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III. 研究成果の刊行物・別刷

CHAPTER

79

Midface Reconstruction

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The midface includes the cheek, maxilla, palate, orbit, and nose. The face presents a human's identity to others. In addition, functions such as respiration, mastication, deglutition, and speech are greatly influenced by midface morbidity. The goal of midface reconstruction, therefore, is to minimize functional as well as aesthetic defects. However, in general, less attention has been paid to reconstruction of the midface than of other areas of the head and neck, especially in cancer treatments.[1,2] Because three-dimensional reconstruction of the skin, bone, and mucosa complex is required, technical difficulties may interfere with adequate midface reconstruction. Reconstructive options, however, have been greatly expanded with the introduction of various procedures during the last few decades, including microvascular free tissue transfers.[3,4]

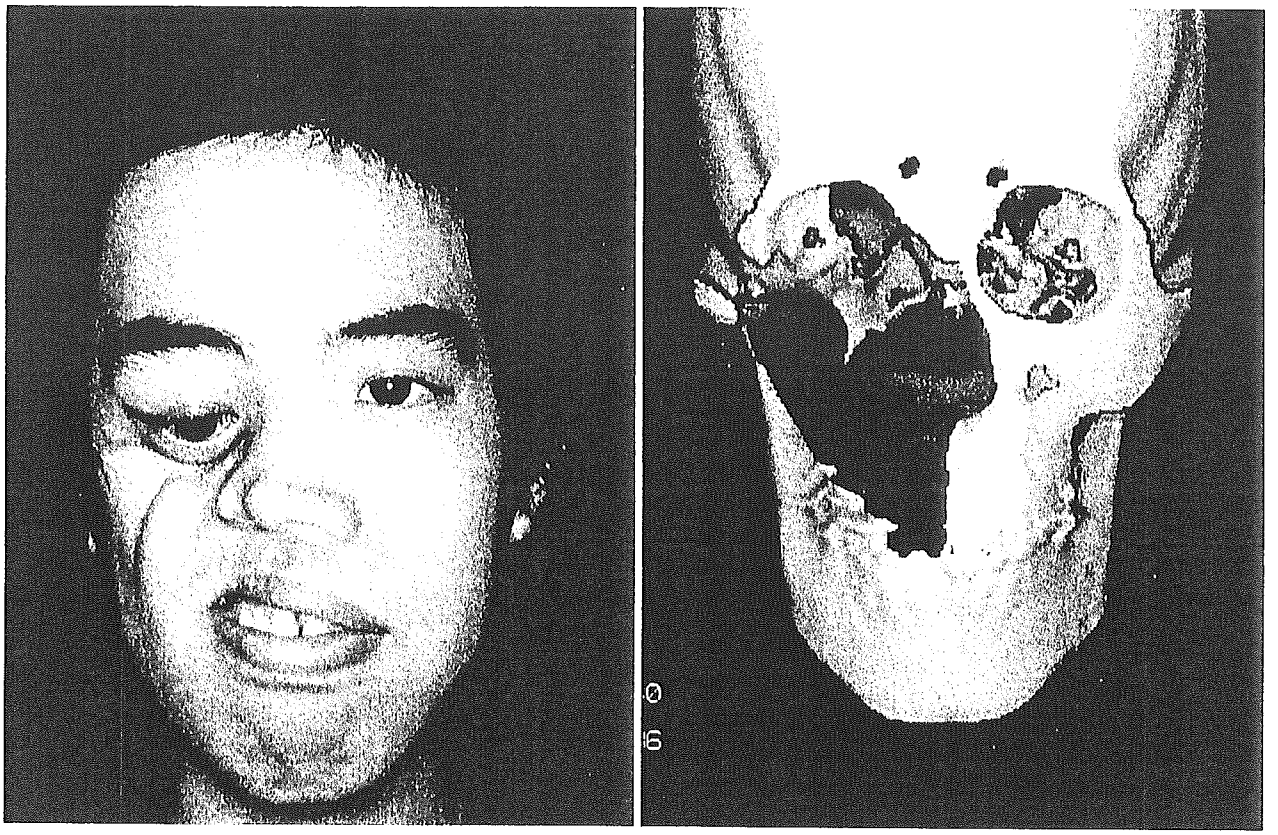
ANATOMIC STRUCTURES OF THE MIDFACE

The midface represents the central portion of the face and includes a wide area of soft tissues and musculature supported mainly by the maxillary and zygomatic bony scaffolds. It extends to the orbit and the anterior skull base. Sagging or downward deviation of the ocular globe caused by an inadequate or absent orbital floor frequently leads to diplopia and eye pain as well as facial disfigurement.[5] A watertight seal between the nasoethmoidal and intracranial spaces is a prerequisite in defects of the anterior skull base to minimize life-threatening infections. Three-dimensional structures of the midface consist of various elements, such as skin and subcutaneous tissues, muscles, bones, and oronasal mucosal lining, which makes reconstruction complex and difficult. It is made more difficult by the need for optional aesthetic reconstruction as well as functional restoration.

Specific Organs

Eyes are an important focal point in the midface and serve as the primary antenna of the central nervous system. Maxillary and zygomatic bones support the orbital bones and their contents. Impairment of the orbital bones as well as of the extraocular muscles may cause dislocation of the globes, frequently resulting in diplopia and eye pain. Enophthalmos and hypophthalmos caused by orbital bone deficiencies also lead to severe functional morbidity as well as an asymmetric appearance (Fig. 79-1).

The nose acts as both a respiratory and olfactory organ. It serves as the primary airway in the upper respiratory system, filtering inspired air and providing warmth and humidification. Inability to breathe through the nose causes discomfort, chronic oral drying, and olfactory dysfunction.[5] The functional roles of the paranasal sinuses are still controversial, but they apparently reduce the weight of the facial skeleton and head and also protect the brain from anterior impact. Their function is not critical, but the sinus spaces are important to maintain the volume of the anterior face. In addition to respiratory and olfactory functions, the nose itself is aesthetically important because of its central location in the face. It often presents a significant challenge to a reconstructive surgeon.



A B

FIGURE 79-1. *A,* Severe depression deformity of the cheek and downward dislocation of the eye after resection of a right maxillary carcinoma including a large part of the maxillary bone. The patient complained of diplopia and eye pain. *B,* A three-dimensional computed tomography scan of the same patient is shown.

Soft Tissues

Facial skin has unique characteristics including rich sebaceous glands, color, texture, and flexibility. The aesthetic facial units first mentioned by Gonzalez-Ulloa et al[6] need to be considered in reconstruction of the midface. Skin in such widely differing areas as the cheek, nose, lips, and orbital regions must be matched according to the criteria mentioned. The lips are defined from the cheek by the nasolabial sulcus running from the nasal ala to the angle of the mouth. Relaxed skin tension lines or wrinkle lines are also important landmarks to note for minimizing incisional scars on the face.[7]

Facial subcutaneous fat consists of small and dense fat particles and tends to accumulate in the buccal region. The buccal fat pad is deeply in the cheek between the masseter and buccinator muscles, forming the wall of the cheek with the buccinator muscle.

Posteriorly in the cheek, the masseter muscle covers the vertical ramus of the mandible. The parotid gland, the largest salivary gland, is located subcutaneously in the posterior cheek, forming a flattened and three-sided pyramid. The superficial surface of the parotid gland is covered by a dense parotid fascia, partly connected to the superficial musculoaponeurotic system, blending caudally with the platysma fascia and anteriorly to masseter muscle fascia.[8] Clinically, the parotid gland is separated into two portions by the facial nerves. The superficial and large portion anteriorly covers the posteroinferior portion of the masseter muscle. Posteriorly, it covers the ramus and temporomandibular joint of the mandible. It also extends cephalically to the zygoma while it tapers caudally and overlaps the posterior belly of the digastric muscles. The deep and relatively small portion of the parotid gland is mostly located beneath the mandibular ramus. The function of the subcutaneously underlying mimetic musculature innervated by the facial nerves is extremely important. The mimetic muscles allow humans to communicate emotionally with others through various expressions. Treatment of a paralyzed face, therefore, has been a great challenge for reconstructive plastic surgeons.[9]

Bones

The skeletal framework of the midface consists of thicker segments of pillar bones, the so-called buttresses, which form the major support system of the face.[10,11] As Coleman[12] emphasized, the buttresses of

the midface are vertically and horizontally oriented and form a three-dimensional skeletal support, preventing soft tissue collapse inward and downward (Fig. 79-2). The paired maxillary and zygomatic bones, palatine bones, orbital bones, and nasofrontal bones serve as the buttresses. Of these, the three vertical buttresses of the maxilla—the nasofrontal, zygomatic, and pterygomaxillary—maintain the midfacial projection and vertical height. The lower horizontal buttress, chiefly consisting of the palatal bone and maxillary alveolus, provides a normal occlusal plane to the mandible. It also keeps facial width and proportion in close connection with the vertical buttresses. The upper horizontal buttress, consisting of the infraorbital rim and zygomatic arch, supports the eyes and forms the zygomatic prominence, aesthetically important in manifesting a three-dimensional form of the face. Between these buttresses, thin membranous bones intervene to separate cavities and are lined with oronasal mucosa.

