Chapter 27 – Inferior Maxillectomy

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The hard palate is the site of origin of both benign and malignant tumors.[1,2] The most common tumor of minor salivary gland origin in this site is pleomorphic adenoma, a benign tumor that usually appears as a smooth submucosal mass. Approximately 5% of cancers of the oral cavity involve the hard palate and maxillary alveolus.[3] Squamous cell carcinoma accounts for approximately two thirds of the malignancies of the hard palate and the upper alveolar ridge (Fig. 27-1).[4] Cancers arising in the minor salivary glands are the most prevalent non–squamous cell malignancies of the hard palate. Adenoid cystic carcinoma is the most common of the malignant salivary gland tumors, followed by mucoepidermoid carcinoma, malignant mixed tumor, acinic cell carcinoma, and other adenocarcinomas (Fig. 27-2).[4] Lymphoma and plasmacytoma are also found on the hard palate (Fig. 27-3). Polymorphic reticulosis (formerly called lethal midline granuloma) commonly involves the hard palate and upper alveolus. There is evidence to suggest that this process represents a polyclonal T-cell lymphoma and should be treated with combined chemotherapy and radiotherapy.[4] Malignant melanoma may also occur in the mucosa of the hard palate (Fig. 27-4). Sarcomas of bone and soft tissue have likewise been reported in the hard palate and upper alveolus. These tumors are more common in children.[4]

The evidence of a direct cause-and-effect relationship between tobacco, alcohol, and cancer of the hard palate is not as clear-cut from an epidemiologic point of view as it is with cancer in other sites of the upper aerodigestive tract. A striking exception, however, is the high incidence of cancer of the hard palate in certain parts of India and the Philippines, where the custom of reverse smoking is practiced.[5,6] Poor oral hygiene, mechanical irritation, ill-fitting dentures, syphilis, and even mouthwash have been suggested as other possible causative relationships.[7–9]

