin flap. A Joseph hook is used to cradle the columella at the nasal apices to put traction on the columella. The Joseph scissors are then spread underneath the planned and previously outlined transcolumellar incision, which is then made using a sharp No. 15 blade at right angles. These scissors protect the medial crura in the columella. There are usually one or two small columellar vessels, which must be cauterized.

The nasal skin is then elevated off the underlying medial crura and dome cartilages and dissection continues back over the upper lateral cartilages and dorsum (Fig. 20-3). By staying on the cartilages and bone, surgeons can achieve an ideal dissection plane that is relatively avascular. Cautery can be used for any bleeding. Debulking of the supratip or any noted scar tissue may be accomplished at this time. In debulking any nasal skin, it is important to have a finger on the external surface of the skin to palpate the depth of such dissection and to prevent any perforations through the skin.
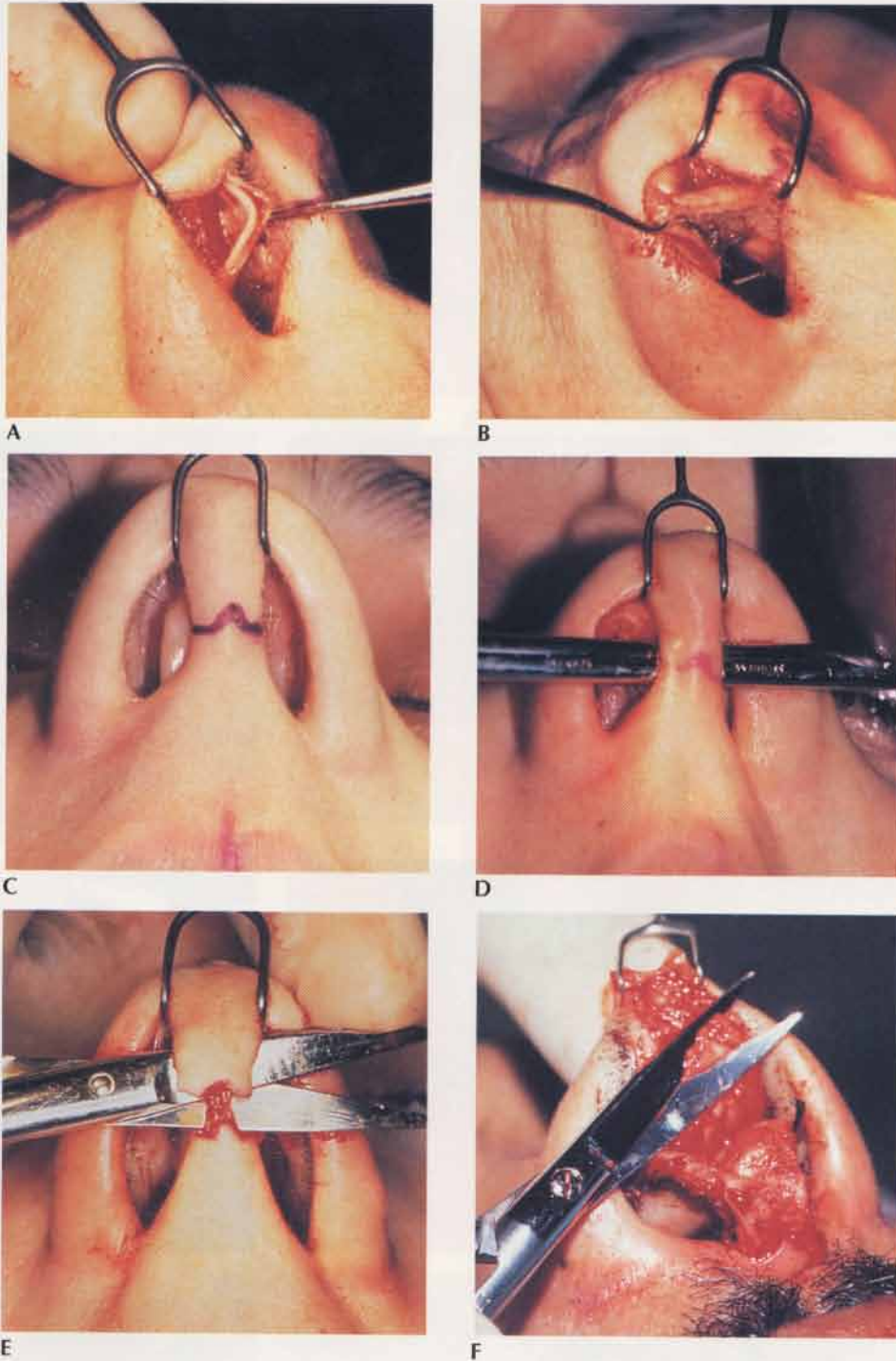
Figure 20-2
A. The open approach is begun laterally along the caudal margin of the lower lateral cartilage. A single hook is helpful for retraction and visualization. B. The incision is continued down along the vertical component of the columella. C. After both lateral incisions have been made, a Joseph hook is placed in the columellar apices for retraction and an inverted-V incision is outlined on the columella inferiorly. D. After both lateral columellar incisions have been made, the Joseph scissors are placed anterior to the medial crura but posterior to the columellar skin to protect the medial crura. A No. 15 blade is then used to cut the inverted-V–shaped incision. E. The protective blades of the Joseph scissors are shown after most of the columellar incision has been made. A few blood vessels that must be cauterized are temporarily still intact. F. Debulking the supratip.