Vessels and Nerves

The blood supply to the midface is primarily from branches of the external carotid artery. The facial artery, accompanied by the anterior facial vein, is the only significant cutaneous blood supply of the cheek. However, many close anastomoses with other arteries also serve the midface (e.g., infraorbital, buccal, transverse facial arteries). Sacrifice of the facial artery itself, therefore, leaves no impairment of blood supply to the midface. The deeper blood supply is derived from the branches of the internal maxillary artery, a branch of the external carotid artery, as well as from communicating branches of the external carotid artery. Abundant blood supply from many arteries frequently makes hemostasis difficult in patients with severe trauma.

There are two major nervous systems in the midface, the trigeminal and facial nerves. The sensory nerves originating from the sensory branches of the trigeminal nerve contribute to sensory innervation to the face; the motor branches of the trigeminal nerve innervate the muscles of mastication, such as the temporal, masseter, and pterygoid muscles. The facial nerve chiefly supplies the motor branches to the mimetic muscles.

Finally, lymph drainage of the midface gathers primarily into the parotid and submaxillary lymph nodes and flows to the cervical lymphatic system.

MORBIDITY AND ETIOLOGY

Congenital anomalies, trauma, tumor resection, degenerative diseases, or diseases with an unknown etiology can cause midfacial morbidity. A hemifacial microsomia, although uncommon, typically presents as underdevelopment of the cheek including the mandible, maxilla, and soft tissues. It is sometimes

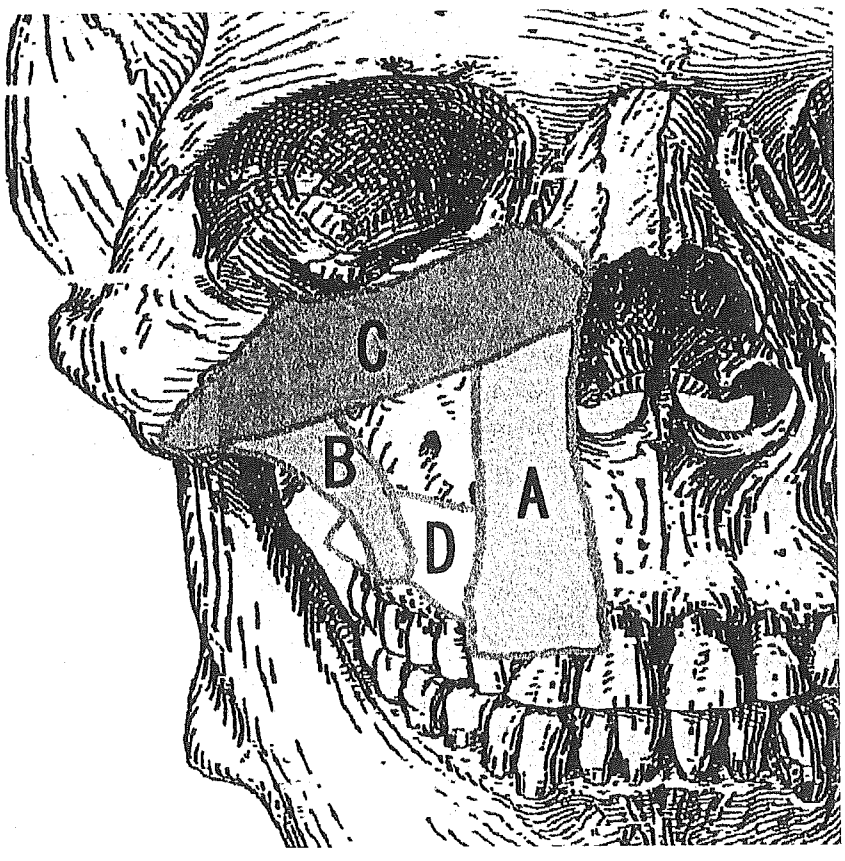


FIGURE 79-2. Schema of the maxillary buttresses: A, nasomaxillary buttress; B, zygomatic buttress; C, upper horizontal buttress mainly consisting of the infraorbital rim and zygomatic arch; D, lower horizontal buttress mainly consisting of the palatine bone and alveolus.

accompanied by facial paralysis because of loss of the mimetic muscles (Fig. 79-3). Severe facial clefts may also require soft tissue reconstruction as well as skeletal rearrangement with a craniofacial procedure. Devastating trauma, such as a gunshot wound or industrial accident, often leads to deficiencies in soft tissues and supportive bones. Deep burns frequently leave thick, wide scars that are best reconstructed with skin grafts.

Defects and morbidity after resection of tumors, however, represent the majority of patients requiring midface reconstruction. For example, radical orbital-nasal-maxillary resection for maxillary carcinoma results in massive and complex defects of the orbital content, maxillary and zygomatic bones, palate, mucosal lining of the oronasal cavity, and sometimes soft tissues of the face. Exposure of the brain through an anterior skull base defect should be immediately sealed from the upper aerodigestive tract to prevent a life-threatening infection (Fig. 79-4). An adequate dental prosthesis may also be required for normal mastication and facial appearance to be regained.

In addition to malignant tumors, extensive resection of a large vascular malformation, such as arteriovenous malformation or lymphangioma, may leave skin, soft tissue, and bone defects (Fig. 79-5). Facial paralysis may become a problem when a wide and deep vascular malformation of the cheek is resected. Parotid tumors, particularly if they are malignant, frequently also result in facial paralysis as well as a soft tissue depression after resection.

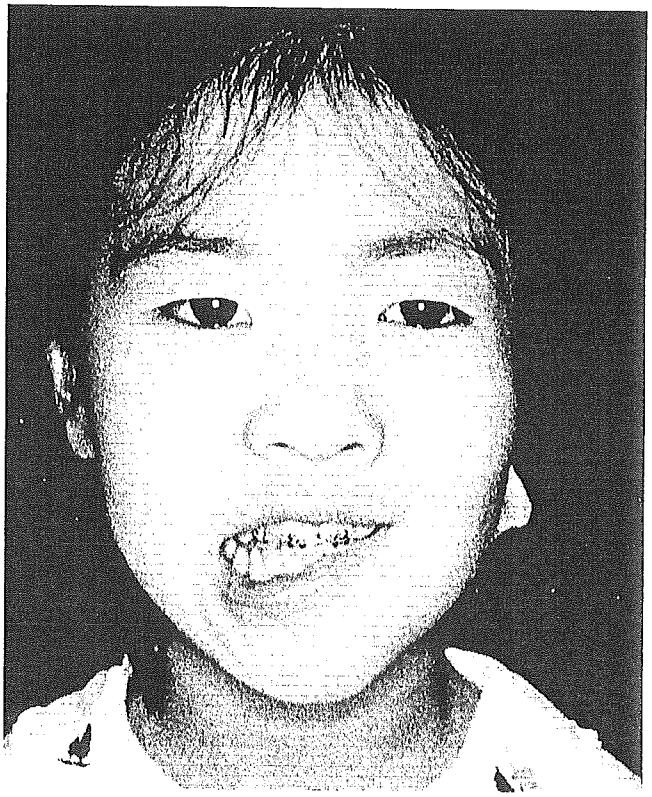


FIGURE 79-3. Left hemifacial microsomia with paralysis of the lower face.

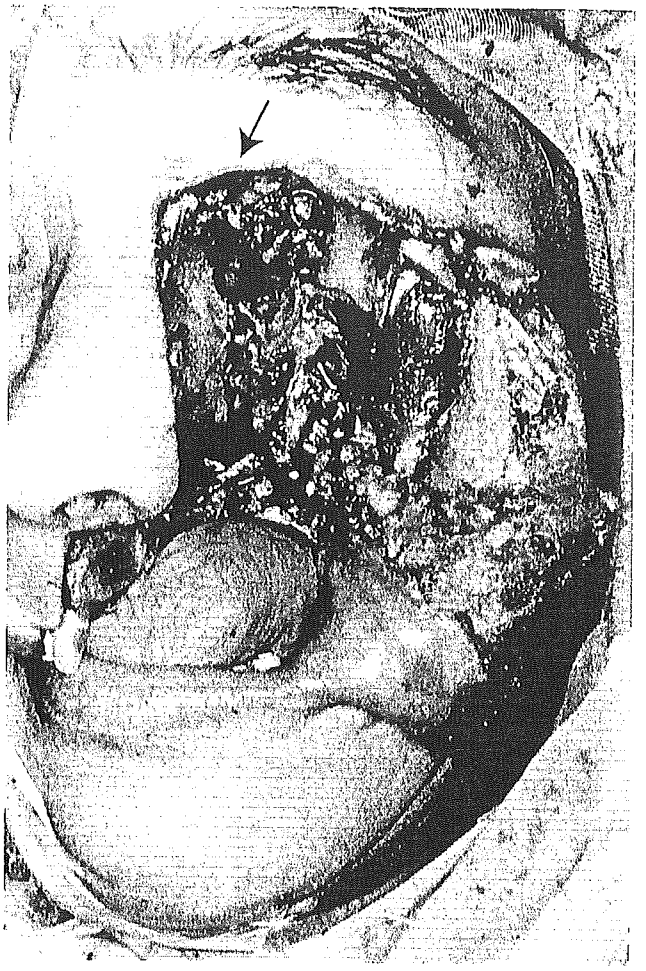


FIGURE 79-4. A large cheek defect with exposure of the brain through a defect of the anterior skull base *(arrow)*. Immediate sealing of the brain from the aerodigestive tract is required to prevent a life-threatening infection.