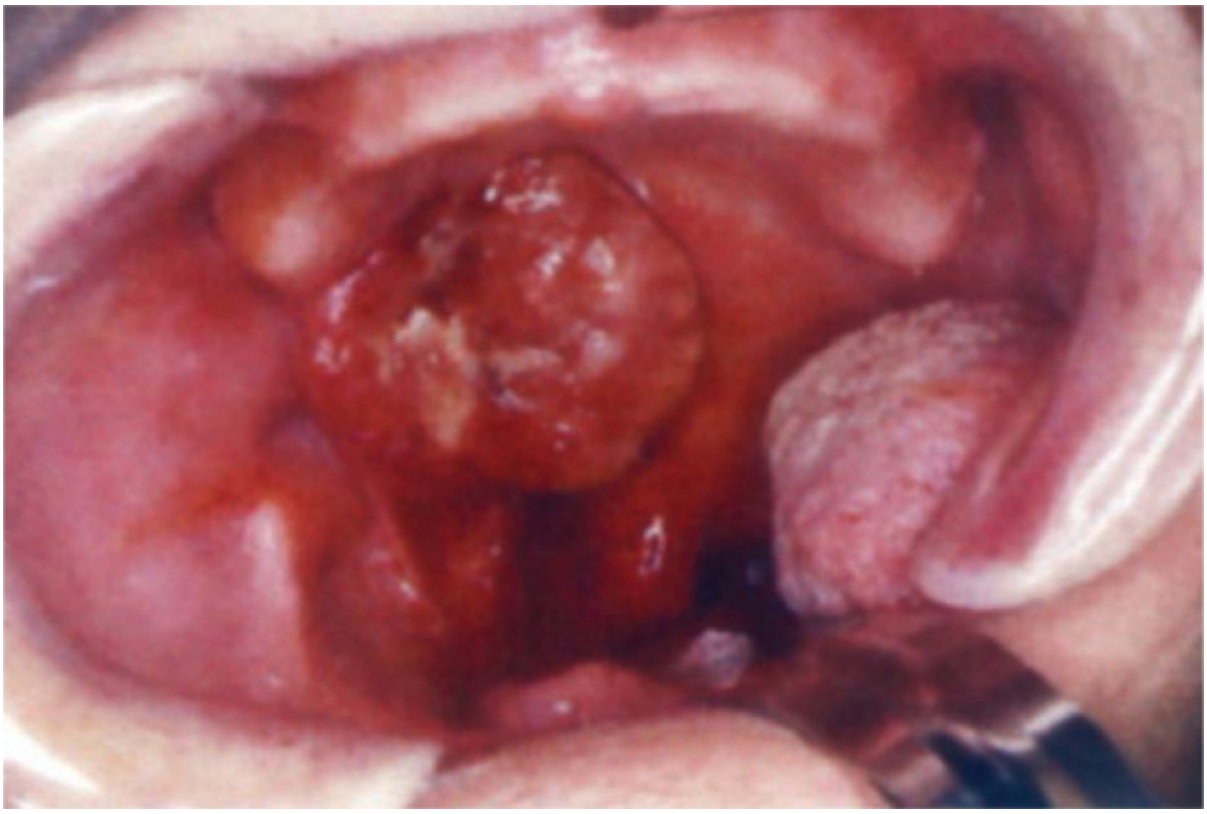

Figure 27-1 Squamous cell carcinoma is the most commonly encountered cancer of the hard palate.

Figure 27-2 Low-grade polymorphous adenocarcinoma.

