Volume 2

Section 9 – PLASTIC AND RECONSTRUCTIVE SURGERY

Chapter 80 – Management of Skin Cancer of the Head and Neck

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Cancer of the skin is the most common form of cancer in humans. The incidence of skin cancer is greater than that of all other forms of cancer combined and is increasing faster than any other cancer, largely because of an aging population and the popularity of sun exposure during the last half-century. Skin cancer is most common in the 60- to 80-year-old age group, and as our life expectancy and this segment of the population have increased, the incidence of skin cancer has risen dramatically. In addition, since discovery of the health benefits of vitamins in the early 20th century, particularly the role of sunlight and production of vitamin D, sun exposure was advocated for its health benefits. As leisure time increased and convenient transportation offered sunny vacations to those living in colder climates, the lifetime exposure to ultraviolet light increased as well, thereby expanding the age range and incidence of skin cancer in each age group. Skin cancer contributes in part to the practice of most specialties in medicine, and because the majority of skin cancers arise on sun-exposed areas of the head and neck, it is an important part of operative otolaryngology. Together, these and other epidemiologic factors have resulted in a virtual epidemic of skin cancer that requires the expertise of multiple specialties of medicine.

Malignant neoplasms may arise from any cell type in the skin, and thus there are numerous forms of skin cancer to consider. Cancer may arise from the epidermis (epidermal precursor cells [basal cell carcinoma], differentiated epidermal cells [squamous cell carcinoma], and melanocytes [melanoma]), neuroendocrine cells (Merkel cell carcinoma), adnexal skin cells (sebaceous glands [sebaceous carcinoma], eccrine glands [eccrine carcinoma, microcystic adnexal carcinoma], and apocrine glands [extramammary Paget's disease]), fibroblasts (dermatofibrosarcoma protuberans [DFSP], atypical fibroxanthoma, and malignant fibrous histiocytoma), endothelial cells (angiosarcoma), and smooth muscle (leiomyosarcoma). Each type of skin cancer has a unique appearance, biologic behavior, prognosis, and response to treatment, so knowledge of each type is important before treatment is begun. This chapter discusses the biology and operative management of the most common forms of skin cancer of the head and neck.

PATIENT SELECTION

Selection of patients for surgical management of skin cancer is not difficult. Most patients are surgical candidates. Most skin cancers are small (<2 cm) and can be treated under local anesthesia in the office, ambulatory surgery center, or hospital outpatient setting with or without sedation. Many common contraindications to surgery do not apply to these smaller operative procedures. For example, patients taking anticoagulants such as aspirin or warfarin (Coumadin) may safely continue their medications for most skin cancer surgery. The risk of complications from thrombosis caused by discontinuing their medications (i.e., stroke or heart attack) is more serious than the uncommon and less serious complication of bleeding or hematoma (<1%). Age is also rarely a contraindication to surgery. Most skin cancers are treated by simple operative procedures that have very few risks or complications and are not disruptive, even to fragile elderly patients. A short operative procedure in 1 day is often less disruptive than managing chronic nonhealing skin ulcers from untreated skin cancer.

Contraindications to Surgery

Although contraindications to surgery for skin cancer are rare, a few situations should be considered. The first issue is life expectancy rather than age. One must consider, all together, the type of skin cancer, its biologic behavior, and the patient's health and life expectancy. For example, basal cell carcinoma is a slowly growing tumor that may be asymptomatic for years. Therefore, treatment is no emergency, and there may be no need to treat a small nonulcerated basal cell carcinoma in a patient with other metastatic disease and a life expectancy of less than 1 year. On the other hand, treatment of nodular melanoma in an independent 95-year-old patient may be curative and allow the family to celebrate the potential 100-year mark. Each patient and each tumor must be considered individually, but health and life expectancy are more important than age when considering the need to treat skin cancer.

Another important consideration in patient selection and the decision for surgery is the extent of disease and the impact of surgery. Although surgery for skin cancer is rarely serious or life-threatening, there are occasions when extensive or invasive tumors may require surgery that has a significant mortality rate and impact on quality of life after surgery or is unlikely to achieve cure. In these rare cases the balance of risks and benefits must be weighed carefully. Is it worthwhile to remove one eye because of a slowly growing basal cell carcinoma in an elderly patient who has little or no vision in the other eye? Is temporal bone resection for management of a “close positive margin” after excision of squamous cell carcinoma worth the mortality risk? In difficult management cases, discussions and informed consent must include a realistic probability of results from treatment versus no treatment, as well as the possibility of alternative forms of therapy or palliative treatment.

When selecting patients for surgery it is also important to discuss nonoperative alternatives. Although surgery usually offers a simple treatment with little pain, delivers specimens for a pathologist to evaluate the success of removal, and is usually accompanied by an aesthetic reconstruction, there are significant reasons to consider alternative methods. The single most common treatment of skin cancer today is the use of destructive techniques such as curettage and electrodesiccation, laser destruction, cryosurgery, radiation therapy, or topical treatment with chemotherapy and immunomodulating creams. Altogether, they offer cure rates similar to those of surgical excision in properly selected patients after considering variables such as tumor type, size, location, and patient expectations of cosmetic results.

Curettage with electrodesiccation is the technique commonly used for small noninvasive basal cell carcinomas less than 2 cm in diameter and very small squamous cell carcinomas. Under local anesthesia, a circular knife 2 to 6 mm in diameter is used in a scraping motion to remove the tumor, which is soft in comparison to the normal surrounding dermis. Scraping removes the majority of the tumor, and this portion of the procedure is followed by electrodessication of the wound, which destroys an additional 3 to 4 mm of skin and soft tissue. This procedure is not useful if the tumor involves fat, cartilage, or tissue, for which one cannot feel the contrast between tumor and normal skin with the curette. Similarly, it is not useful in scar tissue, recurrent skin cancers in scar tissue, or hard infiltrating tumors that cannot be separated from normal dermis. After removal of the tumor and wider destruction with electrodesiccation, the wound heals by secondary intention, and a pale but acceptable scar is often left in carefully chosen locations.

Laser destruction is often successful for superficial skin cancers confined largely to the epidermis and superficial dermis, such as superficial basal cell carcinoma and Bowen's disease or microinvasive squamous cell carcinoma. Like electrodesiccation and curettage, the wounds are left to heal by secondary intention, and pale white scars often result. Two advantages of laser destruction are its ability to destroy very superficial layers of skin with less destruction than occurs with curettage and electrodesiccation and its ability to detect focal invasive areas of tumor during vaporization by their unique “bubbling” reaction as opposed to the simple shrinkage of underlying normal dermis.

Cryosurgical treatment of skin cancer uses liquid nitrogen as a coolant to freeze tumor and adjacent skin and kill cells by dehydration or the formation of intracellular ice crystals, which will burst the cell. It is often claimed as a method to kill cancer cells and preserve a viable framework of collagen that heals with less scarring than with other techniques. However, in practice, the cosmetic result is similar to that achieved with other destructive techniques, and the results are quite operator dependent because there is no way to accurately judge the depth of destruction without significant experience.

Radiation therapy for skin cancer was once a popular alternative to surgery that was used by dermatologists and radiation oncologists alike. It too is quite operator dependent because experience is needed to estimate not only the width of the surgical margin but, with more difficulty, the depth of tumor invasion as well. In practice it is inconvenient for most patients because 10 to 30 visits are required, and it is also the most expensive treatment option. The advantage of radiation therapy is that it provides a cure rate similar to that of surgery without most of the risks and complications of surgery. Nowadays it is most useful as an adjunct to surgery, especially for tumors whose surgical margins are positive but inoperable or whose margins are questionable but at high risk for recurrence, as well as for adjunctive treatment around the surgical site to provide local control if there is a high risk for satellite metastases. It is commonly used, for example, after excision of high-risk squamous cell carcinoma and Merkel cell carcinoma. It is also used as a nonoperative adjunct to elective management of high-risk lymph node metastases.

Another nonoperative option for head and neck skin cancer is *topical therapy*. The use of topical chemotherapy, specifically, 5-fluorouracil cream and topical immunomodulators such as imiquimod, has been tried with some success. However, it must be emphasized that fluorouracil and imiquimod have been approved by the Food and Drug Administration only for superficial skin cancer and imiquimod is not approved for use on the head and neck. The results of current studies show short-term success rates of 80%, and long-term cure rates will probably be significantly lower. The cost is high, the results are interim, and their use is limited. Some may consider topical therapy for widespread superficial disease that would otherwise be inoperable or for very superficial tumors that with excision might result in significant cosmetic deformity.

Besides nonoperative alternatives to routine surgical excision of skin cancer, there is one operative alternative to consider when selecting patients for surgery—*Mohs surgery*. Mohs surgery is a method of complete histologic control of the surgical margin.[1] Like routine excisional surgery, Mohs surgery is an excisional method performed under local anesthesia but differs from routine excision by the method of evaluating the surgical margin. In contrast to routine excision and pathologic evaluation (with or without frozen section control), in which less than 0.1% of the margin is sampled, Mohs surgery literally examines 100% of the margin. By examining the entire surgical margin of the excision and accurately mapping any positive areas within the wound, the excision can be continued until a negative margin is ensured with almost certainty. The result is a low recurrence rate, the ability to remove tumor with very narrow margins, and a method to preserve valuable normal skin for reconstruction. Mohs surgery as an alternative to routine excision is most useful for skin cancers that might be at higher risk for recurrence, such as those in the midface and ears because the depth or lateral margins are difficult to estimate, for previously treated skin cancers that have recurred or those excised with positive margins, or for cancer in areas where the smallest possible wound is important to achieve the best cosmetic or functional result. This surgery is not time consuming, but like routine excision it usually requires a half- or full-day time commitment for patients. Its costs compare favorably with other office procedures, but it does require special fellowship training.

In times of limited health care dollars, the cost of treatment must also be considered in patient selection. A comparison of costs for the most common treatment options is presented in Table 80-1, including the cost from the time of initial evaluation up to and including 5 years of follow-up screening.[2]

Table 80-1 -- AVERAGE COST OF TREATING SKIN CANCER BY DIFFERENT METHODS[*]

Method	Cost ($)
Destruction	652
Office excision/permanent section	1167
Mohs surgery	1243
Office excision/frozen sections	1400
Ambulatory surgery/frozen section	1973
Radiation therapy	4558

From Cook J, Zitelli JA: Mohs micrographic surgery: A cost analysis. J Am Acad Dermatol 39:698-703, 1998.

* Based on a 1.5-cm facial skin cancer.

Syndromes and Predisposing Factors

It is important to recognize a few common syndromes and predisposing factors that often influence the surgical decision and management of skin cancer.

Basal cell nevus syndrome has cutaneous findings of multiple basal cell carcinomas, including tiny pits in the stratum corneum of the palms and plantar surfaces of the fingers, toes, hands, and feet; the characteristic facial appearance of frontal bossing and wide-set eyes; and internal findings of jaw cysts, skeletal abnormalities, and calcification of the falx cerebri. The difficulty in treating patients with basal cell nevus syndrome is that tumors begin to appear at an early age (often before puberty) and they number in the hundreds over a lifetime. Patients usually become discouraged because of the need for frequent treatment and are often lost to follow-up, only to reappear with multiple difficult-to-treat lesions. Effective lifetime care should include counseling to prevent discouragement and lack of regular follow-up routine care, treatment planning to minimize loss of work/school and quality time, and selection of treatment with a high cure rate to prevent multiple repeat treatments and minimize deformity. Thus far, chemoprophylactic treatment either topically or with systemic retinoids has not proved useful in the long term. Effective management often requires the resources of multiple forms of treatment and multiple specialists over a lifetime. These patients are often very difficult to manage.