Irradiation, preoperatively or postoperatively, may also cause some sequelae, such as bone necrosis, chronic radiation ulcers, and contractures. Surgery and adjuvant radiotherapy for soft tissue sarcoma or retinoblastoma in children frequently result in underdevelopment of the cheek and the mandible. Such degenerative diseases as progressive hemifacial atrophy (Romberg disease), lipodystrophy, and localized morphea also cause a severe depression of the cheek, leading to significant cosmetic defects.

PREOPERATIVE EVALUATION

It is important preoperatively to evaluate the type of defect present and the anatomic location. The patient and the patient's requirements should also be carefully assessed. A complete understanding of the functional and aesthetic relationship of the normal midfacial units is also indispensable. For example, the goal of surgical therapy for maxillary cancers is total extirpation of the tumor with cure of the patient. However, resection of the maxillary bone, paranasal sinus, palate, zygoma, and possibly orbit results in

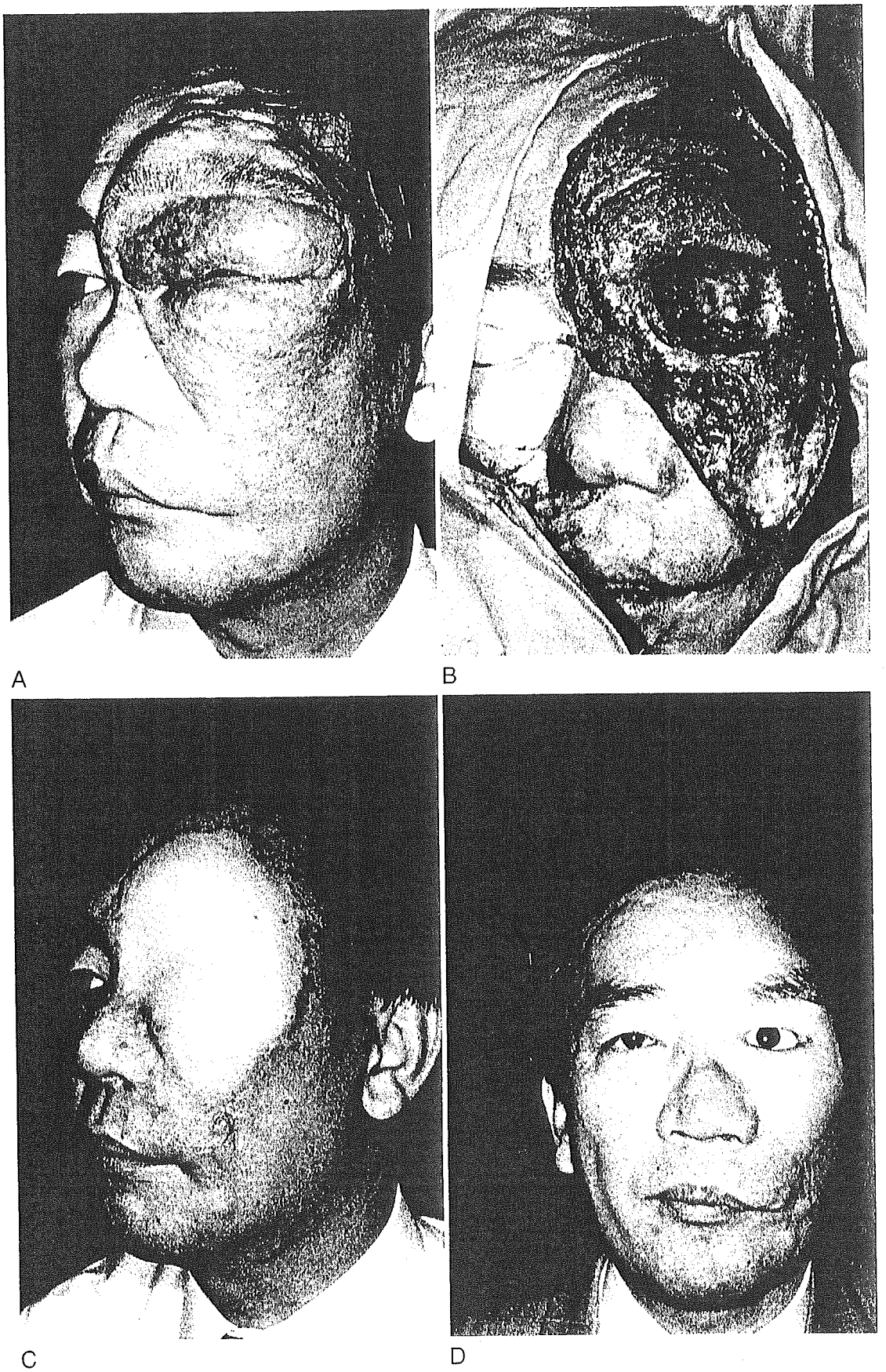


FIGURE 79-5. A 44-year-old man with a severe arteriovenous malformation of the left upper cheek including the eye. *A*, Preoperative view. *B*, Soft tissue defects after extensive resection including the eye. *C*, Immediate coverage with a free latissimus dorsi flap, 4 months postoperatively. *D*, Final result, 2 years postoperatively, after eye socket and eyebrow reconstruction.

significant functional and aesthetic defects and severe morbidity (Fig. 79-6).[13]

A reconstruction algorithm should be regulated by the type of patient, the size of the defect, the anatomic location of the defect, and the structures involved. Wells and Luce[13] proposed a classification of midfacial defects after resection of maxillary malignancies into five unique types according to the size of the skin defect, the extent of the loss of maxillary buttress, the size of the palatal defect, and the loss of orbital support. In the following sections, these types of midfacial defects are listed and categorized in accordance with the size and depth of the defect, location, and structures involved.

Type I Defect

A type I defect includes the cutaneous and superficial subcutaneous tissues. The underlying bony framework and deep structures are mostly intact. No penetrating defects to the aerodigestive cavities are noted. Surgery for burn scar, traumatic scar, and various nevi for which laser treatment is ineffective frequently results in a type I defect. When a skin defect cannot be closed directly, various standard reconstructive modalities for skin replacement are required. A simple skin graft or local flap reconstruction is the preferred choice.[14] Tissue expansion can provide a sufficient local skin flap with good color and texture from the surrounding region to close a relatively large defect, although some authors have reported a high complication rate.[15]

FIGURE 79-6. A full-thickness defect of the cheek after extensive resection of an advanced maxillary cancer and radiation treatment.

Type II Defect

Deeper soft tissue defects, sometimes including the mimetic and masticatory muscles, require greater bulk to restore facial contour. These are classified as type II defects and are frequently caused by progressive hemifacial atrophy (Romberg disease), lipodystrophy, localized morphea, severe hemifacial microsomia, and ablative surgery for extended malignant tumors of the parotid gland. Facial skin and intraoral mucosa are intact or minimally involved.

A de-epithelialized free skin flap or omental free flap is the ideal reconstructive option for augmentation of missing soft tissues for type II defects (Fig. 79-7).[16,17] A galea-temporoparietal fascia or temporal muscle flap can also augment a depressed orbital region and upper cheek with a simple technique when the defect is limited (Fig. 79-8).[18,19] A conventional pedicle flap from a distant area would be a choice only when local tissues cannot be employed or no vessels are available for free vascularized tissue transfers. A free autogenous fat or dermal fat graft is indicated when a defect is relatively small and has a well-vascularized bed.

