Chapter 24: Management of Basal and Squamous Cell Carcinoma

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The clinical presentation, differential diagnosis, and etiologic factors for basal cell carcinoma and squamous cell carcinoma were detailed in Chapter 19. This chapter defines the treatment modalities that are effective in extirpating cutaneous basal cell and squamous cell carcinomas, including electrosurgery, excisional surgery, cryosurgery, irradiation, and Mohs surgery. The last technique, also known as microscopically controlled excision, will be detailed, including its historical evolution, the technique itself, indications for its use, and a brief discussion of options for reconstruction of defects. Once the modalities have been discussed, a section dealing with the choice of the appropriate modality will follow. For the most part, basal cell and squamous cell carcinoma will be dealt with in the same fashion, since the treatment modalities are similar for each. Fig. 24-1 outlines a schematic approach to basal cell carcinoma.

Treatment Modalities

Electrosurgery

Electrosurgery is an invaluable treatment modality used primarily by the dermatologist (Albright, 1982; Swanson, 1983b). It can yield 92% to 98% success rates in skilled hands (Crissey, 1971; Ferrar, 1960; Freeman et al, 1964; Knox et al, 1960; Kopf et al, 1977). The comparative success rates of several different modalities are listed in Table 24-1. The keys to success with this technique include (1) the skill and experience of the operator, (2) appropriate use of large and small curettes, (3) appropriate selection of tumor, and (4) detailed instructions to the patient for wound healing.

Table 24-1. Comparative success in treatment methods used for basal cell carcinoma

Treatment method	Success rate (%)
Electrosurgery	92.6-98.0
Excisional surgery	93.2-95.5
Cryosurgery	94.0-97.0
Radiation therapy	92.1-96.0
Mohs surgery	97.4-99.1

Technique

The curette comes in varying sizes, from 1 to 8 mm. Basal cell carcinoma and squamous cell carcinoma have a soft feel that can be differentiated from normal surrounding skin that feels smooth and firm (Swanson, 1983b). By using first a large curette to debulk the majority of the soft tumor-containing tissue followed by a small curette to remove any small nests and projections of tumor, the surgeon can selectively remove the cancerous tissue and spare the normal surrounding skin.

A recommended technique for electrosurgery follows (Swanson, 1983). (1) The skin is cleansed and prepared with alcohol or chlorhexidine gluconate (Hibiclens), the clinical margins of the tumor are outlined, and local anaesthesia is obtained. (2) With a large curette, the surgeon removes the bulk of tumor until he reaches normal-feeling surrounding tissue. (3) Electrodesiccation or fulguration of the base of the wound is performed, and a 1 to 2 mm margin of surrounding skin is also desiccated. (4) With first a large curette and then a small curette (No. 1 or 2), the surgeon again performs curettage of the base of the wound. This is again followed by electrodesiccation (fulguration) of the wound with 1 to 2 mm surrounding margins. (5) This sequence is repeated until normal tissue is felt with both sizes of curettes. Once this occurs, electrodesiccation follows once more. Therefore this sequence may occur twice or as many as five or six times depending on the size and feel of the lesion. (6) After final electrodesiccation (fulguration), a light curetting is performed to remove excessive tissue char, and a sterile dressing is placed.

Wound care consists of hydrogen peroxide soaks two to three times daily followed by soap and water rinsing and the application of bacitracin ointment and a Telfa pad or bandage. Once tissue char is removed and a healthy granulating wound base is achieved, this regimen should be repeated daily. The patient is carefully instructed not to let an eschar form, since a wound granulating from the base will fill in its depth under moist occlusion and leave a more cosmetically acceptable scar.

With this technique, a high cure rate for properly selected tumors can be achieved ranging from 93% to 98% (Crissey, 1971; Ferrar, 1960; Freeman et al, 1964; Knox et al, 1960; Kopf et al, 1977). The treatment can be performed on small tumors with clearly defined borders, especially in anatomic sites over a fixed underlying structure such as the bridge of the nose, the anthelix of the ear, the hands, and the trunk (Albright, 1982; Swanson, 1983b).

Advantages and disadvantages

The major advantage of electrosurgery is that in an outpatient setting, rapid treatment of a cutaneous neoplasm can be achieved with excellent results. Disadvantages include scarring, a delay in wound healing, and occasional bleeding. The scar can be minimized by proper wound care. This treatment should be avoided in most patients with lesions in cosmetically important areas because a better cosmetic result can be obtained in these patients with excisional surgery (see Fig. 24-1). Electrosurgery offers a good cosmetic result when used to treat superficial lesions on the bridge of the nose or nasal tip, small lesions on the temple, and lesions on the ear and postauricular area that have well-defined clinical borders and are smaller than 2 mm. The wound often takes 3 to 6 weeks to heal completely. On occasion, especially when the desiccated tissue separates from the base of the wound, a small amount of bleeding may occur.

Contraindications

Contraindications to electrosurgery include large tumors (greater than 2 cm) and those extending deeply into the dermis or fat. If the curette reaches fat, the surgeon should stop and consider a different treatment modality. Second, certain anatomic locations are of high risk (Fig. 24-2). Other anatomic areas may yield a cosmetically unacceptable scar. Third, morpheaform or sclerotic basal cell carcinomas have a scarlike stroma that removes the "feel"

of the curette from the surgeon and should not be treated with this modality. Last, except for unusual circumstances, recurrent tumors are best treated by other modalities. Patients with demand pacemakers can be treated with electrodesiccation with current without a patient ground for less than 3 to 4 seconds at one time. For patients with other than demand pacemakers, electrosurgery is contraindicated.

Excisional surgery

Excisional surgery also offers an excellent success rate for the treatment of primary basal and squamous cell carcinomas in experienced hands (93% to 95%). Excision surgery can be performed with a simple side-to-side closure, or the defect may be closed with a flap or skin graft (full thickness or split thickness). Careful marginal control is necessary no matter which closure is used. Several methods are available to check pathologic margins, and the surgeon should become familiar with the method that the person processing the tissue specimens uses. Both lateral and deep margins should be checked. Proper specimen orientation for presentation to the pathologist is critical and may be accomplished by marking one end of the incision with suture or using an M-plasty, dyes, or other methods worked out between the pathologist and surgeon.

Surgical margins are a debated topic for any cutaneous lesion. For the routine well-demarcated nodular basal cell carcinoma, a 2 to 3 mm margin is sufficient. For multicentric tumors, morpheaform basal cell carcinomas, and keratotic basal cell carcinoma when Mohs surgery is not available for careful marginal control, the margins of excision should be greater (Gooding et al, 1965).

Technique

Excisional surgery may be performed on routine primary basal cell carcinomas on an outpatient basis with the patient under local anaesthetic. After the tumor is outlined clinically, the closure is planned to best fit into cosmetic skin and tension lines. The area is anesthetized by local infiltration and nerve block where appropriate. First the clinically apparent tumor is curetted. Often this step will yield a clinical tumor margin outside that visible with the naked eye. The excision is then outlined confirming to skin tension lines with 2 to 3 mm borders around the clinical and curetted tumor margins. The excision is performed and the wound is undermined and closed in the preplanned fashion (Johnson et al, 1991). The surgical specimen is carefully oriented and sent to the pathologist for careful examination. The wound is then dressed and cared for in the usual postsurgical fashion.