Muir-Torres syndrome is a form of familial polyposis characterized by multiple sebaceous tumors of the skin, particularly sebaceous carcinoma and adenoma, and adenocarcinoma of the colon and small intestine. Sebaceous carcinoma behaves like squamous cell carcinoma in its risk of metastasis, and treatment is similar. Any patient with even a single sebaceous carcinoma of the skin should be counseled about the possibility of Muir-Torres syndrome and be referred for colonoscopy and genetic counseling. Most patients have only a few skin cancers, and they are curable if treated early. Important in the long-term management of these patients is patient education about the risk of colon cancer, affected family members, and the need for self-examination of the skin; routine gastrointestinal follow-up; and regular lifetime skin cancer screening.

The *syndrome of multiple trichoepitheliomas* is important to recognize when selecting patients for treatment. A trichoepithelioma is a benign neoplasm of the hair follicle that often simulates basal cell carcinoma both clinically and histologically. Patients with this syndrome have increasing numbers of small papules on the medial aspect of

the cheeks, nose, and upper lip, as well as on the ear and elsewhere on the face. Management difficulties arise because (1) the tumors resemble basal cell carcinoma clinically and histologically; lesions may be misdiagnosed as basal cell carcinoma if an accurate clinical description is not given to the pathologist or if an expert pathologist is not available to examine the lesion; (2) these patients often have true basal cell carcinomas developing within benign trichoepitheliomas that require adequate treatment; and (3) excision of basal cell carcinomas in these patients is complicated by difficulty assessing the pathology margin because of confusion between benign trichoepithelioma and malignant basal cell carcinoma at the margin. In general, a single lesion that looks different from the other dozens of lesions or any lesion that is enlarging or ulcerated should undergo biopsy and be interpreted by an experienced dermatopathologist.

Dysplastic nevus syndrome, or *atypical mole syndrome*, is another syndrome important to recognize in the management of skin cancer, especially melanoma. Dys-plastic nevus syndrome is inherited as an autosomal dominant trait with incomplete penetrance and is characterized by frequent spontaneous mutations. Recognized only in the last 2 decades, there is still considerable confusion and controversy surrounding both diagnosis and management. A dysplastic nevus is clinically recognized as a pigmented mole and is usually larger than a normal nevus or greater than 6 mm in diameter. It is nonuniform in pigmentation with slight variations of brown. The pigment at the border appears to diffuse into the surrounding skin, in contrast to the clear distinction at the border of normal nevi. The importance of dysplastic nevus syndrome is its association with an increased lifetime risk for melanoma. Patients with dysplastic nevus syndrome usually have multiple dysplastic nevi on the trunk, as well as on the head, neck, and scalp. Although the normal population has a 1% lifetime risk of melanoma, patients with common dysplastic nevus syndrome have an approximately 5% risk. Patients with even a single dysplastic nevus may have an increased risk for melanoma, but those with multiple nevi and a family history of melanoma together have the highest risk for melanoma, approaching 100%. Management problems in a patient with dysplastic nevus syndrome arise around the controversy regarding diagnosis and treatment. Dysplastic nevi resemble melanoma in some ways, both clinically and histologically. Biopsies are common because of the irregular clinical appearance similar to melanoma, and pathologists may have difficulty distinguishing the pattern of atypical cells from melanoma or describe the common but benign finding of cellular atypia and dysplasia and comment that margins are still positive. Ambiguous pathology reports often leave management decisions to be made by the clinician, who may be confused about the unresolved controversy. Important facts are that dysplastic nevi are benign and do not to be excised. Melanomas that arise in these patients, although they may appear in preexisting nevi, often develop in normal skin. Elective removal of all or most dysplastic nevi is not recommended for decreasing the risk of melanoma. Because dysplastic nevi are benign and commonly show atypia and dysplasia, they do not need to be either excised or re-excised if a biopsy specimen shows a positive margin. Some pathologists write this recommendation to absolve themselves from the responsibility of not having looked at an entire lesion (if the margin is positive, some of the dysplastic nevus remains in a patient who has not been examined histologically). They also point out the later difficulty in making a histopathologic diagnosis from a biopsy specimen of a recur-rent nevus that even more closely falsely resembles melanoma.

In general, it is important to recognize and diagnose this syndrome to counsel patients to minimize lifetime exposure to ultraviolet light, to perform regular self-examination of skin, to have yearly checkups by dermatologists, and to understand the genetics for children and close family members.

Associated Diseases

Along with syndromes, some cutaneous conditions have important associations with skin cancer. *Oral lichen planus* is a chronic inflammatory condition involving both skin and mucous membranes. On the lips, whitening of the vermilion, ulceration, thickening of the epidermis, and induration caused by the inflammatory response together can simulate squamous cell carcinoma both clinically and histologically. Despite the possibility of lichen planus simulating squamous cell carcinoma, it also predisposes one to the development of true invasive squamous cell carcinoma. As with many other conditions, it is important to match the findings on a biopsy report to the clinical picture.

Skin cancer is also a serious and almost universal long-term complication in *solid organ transplant* patients or other patients who are chronically immunosuppressed and represents an experiment in nature, thus emphasizing the important role of immune surveillance in preventing skin cancer. Skin cancer in transplant patients is similar to skin cancer in patients with basal cell nevus syndrome in that transplant patients often become discouraged with the overwhelming number of skin cancers, the need for frequent treatment, and the time and effort required to keep up with treatment. Worse yet is that the majority of skin cancers are squamous cell carcinoma and squamous cell carcinoma in situ. Neglected or recurrent disease may be life-threatening and is often the cause of death in transplant patients. This emphasizes the need for early effective treatment and constant surveillance, follow-up, and patient education. Coordinating medical management with the transplant team to keep immunosuppressive drugs at their lowest possible dose is often advisable.

Other forms of *immunosuppression* are also associated with an increased risk for skin cancer. Human immunodeficiency virus–positive patients with low $CD4^+$ lymphocyte counts have a higher risk for squamous cell

carcinoma and often other forms of skin cancer as well. Chronic infection with human papillomavirus plays an important role in the development of squamous cell carcinoma in these immunosuppressed patients. Immunosuppression not only predisposes patients to skin cancer but also complicates and compromises the prognosis of patients at high risk for metastatic disease or those with known metastatic disease. Again, coordination of their care to balance the risks and benefits of immunosuppression is an important part of patient selection for surgery.

PREOPERATIVE EVALUATION

The *patient's history* plays a small but important role in the preoperative evaluation. In general, lesions that have not undergone change for many years tend to be benign, whereas a history of increasing size or growth is a signal to consider malignancy and therefore biopsy. A history of previous treatment of skin cancer is a signal that the original treatment failed because of inadequate treatment, usually secondary to unrecognized positive margins. It is important to remember that routine pathology can only sample surgical margins and a report of clear margins is only an estimate of clear margins. In the face of recurrence, retreatment with routine surgery is associated with a much higher recurrence rate than treatment of the primary lesions is, and therefore Mohs surgery may be indicated.

Physical examination, however, plays a very important role in the preoperative evaluation. It is important to incorporate tumor location, size, and depth into the decision-making process. To assess size and therefore tumor margins it is extremely important to tightly stretch the skin under very bright light such as that of an examination or operating room light. Clues to tumor extension of basal cell carcinoma and squamous cell carcinoma may include subtle pink from the vascular response induced by inflammation, scar-like white or yellow from fibrosis and tumor infiltration, a more shiny pearly appearance from underlying tumor lobules, and lack of normal fine skin wrinkling. Extension of superficial basal cell carcinoma or squamous cell carcinoma in situ beyond invasive disease may stimulate dermatitis and have a totally difference appearance than the primary tumor. Tumor depth may be more difficult to estimate beyond simple palpation and movement over underlying structures such as attachment to bone.

Estimating melanoma margins is more difficult on the head and neck than on the trunk and extremities. Normal skin lesions such as lentigines, freckles, seborrheic keratoses, and actinic keratoses may all camouflage the margin. Furthermore, in situ extensions at the edge of a melanoma on the skin of the head and neck are often amelanotic and simulate dermatitis or may be totally invisible.

Palpation for signs of local, regional, or metastatic disease in the form of satellite metastases, in transit metastases, and lymph node metastases is necessary for skin cancers with a risk of metastatic disease, especially squamous cell carcinoma, melanoma, Merkel cell carcinoma, malignant fibrous histiocytoma, and sebaceous carcinoma.

Adjunctive testing to evaluate the lymph nodes for metastatic disease has limited value. Computed tomography (CT), magnetic resonance imaging (MRI), and ultrasound may be useful in obese patients, in whom palpation of early clinical disease is difficult. Sentinel lymph node biopsy is a technique that has not been proved to improve survival, and research results on its benefit are limited to improvements in staging. Similarly, preoperative testing with CT or MRI to determine the extent of invasion is rarely helpful except in the largest cases, and even then they are helpful only to get an estimate of the likelihood of bone invasion, orbit invasion, or involvement of vital structures of the neck. The resolution of these tests can estimate the extent of gross tumor involvement but cannot detect microscopic extensions of skin cancer in soft tissue, which are often located just millimeters from the main tumor mass.

Histopathology laboratory results are an essential part of the preoperative evaluation, and a histologic diagnosis is important before definitive surgery is planned. The tumor type determines the need for evaluation of metastases, as well as the width of the surgical margin. Because many types of skin cancer and other benign diseases have a similar appearance, the proper diagnosis is important before planning excision. Furthermore, one should always be sure that the pathology results correlate with the clinical picture. Biopsies are often small samples of a larger lesion and may not represent the entire tumor. Sometimes the microscopic appearance of one skin cancer simulates another tumor. A melanoma can be confused with a superficial basal cell carcinoma, and a Merkel cell carcinoma can be confused with cutaneous lymphoma. The clinician must be sure that the patient's history, the appearance, and the histopathology results all correlate; otherwise, another biopsy may be indicated.

SURGICAL APPROACH

Tumor Type

The goal of surgery is complete removal of skin cancer with clear margins as determined by histopathology. This goal is achieved by careful selection of patients, careful surgical planning, and extensive examination of the margins by the pathologist. The surgical approach differs according to tumor type.

Basal Cell Carcinoma

Careful selection and planning should achieve a 5-year cure rate of 90% to 95% for basal cell carcinoma (Fig. 80-1). For primary basal cell carcinoma 2 cm or less in diameter that has clearly visible margins, a surgical margin 4 mm wide should be adequate.[3] The depth of the surgical margin is more difficult to estimate and depends a great deal on tumor location and clinical judgment. Histopathologic variants such as morpheaform or sclerosing basal cell carcinoma and micronodular and even superficial basal cell carcinoma require wider margins than 4 mm, as well as the aid of careful intraoperative frozen section control during excision. Similarly, tumors larger than 2 cm in diameter and recurrent tumors require a wider margin to achieve acceptable cure rates. The best chance for cure is the first operation, and although 1- to 2-mm margins often cure some basal cell carcinomas, 5-year cure rates are only 50% to 60% and are considered inadequate for such narrow margins.