When loss of the mimetic muscles results in facial paralysis (which greatly distresses patients because of facial asymmetry as well as dysfunction), a neurovascularized free muscle or musculocutaneous flap can often provide a good result (Fig. 79-9).[20,21]

Type III Defect

A full-thickness defect of the cheek predominantly results from resection of advanced malignant neoplasms. Simultaneous reconstruction of a through-and-through defect of both internal lining and external coverage requires a difficult and complex reconstructive procedure.[22-24] Pedicled or free musculocutaneous flaps, such as the pectoralis major, trapezius, latissimus dorsi, or rectus abdominis flap, can form two or more separated skin paddles on the muscle pedicle. This can then be safely folded to provide flaps for simultaneous coverage of both the internal lining and external skin defect of the cheek (Fig. 79-10).[25-29] In most situations, free musculocutaneous flaps are the most versatile choice because of their reliable vascularity. However, free fasciocutaneous flaps, such as the radial forearm flap, may also serve as a folded flap.[30,31]

Reconstruction of a total or subtotal nasal defect is also a challenging procedure because the nose is located

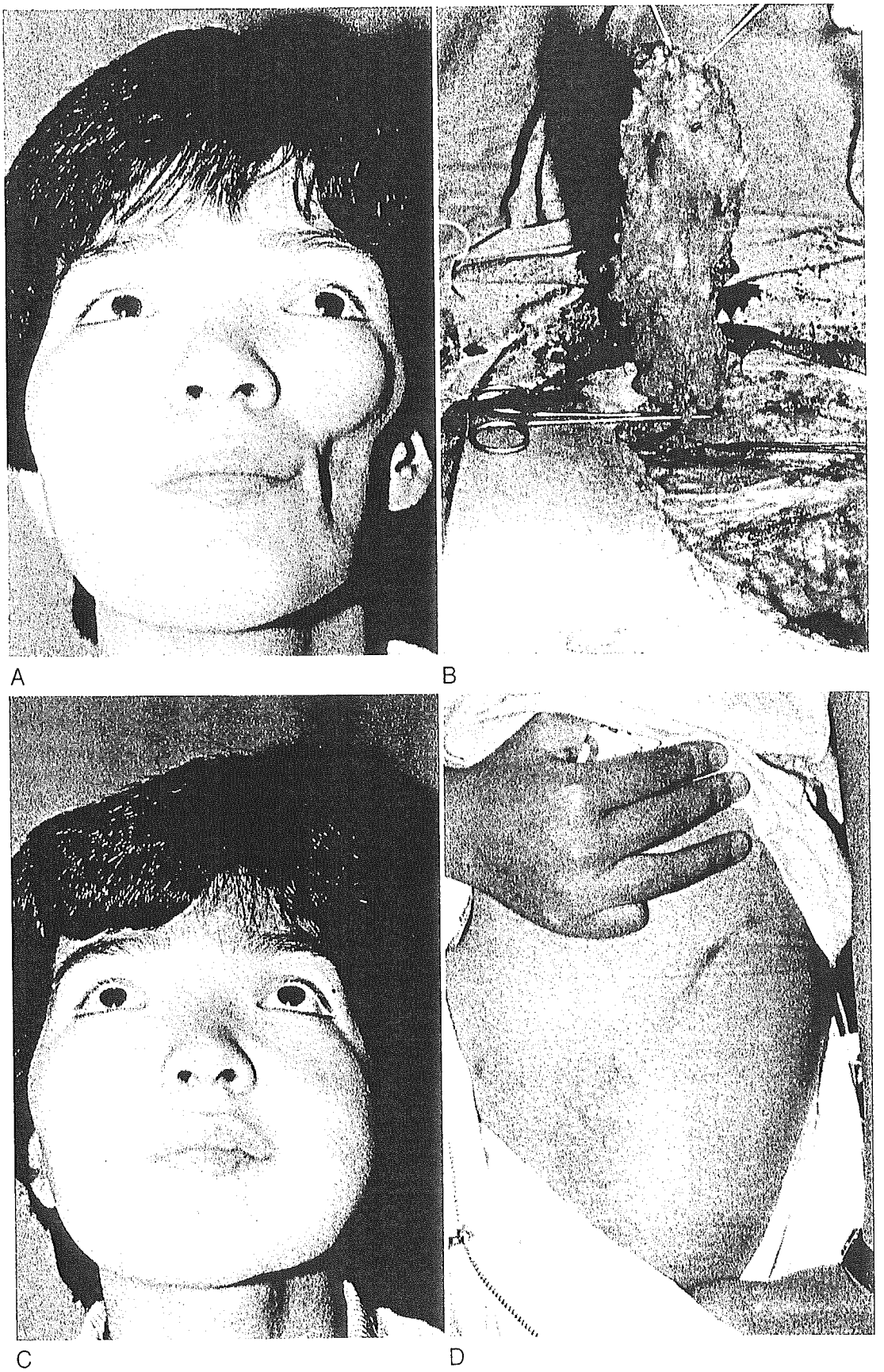
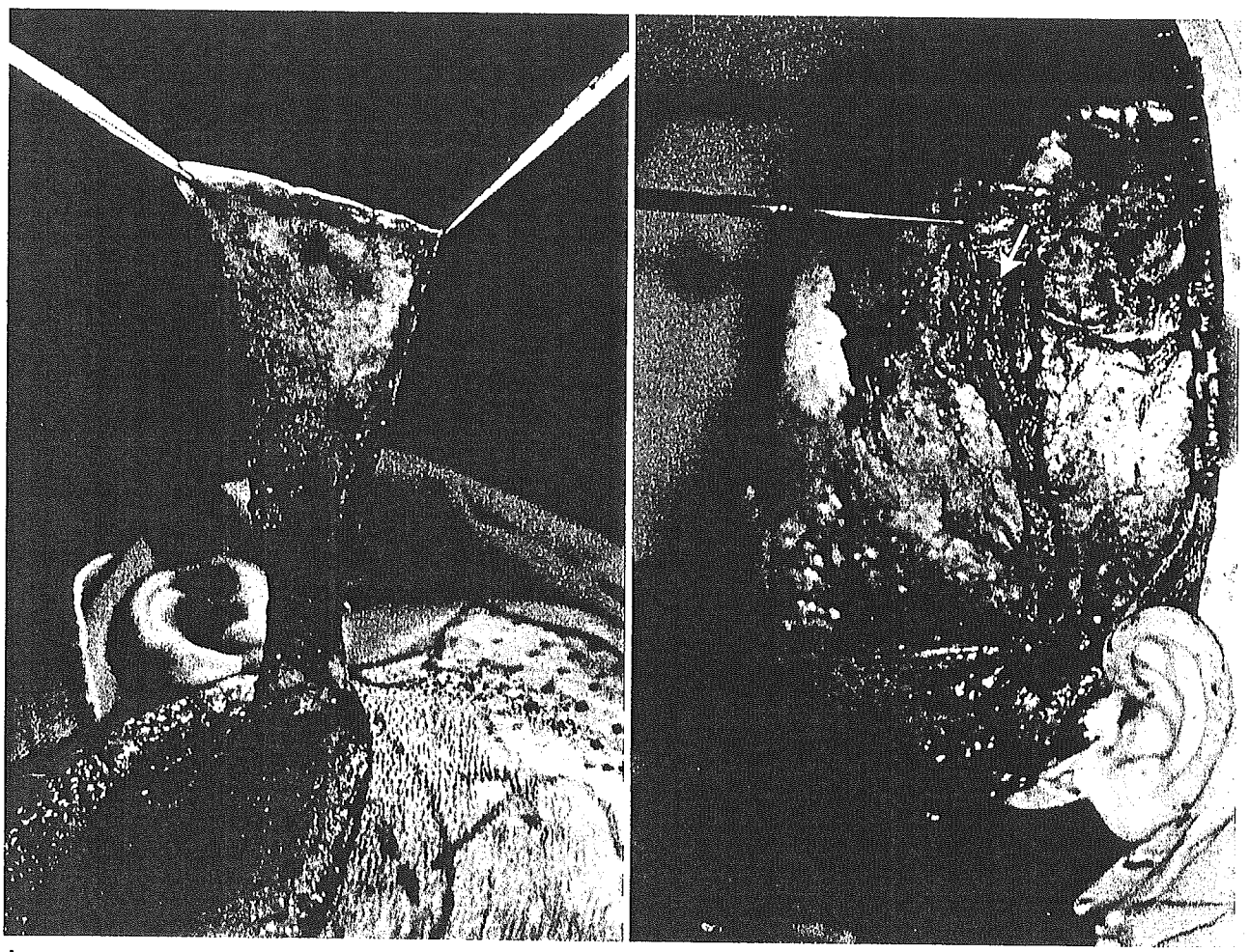
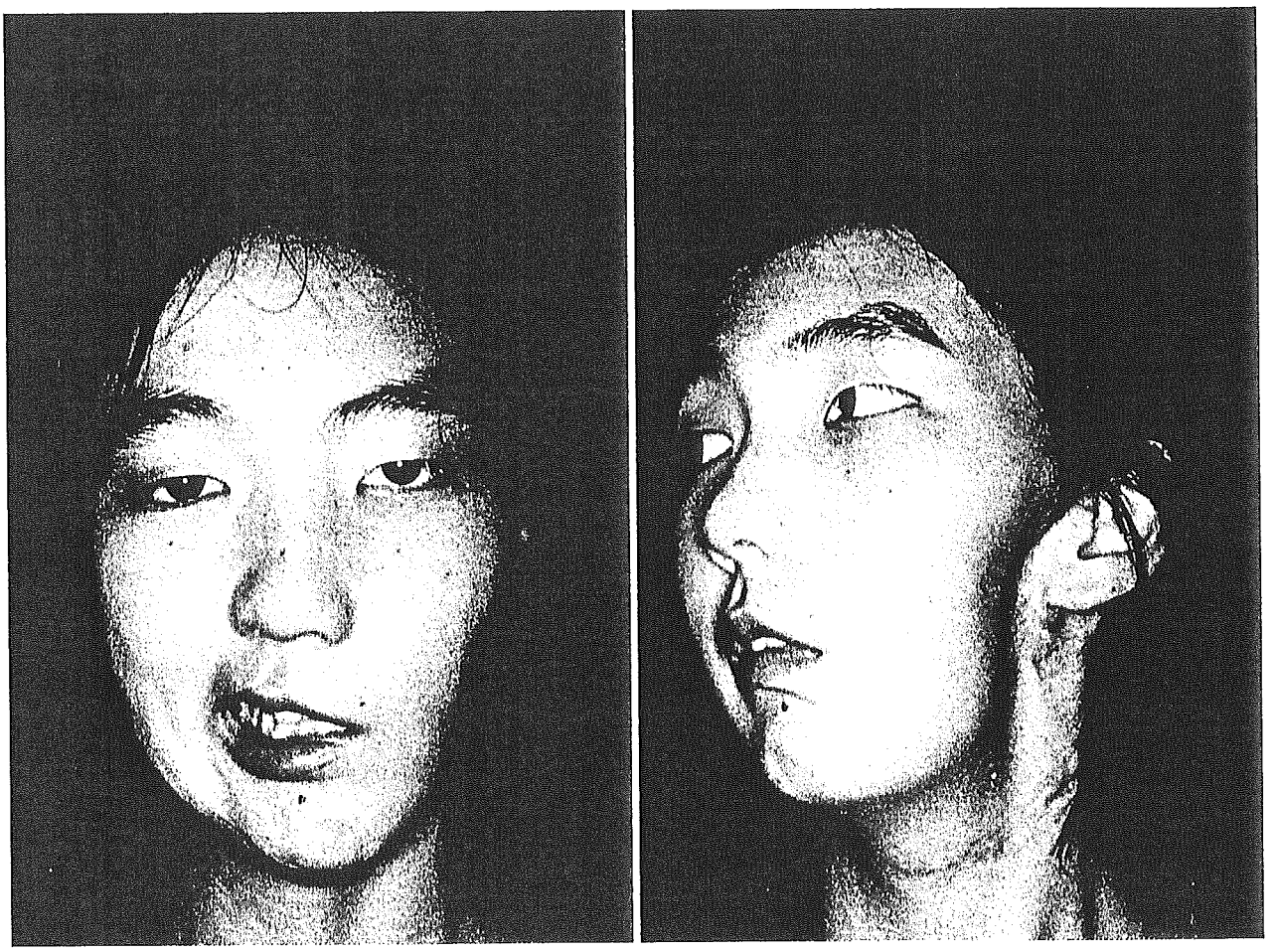