Where appropriate and available, random vertical frozen sections can help with the assurance of obtaining tumor-free margins. However, as will be discussed under the section on Mohs surgery, random vertical sections are not as complete as the total horizontal sections used by the Mohs surgeon (Cottell and Proper, 1982; Gooding et al, 1965; Swanson, 1983a). Unlike basal cell carcinoma, squamous cell carcinoma may spread with curettage before excision. Therefore it should be excised without curettage and with excision margins greater than those with basal cell carcinoma.

Advantages and disadvantages

A major advantage of excisional surgery is cosmesis. An excellent scar forms in a shorter time than with other treatment modalities. Another advantage is the availability of tissue for pathologic sectioning and confirmation of diagnosis and completeness of excision. The disadvantages of excisional surgery are few. It is more time consuming than is electrosurgery or cryosurgery and entails more skill and understanding of basic surgical techniques on behalf of the surgeon.

Indications

Excisional surgery is indicated in the following situations. It is recommended for tumors in anatomic locations where the tissue is mobile and elastic and where cosmesis is important (Fig. 24-1). These areas include cheeks, forehead, scalp, neck, and extremities. Second, excisional surgery is indicated when rapid healing and minimal postoperative morbidity are desired and pathologic confirmation of surgical margins is critical.

Contraindications

Contraindications to excisional surgery include very large tumors and most morpheaform and keratotic basal cell carcinomas. Lesions that are multicentric and do not have well-demarcated margins are often difficult to excise completely. This is less of a problem with excision than with some other treatment modalities since tissue is available for marginal confirmation. In anatomic sites where tissue is poorly mobile, such as the nose, ears, hands, and fingers, surgeons tend to minimize surgical margins to ensure closure. Electrosurgery and cryosurgery are better treatment alternatives in these sites. In elderly patients and those with fragile general health, the length of time needed to perform adequate excisional surgery may be a relative contraindication. Patients receiving anticoagulant therapy are at a risk for perioperative and postoperative bleeding, and meticulous hemostasis must be achieved before closure.

Cryosurgery

Cryosurgery is a treatment option offering cure rates that are comparable to most others for properly selected tumors, principally basal cell carcinomas (Table 24-1). Its use is less common in the treatment of squamous cell carcinomas. As with any procedure, the skill and experience of the operator are critical. A detailed discussion of cryosurgery is beyond the limits of this chapter. Several good review articles exist (Lubritz, 1977; Zacarian, 1975, 1982).

The cryogen of choice and the one most commonly applied for skin cancer surgery is liquid nitrogen. It is administered by either a spray apparatus or the use of cryoprobes in a "closed system". Cryogens such as carbon dioxide, Freon, and liquid nitrous oxide do not have the ability to freeze tissue to adequate depths and temperatures and should not be used.

The temperature range between -25°C and -30°C is lethal to cutaneous malignant tissue. Modern cryosurgeons believe that for proper cryonecrosis, a minimum temperature of -30°C must be obtained throughout all cancer-containing tissue. Several cryosurgeons

recommend a temperature of -50°C. Tumor cryonecrosis is obtained through multiple freeze-thaw cycles with temperatures monitored by thermocouple needles or a cryometer. The experienced cryosurgeon can often monitor this visually. Cryosurgery has three critical parameters: the depth of the freeze, the width of the freeze beyond the critical margin of the tumor, and the thaw time. The thaw time is differentiated into marginal thaw time and total thaw time. The marginal thaw time is more important and should be at least 120 seconds in treating cutaneous basal cell carcinomas. Double and triple freeze-thaw cycles are strongly recommended, since they have been shown experimentally to increase the thoroughness of cryonecrosis.

Technique

Cryosurgery is performed by first clinically outlining the tumor with a 2 to 5 mm border of normal-appearing tissue. The area is then usually anesthetized with lidocaine. By either a spray technique or a closed system, cryoprobes or thermal couples are placed to the appropriate depth at the margin of the tumor (not within the tumor). The tumor and surrounding tissue are frozen. The tissue is then allowed to thaw, noting the marginal thaw time. The procedure is then repeated a minimum of one time. The wound is handled in the usual fashion, expecting a good deal of tissue inflammation, necrosis, and blistering. Prefreezing curettage can also be of benefit.

Advantages

The indications and advantages of cryosurgery are similar to those of electrosurgery. First, this technique is excellent on or around tissue with a fixed undersurface. The nose, ears, and digits are particularly amenable to this therapy. Second, cartilage can be frozen without undergoing necrosis, and therefore cryosurgery is particularly useful for tumor overlying cartilage. Third, it has been shown that scars forming after cryosurgery exhibit less wound contracture than do scars healing from other forms of excision (Zacarian, 1975). Therefore it is advantageous in areas in which scar contraction or keloid formation is a problem, such as eyelids or presternal chest. Fourth, basal cell carcinomas in patients taking anticoagulants and those who have pacemakers or who are sensitive to local anesthetics can be treated effectively by cryosurgery. Last, this technique is a valuable addition to the overall therapeutic plan in a patient with multiple basal cell carcinomas (Lubritz, 1977).

Disadvantages

Disadvantages of cryosurgery include a prolonged healing time of 3 to 10 weeks. During the initial 2 weeks, the wound exhibits marked edema and necrosis and often has a considerable amount of serous drainage. Although the resultant scar becomes soft and pliable with time, hypopigmentation is a common occurrence. Second, anatomic control is limited since cryonecrosis affects anything in its path including blood vessels and nerves. Last, as with electrosurgery, precise anatomic control of tumor margins is lacking.

Contraindications

Contraindications to cryosurgery include skin cancers with poorly defined borders, fibrotic or morpheaform basal cell carcinomas, tumors in cosmetically important areas, tumors

in hair-bearing skin (since the hair follicles can be permanently destroyed), and most recurrent skin cancers.

Radiation therapy

Radiation therapy was once a popular modality that dermatologists and radiologists used to successfully treat skin cancers (Crissey, 1971; Ferrar, 1960; Freeman et al, 1964; Pack and Davis, 1965), but now radiation therapists are its primary users. Its use in the treatment of basal cell carcinoma has decreased to specific indications. Several relative disadvantages and contraindications to radiation therapy have made its use less common than the three modalities previously described. Indications and advantages to radiation therapy relate to certain areas such as ears, eyelids, nose, and lips. Radiation chondritis and osteoradionecrosis can occur. These complications can be prevented by proper dose fractionation by the radiation therapist. This can be a useful modality in elderly patients who are medically debilitated and who are poor operative risks. It is also a useful form of palliative therapy for large skin cancers in elderly patients.