Figure 20-3

A. With retraction of the nasal skin, the caudal septum is visualized and both medial crura are retracted laterally. B. A mucoperichondrial pocket is developed superiorly between the upper lateral cartilages and the septum using a Cottle elevator. C. A No. 15 blade is placed in a superior pocket made to sharply separate the upper lateral cartilages from the septum. D. The upper left lateral cartilage has been totally separated from the septum. E. Both upper lateral cartilages have been sharply separated from the septum, providing outstanding and complete exposure of the septum. F. After the upper lateral cartilages have been cut away from the septum, the excellent exposure afforded by the open rhinoplasty approach is evident from both the caudal and the dorsal approaches. G. Opening up into the septal perforation through the left septal mucosal flap. From Kridel, R., Appling, D., Wright, W. Septal perforation closure utilizing the external septorhinoplasty approach. *Arch. Otolaryngol.* 112:168, 1986. Used with permission. H. Intraoperative view. I. The effect of making a floor inferior turbinate flap and advancement of the mucosal floor flap toward the septum to close the perforation. J. In those instances in which elevation of the mucoperichondrium from the undersurface of the upper lateral cartilage is not desired, the mucoperichondrium can be cut superiorly at the junction of the upper lateral cartilage and the septum and moved down. This technique can only be done on one side so as not to expose the dorsal septal cartilage bilaterally. K. Reduction rhinoplasty with takedown of the hump can often provide more septal mucosa for perforation flap closure. When this takedown is accomplished, the upper lateral cartilages may be set down lower to the new height of the dorsal septum. L. Takedown of a cartilage hump, with the resultant decrease in height of the dorsal septum and resetting of the upper lateral cartilages at a lower level, provides more septal mucosa. M. Both mucoperichondrial flaps sutured together and a connective tissue graft being