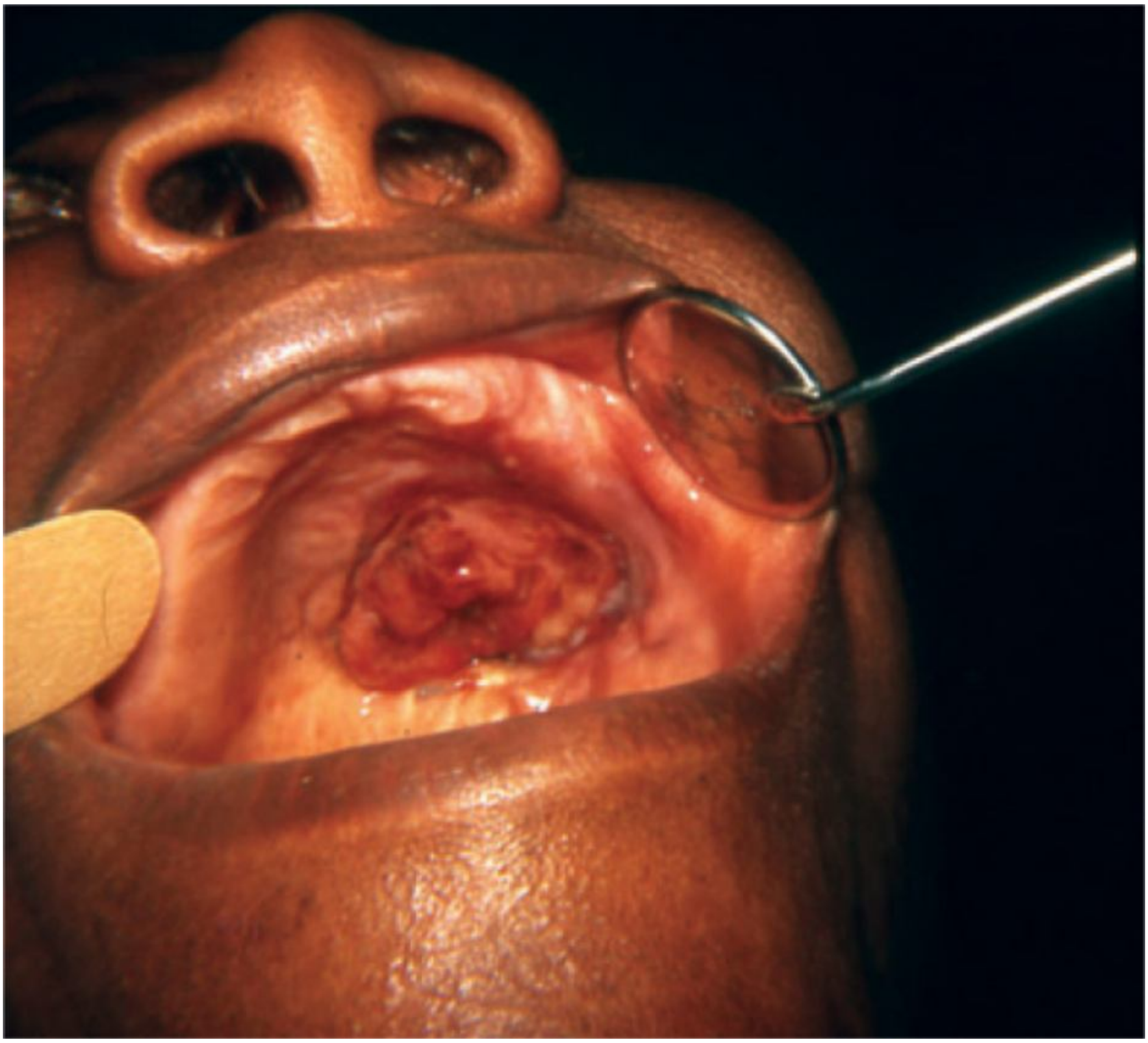

Figure 27-3 This mass on the hard palate proved to be B-cell lymphoma.

Figure 27-4 Malignant melanoma arising in the hard palate.

SURGICAL ANATOMY

The hard palate and alveolar ridge are the subsites that form the superior boundary of the oral cavity; they are lined by stratified squamous epithelium, which also contains numerous minor salivary glands. The hard palate separates the oral cavity from the nasal cavity and maxillary sinuses and therefore provides oral-nasal separation. The maxillary sinus and nasal cavity are air-containing spaces directly superior to the hard palate.[10]

PATIENT SELECTION

A detailed history should be recorded with special consideration given to the type and duration of symptoms, including the rate of growth, loose dentition, ill-fitting dentures, pain, and numbness of the palate and face. The neck should be examined for the presence of a mass because in many patients metastasis to the neck will have already occurred. A diagram should be made and the area of the tumor mapped, including areas of swelling suggestive of subepithelial spread of tumor. Any loose dentition should be examined closely for the possibility of malignant involvement of the dental sockets and bone. Neurologic examination for numbness of the palate may indicate malignant involvement of the foramina and base of the skull. Detailed inspection of the floor of the nasal cavity with a nasal endoscope should be performed to determine the presence of intranasal extension. Evaluation of the remainder of the upper aerodigestive tract is performed to exclude the possibility of a second primary cancer because second primaries may occur in 20% to 25% of patients with squamous cell carcinoma of the oral cavity and oropharynx.[11]

Evaluation of a patient with a tumor of the hard palate and alveolar ridge is not complete without imaging studies. Computed tomography (CT) is the most frequently used imaging method and is usually the only one necessary to identify areas of bone invasion because of its high degree of accuracy (Fig. 27-5). CT will also be able to detect the size and extent of infiltration, the possibility of involvement of the nasal cavity and maxillary sinuses, and the presence of metastases to the lymph nodes. CT is also very helpful in diagnosing distant metastases, which occur most commonly in the lung. Priority should be given to evaluation and management of metastases before major surgery on the primary cancer.