FIGURE 79-7. A 20-year-old woman with severe progressive hemifacial atrophy (Romberg disease). *A*, Preoperative view. *B*, Elevation of a de-epithelialized groin flap, which was transferred to augment the depressed cheek. *C*, Two years postoperatively. *D*, A scar directly closing the donor defect is well accepted by the young woman. (From Hirabayashi S, Harii K, et al: A review of free de-epithelialized skin flap transfer for patients with progressive hemifacial atrophy. J Jpn Soc Plast Reconstr Surg 1987;7:260.)



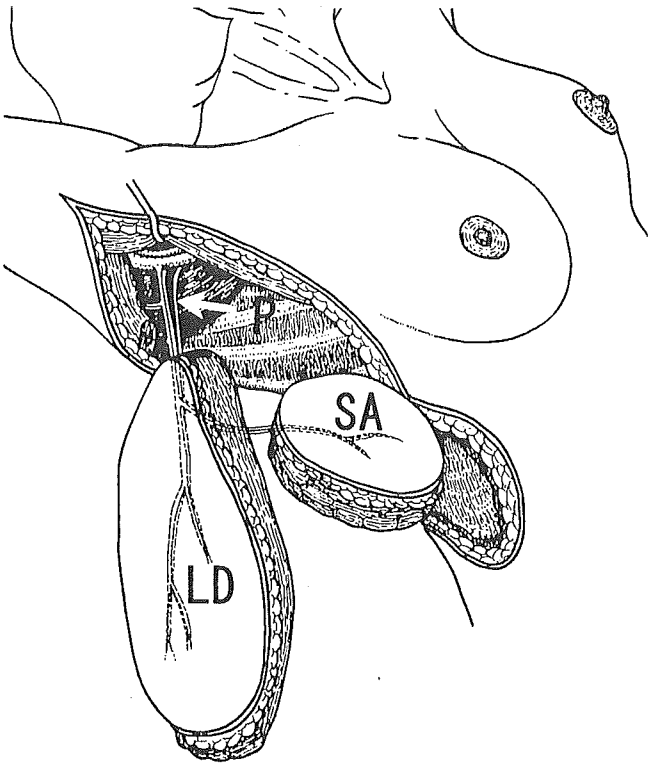
A B

FIGURE 79-8. *A*, Elevated galea-temporoparietal flap. *B*, A vascularized calvarial bone segment *(arrow)* elevated with a temporoparietal flap.

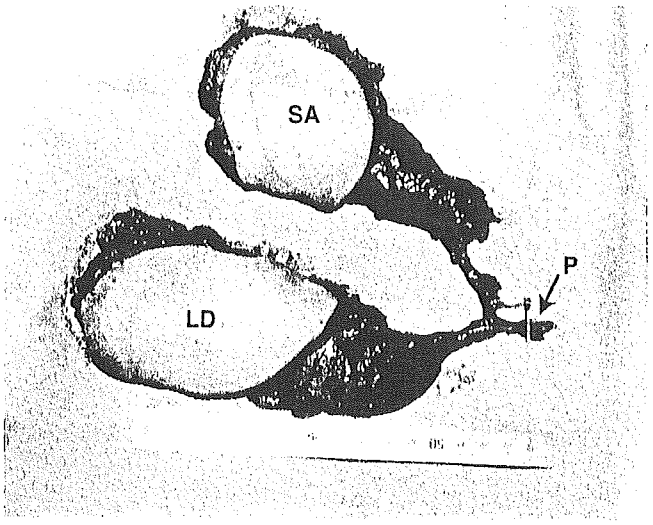


A B

FIGURE 79-9. *A* and *B*, The patient with facial paralysis and cheek depression after extensive parotidectomy including the facial nerve is a good candidate for a neurovascular free muscle or musculocutaneous flap.



A



B

FIGURE 79-10. A double musculocutaneous flap with the latissimus dorsi and serratus anterior muscles, nourished by a common pedicle of the thoracodorsal-subscapular vessels, is available for closure of full-thickness cheek defects. *A*, Schema of flaps. *B*, Isolated flaps. LD, latissimus dorsi flap; SA, serratus anterior flap; P, thoracodorsal-subscapular vessel pedicle.

in the center of the face and therefore requires a good aesthetic result.[32] A forehead flap is the best reconstructive option for the nose because of its good color and texture match and proper skin thickness. An expanded forehead flap can provide a sufficient amount of tissue for reconstruction of the total nose.[33,34] A free flap may be an alternative if forehead skin is not available or the patient refuses the use of forehead skin because of its conspicuous donor scar (Fig. 79-11). The free flaps currently used, however, are either a poor color and texture match or of an unfit thickness. Development of a new flap or prefabricated flap would be required to achieve a better result.[35]

Type IV Defect

Type IV defects include deformities to bony structures or bony frameworks (buttresses) of the maxilla and zygoma leading to significant aesthetic deformities of the cheek as well as serious functional morbidity of the eye and dentition. Trauma, severe congenital facial cleft, and tumor ablation may cause this type of defect. Although a large defect of the anterior maxillary wall may cause a depression deformity of the cheek from collapse of the subcutaneous soft tissues into the paranasal sinus, loss of the multiplanar buttresses causes severe deformities of the orbit, cheek, and alveolus.[36,37] Type IV defects are further divided into two subtypes, IVA and IVB.

TYPE IVA DEFECT

Partial loss of the maxilla with loss of the palate and alveolar ridge is a type IVA defect. The nasomaxillary and zygomaticomaxillary buttresses and floor of the orbit including Lockwood ligament are intact. In maxillary cancer cases, this type of bone defect is usually associated with loss of the internal mucosal lining, which permits use of a free skin graft and allows the use of a denture prosthesis. The prosthesis also serves as a palatal obturator and assists in maintaining midfacial projection.