A

B

C

D

E

F

Septal Cartilage

Upper Lateral Cartilage

Perforated Mucosal Flap

Medial Crus

G

H

I

J

K

L

M

N
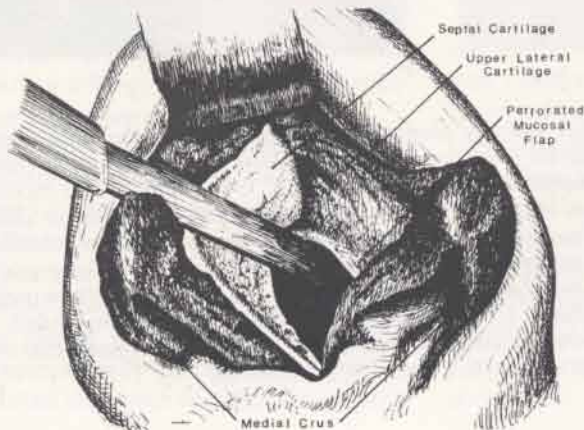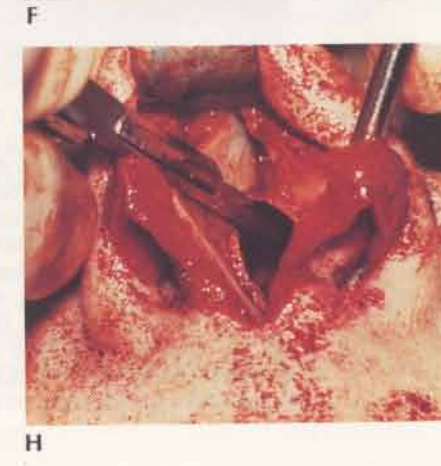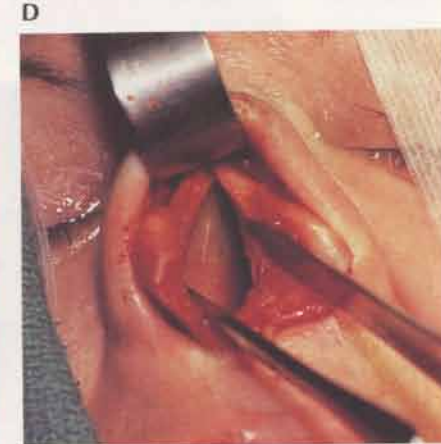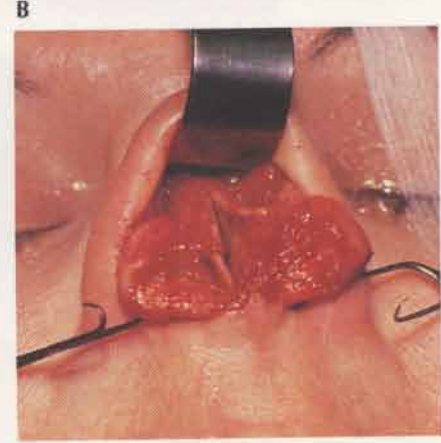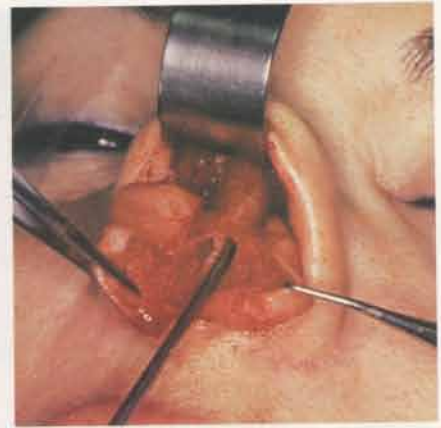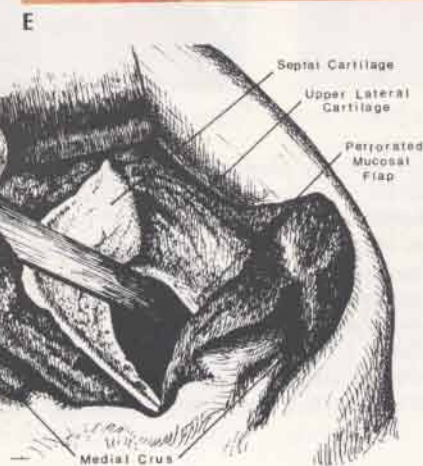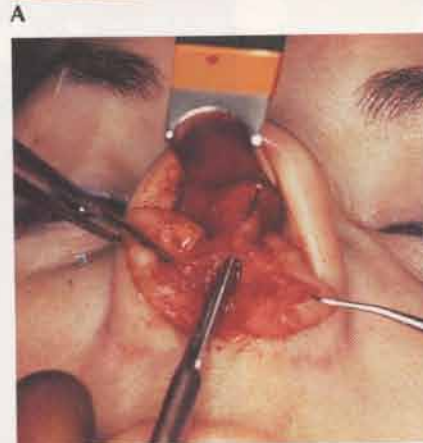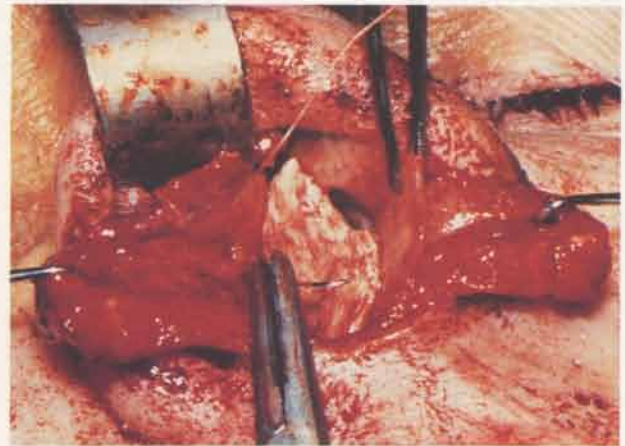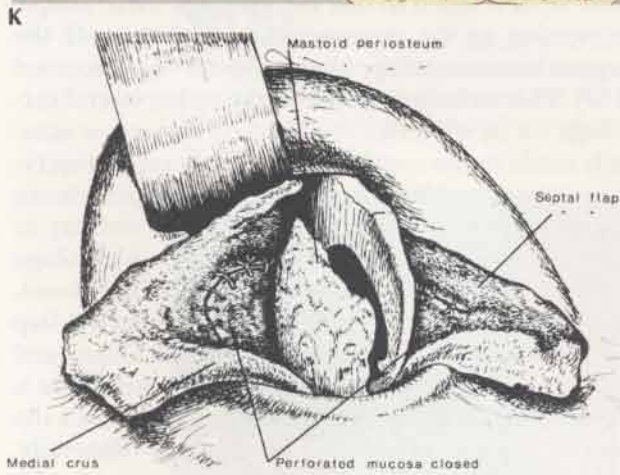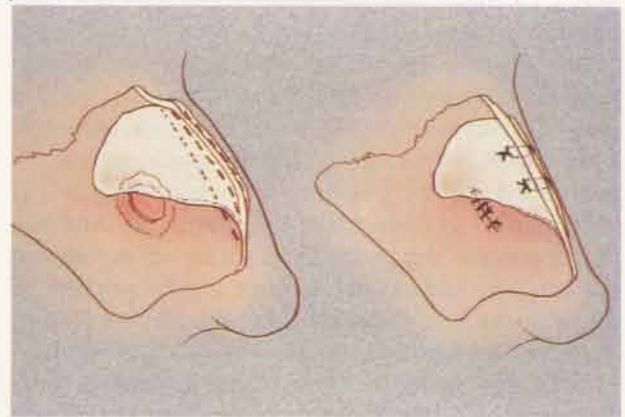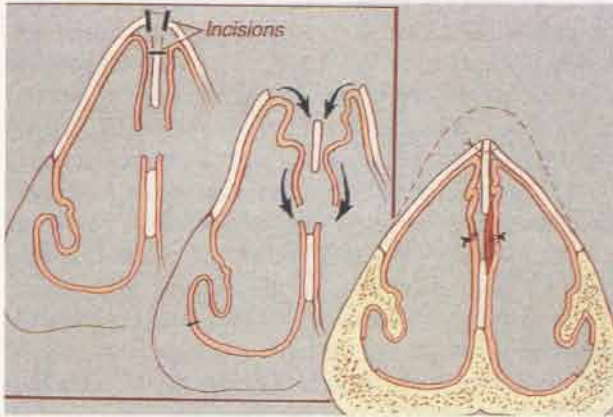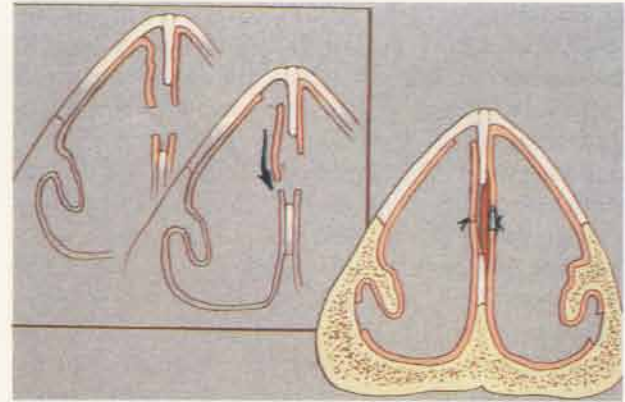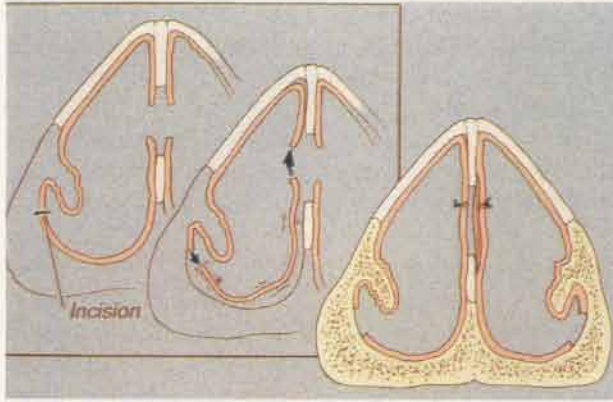
sewn in place to the cartilage remnant. From Kridel, R., Appling, D., Wright, W. Septal perforation closure utilizing the external septorhinoplasty approach. *Arch. Otolaryngol.* 112:168, 1986. Used with permission. N. Intraoperative view. O. The medial crura must be sewn back together, with the interposition of a columellar strut. The domes often should be sewn together for postoperative tip support and definition. P. Immediate postoperative view showing the Gelfoam packing in place prior to placement of the external nasal splint.
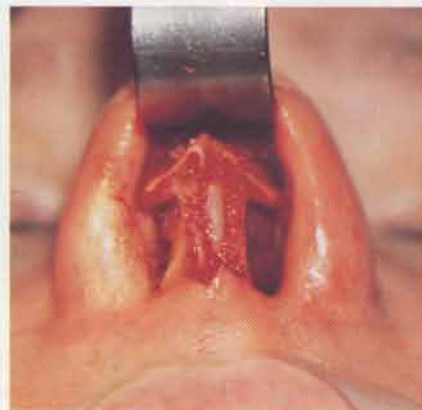
O