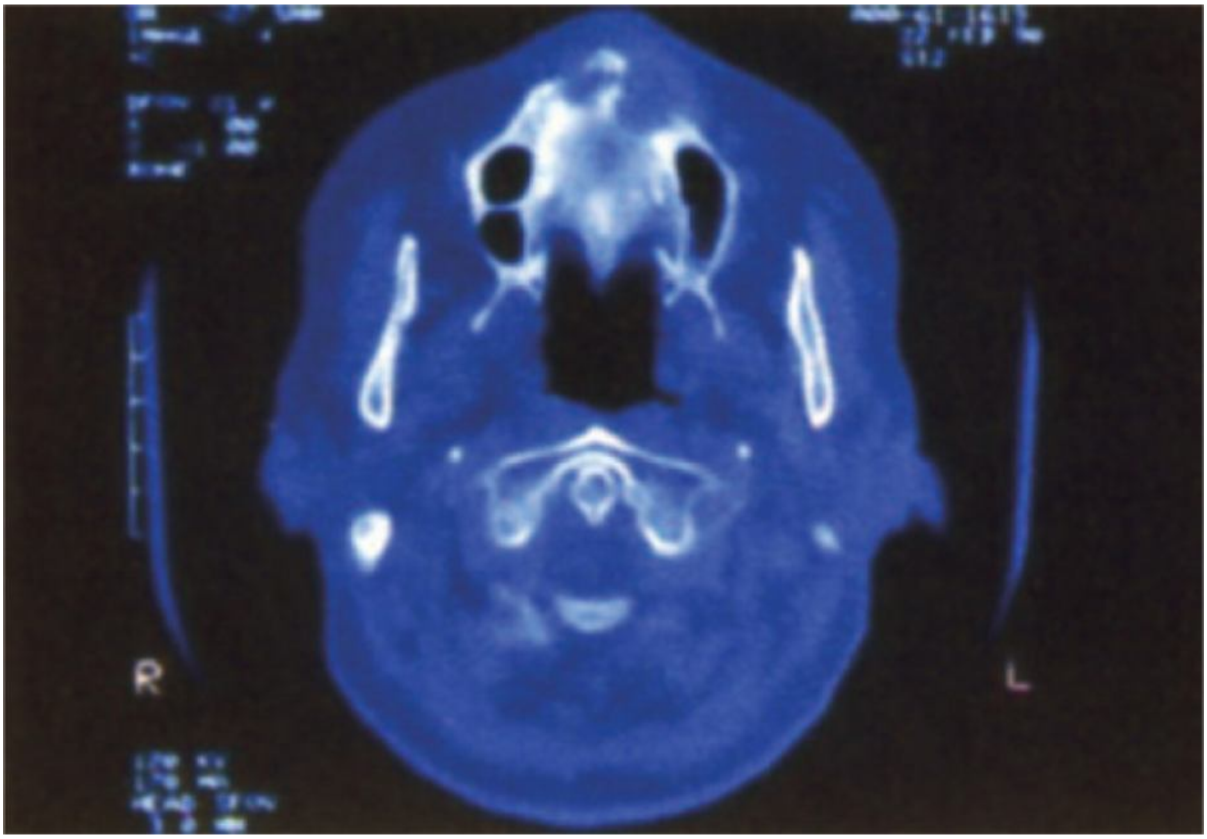

Figure 27-5 Computed tomography scan demonstrating marked destruction of bone of the maxilla.

Positron emission tomography (PET)/CT scanning is useful in pretreatment planning. This technique is not valuable in evaluation of the primary cancer, but it may be very helpful in evaluating the neck for metastatic lymph nodes because they may be involved in up to 50% of patients with squamous cell carcinoma of the hard palate.[10] PET/CT scanning is also valuable in evaluating the presence of distant metastasis.

A definitive biopsy is necessary to plan surgical management. Many of these lesions will have already undergone biopsy by oral maxillofacial surgeons before referral. Squamous cell carcinoma of the hard palate and alveolar ridge is usually ulcerative and exophytic, and transoral biopsy with cup forceps under local anesthesia is generally satisfactory for accurate diagnosis. Lesions such as pseudoepitheliomatous hyperplasia and necrotizing sialometaplasia may appear to be malignant lesions clinically.[1] Diagnosis of these lesions requires a high index of suspicion, and an incisional biopsy should be carried out. Both benign and malignant tumors of salivary gland origin may be covered by mucosa, and incisional biopsy is usually necessary in such cases for accurate diagnosis.

Surgery is the first-line treatment of all benign and most malignant tumors of the hard palate and alveolus. Most benign tumors of the hard palate may be removed without resecting bone, so there is no need for reconstruction. Most malignant tumors of the hard palate will require resection of part or all of the hard palate or maxillary alveolus (or both) to remove bone that is obviously involved or to remove bone as a deep margin. Such surgery invariably results in lack of oral-nasal separation, which interferes with speaking and swallowing.

A decision should then be made about whether the patient will require restoration of oral-nasal separation with a dental prosthesis, a local pedicle flap, or free flap reconstruction. If dental prosthetic evaluation will definitely be required, the patient should be seen by a maxillofacial prosthodontist before surgery. This allows the patient to better understand the resulting defect and the prosthodontist to do whatever restorative work or dental extractions are necessary and to take impressions so that a surgical splint will be ready at the time of removal of the tumor. The surgical splint provides oral-nasal separation and allows the patient to eat in the immediate postoperative period, thus avoiding the need for placement of a nasogastric tube or a gastrostomy. Tracheostomy is not usually necessary for airway management, but plans should be made for tracheostomy in the event that a free tissue transfer is used for reconstruction.