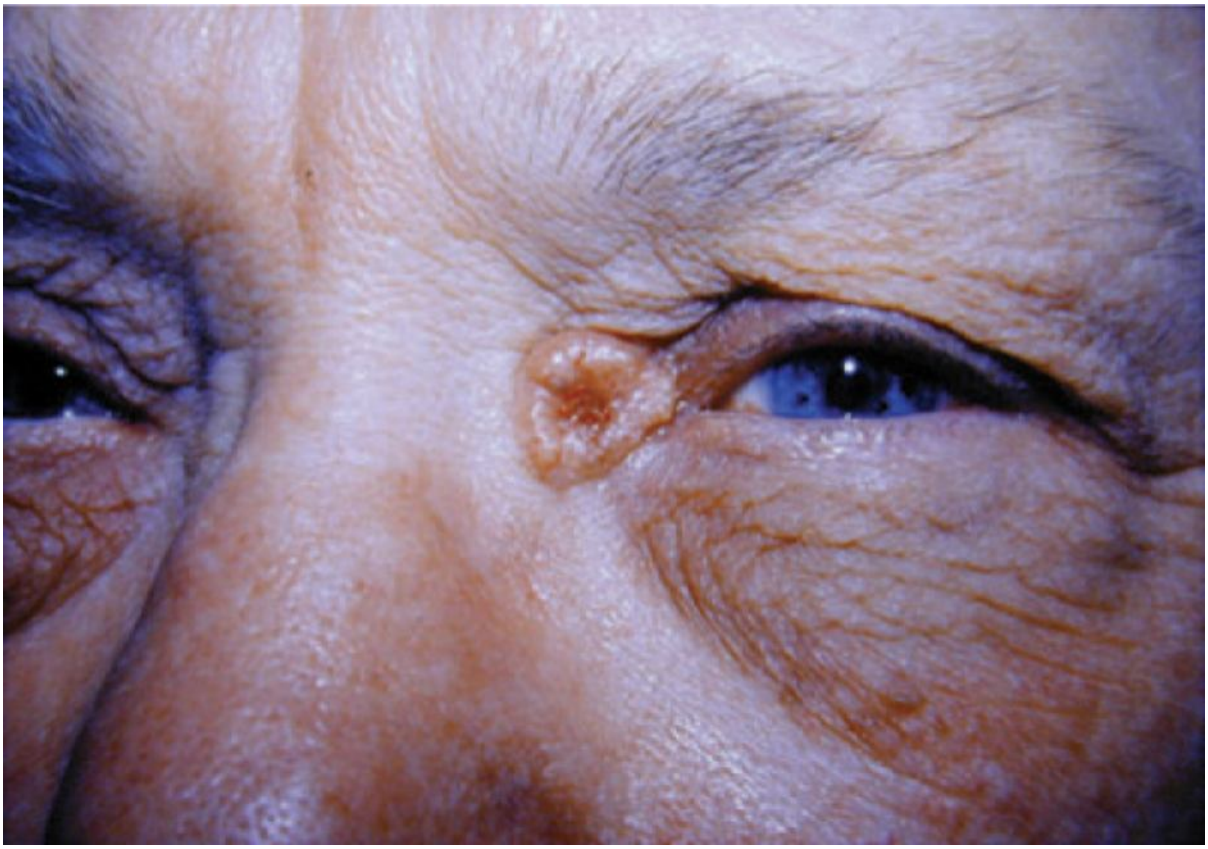

Figure 80-1 Nodular basal cell carcinoma of the inner canthus.

Squamous Cell Carcinoma

Even though squamous cell carcinoma is associated with a significant risk for metastases, the goal of surgery is still complete removal with negative surgical margins (Fig. 80-2). Extra wide margins, excised in the hope of including microscopic satellite metastases, do not improve survival or local control. However, squamous cell carcinoma usually requires wider surgical margins than basal cell carcinoma does to achieve clear margins of the primary tumor. For low-risk squamous cell carcinomas 2 cm or less in diameter in areas such as the cheek and neck and not invading fat, a surgical margin of 4 mm is acceptable. For moderate-risk squamous cell carcinomas up to 2 cm in diameter, a 6-mm margin is necessary to approach a 95% chance of achieving clear surgical margins. For high-risk squamous cell carcinomas greater than 2 cm in diameter, those on the temple, scalp, or lip, or those invading fat, a 9-mm surgical margin is necessary to achieve an acceptable chance of negative margins.[4] If histopathologic sampling confirms negative margins with these clinical margin widths, the risk for local persistence of tumor is minimized to an acceptable level.

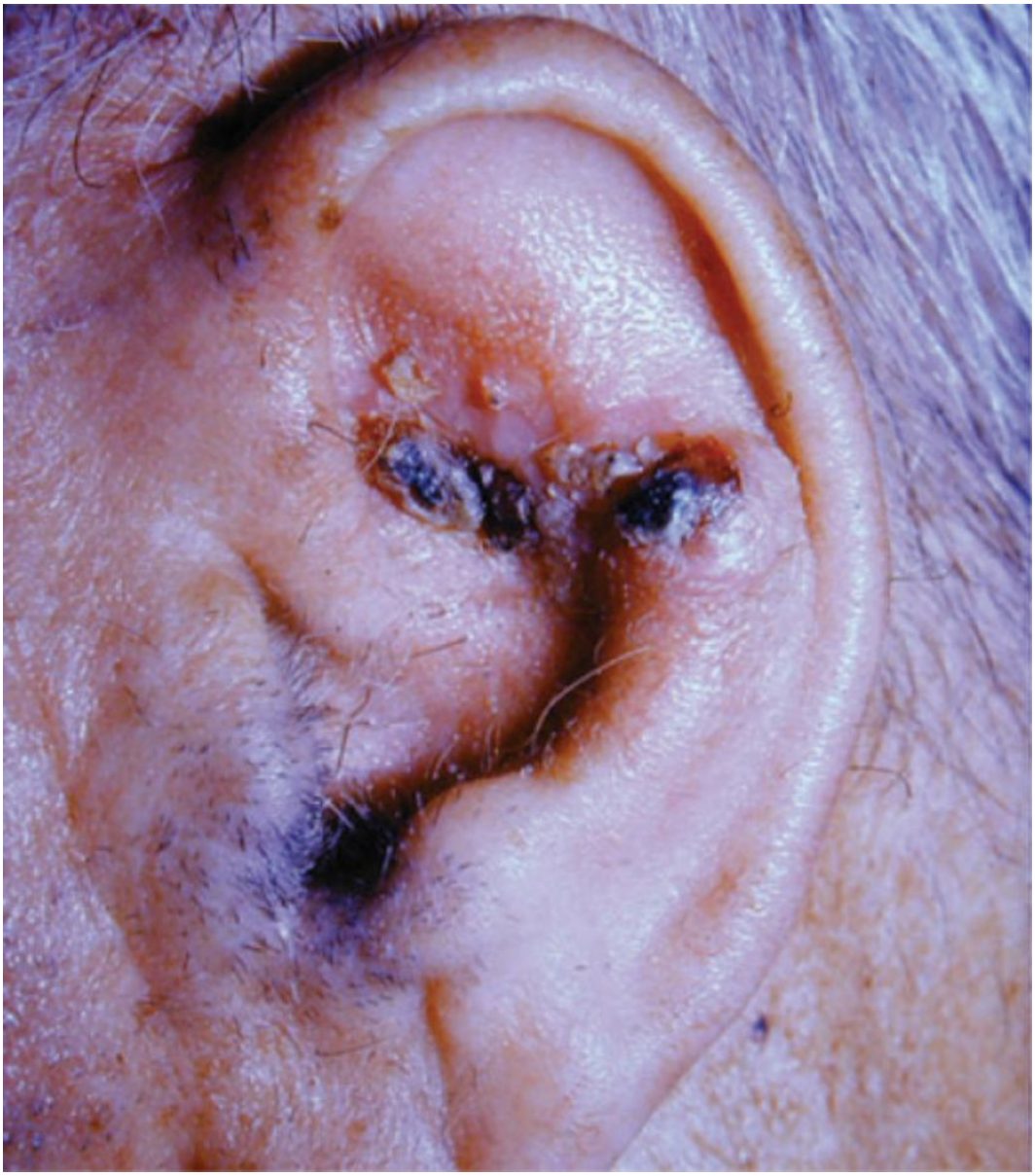

Figure 80-2 Squamous cell carcinoma of the ear.

Keratoacanthoma is a variant of squamous cell carcinoma that often shows extremely rapid growth of a dome-shaped nodule. Although keratoacanthomas have been reported to spontaneously involute without treatment, these tumors can be aggressive, destructive, and otherwise indistinguishable from true squamous cell carcinoma, including the ability to metastasize. Complete surgical excision is the treatment of choice.

Squamous cell carcinoma in situ appears as a superficial scaly lesion that may be small or large. Although the malignant atypical cells are limited to the epidermis, the difficulty in treatment occurs when the atypical cells extend down hair follicles into the dermis. In this case, either deep destruction or full-thickness skin excision is required to achieve effective cure rates. When there is little or no follicular extension, superficial destruction with curettage, cryosurgery, or laser surgery is quite effective. Left untreated or inadequately treated, squamous cell carcinoma in situ often progresses to true invasive squamous cell carcinoma with metastatic potential.

Melanoma

Successful excision of melanoma on the head and neck (Fig. 80-3) is more difficult than excision on the trunk and extremities because melanoma margins are more difficult to visualize, amelanotic melanomas are more common, and surgical margins are often reduced because of cosmetic and functional concerns. Therefore, these melanomas recur at the surgical margin in 9% to 18% of cases because of inadequate excision. The previously published recommendation of a 5-mm margin for melanoma in situ has no scientific basis and often results in inadequate excision and recurrence of both melanoma in situ and invasive melanoma. When possible, 1.2-cm margins are likely to clear melanoma on the head and neck in 97% of cases.[5] When this margin cannot be excised, very careful histopathologic examination of the more narrow margins is necessary to confirm clear margins. Melanomas

that recur at previously treated surgical margins may be due to previous inadequate excision rather than metastatic disease. In the former case the histopathology of the biopsy specimen generally shows an intraepidermal component. Metastases are usually located in the dermis or subcutaneous tissue. Melanoma recurrences as a result of previous inadequate excision have a much better prognosis than metastatic recurrences do, and their prognosis is still accurately related to tumor thickness.

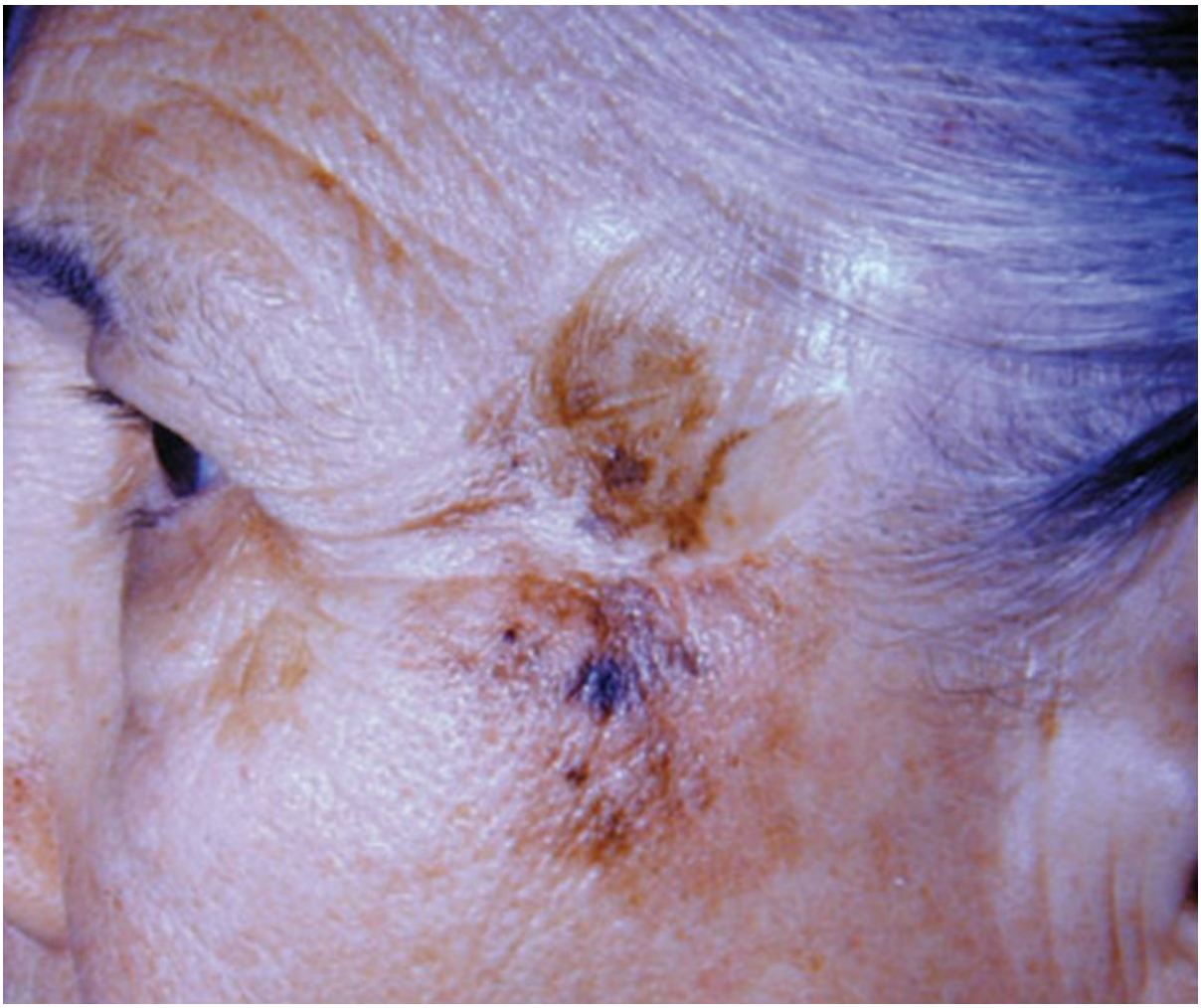

Figure 80-3 Locally recurrent melanoma on the temple.