Radiation therapy has several disadvantages. One is the length of time required, since properly fractionated therapy usually extends over 4 to 6 weeks. Therefore the patient must be mobile enough and have sufficient time to complete therapy. Second, the development of radiodermatitis and further aging of the skin can occur. There is even potential for further carcinogenesis within the treated area. Therefore it use in patients under the age of 60 years should be limited. Third, similar to cryosurgery, tissue for margin control is lacking. Finally, tumors that recur after radiation therapy tend to do so late and to be clinically aggressive. The treatment of choice for such recurrent tumors is Mohs surgery (Cobbett, 1965; Swanson, 1983a).

Mohs surgery

While a medical student in the middle 1930s, Frederic Mohs developed a technique for extirpation of cutaneous tumors using microscopic control after chemical fixation of the tumor. After clinical trials, he published the results of his "chemosurgery technique" in 1941 (Mohs, 1941; Mohs and Guyer, 1941). The chemical fixative, zinc chloride paste, fixed cancer in situ permitting careful serial removal with examination of the entire specimen histologically to identify pockets of residual carcinoma. Despite minor modifications (Mohs, 1959, 1976; Phelan and Milgrom, 1967; Robins, 1974; Robins and Menn, 1970; Tromovitch et al, 1965a, 1966), the basic technique of fixed-tissue chemosurgery has remained the same. The fixative was made by combining zinc chloride with granulated stibmite and an extract of *Sanguinaria canadensis* (blood root), resulting in a black paste. The essential principles of the fixed-tissue technique include first debulking the tumor mass and applying a thin layer of zinc chloride paste under a moist occlusive dressing. This is left in place for 12 to 24 hours, resulting in an in vivo fixation of tissue. A thin layer of fixed tissue is then excised, carefully mapped, marked, and color coded at the margins with colored dyes. The entire undersurface as well as the epidermal edge is sectioned by the use of horizontal sections. Microscopic examination of these sections pinpoints the exact location of residual tumor, which is drawn on the map. This process is then repeated with serial sections as necessary until total tumor extirpation is achieved. The wound is then allowed to heal by secondary intention, often after a slough of fixed tissue occurs 3 to 4 days after completion of surgery. This meticulous serial excision

of skin cancer by the fixed-tissue technique resulted in cure rates approaching 99% for primary basal cell carcinomas.

Encouraged and intrigued by the success of this meticulous technique, those making adaptations began omitting the zinc chloride paste. Mohs himself was the first to do so in 1953 in the treatment of eyelid lesions (Pollack, 1980). However, it remained for Tromovitch in 1970 at the meeting of the American College of Chemosurgery to present the first series of patients on whom the fresh-tissue technique was used. He found several advantages to the omission of zinc chloride paste. These included the relief of perioperative pain from tissue fixation in situ, the ability to do multiple procedures (stages) in 1 day, and the ability to have a fresh wound that could be reconstructed immediately. In 1974 Tromovitch and Stegman published the technique along with the results of long-term follow-up examinations of patients treated with the fresh-tissue technique. For the treatment of difficult basal cell carcinomas, the success rate was similar to that reported by Mohs and others with the fixed-tissue technique. After this work, the technique of fresh-tissue Mohs surgery developed and gradually replaced that of fixed-tissue Mohs surgery. Several authors have now proved the advantages and success of the fresh-tissue technique.

The appropriate nomenclature for this technique is confusing. The American College of Chemosurgery uses "Mohs chemosurgery" for the fixed-tissue technique and "Mohs micrographic surgery" for the fresh-tissue technique. The vast majority of physicians today use the fresh-tissue technique, and the simple name "Mohs surgery" has evolved as the most common term used. Other terms include "microscopically controlled excision" and "microscopically oriented histographic surgery". I will use the term "Mohs surgery" in reference to the present-day fresh-tissue technique. The technique is detailed in Mohs' book and most recently by Swanson.

Technique

The surgeon begins by making a clinical outline of the tumor (a hypothetic medial canthal tumor as in Fig. 24-3). The tumor is then debulked in obvious cancer cells with a scalpel or curette. With the scalpel angled 45 degrees to the skin to bevel the excision edge, a thin layer of tissue is removed in the shape of a saucer. Careful anatomic orientation is maintained. The remaining skin edge and the surface of the tissue removed are scored (hatched) to preserve the orientation. Hemostasis is obtained.

A careful map is drawn corresponding to the patient's "defect". The tissue is divided along the scored lines and inverted (turned over with the dermis side up), and the edges are color coded with stains corresponding to the carefully drawn map. By inverting a saucer of tissue and flattening the saucer, the technician can perform horizontal frozen sections of 5 to 7 microm thickness, thus including the entire undersurface as well as epidermal margin for histologic review. This histologic examination is performed with a cryostat kept adjacent to the outpatient surgical site.

The slides are then stained, usually with hematoxylin and eosin, and interpreted by the surgeon serving as his own on-site pathologist. Residual neoplasm can be carefully marked on the map so that the surgeon can return to the patient and remove precisely only the tissue in which the tumor is microscopically persistent. Schematically, the superior margin of Fig.

24-3 contains residual tumor, and the inferior margin of this medial canthal lesion is free of tumor. Therefore only the superior half must be removed in a second stage of the procedure.

The second excision is made as before with the tissue carefully handled, mapped, color coded, and processed. In our hypothetic case, this resulted in total extirpation of the tumor (Fig. 24-3). However, the process can be repeated as often as necessary for total removal of the tumor.

The fresh-tissue Mohs surgery offers several obvious advantages. This precise method of removing only tissue with residual neoplasm permits the maximal preservation of normal surrounding tissue. The defect remaining can be reconstructed immediately. In addition to precise handling of the tissue, horizontal sectioning of tissue is critical to the technique. Horizontal sectioning has been shown to be superior to vertical sectioning for the demonstration of all contiguous strands of tumor. Because surgery and handling of tissue occur within one outpatient site by one physician, the technique is both time and cost effective. Finally, the experienced surgeon becomes adept at microscopic interpretation of horizontally cut frozen sections of carcinoma.

Because of these advantages, the vast majority of Mohs surgery performed today uses the fresh-tissue technique. Even bone can be handled with the fresh-tissue technique. Fresh bone can be chiseled and mapped as carefully as fixed bone. Other surgical subspecialties may aid in tumor removal once bony involvement is identified. This technique has been successfully used (Levine et al, 1979; Swanson, 1983a; Swanson et al, 1983) on tumors invading bone and through bone to include the dura mater, with the aid of the otolaryngologist-head and neck surgeon and neurosurgeon. Therefore the fresh-tissue technique of Mohs surgery as detailed in Fig. 24-3 is the one the majority of surgeons currently use.

Table 24-2 compares the fixed- and fresh-tissue techniques.

Table 24-2. Comparison of fixed- and fresh-tissue Mohs surgery.

Factor	**Fixed**	**Fresh**
Success (no recurrence)	96-99%	96-99%
Pain	Often intense	Little
Efficiency	One stage achievable per operation	Multiple stages achievable per operation
Hospitalization for surgery	Frequent	Infrequent
Precise anatomic control	Difficult	Easy
Bleeding during surgery	Rare	Easy
"Mapping" of tumor	Easy	Easy
Slide interpretation	Can be difficult	Easier
Conservation of normal tissue	Good	Excellent
Repair	Must be delayed	Immediately possible.