TYPE IVB DEFECT

A type IVB defect indicates a more extensive loss of the maxillary bone including the nasomaxillary and zygomaticomaxillary buttresses, palate, and floor of the orbit. Total maxillectomy for maxillary cancer frequently leads to this type of defect. Devastating trauma, such as a gunshot wound, also causes an extensive defect of the maxilla; however, this type of defect occurs in far fewer patients than do those defects resulting from resection of maxillary cancer. Reconstruction of the bony constitution, especially the upper horizontal buttress and orbital floor, is required for maintenance of facial contour and prevention of dislocation of the globe (Fig. 79-12). When soft tissue lining is complete, an autogenous free bone graft or costal cartilage graft may safely replace the

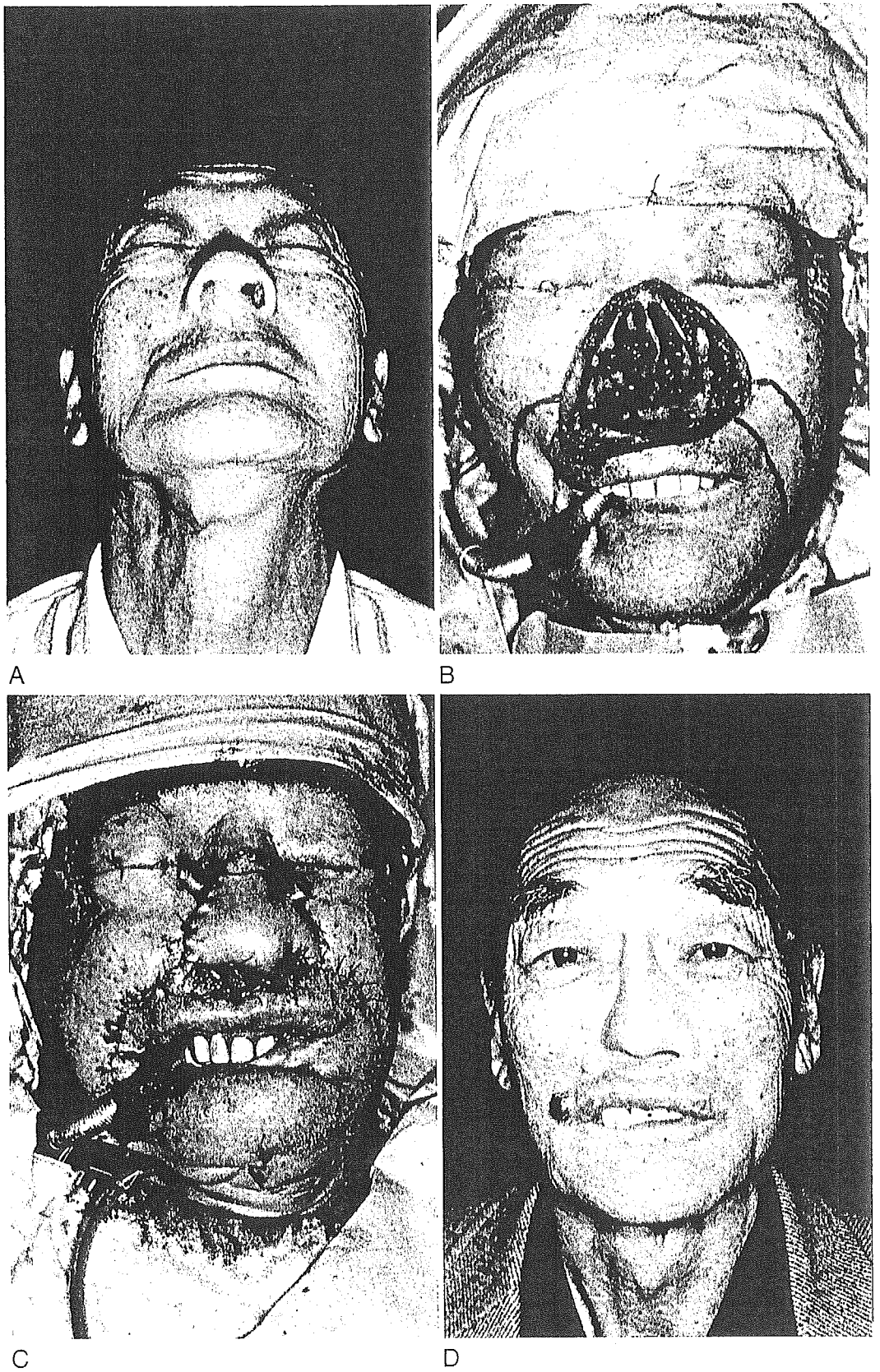
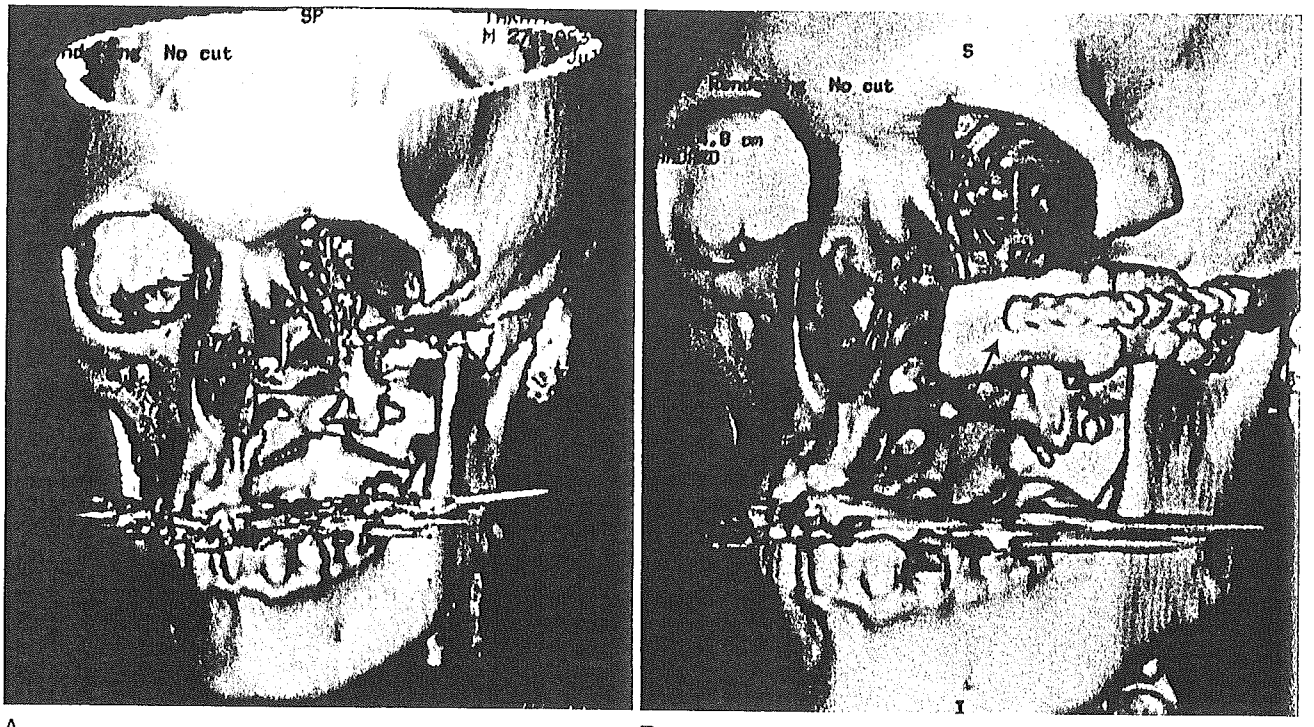


FIGURE 79-11. A 69-year-old man with a squamous cell carcinoma originating from the nostril floor. Despite an innocuous external appearance, the tumor was invasive to a wide area of the nose. *A,* Preoperative view. *B,* Extensive nasal defect after wide resection of the tumor required immediate reconstruction for nasal function and appearance. *C,* Because the defect was too extensive in this particular case, a free radial forearm flap was employed instead of a standard forehead flap. The lining was made by bilateral nasolabial flaps. An iliac bone strut was also used to support the nasal height. *D,* Good appearance obtained 6 months postoperatively. (From Takushima A, Asato H, Harii K: Reconstructive rhinoplasty for large nose defects. Jpn J Plast Reconstr Surg 2003;46:881.)



A B

FIGURE 79-12. *A,* Three-dimensional computed tomographic image of an extensive loss of the upper part of the maxillary bone after resection of a sarcoma in a 27-year-old man. *B,* Three-dimensional computed tomographic image, 6 months postoperatively, after reconstruction of the upper horizontal buttress by a free scapular osteocutaneous flap to correct the downward dislocation of the eye. Arrow indicates a well-surviving scapular bone segment placed into the bone defect of the upper maxillary buttress.

buttresses.[38] A vascularized calvarial bone graft pedicled by the temporoparietal fascia is especially useful for reconstruction of infraorbital and zygomatic regions of the midface.[39-41] However, its size is limited, and difficulty in fabrication may be a problem. In contrast, a free vascularized bone graft or osteocutaneous flap offers a more reliable bone replacement option for extensive bone defects, although the surgical technique is more complex.[42,43]

Reconstruction of the alveolar ridge is also important to affix dentures. Osseointegration has now been popularized in restorative dentistry to stabilize prostheses,[44,45] but it frequently requires an adequate bony support or platform using vascularized bone grafts.[46,47]