The value of elective lymph node dissection for melanoma of the head and neck is still unproven. The interim results of the Multicenter Selective Lymphadenectomy Trial I (MSLT I) have shown no survival benefit for sentinel lymph node biopsy and complete lymph node dissection in patients with microscopically positive disease.[6] Possible benefits of sentinel lymph node biopsy include a slight improvement in estimating a patient's prognosis in comparison with Breslow's thickness alone, although this may be true only for melanomas 2 to 4 mm thick. For other thicknesses, the benefit of sentinel lymph node biopsy in estimating prognosis is no better than Breslow's thickness. Early detection of microscopically positive disease with complete lymph node dissection may also aid in improved regional control, which can be an important benefit in the head and neck, especially in patients who may otherwise neglect regular follow-up or self-palpation of lymph nodes and be seen instead with advanced regional nodal disease. The final results of the MSLT II trial will hopefully provide further evidence to guide clinical decisions about sentinel lymph node biopsy.

The benefits of radiation treatment in the management of high-risk, but clinically negative nodes is currently unproven and is being investigated. For now, management of melanoma is still a surgical issue. There is no adjuvant treatment that significantly prolongs survival. Early treatment with complete removal of primary disease is the most important factor. Surgical removal of local, in transit, and regional disease can still salvage a significant number of patients with metastases. Teaching patients to palpate nodes and soft tissue is an important part of surgical management.

Adnexal Neoplasms

Cancer may arise within any skin structure, such as sebaceous glands and eccrine sweat glands, or differentiate

toward the structures. Sebaceous carcinoma is a malignant tumor of sebaceous glands that often arises on the eyelids or skin of the head and neck. Its malignant potential is similar to that of squamous cell carcinoma and it should be treated as such. Microcystic adnexal carcinoma and eccrine carcinoma appear clinically similar to basal cell carcinoma but often show more extensive subclinical invasion. To minimize local recurrence, wider margins are necessary than for basal cell carcinoma to prevent recurrence. In addition, complete margin examination or Mohs surgery will minimize the high rate of recurrence.

Trichoepitheliomas are benign tumors of hair follicles. Clinically and histologically they may resem-ble basal cell carcinoma. Therefore, single or isolated trichoepitheliomas are often treated as basal cell carcinoma, especially if they are large, ulcerated, or growing. Patients with multiple trichoepithelioma lesions do not require treatment; however, these patients often have associated basal cell carcinomas that develop from their benign tumors and will require treatment consisting of complete excision of the basal cell carcinoma portion but not the trichoepithelioma portion often seen at the margin.

Merkel Cell Carcinoma

Merkel cell carcinoma arises from neuroendocrine cells populating the skin and is characterized by a pink or red papule or nodule. It is rarely diagnosed clinically but instead undergoes biopsy when a red papule persists or enlarges. This tumor has biologic behavior similar to that of melanoma, with a very high risk of metastatic disease. The microscopic extensions of Merkel cell carcinoma are much wider and deeper than clinical estimates, and therefore wide and deep margins (i.e., 2 cm) are recommended to provide the best chance of complete removal and minimize the risk of local recurrence. Careful histologic examination of the surgical margins is important to validate complete excision. Mohs surgery can be helpful to ensure total excision. If negative margins are not possible or are in question, radiation treatment may improve local control because this tumor is very radiosensitive. The role of sentinel lymph node biopsy and elective node dissection may be similar to that in melanoma, although there is no proven benefit.

Dermatofibrosarcoma Protuberans

DFSP is a tumor of fibroblast origin that is manifested as a dermal subcutaneous mass and often as a nodular tumor greater than 2 cm in diameter. Although these tumors rarely metastasize, local recurrence rates are high because of difficulty clinically estimating the microscopic extent of the tumor. DFSP invades the dermis and fibrous septa between the fat lobules, so its microscopic extent is much wider and deeper than is visible or palpable. Imaging studies are of limited value because they cannot detect the microscopic involvement of fat lobules accurately. Wide lateral margins of 2 to 2.5 cm of normal-appearing skin may be adequate to clear the lateral margins, but the deep margins are often the most difficult to estimate. Careful histologic margin control is important to achieve negative surgical margins. Mohs surgery is very effective and results in both the lowest recurrence rate and the narrowest margins possible.

Angiosarcoma

Angiosarcoma is a malignant tumor of blood vessels. In its early stage it is a purple papule or nodule, but most often it is seen as a large flat plaque resembling a bruise or ecchymosis that covers wide areas of the scalp and forehead. Clipping or shaving the hair is necessary to see the full extent of these lesions in hair-bearing areas. Surgical management is difficult. Small lesions may be surgically excised with success, but local recurrence rates and regional metastatic rates are high. Surgical margins are difficult to evaluate histologically because growth of the malignant vessel is subtle. Large lesions may not be amenable to surgery because of their extreme size. Angiosarcoma is a radiosensitive tumor, and therefore radiation therapy plays a role in the adjuvant treatment of small lesions to provide local control; radiotherapy also plays a role in the primary treatment of large lesions that are not amenable to surgery. Adjuvant chemotherapy has no proven value for local disease.

Atypical Fibroxanthoma/Malignant Fibrous Histiocytoma

Atypical fibroxanthoma is a skin cancer often seen in sun-exposed areas. It resembles squamous cell carcinoma or basal cell carcinoma because of the presence of a pink papule or erosion. It is usually diagnosed only after biopsy. Tumors involving the dermis and superficial fat are termed *atypical fibroxanthoma* and rarely metastasize. Deeper tumors involving subcutaneous tissue or muscle are labeled *malignant fibrous histiocytoma* and have a high risk of metastatic disease. Surgical treatment of atypical fibroxanthoma is excision with margins similar to those for squamous cell carcinoma, and treatment of malignant fibrous histiocytoma is wide and deep excision, similar to treatment of Merkel cell carcinoma or melanoma. Elective regional node management is unnecessary for atypical fibroxanthoma and has no proven value for malignant fibrous histiocytoma.

Tumors of Uncertain Behavior

Surgeons are often faced with tumors on the head and neck with uncertain biologic behavior. Spitz nevi are benign

nevi manifested as enlarging red papules, usually in children or young adults. The difficulty with this lesion is that it resembles a nodular form of amelanotic melanoma both clinically and histologically. A classic lesion in a young person who also has a histologic diagnosis of benign Spitz nevus from a dermatopathologist may not require excision; however, lesions arising in adults or those showing cellular atypia or nonclassic features histologically may be more difficult to distinguish accurately from melanoma. These uncertain lesions should be excised and treated as though they were melanoma, that is, with negative surgical margins documented histologically by careful examination of margins.

Dysplastic nevi are also benign lesions that are seen on the head and neck and can clinically resemble melanoma because of their large diameter, irregular borders, and irregular pigment. Lesions for which biopsy reports describe the cellular atypia or dysplasia common in benign lesions do not require excision. However, a description of severe atypia may be an indication that the pathologist cannot distinguish the lesion from melanoma with certainty. With these lesions, a discussion with the pathologist may be helpful to understand whether the diagnosis is benign, malignant, or uncertain. Pigmented lesions of uncertain diagnosis should be excised with margins as though they were melanoma and negative surgical margins determined histologically. Benign dysplastic nevi do not require excision even if the biopsy margins are positive.

Many other cutaneous lesions have overlapping features with their benign and malignant counterparts. Desmoplastic trichoepithelioma can resemble morphea or sclerosing basal cell carcinoma both clinically and histologically. Other tumors of follicular origin may be difficult to distinguish from basal cell carcinoma with follicular differentiation. Ultimately, the clinician must process the information described by the pathologist along with the clinical picture to decide whether to manage it as a benign or malignant lesion.

Evaluating Surgical Margins

The goal of treating skin cancer is to excise or destroy the tumor completely with no visible tumor behind. One advantage of surgical excision is the ability to evaluate the margins of the tissue removed at the time of surgery and assess the completeness of removal. In contrast, destructive techniques and radiation therapy rely on a certain amount of guesswork in estimating the margin without the benefit of a tissue specimen to accurately evaluate the success of removal.

Routine processing of tissue specimens by pathologists involves only a sampling of the margin. Most pathologists “bread loaf” specimens and sample both lateral and deep margins for tumor involvement; however, it is important to understand that these sampling techniques examine less than 0.1% of the margin, thus giving the surgeon at best only an estimate of the status of the surgical margin.[7] It is important for the surgeon to keep this in mind when interpreting the pathology report. For example, a biopsy of a malignant lesion that was not removed with the intent to include standard surgical margins may be reported by the pathologist to have negative margins even when there is visible tumor remaining. For this reason it is always important to excise skin cancer with adequate margins of normal skin and only then use the pathologist's report to validate the results of excision.

If the goal of surgery is complete excision and if the surgeon relies on the pathologist to measure the success of excision, the surgeon must understand the process of margin examination. Intraoperative frozen sections give a quick estimate of margins. Frozen sections of the skin and subcutaneous tissue are technically difficult to cut, and intraoperative examination usually samples only a very small portion, far less than the 0.1% of permanent section. Frozen section results are followed by more accurate results from permanent section, but these results are available only days afterward. Permanent sections are of better quality for visualization but still often provide examination of only a small sample of the margins.

Some pathologists are willing to examine a greater portion of the margin by processing strips of tissue from lateral and deep margins obtained with tangential cuts. This more complete examination can be useful in evaluating a high-risk infiltrating skin cancer or those whose margins are difficult to visualize clinically. Such sections have been termed peripheral in continuity tissue examination or en face tissue sectioning.

Mohs surgery provides the most complete margin examination and literally examines 100% of the surgical margin. With Mohs surgery, the tissue is excised in a way that allows the entire margin to be flattened into a two-dimensional, one-plane tissue “patty.” This patty is cut into pieces for processing like a puzzle, and then the edges are dyed and numbered for individual identification. Each specimen is processed so that the entire outer surface is examined microscopically, and the results of the examination are marked on the puzzle-like map of specimens. In this way any remaining tumor at the margin can be located within the wound by using the wound map. Remaining tumor is re-excised in the positive area, reprocessed in the same fashion, and repeated if necessary until its true tumor-free plane is reached. Mohs surgery requires special fellowship training because the surgeon also acts as the pathologist to better understand correlation of the pathology results with the clinical tumor margin. With this method of excision and complete margin examination, the rate of complete excision and skin cancer cure is the highest of any method. In addition, the initial surgical margin is narrower than traditional margins and relies on the complete examination to detect any positive remaining areas. This initial margin is often negative

and results in smaller wounds than those after traditional excision. Mohs surgery is useful when conservation of tissue is important around cosmetic and functional structures of the head and neck. It is also useful for infiltrative tumors or tumors with poorly defined margins, especially recurrent tumors or tumors excised with positive margins. Mohs surgeons are an important part of the multispecialty team for the treatment of skin cancer. They often contribute by completely excising the cancer and working with colleagues for reconstruction after Mohs surgery. They can also be helpful to clear soft tissue margins and identify any remaining tumor near vital structures of the head and neck, such as invasion of bone; perineural invasion extending into the infraorbital, supraorbital, or other important foramen; and invasion of the parotid gland close to the facial nerve.