Indications

The indications for Mohs surgery are listed below.

1. Basal cell carcinoma
    a. Primary
    b. Recurrent
    c. Incompletely excised
2. Squamous cell carcinoma
3. Verrucous carcinoma
4. Other cutaneous lesions
    a. Any locally invasive lesion with a histology interpretable by frozen section
5. Mucosal neoplasms
    a. Tongue
    b. Oral cavity
    c. Paranasal sinus
    d. Adenocystic carcinoma.

Of this list of indications, the most frequent is the treatment of basal and squamous cell carcinomas. These will be discussed in detail later. The surgery is also indicated in the management of verrucous carcinoma, other cutaneous tumors, and some noncutaneous neoplasms.

Verrucous carcinoma is a locally invasive, rarely metastatic tumor believed by some to be a variant of squamous cell carcinoma, while others believe that it is a distinct entity. It can be present in one of three forms: oral or mucosal, genital, or plantar. Genital and plantar verrucous carcinomas are most amenable to Mohs surgery and success in preserving structure and function of the penis and foot, respectively. The same principles have been successfully applied to verrucous carcinoma of the nasal vestibule.

Several other tumors have been treated by Mohs surgery. In general, any cutaneous neoplasm that grows by contiguous spread and has a histology amenable to frozen section interpretation can be treated by this technique. Documented success has been obtained with angiosarcoma, dermatofibrosarcoma protuberans, malignant fibrous histiocytoma, eccrine carcinoma, leiomyosarcoma, merkel cell carcinoma, and primary adenocystic carcinoma of the skin. As an example, adenocystic carcinoma invades locally and displays histopathologic changes easily interpreted on frozen section. Histologically, the differential diagnosis includes basal cell carcinoma. Clinically, this tumor can be relentlessly aggressive, infiltrating facial planes, bones, and particularly the adventitia of nerves. This neurotropism makes the tumor particularly amenable to treatment by Mohs surgery, since the surgeon can follow the neurotropic extensions of the tumor. Mohs surgery is indicated for certain other tumors because of their location on or around functionally important areas. Examples include vulvar extrammary Paget's disease, penile erythroplasia of Queyrat, and Bowen's disease. The eyelid is another important structure in which maximum tissue conservation is of prime importance. Meibomian gland carcinoma, another tumor with histologic features easily discerned on frozen section, has been treated successfully by the Mohs technique. The clinical course of this tumor must be observed closely because of the possibility of metastases to the brain.

Melanoma is probably absent from this list. Mohs has advocated for several years the treatment of melanoma by fixed-tissue Mohs surgery. Many Mohs surgeons do not agree that Mohs surgery offers any benefit in the treatment of this disease and recommend routine surgical management based on contemporary knowledge of melanoma. A melanoma registry exists for those people who continue to use Mohs, and the final word on Mohs surgery awaits further assessment.

Mohs was the first to treat noncutaneous neoplasms of the head and neck when he used the fixed-tissue technique on parotid tumors (Mohs, 1978). He also used the fixed-tissue technique on some oral neoplasms and central facial paranasal sinus neoplasms as well. The multidisciplinary approach to large cutaneous tumors has been successful in several centers. This can be taken one step further by combining the approach of the surgeon who uses the Mohs technique with that of the head and neck surgeon in the treatment of intraoral, paranasal sinus, and other head and neck neoplasms. In conjunction with a head and neck surgeon, I have used this approach in the treatment of squamous cell carcinoma of the floor of the mouth, tongue, palate, tonsillar pillar, and paranasal sinuses. Biologically, these tumors usually present a problem of extension and recurrence locally, with metastases occurring first to the regional lymph nodes. Conventional surgery is often debilitating, resulting in the los of mandible, tongue, or orbital structures. The interdisciplinary approach, with techniques performed simultaneously in the operating room, combines the conventional surgical management of regional metastases with total microscopically controlled excision of the primary tumor. The Mohs technique adds more precise control than the randomly selected margins supplied by conventional frozen sections. The tissue conservation capability of Mohs surgery has permitted the preservation of the mandible in patients with tumors of the oral cavity, the tongue in patients with tumors of the tongue, and orbits in patients with paranasal sinus cancer in whom conventional surgical methods would have sacrificed these important structures (Baker and Swanson, 1984; Davidson et al, 1981).

Mucosal squamous cell carcinoma of the lip warrants special discussion. These tumors are often extensive and require complex lip reconstruction after routine surgical ablation, so these patients can be good candidates for microscopically controlled excision of the tumor. These carcinomas often have a greater metastatic potential than does squamous cell carcinoma of the skin and can be histologically more undifferentiated, particularly when they occur on the upper lip. The use of Mohs surgery for these lesions ensures total extirpation of the tumor with maximal preservation of normal surrounding skin and mucosa. Simple wedge closure can then be performed, often obviating the need for complex reconstruction of the lip.

Keratoacanthoma is often aggressive and locally invasive, especially when giant or when it occurs in the central region of the face. In addition, it can often be difficult to differentiate histologically from squamous cell carcinoma. When these tumors are larger than 1.5 to 2 cm or occur in the central region of the face and are growing aggressively or present a growth phase that seems relentless and unresponsive to routine therapy, they are amenable to and should be considered for treatment with Mohs surgery. I have seen several large central facial keratoacanthomas destroy an entire nose, and present in regional lymph nodes. Therefore this subset of the keratoacanthoma needs to be differentiated and treated more aggressively than smaller lesions, and Mohs surgery is the treatment of choice.

Reconstruction of defects

Fixed-tissue Mohs chemosurgery has given us a better understanding of wound healing, particularly healing by secondary intention. A recognition of those anatomic sites where healing by secondary intention causes unacceptable scarring and the increased use of fresh-tissue Mohs surgery has resulted in the frequent use of local flaps for the immediate repair of postsurgical wounds. The Mohs surgeon can then provide the head and neck surgeon, plastic surgeon, or reconstructive surgeon a tumor-free defect that can be repaired immediately. Options for repair and criteria used in tailoring wound management to the individual patient will be discussed, but details concerning reconstruction of these defects are beyond the scope of this chapter.

Six major factors are critical to the management of Mohs surgical defects. These include timing, the location of the defect, the patient's occupation, the patient's age, the general health of the patient, and the expectations of the patient. Timing of the repair is critical. Mohs surgery is often used to extirpate tumors that have occurred several times, are quite large, or have occurred in areas severely damaged by prior radiation therapy. When this occurs, the chance of recurrence even after the use of the Mohs technique is higher than usual. When this is the case, reconstruction should be delayed, either leaving the wound to granulate or placing a thin split-thickness skin graft that can act as a "window" for wound observation. If after 12 to 18 months of careful observation there is no sign of recurrence, definitive reconstruction may be undertaken.