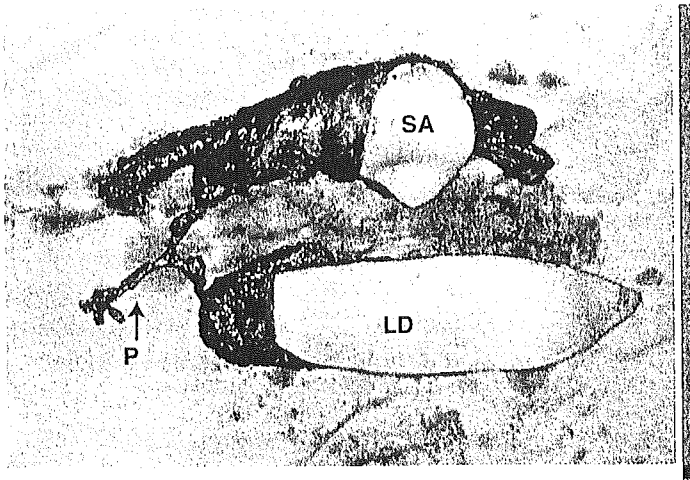
Type V Defect

A total maxillectomy with palatectomy for maxillary cancer or devastating injury to the midface may frequently result in massive defects, or a type V defect, combining the maxillary bony framework, mucosal lining, and cutaneous coverage. Reconstruction is challenging for these defects because the complex maxillary framework or buttresses should be replaced by a suitable support; extensive soft tissue replacement may also be required. In most instances, free flaps are the best reconstructive option because they provide various types of composite tissues in addition to adequate vascularity in a single-stage operation (Fig. 79-13). Of the free flaps currently used, the free scapular osteocutaneous flap and fibular osteocutaneous flap are preferred. These flaps provide a well-vascularized bony support as well as skin flaps for covering skin or mucosal defects. Dual transfer of the osteocutaneous flap and radial forearm flap is also useful for reconstruction of complex defects including maxillary bone, mucosal lining, and skin.

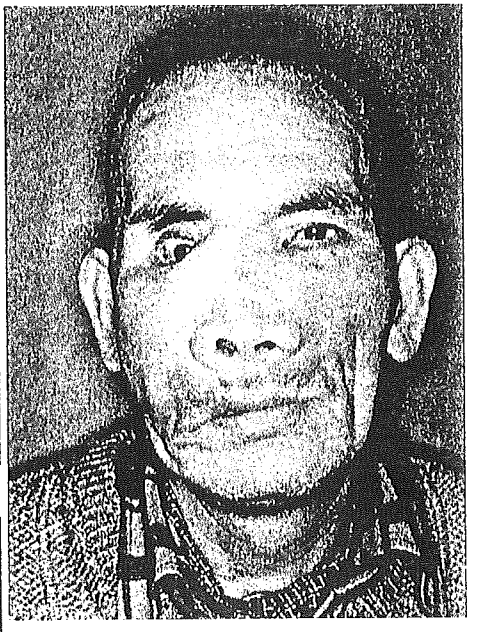
FIGURE 79-13. A 57-year-old man with a large low-grade adenocarcinoma originating from the bilateral maxillary sinuses. *A,* Preoperative view. *B,* Extensive defects of the lower part of the bilateral maxillary bones including oral mucosa and cheek skin. *C,* For immediate closure of these extensive defects, double free flaps including the latissimus dorsi flap (LD) and serratus anterior flap with a rib segment of 10 cm (SA) were harvested and transferred with anastomoses between the facial vessels and thoracodorsal vessels (P). The rib segment was fixed to the bilateral zygomatic arches with miniplates and K-wire. *D* and *E,* Postoperative view and computed tomographic image (arrow indicates the grafted rib segment) 6 months later.

A

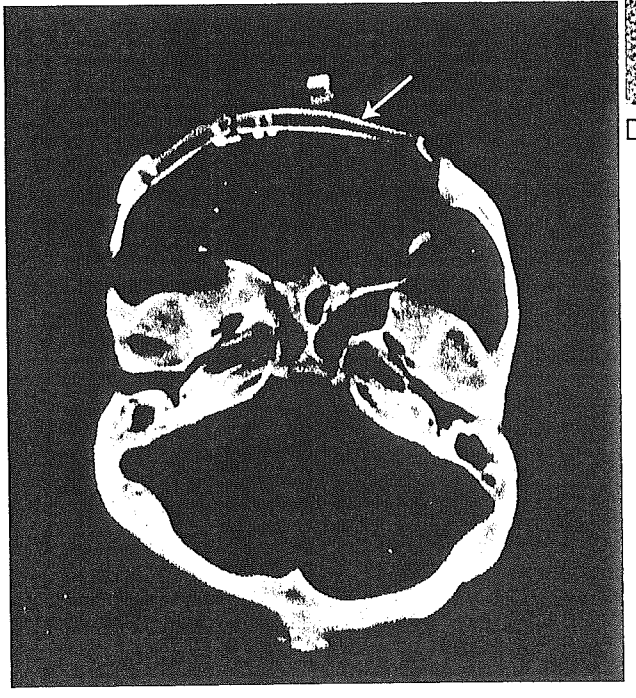
B



C



D



E

OPERATIVE MANAGEMENT

Skin and Soft Tissue Defects

SKIN GRAFT

A free skin graft is the most simple and traditional surgical treatment option when a defect is limited to the skin or superficial cutaneous layer (type I defect, such as postexcisional defect of scar tissue after a burn injury or trauma). The regional aesthetic units should be considered to obtain inconspicuous scar margins of skin grafts.[6] Full-thickness skin grafts usually produce better cosmetic results than do split-thickness skin grafts. The skin graft, however, cannot usually provide skin of an analogous color or texture, and the aesthetic result is frequently poor (with the possible exception of resurfacing eyelids with a postauricular skin graft). Recruitment of free skin grafts in midface reconstruction is therefore limited from an aesthetic standpoint.

LOCAL FLAP AND SOFT TISSUE EXPANSION

A good functional and aesthetic result requires reconstruction to replace missing tissue with similar tissue. Local flaps, such as rhomboid flaps or subcutaneous flaps, can migrate skin with similar color and texture to the missing skin.[48] They produce a good aesthetic result for closure of relatively small but deeper defects. However, secondary scarring after the use of local flaps should always be considered. A flap developed in the forehead can safely provide skin of good-quality color and texture for reconstruction of the nose and midface, but resulting scars in the forehead may present a problem.[22] An expanded forehead flap can provide a sufficient soft tissue flap with minimal donor site scars for reconstruction of a total defect of the nose (Fig. 79-14). A malar flap or cervicofacial fasciocutaneous flap[49,50] is another option for closure of relatively large and full-thickness defects of the cheek. Soft tissue expansion can greatly extend the application of local flaps for large defects in the head and neck.[15,51] An expanded cervicofacial flap can be especially useful for extending the flap to the high cephalad level of the cheek and the lower eyelid (Fig. 79-15).[52] For larger defects, distant or free flaps may be required.

DISTANT FLAP

Before introduction of the musculocutaneous flap, the deltopectoral flap developed by Bakamjian[53] was the preferred procedure for head and neck reconstruction. Staged procedures and limited reach of the pedicle, however, make this reconstruction difficult and lengthy, and it has now been primarily replaced with musculocutaneous flaps such as the pectoralis major, latissimus dorsi, and trapezius.[54] Of these, the pectoralis major musculocutaneous flap developed by Ariyan[55] is one of the preferred musculocutaneous flaps for head and neck reconstruction. The pectoralis major musculocutaneous flap can be extended up to the cheek and infraorbital regions, although vascularity of a skin paddle developed from the distal portion of the pectoralis major muscle may sometimes be unstable. The donor site scar and resulting disfigurement, however, may be a problem for some patients.

The latissimus dorsi muscle has a long vascular pedicle, and its pedicled musculocutaneous flap can reach the zygomaticotemporal region.[56] Vascularity of a large skin island developed on the muscle is highly reliable when the flap includes one or more musculocutaneous perforators. Several skin paddles can be designed on the latissimus dorsi muscle and employed as a folded flap to close a full-thickness defect of the oral and pharyngeal regions. The main drawback of the latissimus dorsi musculocutaneous flap for head and neck reconstruction is the difficulty in positioning the patient for simultaneous resection and flap dissection. This frequently requires a change in the patient's position during surgery and lengthens the operation time.

Other pedicled musculocutaneous flaps, such as the trapezius and sternomastoid flaps, may also be employed for repair of cheek and midface defects. However, because of freedom of flap design and the ability to transfer various types of tissues, the microvascular free flap is generally more versatile than the pedicled flap in head and neck reconstruction.

MICROVASCULAR FREE FLAPS

Microvascular free flap transfer has enabled the development of many new fields of reconstructive surgery in the head and neck. Free skin flaps, such as the groin and deltopectoral flaps, were first employed for resurfacing cutaneous defects of the face and neck[57] or for augmentation of depressed areas of the face as a de-epithelialized flap.[58] A sufficient amount of soft tissue required in the recipient site can be transferred in a one-stage operation. Selection of adequate donor tissue matching the recipient defect provides the best reconstructive option.