A pathology report with a final diagnosis of a positive margin should be taken seriously. Approximately 10% to 12% of excision specimens of head and neck cancer are positive for tumor at the margin. Without further treatment, at least a third will recur and may be difficult to cure after recurrence. Therefore, it is recommended that the first attempt at excision try to achieve clear surgical margins. For high-risk tumors or excisions requiring complex reconstruction, complete margin examination or Mohs surgery should be undertaken to ensure clear margins. Otherwise, routine surgery should be followed by delayed reconstruction until negative margins are confirmed by permanent paraffin pathology sections. When margins are positive, re-excision should be attempted. Mohs surgery can also be helpful to identify any positive margin and remove remaining tumor. When surgery is not an option for treatment of the positive margin, radiation therapy may be considered, but the chance for cure is lower than with surgically or pathologically documented negative margins.

Tumor Location

The surgical approach to skin cancer considers not only the type of skin cancer but also the location of the tumor. The incidence of skin cancer by tumor type varies according to location. For example, sebaceous carcinoma is most common in the eyelids, squamous cell carcinoma is more common on the lower lip, and basal cell carcinoma is more common on the upper lip. The biologic behavior of skin cancer also varies considerably in different locations, and the surgical approach must consider the unique anatomic difference of each location.

Eyelids

Basal cell carcinoma, squamous cell carcinoma, melanoma, and sebaceous carcinoma are the most common cancers of the periocular region. In this location, tumor clinical margins are often indistinct, especially with superficial basal cell carcinoma on the thin skin of the eyelid and those infiltrating into the lid margin and tarsal plate, thus making it very difficult to achieve negative histologic margins with narrow surgical margins. In the inner canthus region, basal cell carcinoma tends to invade deeply, and when the tumor appears to be fixed to bone, it often involves the lacrimal drainage system or extends into the orbit. The reason for deep extension of small tumors is not the often quoted “embryonic fusion plane” theory. Instead, it is well documented that basal cell carcinomas are stromal dependent for continued growth. That is, they will invade tissue only with the appropriate stromal components. Basal cell carcinoma grows slowly and poorly in fatty tissue, but it grows more quickly in fascia and muscle. With little protective fat in the periocular region, basal cell carcinoma quickly invades through the dermis and into the deeper tissues of the medial and lateral canthus and orbital septum. These extensions are invisible and hard to predict, and the small microscopic extensions do not appear on current imaging systems such as MRI or CT. Mohs surgery or careful complete margin examination is important for successful management of skin cancer in this location.

Ears

Basal cell carcinoma, squamous cell carcinoma, atypical fibroxanthoma, and melanoma are most common on the ears. Chondrodermatitis nodularis helicis or focal pressure dermatitis of the ear can simulate skin cancer, thus emphasizing the value of biopsy before initiating surgical excision. On the ear, skin cancer margins are difficult to outline with certainty, and recurrence rates are high. Tumors tend to invade through the thin skin quickly down to perichondrium and spread laterally with little visual surface change. This is particularly true on the antihelix and conchal bowl, as well as extensions down into the external canal. Tumors rarely invade cartilage, but sacrificing cartilage may be necessary to achieve negative surgical margins during excision. In the preauricular and postauricular sulcus, the lack of fat allows tumor to invade quickly, and deep negative surgical margins are often difficult to achieve.

Lips

Basal cell carcinoma is the most common tumor on the upper lip, whereas squamous cell carcinoma is the most frequently seen tumor on the lower lip. Squamous cell carcinoma on the lower lip is often associated with a dense inflammatory infiltrate, which makes the true depth of invasion difficult to assess. The tumor frequently feels deeper than is seen microscopically. However, the in situ component of squamous cell carcinoma on the lip often extends laterally much wider than appears clinically. One option in the treatment of lip lesions is to excise the invasive portion surgically and treat the in situ component with a more conservative approach such as laser

destruction of the vermilion.

Nose

Basal cell carcinoma, squamous cell carcinoma, melanoma, and Merkel cell carcinoma are often seen on the nose. In this location, depth of tumor invasion is most difficult to estimate, especially on the lower third of the nose. The lack of fat allows early invasive tumors easy access to muscle and fibrous tissue. Underlying cartilage also makes it difficult to palpate tumors adequately to determine tumor depth with confidence. Squamous cell carcinoma arising from the nasal septum frequently invades deeply to the bone of the nasal spine. Recurrence rates for all skin cancers are high for these reasons, and therefore very careful examination of margins or Mohs surgery is helpful to ensure clear pathology margins.

Cheeks

All forms of skin cancer are seen on the cheeks, including DFSP and angiosarcoma. The fat is often a barrier to invasion of deeper structures until the cancer becomes very large. Involvement of the medial portion of the cheek adjacent to the nose or the lateral preauricular aspect of the cheeks is associated with the most difficulty during excision because of enhancement of tumor invasiveness by the superficially located muscle or aponeurotic layers.

Forehead, Temple, and Scalp

All forms of skin cancer are seen in these locations. Squamous cell carcinoma tends to be aggressive in these locations, with satellite metastases being a common complication of large tumors. Management of multiple satellite and in transit metastases includes surgical excision when possible and the use of adjuvant wide-field radiation for local and regional control when multiple widespread metastasis has occurred. The bone of the skull acts as a strong barrier to invasion, but when the periosteum is removed during excision and the bone is pitted, the surgeon can safely assume that early bone invasion has occurred. In this case the outer cortex should be removed with an osteotome or burr or by excision, followed by split-thickness skin grafting. Early bone invasion is not easily seen with imaging studies and must be part of the intraoperative assessment of these tumors.

Neck

Skin cancers of the neck are the least difficult. Estimating depth and lateral margins is rarely complex, and the excess loose skin makes reconstruction straightforward. Care must be taken to avoid the greater auricular nerve on the lateral infra-auricular aspect of the neck and the spinal accessory nerve on the posterior lateral portion of the neck.

Reconstruction

The surgical approach to skin cancer must also include plans for surgical reconstruction. Before reconstructing any wound after excision of skin cancer, it is important to have reasonable certainty that the excision margins are clear of tumor. Re-excision for positive margins is very difficult, especially after local flaps, complicated repairs, or repair with extensive undermining of tissue has occurred. Reasonable certainty of negative margins includes evidence-based width of surgical margins around well-defined primary lesions with convincing clinical judgment that the margins are clear. However, for large, deep, recurrent, or poorly defined tumors, reasonable certainty should include negative histopathologic margins by extensive examination of the margin or by Mohs surgery. Otherwise, reasonable certainty occurs only with delayed reconstruction after margins have been determined to be negative by permanent paraffin sections.

In most locations, reconstructive choices are predictable and results are reproducible. The following discussion of reconstruction choices covers the majority of defects after excision of skin cancer; however, each defect is unique and each has its own challenges. Selection of the method of repair depends mainly on (1) the likelihood of negative margins, (2) the laxity and availability of adjacent skin for closure, and (3) the desire of the patient for a good cosmetic outcome.

Periorbital Repair

One of the first considerations of periorbital reconstruction is protection of the eyes, especially the cornea. Poorly planned repairs may result in ectropion with exposure-induced desiccation of the conjunctiva or keratitis from drying of the cornea. Suture must be placed in a manner that prevents irritation of the globe as well. Eyelid margin repair is often best done by an oculoplastic surgeon. In the skin around the eye within the orbital rim, primary closure is easily performed if special care is taken to move tissue horizontally, even if the orientation of the ellipse is somewhat oblique. It is important to have the patient open the eye and for the surgeon to check for lid apposition or displacement after placing the first key suture. Larger defects of the lower lid can be repaired with rotation flaps based inferiorly and laterally. Care should be taken to design the flap by extending the lateral incision

superiorly so that during rotation when the superior portion of the flap moves medially and inferiorly, the eyelid is not pulled down. A full-thickness skin graft also provides a good cosmetic result, especially in the medial and lateral canthus areas. On the lower lid, the inevitable shrinkage of the graft increases the risk of ectropion, and therefore it is a secondary choice. For treatment of defects of the brow, the surgeon must plan to move hair-bearing skin and maintain brow continuity even if brow length is shortened. Vertically oriented primary closure for small defects and island pedicle flaps for larger defects work well. Rarely, hair-bearing full-thickness composite grafts can be harvested from the temples with special care to maintain proper orientation of the hair follicles, even to the point of a double graft in which the top graft of hair faces inferior and lateral and the bottom half of the graft faces superior and lateral.

Ears

Helical wound defects are the most common challenging reconstruction of the ear. When the defect preserves cartilage and provides a good vascular base, a full-thickness skin graft from the postauricular donor site provides a very good cosmetic result. For defects that extend to cartilage or include cartilage but are less than 1 to 1.5 cm, helical rim advancement flaps work well (Fig. 80-4). During design it is important to cut anteriorly through the skin and cartilage but not through the posterior skin. Instead, undermining with separation of the posterior skin from the cartilage leaves a large vascular base for the helical rim flap. If the cut extends through anterior skin, cartilage, and posterior skin, only a small base of the helix is left to provide vascular supply to the flap, and the tip is often compromised. For large defects on the helical rim, an advancement flap from the postauricular surface through the postauricular sulcus can be performed as either a one- or two-stage procedure. This provides a reproducible repair and may require cartilage replacement from the ipsilateral conchal bowl if cartilage is missing in the helical rim. For superficial defects on the scapha, split-thickness skin grafts from the postauricular mastoid work well. Defects inside the rim of the scapha heal nicely by secondary intention without the need for repair. Defects of the external canal should be grafted if they involve more than half the circumference to prevent stenosis of the canal. Very large defects consisting of more than half the ear may do best with a prosthesis rather than surgical reconstruction. When planning to use a prosthesis, salvage of the tragus is important to help hide the prosthetic border. Wedge resection of the ear often results in an inferior cosmetic result when compared with other reconstruction choices and should be avoided if possible.