Many Mohs surgical wounds can be repaired immediately. The location of the defect is important for functional and cosmetic reasons. For example, an eyelid defect should be reconstructed immediately for optimum functional results. In the prevention of ectropion, a through-and-through defect of the nasal ala often needs immediate repair. Large defects of the lip will need immediate functional repair. The helix of the ear is another area in which immediate cosmetic repair is often important. Large scalp defects, especially those involving the dura mater, require immediate repair for protection of the brain.

The patient's occupation and age play a critical role in the choice of treatment. Younger patients often request and require immediate repair of their wounds so that they can return to the job market. This situation is in contrast to elderly patients who are often happy with the "acceptable" cosmetic result of spontaneous granulation.

The general health of the patient is important. Patients in poor health have difficulty tolerating either local or general anesthetic for the long time necessary to perform a detailed surgical repair of the defect and may do better with healing by secondary intention or repair with a split-thickness skin graft. The patient receiving chemotherapy should undergo surgery and repair at a time in his drug cycle when his white blood cell count and function and platelet count are at a maximum to prevent infection and excessive bleeding.

Patient expectations are critical. Explaining the difference between total tumor ablation and reconstruction is important. The surgeon should emphasize and the patient must understand that these are two separate events, with the primary concern of the Mohs surgeon being tumor extirpation. The patient can then place the cosmetic result of the repair in proper perspective, often being much happier with whatever closure option is elected.

Available options. There are several options for immediate repair. They include spontaneous granulation or healing by secondary intention, simple primary or partial closure, and primary repair with a flap or skin graft. The list below illustrates the methods of repair used in the last 1754 Mohs surgery defects handled by us during the past 3 years.

Granulate, 394 (22.5%)
Partial, 39 (2.2%)
Primary, 303 (17.3%)
Flap, 527 (30.0%)
Full-thickness skin graft, 97 (5.5%)
Split-thickness skin graft, 51 (2.9%)
Referral, 343 (19.6%).

Healing by *spontaneous granulation* is still a preferred option for certain tumors. Those that are large, have recurred several times, or are removed from radiation-damaged skin often heal well by spontaneous granulation permitting close observation for possible recurrence and offering the option of delayed reconstruction. Some areas, particularly those over bony prominences, will heal as well by secondary intention as by primary closure, especially when the defect is not full thickness. Examples of this are the tip of the nose and the inner canthus of the eye.

Often healing by secondary intention can be aided with the use of *partial closure.* Key sutures are used to align the wound into an area or plane that will heal well by secondary intention. This can be done, for example, with a large canthal defect and some defects at the junction of the nose and cheek.

Many surgical defects can be closed simply by side-to-side *primary closure.*

Flaps are the most common form of closure (see list). The adequately trained Mohs surgeon can easily perform small local flaps such as advancement, rotation, and simple transposition flaps. Distant flaps, interpolation flaps, large myocutaneous flaps, and other advanced techniques are closure options that the head and neck surgeon can best perform. Finally, skin grafts are of two varieties.

Split-thickness skin grafts are often used to cover wounds in which the chance of tumor recurrence is greater than usual. This graft can act as a "window" in which wound contracture and deformity can be partially prevented and through which deep tumor recurrence can be detected. After 12 to 18 months, during which time most tumor recurrence would occur, a definitive reconstructive procedure can be performed if the patient desires. This type of graft can also be used as a final closure.

Full-thickness skin grafts provide a more acceptable cosmetic result. The nose is the most common site for the use of full-thickness skin graft after Mohs surgery. Last, at times because of a patient's general health, the size of the defect, and patient expectations, a *prosthesis* is the best choice for rehabilitation by camouflaging the defect. The prosthetic device can be either temporary or permanent. The nose and the ear are the most common sites for the use of prostheses. Detailed discussions of each of these types of closure are presented elsewhere in the text.

Other modalities

Interferons, a group of proteins originally identified for their antiviral properties, have been shown to demonstrate anticancer activity. Intralesional injection of recombinant alpha-2 interferon produces complete resolution with minimal scarring in 80% to 90% of primary, low-risk basal cell carcinomas having a nonaggressive histology (superficial, nodular, well circumscribed). Injections are given three times per week for 3 weeks (nine injections), usually at a dose of 1.5 million units per injection (Greenway et al, 1986). Injections must be given superficially into the dermis and epidermis, preferably with a 30-gauge needle. Tumors that respond to intralesional alpha-2 interferon usually develop marked inflammation between the sixth and ninth injection. This inflammatory reaction appears to play a major role in the response of basal cell carcinoma to intralesional alpha-2 interferon. Long-term cure rates with this technique are presently unknown. Studies are underway to examine the effects of intralesional alpha-2 interferon on Bowen's disease and invasive squamous cell carcinoma.

Topical 5-fluorouracil and other topical agents have been reported to be useful in the treatment of basal cell carcinoma. However, a body of literature is available outlining problems with these agents and recommending discontinuing their use in the treatment of basal cell and squamous cell carcinoma (Swanson, 1983a, 1983b). The major problem, deep foci of tumor, can be concealed until dermal spread occurs, and then the lesion is found to be much larger than previously recognized. Topical 5-fluorouracil therapy is effective for treatment of actinically damaged skin and actinic keratoses but should not be used for the treatment of basal cell carcinoma.

The retinoids, a class of vitamin A derivatives, have received some attention as potential tumor inhibitors. Experimentally, etretinate (Ro 10-9369) and isotretinoin (Accutane) (13-cis-retinoic acid) have been shown to inhibit tumor growth in vitro (Ellias et al, 1981). There have been anecdotal reports of these agents also acting in a tumor-preventative fashion in people with many basal and squamous cell carcinomas. One such group are those persons with the nevoid basal cell carcinoma syndrome. Ongoing studies are currently assessing the potential use of these agents in the treatment of such patients, but their final role remains unsettled.

Last, another interesting treatment option is that of laser photoactivation of a porphyrin derivative that localizes in neoplastic tissue of the skin. There are some early reports of a success rate of 85% to 90%. Further refinements in the porphyrin derivative, tagging the derivative to monoclonal antibody carriers, and laser physics may make this a treatment of choice in the future.

Selection of Treatment

An understanding of the advantages and disadvantages of and indications for each of the available treatment modalities discussed allows one to adopt a fairly uniform approach to the treatment of basal cell and squamous cell carcinoma of the skin. The treatment principles used for these two tumors will be discussed synonymously here since their treatment is similar. Four major factors are related to the choice of treatment for basal cell carcinoma: tumor location, tumor histology, tumor size, and the clinical nature of the tumor (Fig. 24-4). Factors related to the choice of treatment for high-risk cutaneous squamous cell carcinoma

are discussed at the end of this chapter.

Most common basal and squamous cell carcinomas

The majority of basal cell carcinomas fall on the right side of Fig. 24-4 and can be easily and adequately treated by excision, electrosurgery, cryosurgery, or irradiation. Combinations of these methods of therapy have been proposed, such as curettage and excision or curettage and cryotherapy. Most basal cell carcinomas occur in low-risk areas and are of a nodular, ulcerative, or superficial histologic nature. They are frequently small and present as slow-growing tumors with well-defined clinical margins. With radiation therapy reserved for the indications that were discussed previously, excision surgery, electrosurgery, and cryosurgery are good treatment alternatives. The choice of therapeutic option depends on the clinical experience of the surgeon and the location of the tumor (Fig. 24-1).