P

The middle crura are then separated and retracted laterally to access the caudal septum. The bilateral mucoperichondrial flaps are then elevated and only bare septal cartilage remains. This technique preserves the nutrient blood supply of the flap.

It is at this point that one of the great advantages of the open approach becomes apparent. As superior elevation of mucoperichondrial pockets is developed just underneath the junction of the upper lateral cartilages with the septum, a knife blade can be placed in this pocket to sharply separate the upper lateral cartilages from the septum. The mucoperichondrial flap is then attached to the upper lateral cartilage and can be retracted laterally, thus providing more visualization to the dorsal portion of the septum, as well as access to the posterior aspect of the septal perforation. The assistant can use a Converse retractor under the nasal skin and a skin hook to retract the middle crura laterally. A ball-ended elevator, such as a mastoid searcher, is very helpful to dissect the flap bluntly around the perforation in the posterior-inferior areas that are not easily visible. At the inferior caudal portion of the septum, the flaps are likewise elevated, and, after cutting some of the fibrous bands at the premaxilla, the surgeon uses a floor approach, with elevation of bilateral floor flaps using the Cottle elevator. These floor flaps extend all the way under the inferior turbinates. The bilateral floor pockets are then brought into continuity with the rest of the dissection on each side.

The most comforting step when dissecting between the adherent septal flaps is finally to reach the normal septal cartilage or bone. It is then clear that the surgeon has attained the correct plane between the two flaps. The first goal of dissection is to avoid any further perforations, which is accomplished by trying to identify normal anatomy. Once the cartilage is found, dissection is usually easier because the flap posterior to the cartilage can be dissected to assure correct position. The edges of the perforation are then approached, and an incision is made where the mucosal flaps have been adherent to the edges. This incision then creates three separate tissue planes: the left septal mucosa with the perforation, the cartilaginous septum with the perforation, and the opposite right septal mucosa with the perforation. Sometimes this incision through the perforation must be made posteriorly prior to dissection because of scarring. If there is any granulation-type tissue at the edges of the septal perforation, the edges may be freshened by removing a small amount of tissue circumferentially. If a crooked perpendicular plate, vomer, or maxillary crest is noted, the original septoplasty can be completed.

If the perforation is 1 cm or less, simple undermining and development of the flaps may be enough to enable closure of the mucosal perforation with simple interrupted 4-0 or 5-0 chromic or plain sutures. However, if there is any tension on the closure, or for larger perforations, mucosal advancement flaps must be considered. The first of these flaps to be used would be a bipedical floor flap. To mobilize the mucosa that has been elevated off the floor, the surgeon must make an incision laterally to allow the flap to shift medially and superiorly to close the perforation. An incision is made under the inferior turbinate on the bone over the lateral nasal wall, where the nasal wall bone is quite thin; the maxillary sinus can be entered if caution is not used. The flap should be checked to ensure it is thoroughly elevated off the nasal floor and the lateral wall. Its blood supply comes from its posterior and anterior attachments, which give it good viability. An attempt should then be made to close the perforation; for most perforations up to approximately 2.5 cm, bilateral inferior floor flaps may be all that are necessary.