Midface reconstruction, however, has been greatly advanced by clinical introduction of various reliable microvascular free flaps, such as free musculocutaneous and fasciocutaneous flaps, in the 1980s. Free musculocutaneous flaps, such as the latissimus dorsi and rectus abdominis flaps, provide a thick soft tissue flap suitable for repair of large or deep midfacial and cheek skin defects. These musculocutaneous flaps can be folded and used to reconstruct a full-thickness cheek defect (Figs. 79-16 and 79-17).[25,28,29] When a skin defect is relatively small and thin, free fasciocutaneous flaps, such as the radial forearm flap, dorsalis pedis flap, or

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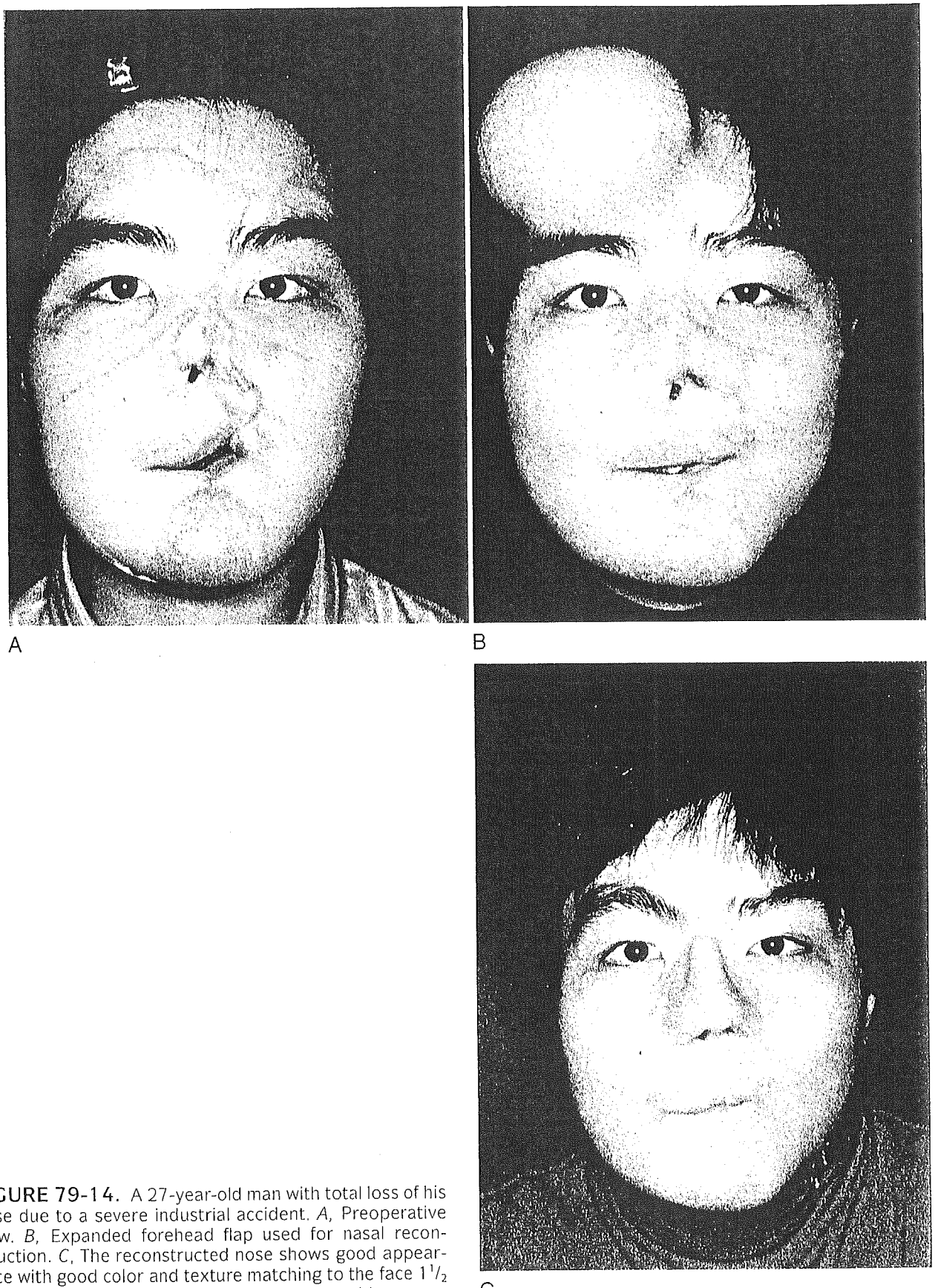

FIGURE 79-14. A 27-year-old man with total loss of his nose due to a severe industrial accident. *A*, Preoperative view. *B*, Expanded forehead flap used for nasal reconstruction. *C*, The reconstructed nose shows good appearance with good color and texture matching to the face $1^1/_2$ years later. The donor site scar is also acceptable.

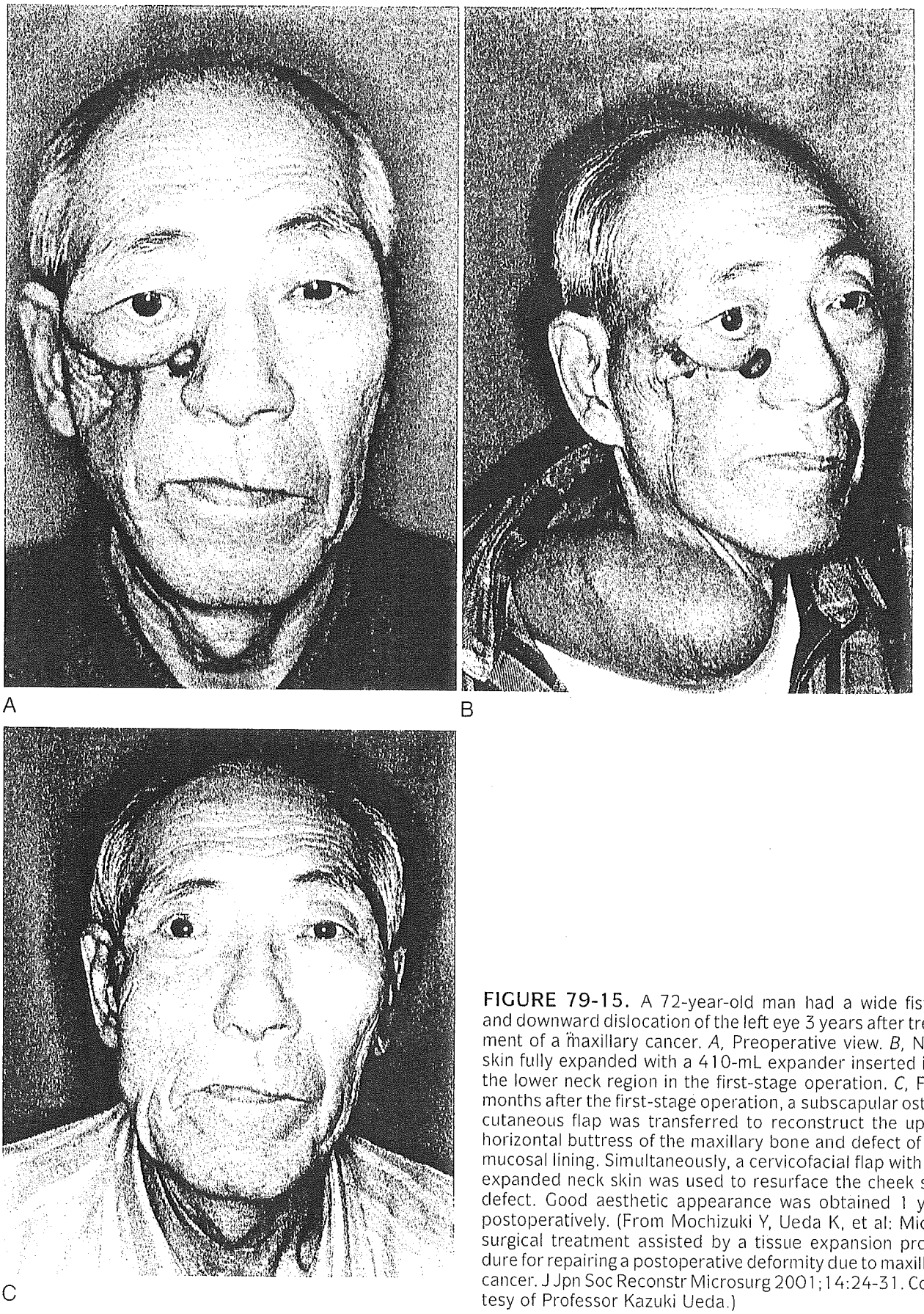

FIGURE 79-15. A 72-year-old man had a wide fistula and downward dislocation of the left eye 3 years after treatment of a maxillary cancer. *A,* Preoperative view. *B,* Neck skin fully expanded with a 410-mL expander inserted into the lower neck region in the first-stage operation. *C,* Four months after the first-stage operation, a subscapular osteocutaneous flap was transferred to reconstruct the upper horizontal buttress of the maxillary bone and defect of the mucosal lining. Simultaneously, a cervicofacial flap with the expanded neck skin was used to resurface the cheek skin defect. Good aesthetic appearance was obtained 1 year postoperatively. (From Mochizuki Y, Ueda K, et al: Microsurgical treatment assisted by a tissue expansion procedure for repairing a postoperative deformity due to maxillary cancer. J Jpn Soc Reconstr Microsurg 2001;14:24-31. Courtesy of Professor Kazuki Ueda.)