Location

Cosmetically important areas with freely movable tissue such as cheeks, forehead, scalp, chin, neck, and extremities are best treated by excision and closure either primarily or with flaps. This enables rapid wound healing and placement of the surgical scar within cosmetic skin lines. Areas with tense underlying structure and less tissue mobility such as the nasal tip, ear, some areas of the temple, and digits are best treated with electrosurgery or cryosurgery. Fig. 24-2 shows tumor location and its effect on therapy.

Histopathology and size

The histologic pattern and depth of tissue obtained from the biopsy specimen may influence the choice of treatment. A tumor that extends deeply into the dermis is best handled by excision, whereas more superficial lesions can be adequately treated with electrosurgery or cryosurgery.

Clinical nature

The clinical nature of the tumor and the age and general health of the patient are also important considerations. Patients with cardiac pacemakers or taking anticoagulants warrant special consideration and are often best treated with cryotherapy or careful electrosurgery (without the patient grounded). Because long-standing tumors tend to be more invasive, they are best handled by excision so tissue margins can be carefully examined.

Patients with multiple tumors present an unusual problem. A combination of techniques is often warranted in these patients. Multiple, small, well-defined nodular lesions can be handled appropriately by any combination of surgical modalities. Care must be taken to maximally preserve normal surrounding skin. In patients with syndromes, such as the nevoid basal cell carcinoma syndrome, this concept is critical. Central facial lesions in patients with this syndrome are best approached with Mohs surgery because of tumor aggressiveness and the need to conserve tissue. It is important to realize that skin grafts and flaps used in these patients probably will develop new tumors on the grafted or transposed skin. Multiple treatment modalities can be used effectively in the same treatment session. Therefore lesions falling on the right side of Fig. 24-4 may be treated successfully in a highly

individualized fashion depending on several factors (Table 24-1).

Carcinomas requiring special consideration

Lesions falling on the left side of Fig. 24-4 as primary, incompletely excised, or recurrent basal cell or squamous cell carcinomas warrant special consideration. Where available, Mohs surgery is the treatment of choice. Moreover, with time, experience, and improvement in technique, the list of indications has grown.

Biology and growth

Subgroups of primary basal cell carcinoma, all recurrent basal cell carcinomas, and incompletely excised tumors exist that might best be treated by Mohs surgery. To understand which tumors are best treated by Mohs surgery, one must review the biology and growth of basal cell carcinomas. These tumors send out contiguous, silent extensions that have a particular affinity for fascial planes, periosteum, perichondrium, embryonic fusion planes, nerve sheaths, lymphatic channels, and blood vessels. Affinity for the dermis is best illustrated by the stromal-dependent basal cell carcinomas of the morpheaform or sclerotic type. Burg et al (1975) and Salasche and Amonette (1981) evaluated the subclinical extension of basal cell carcinoma, defined as the area beyond clinically evident tumor that needed to be removed by microscopically controlled excision to remove all of the neoplasm. They found that morpheaform basal cell carcinoma often has a large subclinical extension. Burg et al (1975) and Mohs and Lathrop (1952) found this subclinical dermal spread to be most advanced on the temple and forehead.

Basal cell carcinoma tends to follow the path of least resistance. Therefore it displays an affinity for fascial planes, periosteum, perichondrium, and the tarsal plate of the eyelid. The tumor often grows to these structures and then spreads along them before invading more deeply. Specific examples would include spread along the temporalis fascia in the temple, the periosteum of the nasal bone or cranium, and the perichondrium before invasion of the alar cartilage of the nose or helical cartilage of the ear. Basal cell carcinoma of the eyelid will often spread over the tarsal plate to the conjunctival mucosa before penetrating the tarsal plate itself.

Supporting structures can also be invaded by basal cell carcinoma. Robinson et al (1980) have shown that, although rare, cartilaginous invasion does occur. Nerve sheaths, lymphatic vessels, and blood vessels also provide a means of spread for basal cell carcinoma (Cottell, 1982; Mark, 1977; Weimer et al, 1979). Lymphatic spread is rare but has been reported. Blood vessel affinity is seen by invasion along adventitia of arteries and by permeation through the vessel wall itself. The deepest penetration of tumor often follows the most highly vascular area supplying the tumor. Perineural expansion has been widely described in both basal cell carcinoma and squamous cell carcinoma (Cottell, 1982; Mark, 1977; Weimar et al, 1979). This occurs by invasion of either the nerve sheath or the nerve itself. This may prove the entrance route for basal cell carcinoma into the maxillary sinus through the infraorbital foramen by following the infraorbital nerve.

Last, subtle spread of basal cell carcinoma can occur in planes perpendicular to one another by following embryonic fusion planes (Panje and Ceilley, 1979). Three important sites

in which this occurs are the junction of the nasal ala with the nasolabial fold, the junction of the columella with the upper lip and floor of the nose, and the junction of the auricle with the preauricular skin.

Primary lesions

Special considerations in the treatment of basal cell carcinoma, particularly primary lesions, stem from an understanding of these growth patterns. These considerations include tumor location, tumor histology, tumor size, and the biologic behavior of the tumor.

Location. Tumor location is critical. Certain anatomic sites need special consideration when one is selecting the best treatment method. Fig. 24-2 illustrates schematically some of the locations best suited to Mohs surgery. These anatomic sites are important for two reasons. First, they comprise areas showing an increased recurrence rate for basal cell carcinomas. Second, they are important functional and cosmetic sites. Mohs surgery, which offers maximum preservation of normal tissue as well as a high cure rate, is a valuable treatment modality in these locations.

Mora and Robins (1978) have shown that basal cell carcinoma in the central region of the face tends to be more invasive, more destructive, more often recurrent, and more difficult to treat than are similar tumors in other sites. Specifically, the junction of the nasal ala with the nasolabial fold is important because it represents an embryonic fusion plane. A special area of subtle tumor spread is the nasal septum. After lateral rhinotomy for maximal surgical exposure to the septum, complete tumor ablation can be achieved while septal support structures may be preserved and the tumor observed as it tracks deeply along the septal mucosa. The ala is important because of possible subclinical perichondrial spread of the tumour.

The periorbital region is critical for several reasons. Inner canthus tumors often extend posteriorly much further than is clinically apparent and thus can require orbital exenteration. The spread of basal cell carcinoma over the tarsal plate to involve the conjunctival mucosa results in a high recurrence rate for eyelid tumors.