For larger perforations (≥3 cm), bilateral bipedical floor flaps are not sufficient; a superiorly based bipedical flap is also necessary (Fig. 20-4). This flap can be developed in one of two ways. First, simple dissection of the mucoperichondrial flap off the upper lateral cartilage bilaterally can be performed [10]. This technique denudes the upper lateral cartilage on its undersurface, but no incision is actually made in the superior mucosa, thereby preserving even more blood supply. Such an approach can be used on both sides without fear of viability to the dorsal septum and the upper lateral cartilage that remain without mucoperichondrium. Second, a superior incision in the mucoperichondrial flap at the junction of the upper lateral cartilages and the septum can be made. If this latter technique is used, it can only be performed on one side or the dorsal septum would also be exposed bilaterally, which might predispose toward a new septal perforation at this level. Whichever technique is utilized, the extra mucosa needed to close the septal perforation is usually provided.

If the patient has a large dorsal hump and desires reduction, taking down the bony and cartilaginous hump after separating the upper lateral cartilages allows replacement of the upper lateral cartilages at a lowered height and also diminishes tension on the mucoperichondrial flap [12]. Therefore, hump removal with septal perforation repair can indeed be helpful (Figs. 20-5, 20-6). A large hump reduction may provide the extra mucosa needed for an otherwise unclosable perforation.
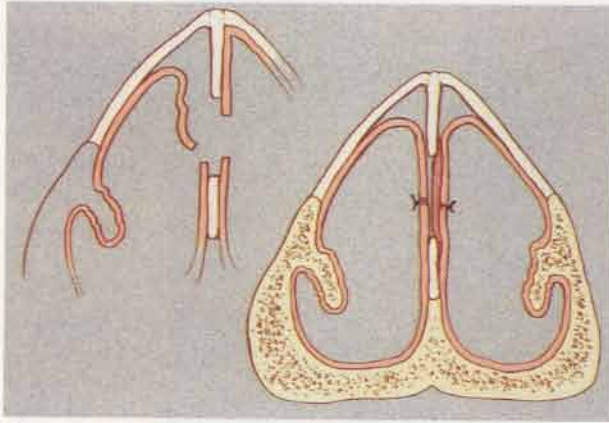
A

Figure 20-4
A. In larger perforations, not only must a floor flap be accomplished, but superior flaps must also be developed to provide extra mucosa. In this particular instance, the mucoperichondrial flap has been elevated from the undersurface of the upper lateral cartilage. B. Bilateral floor flaps, as well as bilateral superior flaps, have been developed. The temporalis fascia has been placed between the flaps, which have been closed, and the upper lateral cartilages have been reattached to the septum at their original height.
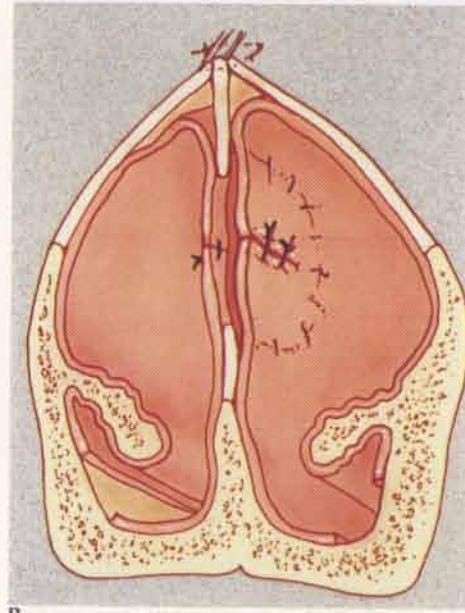
B

Figure 20-5
A. Preoperative view of a patient with a septal perforation as well as a dorsal hump. B. Postoperative view of the same patient after septal perforation repair and takedown of the dorsum. Patients must be aware that repair of the septal perforation will be the primary concern of physicians. If cosmetic changes are possible, they are an added benefit, but not the goal, of surgery.