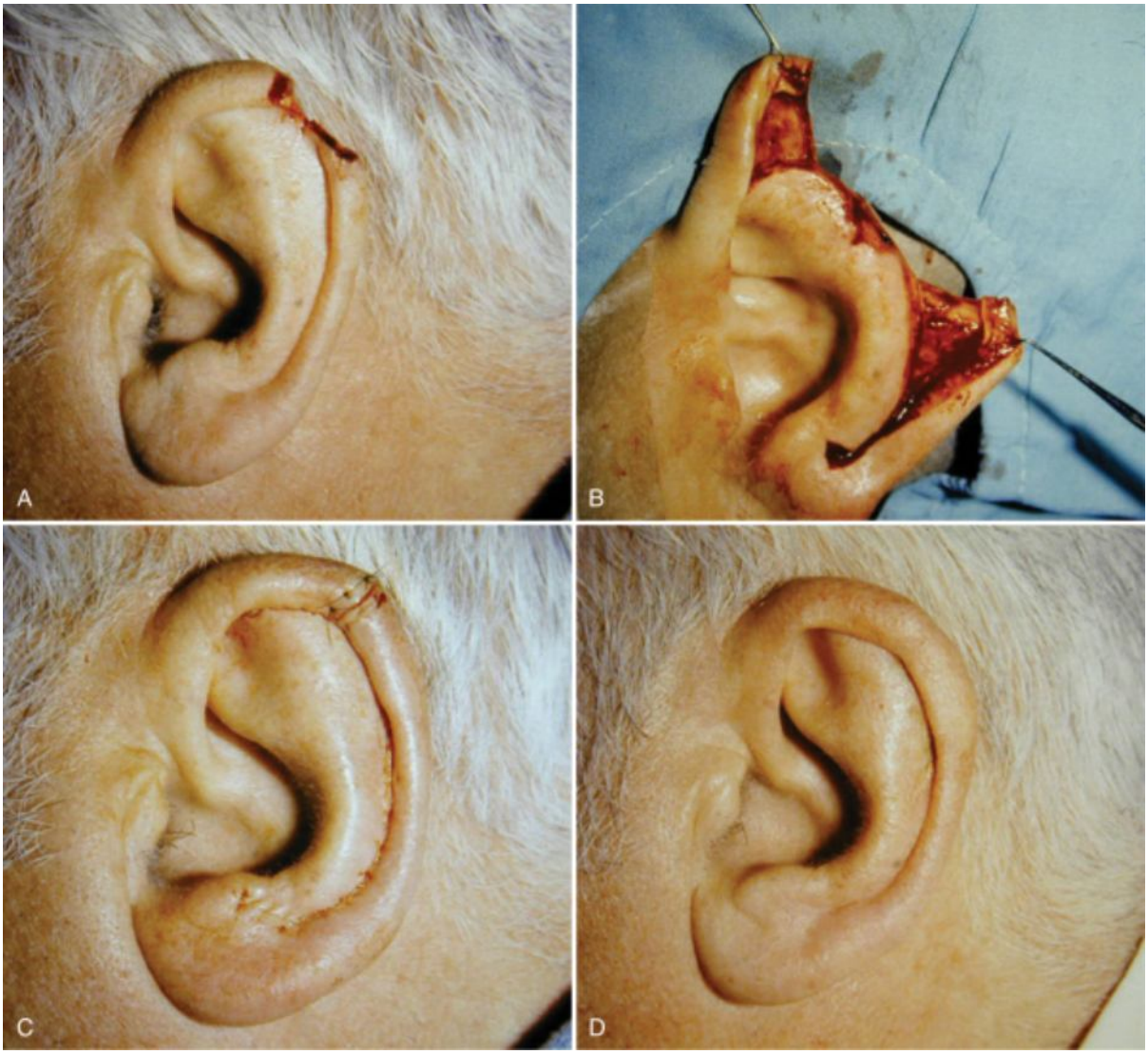

Figure 80-4 Helical rim advancement flap. **A,** Defect after excision of basal cell carcinoma. **B,** Bilateral helical rim advancement flaps elevated with a broad posterior base. **C,** Immediate postoperative result. **D,** Cosmetic result after 6 months.

Upper Lip

Most wounds up to 1 to 1.5 cm can be repaired as a vertically oriented primary closure.[8] There is no value in attempting to avoid cutting through the vermilion border and the inferior triangle and using laterally based incisions above it such as an A-to-T closure. Vertical incisions around the vermilion should extend around the lip and superiorly onto the labial mucosa. The caveat is to avoid ending Burow's triangle on the vermilion or lip margin because this often results in inferior displacement of the lip.

Defects of the philtrum can be closed primarily only if they are very small. Larger superficial defects down to muscle can be grafted with donor skin from the preauricular, postauricular, or conchal bowl skin or from Burow's triangle harvested from above the defect and extending to the inferior columella. Large and deep defects of the medial aspect of the lip into muscle near the philtral crest that are too large for primary closure can be closed with horizontally moving advancement flaps using a perialar crescent and, if necessary, another Burow's triangle lateral to the commissure of the mouth. Defects of the lateral portion of the lip are more easily repaired. Superior lateral defects respond nicely to island pedicle flap repair (Fig. 80-5). Preferably, these flaps are designed within the cosmetic unit of the lip and nasolabial fold. If necessary, the flap may be designed to include the medial cheek skin as well. It is important for the apex of the triangular island pedicle flap to be oriented vertically at the most inferior portion to prevent distortion of the commissure or upward pull of the lip. For large inferior lateral defects of the upper lip, inferior or laterally based transposition flaps may be helpful. Rarely are Karapanzic or Abbé flaps necessary.

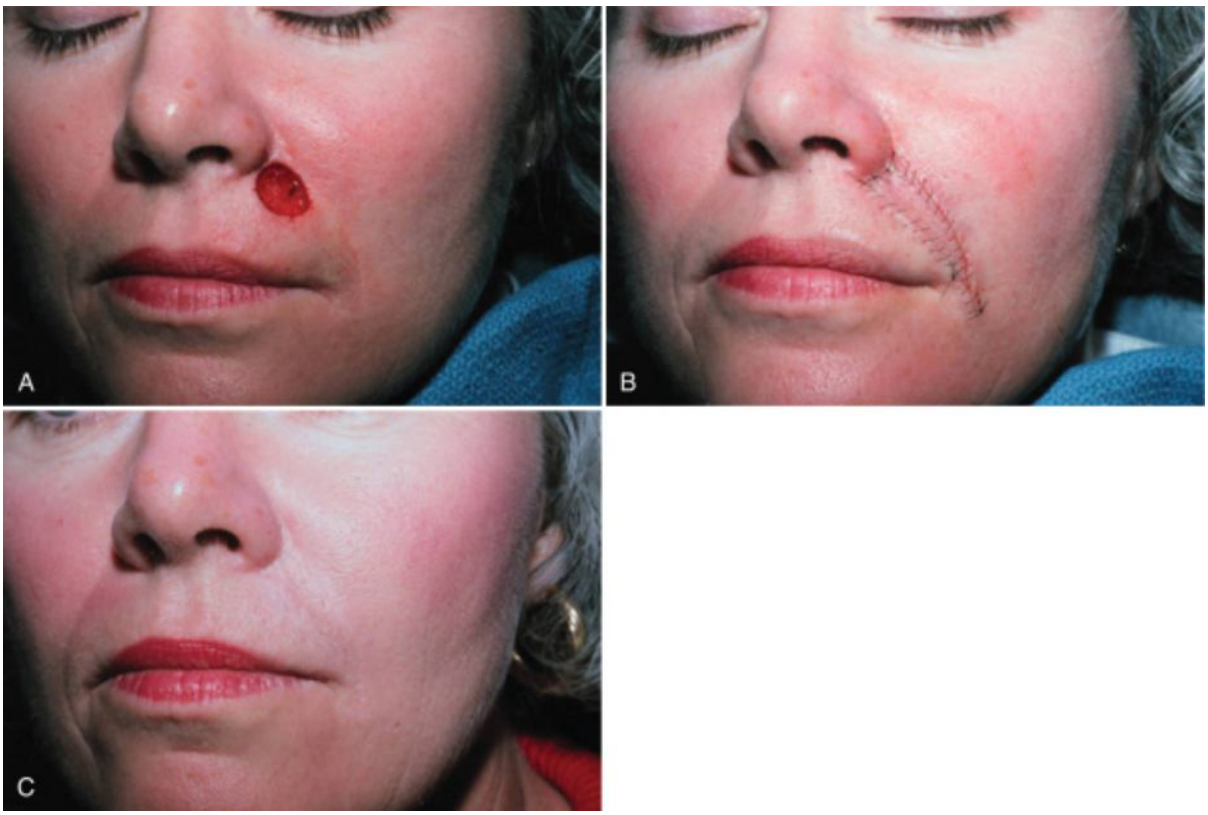

Figure 80-5 Island pedicle flap reconstruction of the lip. **A,** Defect on the superior lateral aspect of the upper lip. **B,** Immediate postoperative result. **C,** Cosmetic result after 6 months.

Lower Lip

Primary closure of defects of the lower lip is usually possible even if the defects extend up to half of the width of the lip. For the best cosmetic result, primary closure is not a simple wedge resection. A fusiform or elliptical excision of skin is performed so that the superior triangle, if it involves the vermilion, extends around the lip and then inferiorly onto the labial mucosa. For larger defects, some muscle may be excised to minimize bulk on closure, but less muscle than skin should always be excised. Next, both the skin and mucosa are undermined above the muscle and laterally to elevate flaps of skin and mucosa. The muscle is closed first, and then the skin and mucosa are advanced over the muscle and closed in layered fashion. Squamous cell carcinoma arising from the vermilion of the lower lip often presents a problem of dealing with extensive in situ disease along large portions of the vermilion. To minimize the deformity of excision, one option is to excise the invasive portion of squamous cell carcinoma, make plans for primary closure, and then treat the in situ portion with carbon dioxide laser destruction or alternatively with superficial vermilionectomy and mucosal advancement. Very large defects on the lip are fortunately very rare but may require full-thickness cheek advancement with a turnover of labial or buccal mucosa to re-create the mucosa and vermilion of the lip.

Nose

Reconstruction of the nose requires a mastery of local flaps and grafts.[9] For purposes of discussion, the nose can be divided into reconstruction of the upper two thirds and reconstruction of the lower third of the nose. For defects of the upper two thirds of the nose, the skin is less sebaceous than the lower third. Very large defects in the nasal sidewall and dorsum can be repaired with full-thickness skin grafts and good cosmetic results achieved if the wound depth is not significantly greater than the thickness of the grafted skin from postauricular or supraclavicular donor sites. For very deep defects, especially in thick sebaceous skin on the nose, a forehead flap provides a good result. Small midline defects up to 1 cm on the nose can be closed primarily with long vertical incisions extending from the nasal root to the inferior nasal tip and including extensive undermining at the level of perichondrium and nasal bone, essentially skeletonizing the nasal tip and dorsum. This technique may narrow the nose slightly but usually provides an excellent cosmetic result. Small defects on the nasal sidewall can also be closed primarily or may be closed with small inferior and laterally based transposition flaps.

The lower third of the nose is more difficult to repair because of the unique thick sebaceous skin, limited opportunity to recruit nearby skin, and the need to prevent distortion of the tip or alar rim. For defects of the tip, long primary closure as noted earlier usually works well with wounds less than 1 cm in diameter. Defects on the

lateral tip or sidewall up to 1.5 cm can be repaired with a bilobed flap (Fig. 80-6).[10] For defects of the lower sidewall and ala, a single-stage nasolabial flap using cheek skin can provide a very good result if care is taken in the design to excise Burow's triangle superiorly and advance the cheek skin while closing the donor site by tacking the suture line to the immobile tissue above periosteum in the area of the lateral ala and the triangular portion of the upper lip. This preserves the alar crease, prevents tenting across the nasolabial fold, and minimizes the risk of trapdooring. The flap should be trimmed of excess fat before suturing into the defect (Fig. 80-7). Defects of the ala alone may be repaired with a two-stage nasolabial interpolation flap, especially if cartilage is necessary to support the alar rim.[11] Large defects on the tip and ala can be repaired nicely with a two-stage forehead flap (Fig. 80-8). Grafts on the lower third of the nose are useful when the defect is small and no deeper than the thickness of grafted skin. The conchal bowl of the ear is a very good donor site for this area because the skin of the ear matches the skin of the nose better than any other donor skin. In addition, the donor site can heal by secondary intention by simply removing a small plug of cartilage in the center of the wound to allow granulation tissue to cover the remainder of cartilage and promote re-epithelialization of the wound.