The preauricular area, specifically the tragus, is one of the important embryonic fusion planes in which the spread of tumor can be extremely subtle. The ear can be a difficult site to assess because of extension of tumor along the perichondrium or periosteum. This can occur down the external auditory canal so that it can gain access to the middle ear or mastoid. The postauricular sulcus is another embryonic fusion plane along which tumor often grows in an aggressive manner. Ceilley et al (1979) have reported a higher than usual recurrence rate in the treatment of auricular basal cell carcinomas. Robins (1981) described the periauricular areas as having the highest recurrence rates for basal cell carcinomas after Mohs surgery.

The temple, especially in men with receding hairlines, offers a challenge because of tumor spread along fascial planes. Tumor can readily gain access to these planes via the hair follicle. Gormley and Hirsch (1978), Binstock et al (1981), and Mohs and Zitelli (1982) have described the aggressive nature of basal cell carcinoma involving the scalp. This often occurs with deep invasion and tumor extension along the periosteum. Once the calvaria are penetrated, tumor can extend to and invade the dura mater.

Areas of cosmetic importance include the nasal tip, the nasal ala, the upper lip, the eyelids, and the helix of the ear. The nasal tip is an area in which maximal preservation of normal tissue is critical because of difficulties in reconstruction. The alar rim is an important attachment site for nasal reconstruction. Preservation of the rim can dramatically simplify reconstructive procedures. Tissue conservation on the tip can often result in closure by simple techniques, sparing the surgeon and patient advanced and difficult reconstructive techniques. The same is true for eyelids, and preservation of normal tissue in the helical rim can often permit simple methods of repair, preserving normal auricular contour.

Therefore a subgroup of primary basal cell carcinomas that occur in the H zone of the face is particularly well suited for treatment by Mohs surgery. Other treatment modalities can of course be used in these locations but often are less successful. Frequent subclinical extensions of tumor or the desire to conserve normal surrounding tissue in these locations for reconstruction can make excisional surgery, electrosurgery, cryosurgery, and irradiation less attractive options. Even the smallest curette can miss subtle strands of tumor, especially in areas of right-angle embryonic fusion planes. Cryosurgery and irradiation depend on "blind" determination of clinical tumor margins. Neither method yields a specimen for pathologic analysis to decide on tumor eradication, critical in these difficult anatomic sites. Excisional surgery is probably the best alternative to Mohs surgery in these areas, with a good tissue specimen presented to the pathologist for histologic examination. However, the processing of this tissue specimen is not as complete as the meticulous horizontal sectioning of Mohs surgery.

Histopathology. Histopathologic characteristics of the tumor should play an important role in the treatment of primary basal cell carcinoma. As mentioned previously, routine tumor histopathology (nodule-ulcerative or superficial) presents little problem in diagnosis and treatment. However, those tumors with an aggressive histologic appearance such as the morpheaform or sclerotic basal cell carcinoma, multicentric infiltrating tumor, or the keratinizing, aggressive basal cell carcinoma (basosquamous carcinoma or metatypical carcinoma) can be clinically aggressive. A higher than usual recurrence rate for morpheaform basal cell carcinoma, even after treatment by Mohs surgery, has been reported. This may result from the subtle subclinical extension and stromal dependence of this tumor. Salasche and Amonette (1981) found that subclinical extensions in 51 morpheaform basal cell carcinomas averaged 7.2 mm in length. The greatest subclinical extension was in the preauricular area. Ceilley et al (1979) found that of the inadequately excised basal cell carcinomas occurring on the ear, the morpheaform was the most common type. Thomas (1970) noted that morpheaform basal cell carcinoma required more extensive routine surgical resection in its primary treatment. Caro and Howell (1950) described the cicatricial tendency and aggressive nature of this tumor, emphasizing special treatment considerations. In a study of recurrent tumors by Freeman and Duncan (1973) and Freeman (1976), a higher than usual percentage of sclerosing basal cell carcinomas was found. Howell and Caro (1957) found that recurrent tumors that have mundane histologic characteristics as primary tumors often develop a more sclerotic and aggressive histopathologic character when they recur. Kopf and Bart (1975) have reported similar findings. When compared with nodular lesions, Sloane (1977) found that infiltrative or sclerotic tumors showed a higher recurrence rate. Levine and Bailin (1980) also found a greater number of morpheaform basal cell carcinomas in their group of patients who had recurrent tumors. They also found that basosquamous carcinoma (keratinizing basal cell carcinoma) was a difficult, aggressive tumor.

Freeman et al have advocated the terminology of keratinizing basal cell carcinoma to replace that of basosquamous cell carcinoma. They feel a true intermediate class of tumor between basal cell carcinoma and squamous cell carcinoma probably does not exist but rather that this tumor represents a keratinizing type of basal cell carcinoma with an aggressive biologic behavior. Often this behavior is more aggressive than a squamous cell carcinoma (Freeman, 1976). Therefore Mohs surgery should be considered in the initial treatment of primary basal cell carcinoma with aggressive histologic characteristics, in particular the sclerosing or morpheaform tumor and the keratinizing carcinoma.

Size. Tumor size is also an important consideration in the treatment of primary basal cell carcinoma. The success rate in treating basal cell carcinoma decreases with increasing tumor size whichever method of treatment is used. Mohs (1978) reported a cure rate of 99.8% for primary tumors, smaller than 2 cm, a compared with a cure rate of 98% for tumors between 2 and 3 cm and 90.5% for tumors greater than 3 cm. Robins had similar data (Robins, 1981). Burg et al (1975) found a greater subclinical extension of basal cell carcinoma with lesions larger than 2 cm. Mikhail et al (1977) found a correlation between the size of primary tumor and its metastatic potential, with very large tumors exhibiting this rare event. Therefore the basal cell carcinoma larger than 2 cm should be treated aggressively, often with the assistance of Mohs surgery, to achieve greater cure rates than those from other routine therapy alone.

Clinical characteristics. The clinical characteristics of primary basal cell carcinoma are also an important consideration. The majority of tumors are nodular with distinct clinical margins. However, subgroups of tumors exist that have ill-defined, indistinct clinical borders that often exhibit a multicentric nature and can be more difficult to treat. The clinical course of the tumor is also important, with most basal cell carcinomas growing slowly in a nonaggressive fashion. The length of time the lesion has been present is also important, since long-standing lesions may invade deeply and widely. The patient's general health may play a role in host resistance, particularly the immunologic status. Tumors that metastasize often do so in the face of immunologic deficiency. Patients with clinical syndromes such as the nevoid basal cell carcinoma syndrome often have tumors that are treatable by Mohs surgery are previously mentioned. Because tumors occurring in the central region of the face are more aggressive clinically and because additional cutaneous neoplasms may develop during the patient's lifetime, maximal preservation of normal tissue by the use of Mohs surgery is indicated. Therefore the primary basal cell carcinoma that is multicentric with an indistinct clinical margin and that shows an aggressive biologic behavior is most appropriate for treatment by Mohs surgery.