A

B

Figure 20-6
A. This young woman presented preoperatively with a septal perforation due to previous septal surgery. B. Postoperative view showing takedown of dorsal hump and slight increase in rotation of the nasal tip.

After both the mucosal flap perforations have been reapproximated without tension, the harvested fascia graft is then placed between the repaired flaps. Surgeons should be certain it is centered in the area of the previous perforation. The fascia graft can be stabilized to prevent postoperative movement by sewing it directly to the septal cartilage remnant.

In some patients, it is not possible to close the perforation on both sides because of scarring or the size of the perforation; however, because of the interposition graft and because the other side is closed, the unclosed side will usually heal with time if left undisturbed. At least one side must be closed, however, and if the bipedical method (both superior and inferior) is not adequate, unipedical flaps must sometimes be developed, basing the mucosal flap either anteriorly or posteriorly. The disadvantage of this approach is that the flap has less blood supply and certainly has the potential for vascular compromise and flap loss.

Closure

The upper lateral cartilages are reattached to the dorsal septum using interrupted horizontal mattress sutures. Sometimes there is some downward traction on the upper lateral cartilages because of the mucosal flap perforation closure. It is best to reattach the upper lateral cartilages at that level to the septum, which does not cause increased tension on the flap closure. Such reapproximation, however, may cause the upper lateral cartilages to be set too far down the septum, creating a postoperative "pinched" appearance. If such low placement is necessary, and if it is not possible to remove a dorsal hump to obviate such a pinched appearance, then onlay cartilage grafts over the upper lateral cartilages must be considered [12].

The septal flaps are sewn together with a 4-0 chromic mattress suture and a very sharp needle, using a continuous suture technique to bring the flaps and the graft into close approximation and to prevent postoperative hematoma. If the needle becomes blunted, it could possibly cause fraction and displacement of the interpositioned graft between the septal flaps. Sometimes the needle needs to be changed during suturing.

As mentioned, a columellar strut is necessary to prevent postoperative tip drop. The medial crura have already been splayed apart, but usually a premaxillary pocket dissection must also be performed. A strong, straight cartilage strut is developed, placed in the premaxilla directly between the medial crura, and sewn to the medial crura using multiple deep sutures. Despite the septal perforation, there usually is enough cartilage left within the septum to provide necessary struts and grafts while still preserving anterior and superior septal

strength. However, if septal cartilage is in short supply, ear or rib cartilage may be used.

Attention should then be focused on the nasal tip, and any other routine modifications here can be accomplished. In previously operated noses, cartilage is usually added and rarely is there resection of any more dome cartilages. A tip graft or onlay cartilage grafts to the lower lateral cartilages or the medial crura are often necessary. In most patients, it is wise to suture the dome cartilages together to prevent postoperative bossae.

The nasal skin is then returned to its normal anatomical position, and the transcolumellar incision is closed first by taking tension off the skin incisions by using one subcutaneous 6-0 PDS suture placed at the apex of the inverted-V. Closure of the external skin of the columella is then accomplished by placing an interrupted 6-0 Prolene suture at each lateral corner of the transcolumellar incision. The rest of the skin is closed using meticulously placed interlocking 6-0 fast absorbing plain gut sutures. The inverted-V breaks up what would otherwise be a straight-line scar, which would be more noticeable and could possibly lead to retraction. Other authors have described using a totally horizontal incision, but I have had the opportunity to examine these incisions many years after surgery, and they are quite noticeable. The marginal incisions are usually closed by one or two interrupted 5-0 plain sutures.

The center portion at the V almost invariably fades imperceptibly. If care is not taken to reapproximate exactly the lateral portions of the columellar flap, a little bulge is possibly noticeable. The 6-0 fast absorbing gut sutures are usually gone within four days if the patient applies a small amount of antibiotic ointment starting right after surgery. In the rare event that any irregularities do ensue, minor dermabrasion with a diamond fraise can be accomplished 6 to 8 weeks after the initial surgery.