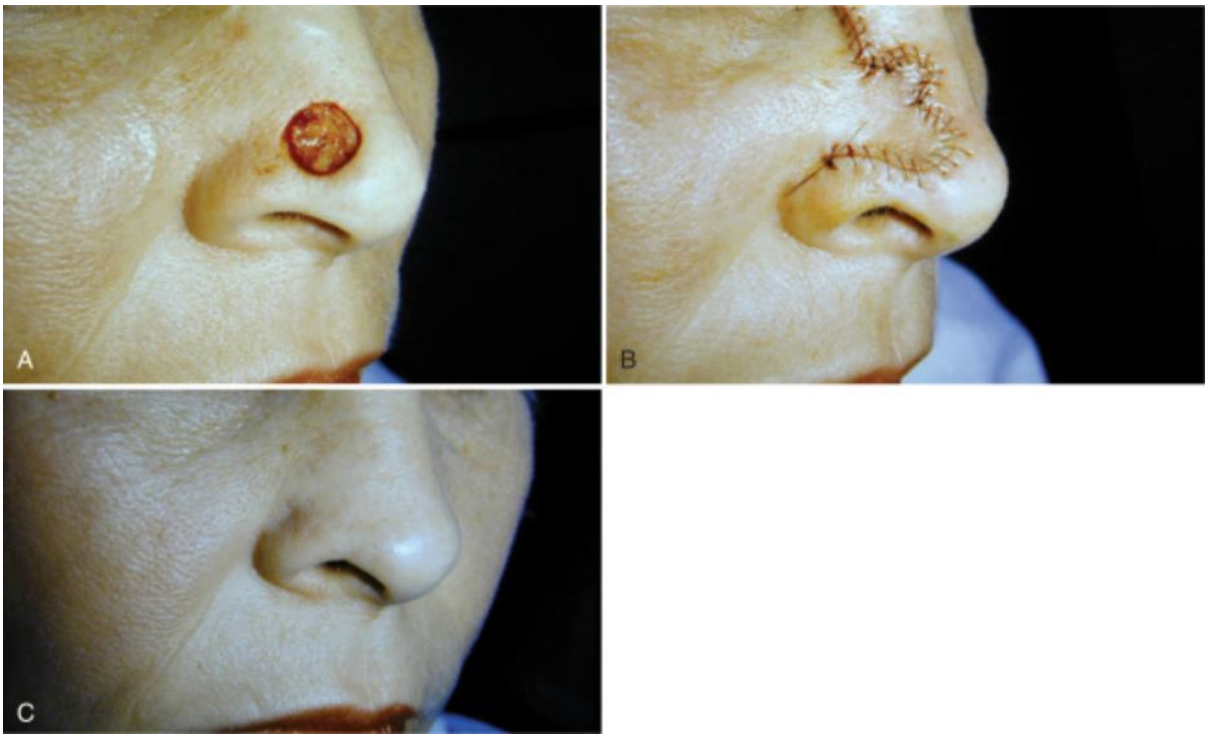

Figure 80-6 Bilobed flap on the nose. **A,** Defect after excision of a basal cell carcinoma. **B,** Immediate postoperative result. **C,** Cosmetic result after 6 months.

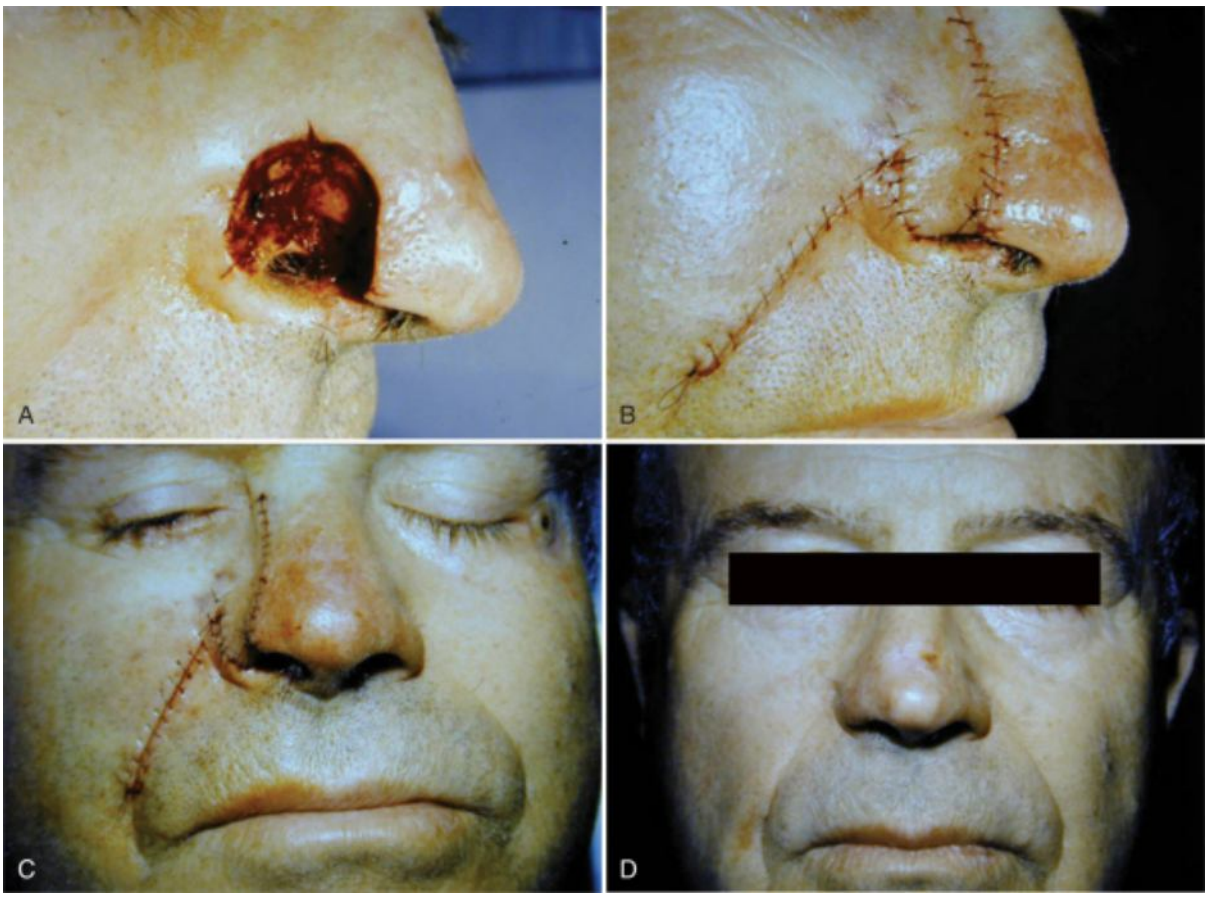

Figure 80-7 Single-stage nasolabial flap reconstruction of the nose. **A,** Defect of the ala with loss of the alar rim. **B,** Immediate postoperative result with the flap turned under the alar rim. **C,** Immediate result with preservation of all creases and sulci. **D,** Cosmetic result after 6 months.

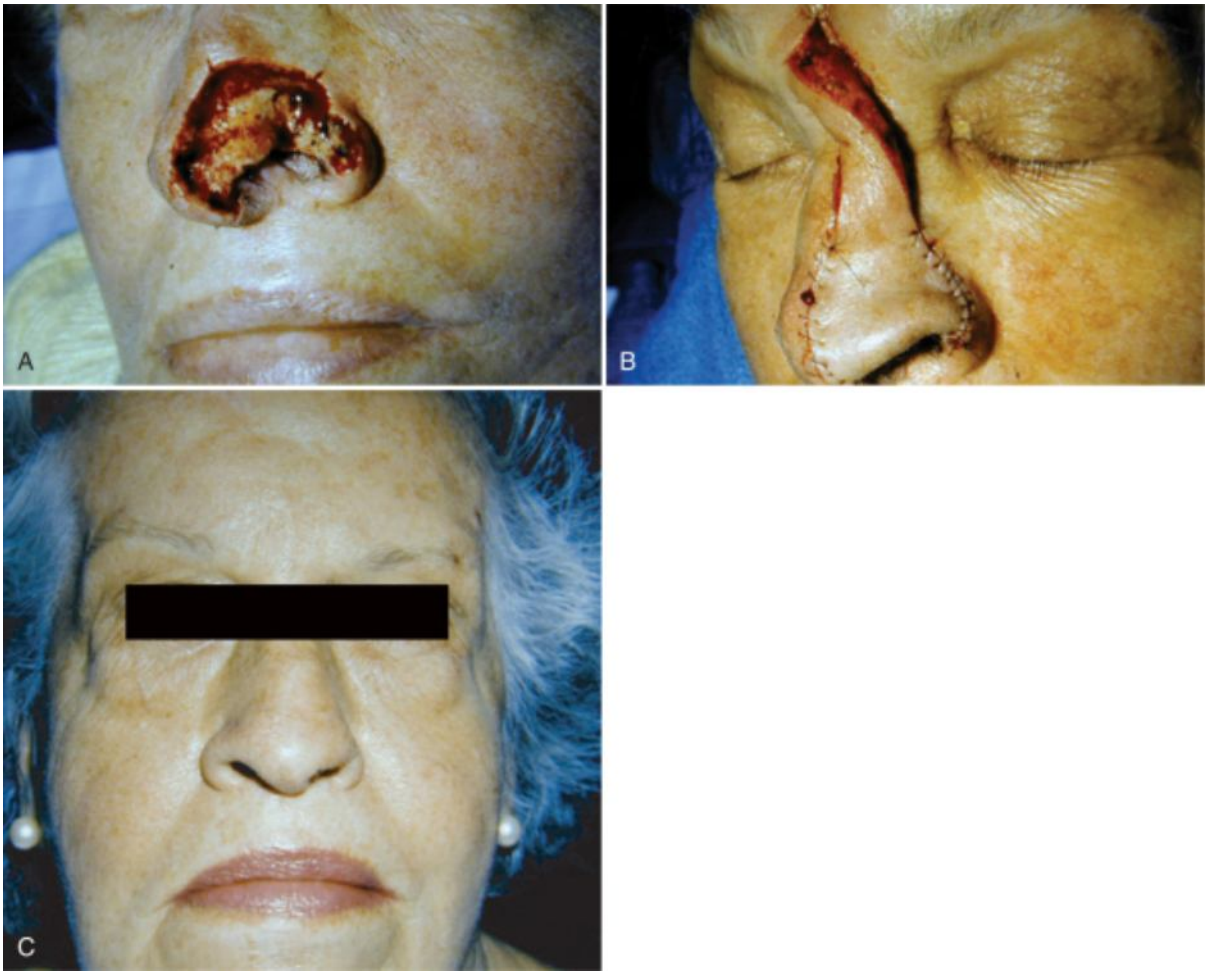

Figure 80-8 Paramedian forehead flap for large nasal reconstruction. **A,** Full-thickness defect of the nasal tip, ala, sidewall, and vestibular dome. **B,** Reconstruction with mucosal advancement for nasal lining, cartilage graft for support, and a paramedian forehead flap for skin coverage. **C,** Cosmetic result after 6 months.

Forehead, Temple, and Scalp

The majority of wounds on the forehead can be closed primarily, often even wounds up to 2 cm in diameter. However, contrary to popular practice, vertically oriented closures provide better results than horizontal closures do. Very small defects less than 1 cm may be closed horizontally. Anything 1 cm or larger may lift the brow and create asymmetry or an irregular pattern in the horizontal wrinkle lines of the forehead, and horizontal closures often result in a persistent numb area above the wound that is disturbing to patients. Skin grafts on the forehead are noticeable and are rarely a good choice for repair. In fact, when no good options for closure exist, allowing the wound to heal by secondary intention is usually better than a skin graft.

On the temple and lateral aspect of the forehead, primary closures are most useful, but with orientation along radial lines so that the closure is vertical on the lateral part of the forehead but horizontal when located lateral to the canthus. Transposition flaps may also be useful on the temple and lateral aspect of the forehead, especially near the hairline. In this area, special care to avoid the temporal branch of the facial nerve during excision and undermining is important.

Scalp

Most scalp wounds less than 2 cm in diameter can be closed primarily after wide undermining below the galea. For larger defects in hair-bearing skin, a very large rotation flap may cover the wound. Scalp skin stretches very little, and large wounds require a very large rotation flap. Healing by secondary intention is often a good choice, even in hair-bearing areas, because the defect contracts significantly and may result in a wound smaller than any secondary defect created during rotation of large flaps. Skin grafts on a balding scalp are a good choice for repair if the wound cannot be closed primarily. When periosteum is removed and bone is exposed, large flaps may be necessary to cover exposed bone. Burring of the bone to cause bleeding, followed by the application of a split-thickness skin graft, is a possible option, but burring of the outer cortex destroys its barrier function to invasion by tumor. Tumor recurrence in this area can then easily invade the bone, thus making treatment of recurrences a

high-risk operation. Burring of bone as management of exposed bone should be a last resort.

Cheeks

The loose skin of the cheeks makes primary closure possible even for very large defects. Closures are usually oriented vertically in the lateral and preauricular parts of the cheek, are crescent shaped in the midcheek area, and are obliquely oriented parallel to the nasolabial fold for medial cheek defects. For large superior medial cheek defects unable to be closed primarily, full cheek rotation flaps provide good results (Fig. 80-9). Large wounds on the midportion of the cheek may be repaired with island pedicle flaps. Large lateral and inferior wounds can be repaired with transposition flaps consisting of loose skin from the neck area as well.