STAGING

Most physicians stage the extent of the cancer after evaluating all the clinical studies. The most common staging system is that developed by the American Joint Commission on Cancer Staging. It involves the TNM system, which indicates the size of the primary tumor (T), the extent of neck node metastases (N), and the status of systemic spread of tumor (M). These indices are used to determine progressive tumor stage from I to IV. The various modalities of treatment and the ultimate prognosis are related to the stage of the disease.[11]

Radiation therapy is not considered first-line treatment of cancer of the hard palate and alveolar ridge because bone has a low oxygen supply and the cancer is less curable in an oxygen-poor environment. Even if the soft tissue component was curable, exposure of radiated bone in the oral cavity leads to osteoradionecrosis. When bone invasion or perineural invasion is present, radiotherapy or chemoradiotherapy may be used in the adjuvant setting. Patients found to have more than two lymph nodes positive or extracapsular spread have been shown to benefit from chemoradiation therapy.[12]

Squamous cell carcinoma is usually manifested as an ulcerative lesion. Both pseudoepitheliomatous hyperplasia and necrotizing sialometaplasia on the hard palate may be malignant-appearing lesions clinically. Clarification of this histologic situation is critical because neither pseudoepitheliomatous hyperplasia nor necrotizing sialometaplasia require extensive surgical removal. Tumors of minor salivary gland origin, such as pleomorphic adenoma, adenoid cystic carcinoma, and mucoepidermoid carcinoma, may appear as a smooth, submucosal mass that must be distinguished from a torus palatinus. It is estimated that 50% to 70% of minor salivary gland lesions will be malignant.[13] Early recognition facilitates surgical removal and may improve outcome. Superficial biopsy may be inconclusive, and incisional biopsy is often needed for definitive diagnosis.

PREOPERATIVE PLANNING

A thorough and complete history and physical examination should be performed in all patients. Careful attention is paid not only to the palate and the maxillary region but also to the cervical lymph nodes because there is a high incidence of metastasis from squamous cell carcinoma of the hard palate and alveolus. The possibility of carcinoma extending posteriorly and superiorly to involve the retropharyngeal lymph nodes (Fig. 27-6) and the skull base should be considered. The presence of middle ear effusion may indicate extension of the cancer into the nasopharynx or invasion of the tensor veli palatini muscle or pterygoid plates. Absence of the blink reflex or palatal hypoesthesia may indicate involvement of the maxillary division of the trigeminal nerve in the sphenopalatine fossa. Wasting of the masseter or temporalis muscle may be indicative of invasion of the mandibular division of the trigeminal nerve.

Figure 27-6 Computed tomography scan demonstrating the presence of metastasis from squamous cell carcinoma of the hard palate to the retropharyngeal lymph nodes.

Biopsy of the primary lesion is essential for planning treatment. Most patients can undergo transoral biopsy in the office with cup forceps.[11] Satisfactory local anesthesia can be achieved with either a local injection or, at times, a topical spray. Biopsy samples should be taken from the margin of the lesion to ensure that viable tumor is obtained and not just necrotic debris. Submucosal tumors may require a preliminary incision through mucosa to yield an adequate tissue sample.

Tumors of the hard palate and alveolar ridge should be investigated with imaging techniques to accurately evaluate the extent of the tumor, particularly the third dimension. The surgeon should indicate directly to the radiologist the information that is needed to facilitate treatment planning. Coronal CT images accurately depict the relationship of the lesion to the palate, periosteum, and bone. An axial CT study with contrast enhancement helps define the relationship of the tumor to posterior structures and serves to assess involvement of the infratemporal fossa or pterygoid plates. The neck should be scanned in patients with high-grade malignancies such as squamous cell carcinoma and mucoepidermoid carcinoma in an effort to evaluate the status of the cervical lymphatics. Cervical metastases from cancer of the hard palate have been thought to occur infrequently; however, our recent study of a series of patients with squamous cell carcinoma of the hard palate and maxillary alveolus has indicated otherwise.[10] Metastasis may also be encountered in the retropharyngeal space (see Fig. 27-6), so this area should be evaluated carefully. Because excision of these lymph nodes is not included in the standard neck dissection, the nodes have to be excised through the neck after the standard neck dissection has been completed.