The repaired septal flaps must now be protected. We continue to advocate use of thin (0.020 inch) pliable Silastic sheeting placed on both sides of the septal mucosa overlying the repair site [11]. This sheeting should remain in place for approximately three weeks after surgery. The rationale here is that the perforation cannot always be closed on both sides, especially with large perforations. The Silastic sheeting protects the graft site and allows for uninterrupted healing and tissue migration. If a raw area were to be exposed to the air, it would often crust over and dry out. These bilateral soft sheets not only keep tissue grafts well apposed, but also keep the healing edges moist and

appear to speed up the healing process. The Silastic sheeting also prevents inadvertent injury to the nose during the cleaning process at postoperative visits. I do not advocate use of plastic septal splints, because they are usually rather sharp and firm. Any Silastic sheeting should be sewn through-and-through, but lightly, to avoid constricting the repair site when the septal membranes swell during healing postoperatively. Usually three sutures are necessary; if one suture comes out, the others hold the sheeting in place.

It is very important not to place a large amount of packing in the nose. As the nose swells, the packing could cause vascular compromise of the perforation repair site. I continue to advocate using Gelfoam that has been cut into 1.5 by 5.0-cm strips and impregnated with an antibiotic cream or ointment [11]. Approximately three to four such strips are placed in each nostril. The antibiotic cream is important because it helps keep the nose aseptically moist postoperatively. The use of Gelfoam is important because it helps soak up any bleeding as a result of development of the bipedical flaps and protects the exposed area of bony floor while it is covered by mucosa postoperatively.

The nose is then externally taped and splinted whether any dorsal modifications, osteotomies, or grafts have been used. The simple action of elevating the open rhinoplasty flap creates a potential for blood accumulation postoperatively, and a standard external nasal splint must be placed to prevent hematomas.

The posterior pharynx is then carefully suctioned, and the oropharyngeal throat pack is removed. A check for hemostasis is performed, an oral airway is usually placed, and the patient turned over to the anesthesiologist for extubation. An external nasal drip pad and mastoid dressing are usually placed at this time.

POSTOPERATIVE CARE

It is important to tell patients that there will be bloody discharge postoperatively. Providing a large number of 4 × 4 all-gauze nasal drip pads and tape is helpful. This discharge often subsides over the first 24 hours, but it is usually necessary to wear a nasal drip pad for approximately one week because other drainage is to be expected.

On the first postoperative day, a small amount of the Gelfoam is suctioned, but no attempt is made to remove all the Gelfoam. Patients are instructed to use saline nose drops 3 to 4 times a day (at least 10 drops in each nostril) to help keep the

nose moist and to loosen the Gelfoam. The patient should be seen periodically over the next 7 to 10 days, and suctioning is performed until all the Gelfoam has been removed. The patient is encouraged to gently place antibacterial ointment in the nose using Q-tips bilaterally to prevent postoperative crusting. The external nasal splint is usually removed at about one week, and the nose is usually retaped for another week. The two lateral interrupted Prolene sutures on the columella are usually removed at approximately five days, by which time most of the fast-absorbing gut sutures along the columella have dissolved.

Three weeks after surgery, the Silastic sheeting is removed bilaterally; patients usually note improved breathing. In the rare event that the mucosa is not totally healed and a crusted area is noted, copious amounts of antibacterial ointment should be applied, and no attempt to remove the crust should ever be made. Given adequate time and moisturization, crusting areas will usually become covered by mucosa themselves.

Patients should be warned not to use any vasoconstrictive sprays postoperatively, and also not to smoke or to inhabit areas where they might be exposed to noxious fumes. Blowing the nose is also to be avoided for the first month postoperatively. For patients in dry climates, humidification with a vaporizer and application of intranasal ointment should be considered for the first 6 weeks after surgery.

The mastoid dressing and drain are usually removed from the donor site on the first postoperative day if there has been no significant drainage. The external scalp sutures are removed at approximately 7 to 10 days. Perioperative antibiotics are important but must be started prior to surgery. I have used cephalosporins for many years without any infections. Some patients may also find postoperative antihistamines to be of assistance until the splints are removed.

In patients with very large perforations (>3 cm), closure has not always been possible [11]. In my experience, surgery should be attempted even in these large perforations to make the patient more asymptomatic and to close as much of the anterior perforation as possible. The more posterior the perforation, the less symptomatic it is to the patient because there is less drying and crusting. I advocate use of the open external rhinoplasty approach for closure of septal perforations. I have achieved success using this approach, in combination with Fairbanks' method of Gollom mucosal advancement flaps with an interposition connective tissue graft.

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