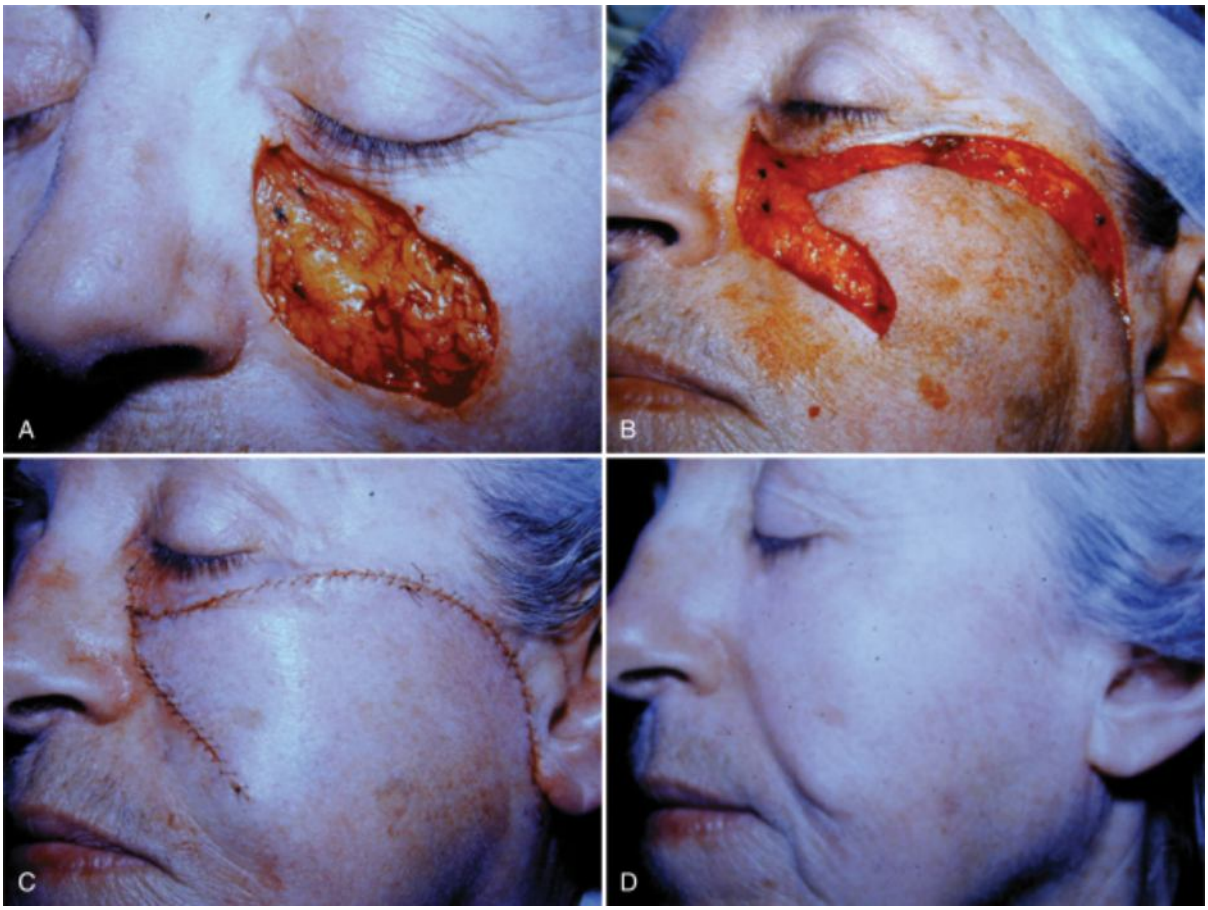

Figure 80-9 Cheek rotation flap. **A,** Large defect on the superior medial aspect of the cheek. **B,** Rotation flap incised and undermined. **C,** Immediate postoperative result. **D,** Cosmetic result at 6 months.

Neck

The neck, like the cheek, has the advantage of large amounts of loose skin, and therefore almost all wounds can be closed primarily or with transposition flaps.

POSTOPERATIVE MANAGEMENT

The immediate concerns during the postoperative period are pain and bleeding. Most patients claim that the aching or pain after skin cancer surgery is handled well by acetaminophen for minor procedures and minor narcotic pain relievers for larger procedures, especially for wounds under tension or those involving muscle. Bleeding is a risk, particularly in the first 6 to 8 hours postoperatively, and is minimized by careful intraoperative hemostasis, a well-placed dressing that applies pressure over the wound and undermined areas, and instructions to the patient to minimize physical activity. Patients should be instructed that if bleeding occurs, steady pressure for 20 minutes should stop most bleeding episodes.

After 4 weeks, when the wound has developed tensile strength, patients may massage their wounds to minimize swelling and firmness of the scar. Rarely is any scar revision worthwhile before 3 months. At 3 months dermabrasion of wounds on the nose may be helpful, and at 6 months re-evaluation of wounds for any other revision surgery can be considered.

Managing Open Wounds

Some wounds are best managed without reconstruction. Small biopsy wounds; wounds after excision of small cancers at the medial canthus, alar crease, ear, forehead, and scalp; and even large graft donor sites may heal better by secondary intention than by reconstruction. Wounds in concave areas heal with better cosmetic results than do wounds on convex surfaces. Scars from wounds on pigmented skin or a red, ruddy complexion will be more noticeable than the same scar in pale, white skin. A scar is better camouflaged in skin with other lesions such as lentigines or keratoses than in flawless, smooth skin. All wounds contract and can therefore create distortion of nearby structures during healing, such as eclabion and ectropion. With these predictable events in mind, one can make a better informed decision about which wounds can heal and which wounds should be repaired.

COMPLICATIONS

Aside from pain and bleeding, most postoperative complications appear in the first few weeks. Surgical site infections are noted as early as 48 hours but most commonly 5 to 7 days after surgery. An infection is almost always *red* and *painful*. Purulent discharge may not be present. Redness may also be due to normal wound healing or be exaggerated by a tight closure, excess intraoperative electrocoagulation to control brisk bleeding, or poor tissue handling or suturing technique. The diagnosis of a surgical site infection is a clinical diagnosis by the surgeon alone. There is no absolute set of criteria for infection. Even culture results do not define infection; they serve as only a guide for appropriate antibiotic therapy once a diagnosis is made.

Hematoma at the surgical site should be drained if possible and can usually be achieved through a 1- to 2-cm opening in the incision line. Local anesthesia may be necessary if the blood is coagulated, and pressure is necessary to evacuate the hematoma. Interstitial hematomas occur when blood and fluid infiltrate the tissue without a pooled collection. They cannot be drained. Fortunately, interstitial hematomas resolve quickly and completely.

Necrosis of flaps and grafts may begin to occur at 1 week and develop over the subsequent few weeks. Because it is difficult to estimate the true extent of tissue loss in the first week or two, it is better to delay any decision to débride tissue until the full extent of necrosis is evident by the appearance of a black eschar or autolysis and separation of fully necrotic skin. Many times dark or violaceous tissue will heal nicely with-out the need for débridement. Early débridement is discouraged.

One frustrating event in the postoperative course is an open wound that fails to heal. Nonhealing wounds are often caused by one of three conditions. The most common is overgrowth of *Candida albicans* caused by the topical application of antibiotics and the use of occlusive dressings continuously for 3 weeks or longer. There may be no clinical evidence of infection by yeast. By simply adding or switching to a topical antiyeast medication, healing can be promoted. If the wound does not respond to antiyeast medications, the failure to heal may be related to a skin condition called erosive pustular dermatosis. This commonly occurs on the scalp and forehead, although it can be seen elsewhere as superficial erosions with thick yellow and greasy crusts. This condition responds quickly to the topical application of potent corticosteroid creams.

When exuberant granulation tissue appears elevated over the wound edges, scraping it with a curette or scalpel may promote wound healing. Local anesthesia with epinephrine plus a pressure dressing is helpful to control oozing and bleeding. If the granulation tissue is only minimally elevated, it does not interfere with healing and no manipulation is necessary. Topical treatment of granulation tissue with silver nitrate or other caustic agents delays wound healing and is not recommended.

PATIENT EDUCATION

An important part of the postoperative management of patients after skin cancer surgery is education of the patient. Patients should be advised of their prognosis and risk for recurrence locally, regionally, and systemically, all of which differ according to tumor type, size, location, and treatment. Patients should be advised about their family risk as well. Patients with a history of melanoma and dysplastic nevus syndrome may have family members at increased risk who should be evaluated. Patients with sebaceous carcinoma are at increased risk for gastrointestinal malignancies because of its association with familial polyposis, and their families should also be screened.

Patients with a tumor at risk for regional recurrence in lymph nodes should be instructed in self-palpation of lymph nodes. Instruction should emphasize the method of palpation and that most regional disease is discovered first by the patient. Instruction may result in earlier detection by the patient before regularly scheduled follow-up appointments. One should emphasize the method of palpation and advise that involved nodes are not usually painful. They should also be instructed to palpate for satellite and in transit disease.

Most skin cancers are associated with ultraviolet light exposure. Patients should be instructed to minimize

exposure to ultraviolet light through the liberal use of sunscreens and protective clothing. Sunscreens should absorb ultraviolet light in both the UVA and UVB range. Most people do not apply sunscreens liberally enough to get the absorption indicated on the label by the sun protective factor (SPF) value, so UVB protection ratings of SPF 30 or higher are better than a rating of 15. Sources of artificial light in tanning booths are just as harmful as sunlight and should be avoided as well.

FOLLOW-UP

Patients with a history of skin cancer have at least a 40% risk of a second skin cancer within the first 5 years after surgery and a higher risk if they have squamous cell carcinoma or a history of multiple skin cancers. For this reason they should be instructed in self-examination of their skin at least monthly with a description of the appearance of skin cancer. They should also be advised to undergo full-body skin examination by a dermatologist at least yearly to detect new skin cancers early. Follow-up schedules to observe for signs of local, regional, or distant disease depend on the tumor type and stage. For example, patients with high-risk tumors such as Merkel cell carcinoma, thick melanomas, or deep squamous cell carcinomas may be monitored every 2 months, whereas those with uncomplicated low-risk basal cell carcinoma should be scheduled for yearly follow-up.

Follow-up for evaluation of the cosmetic result of reconstruction varies with the procedure. Repairs at risk of contraction and distortion may benefit from the injection of high-dose intralesional steroids (triamcinolone, 40 mg/mL) 1 month after surgery in areas such as the lower eyelid or upper lip. Dermabrasion of suture lines on the thick sebaceous skin of the nose occasionally helps and is valuable at 3 months. Most other surgical revisions are best delayed until 6 months because of spontaneous improvement in the early stages of wound healing.

PEARLS

- Always have a pathology report from a biopsy of the lesion and understand its significance before planning surgery.
- Know the literature about skin cancer. There are standards for treatment that include surgical margins, laboratory and imaging evaluations, and the value of adjuvant therapy, including surgery, radiation therapy, immunotherapy, and chemotherapy.
- Learn how to visualize tumor margins with bright lights and stretching the skin.
- Respect the need for clear surgical margins and learn the meaning of the pathologist's interpretation of clear surgical margins.
- Practice quality assurance to improve the quality of patient care and the results of surgery.

PITFALLS

- Failure to respect local recurrence of disease results in a high risk for persistent disease when retreating recurrent cancer.
- The use of surgical excision as the only option for treating skin cancer overlooks important alternative choices, including destruction, Mohs surgery, radiation therapy, and topical therapy.
- Immediate reconstruction after excision of complex cancer before clear margins are documented may result in buried and fragmented persistent tumor and more difficult re-excision and repair options.
- Failure to seek the help of other specialists for difficult cancers may adversely affect patient care.
- Failure to arrange and ensure continued patient care may result in missed or delayed treatment of recurrent disease, as well as discovery of new primary skin cancers.