Incompletely excised basal cell carcinoma

The second category of basal cell carcinoma amenable to the Mohs surgery technique is the incompletely excised tumor. When tumors that have been excised with a histopathologic report of tumor to the margins are watched clinically (with no reexcision), high recurrence rates result. Pascal et al (1968) found that when a tumor was present within one high-power field (x400) of a surgical margin, 12% of lesions recurred. Once the tumor involved the margin itself, a 33% recurrence rate was noted. The mean interval between excision and recurrence in this study was found to be 2 years, and there was no difference in recurrence rate between deep and lateral margin involvement. Gooding et al (1965) reported a recurrence

rate of 35% in patients in whom the tumor involved surgical margins and who were observed for less than 2 years without reexcision. Thomas (1970) also studied incompletely excised tumors. He found an 82% recurrence of incompletely excised tumors around the eyes, nose, and ear. He found a 25% recurrence rate on the remainder of the head and neck. Jackson (1974) reported similar findings. Retreatment of these tumors before clinical recurrence is indicated to reduce these treatment failures. Mohs surgery presents an excellent way to treat the inadequately excised tumors and to preserve the maximum amount of normal skin.

A modification of the Mohs technique, the "chemocheck", is an excellent way to treat such lesions. Tromovitch et al (1965b) and Swanson et al (1980) have detailed this elsewhere. Briefly, the original excision scar is reexcised with 2 to 3 mm borders with the Mohs technique. By angling the scalpel blade 45 degrees to the skin, a triangle or wedge of tissue is removed with the apex of the triangle being the deep margin. The tissue is then cut and divided along the original excisional scar so that the two noncutaneous limbs lie flat and can be horizontally sectioned to examine their entire undersurface. When present, residual tumor can then be precisely located and ablated.

Recurrent basal cell carcinoma

The third category of patients to be considered for treatment by the Mohs technique are those with recurrent lesions. A success rate of greater than 96% for the retreatment of recurrent basal cell carcinomas with Mohs surgery has been reported. This is in contrast to the success rates (in the neighborhood of 50%) achieved in the treatment of recurrent basal cell carcinomas by other methods. Menn et al (1971) studied retrospectively 100 tumors that had recurred after treatment at the New York University Skin and Cancer Hospital. These had initially been treated by excision, electrosurgery, or irradiation. They were then treated again by the same modality but adding Mohs surgery for five patients. Of 56 lesions treated by electrosurgery, 59% (33) recurred. Of 28 lesions treated by excision, 40% (11) recurred. Of 11 lesions treated by irradiation, 27% (three) recurred. Of five lesions treated with Mohs surgery, none recurred. Many studies support these data.

Selection of Treatment for Squamous Cell Carcinoma

The proper selection of treatment for cutaneous squamous cell carcinoma, like basal cell carcinoma, depends on an understanding of the various risk factors that identify the high-risk lesion. Based on a review of the literature since 1950, Johnson et al (1991) identified eight prognostic factors that indicate a high risk of local recurrence, metastases, and low survival rates: (1) a deeply invasive lesion (Clark level IV or V); (2) a poorly differentiated tumor; (3) an immunosuppressed patient; (4) tumor size greater than 2 cm; (5) a lesion of the auricle; (6) a lesion arising in scar tissue, irradiated skin, a chronic ulcer, or a sinus tract; (7) recurrence following treatment; and (8) lesions with perineural invasion.

Fortunately, the majority of cutaneous squamous cell carcinomas are small, low-risk lesions. These can be managed by excision, curettage and electrodesiccation, thermocontrolled cryosurgery, or irradiation, with a 90% to 95% cure rate. The 5-year survival rate for higher-risk primary cutaneous squamous cell carcinoma approaches 95% to 97% with Mohs surgery compared to 85% to 87% with standard surgical excision. The 5-year survival rate for higher-risk recurrent cutaneous squamous cell carcinoma is approximately 90% with Mohs surgery

compared to 50% to 75% with other methods, including standard surgical excision. When available, Mohs surgery is the treatment of choice for the majority of high-risk cutaneous squamous cell carcinomas. However, some tumors are simply too large for Mohs excision, mostly depending on the experience and skill of the Mohs surgeon. If Mohs surgery is not available or applicable, local excision with careful histologic margin control should be performed.

Regional control of high-risk lesions is strongly influenced by the presence or absence of metastatic nodes. Eighty to ninety percent of metastases from cutaneous squamous cell carcinomas occur first to the regional nodes. If no palpable nodes are present, options usually include monitoring for clinical nodal disease versus prophylactic irradiation to the primary site and the primary draining lymph nodes. If the primary tumor is located in a position to drain through the parotid nodes to the neck, any treatment of regional nodes should include the parotid. When prophylactic irradiation is used for high-risk lesions, it is usually initiated 3 to 5 weeks after surgery. Prophylactic node dissection is usually not recommended for those patients with no clinical evidence of regional metastases.

If palpable nodes are present, therapeutic options include irradiation, surgical neck dissection, or a combination of lymph node dissection and radiation therapy. The diagnosis of squamous cell carcinoma should be confirmed by surgical biopsy or fine needle aspirate before definitive therapy. The survival rate may be greater using the combination of these methods. Once regional disease is present, the 5-year survival rate is approximately 35%. New trials using induction chemotherapy before surgical or radiation treatment may lead to higher survival rates for these patients. The outlook for distant metastatic disease is very poor.

It is important to note that 75% to 90% of all local recurrences and metastases occur within the first 2 years after treatment of cutaneous squamous cell carcinoma. Therefore patients with high-risk lesions should be observed every 2 to 4 months during this period. They should also be educated concerning clinical signs of local recurrence and self-palpation for nodal enlargement.

Summary

In summary, Fig. 24-4 presents an overall approach to the current therapy for basal cell carcinoma of the skin. Incompletely excised basal cell carcinomas and recurrent basal cell carcinomas should be treated with Mohs surgery when possible. The vast majority of primary basal cell carcinomas will present on the right side of Fig. 24-4. They will occur in low-risk locations, be of a nonaggressive histologic and clinical nature, and be small. These are fully amenable to treatment by excision, electrosurgery, cryosurgery, or irradiation. The choice of technique will vary depending on the cosmetic concerns of the patient, age of the patient, and anatomic site of the primary tumor (Fig. 24-1). However, the following are amenable to more aggressive therapy: (1) primary basal cell carcinomas that occur on the left side of Fig. 24-4; (2) those in problem locations with difficult histopathologic characteristics (morpheaform or keratinizing basal cell carcinoma) and diameters greater than 2 cm or with clinical characteristics including multicentric tumors; (3) those with indistinct margins; (4) lesions present for an exceptionally long duration; and (5) lesions in patients with syndromes or who are immunologically suppressed. Mohs surgery is often the best initial treatment for these lesions.

Low-risk cutaneous squamous cell carcinoma is amenable to treatment methods used for low-risk basal cell carcinoma. Those tumors with high-risk factors are best treated locally with Mohs surgery when available and applicable. Alternatively, surgical excision with good histologic margin control may be used. Regional control depends in large part on the presence or absence of regional lymph node metastases as outlined previously.

In conclusion, a thorough knowledge and understanding of prognostic risk factors for cutaneous basal cell carcinoma and squamous cell carcinoma will enable the clinician to determine the most appropriate therapy for each individual patient and tumor.