Information obtained on physical examination, imaging studies, and biopsy allows the surgeon to stage the tumor and to integrate therapeutic recommendations to meet the patient's needs. Surgical therapy is expedient and the defect can be reliably rehabilitated with the use of a prosthesis or flap reconstruction. The resection should be designed to completely remove the tumor with clear margins. The palate is a midline structure, and areas at risk for metastatic spread include the cervical and retropharyngeal lymph nodes on both sides. It has been demonstrated that the rate of metastatic spread to the cervical lymph nodes is high in squamous cell carcinoma of the maxilla, even in a clinically negative neck. Selective neck dissection should be included for a unilateral lesion and bilateral selective neck dissections if the lesion is in the midline.

In the preoperative planning phase, the surgeon must determine whether resection of palatal bone will be required. Superficial and particularly benign lesions that do not invade the periosteum do not require through-and-through resection of the palate into the sinus and nasal fossa. Conversely, lesions that clearly infiltrate or have eroded the palate will require more extensive three-dimensional resection. Tumors involving the alveolus may gain access to bone through invasion of the tooth sockets. In contrast, in well-localized tumors that are centrally located in the hard palate, preservation of the uninvolved alveolus is appropriate and facilitates rehabilitation.

Patients with cancer extending into the maxillary antrum or nasal cavity may benefit from a surgical approach that allows the surgeon to adequately visualize the deep margin of resection. Improved exposure through performance of an anterior antrostomy allows visualization of the tumor, which contributes to ensuring an adequate margin of resection in tumors extending into the maxillary sinus. In patients in whom the tumor extends posteriorly into the infratemporal fossa and pterygoid muscle, transoral resection may be inadequate and a surgical approach must be planned to ensure adequate tumor removal. One approach is to expose the infratemporal fossa through a preauricular incision while taking care to identify and preserve the facial nerve. When necessary, the mandible can be displaced anteriorly to facilitate exposure to the infratemporal fossa during tumor extirpation.

The preoperative planning phase of patient care must consider rehabilitation. Anticipated postoperative difficulties will, of course, reflect the extent of resection required. Patients with superficial lesions or benign tumors can be treated by resection to the depth of the palatal periosteum. These defects will heal by secondary intention and thus make split-thickness skin grafting unnecessary. Patient comfort will be greatly facilitated if a temporary acrylic prosthesis is fabricated by a maxillofacial prosthodontist before surgery. The prosthesis will protect the palate during eating. It can be removed between meals for local wound care.

If the dimensions and site of the tumor, whether benign or malignant, require resection of the maxillary alveolus or palatal bone, or both, a plan must be made to achieve oral-nasal separation. In most circumstances this can best be accomplished through the use of an “obturator.”[14–16] The prosthodontist should always be consulted preoperatively so that the appropriate dental records and impressions can be taken. Aramany devised a classification of surgically created palatal defects that is very helpful in designing a proper prosthesis.[14] The prosthodontist should create a surgical splint to be inserted at the time of surgery. Interim prostheses and a final prosthetic device are developed postoperatively as the patient convalesces and the defect matures.

Reconstruction of total palatal defects has usually been accomplished with a temporalis muscle transposition. However, such management eliminates the possibility of dentures. Reconstruction with an osseocutaneous free flap is now a reality because many of the problems of fixation and preservation of a nasal airway have now been overcome.[17] This technique provides oral-nasal separation, as well as the opportunity for osseointegrated dental restoration.

Surgical resection of a tumor involving the palate usually results in less postoperative morbidity than is the case with other procedures performed on the oral cavity and oropharynx. Accordingly, a patient's preoperative status relative to cardiopulmonary reserve, for instance, tends to be less important in determining operability. Immediate rehabilitation through insertion of a surgical splint greatly enhances this aspect of patient care. Most patients can anticipate institution of a soft or liquid diet on the first postoperative day. Insertion of a nasogastric tube is rarely necessary. Tracheostomy is rarely required for patients undergoing resection of palatal lesions. These considerations are all important for preoperative counseling and surgical planning.

SURGICAL TECHNIQUE

Approaches to the surgical management of cancer limited to the hard palate and alveolar ridge include

- Partial lateral maxillectomy
- Inferior maxillectomy
- Total maxillectomy (see Chapter 11)

Partial Lateral Maxillectomy

This surgical approach is designed to be carried out transorally for the excision of small tumors of the lateral maxillary alveolar ridge and hard palate. The line of incision should be drawn with a marking pen on the mucosa and should allow margins of at least 1 cm. The incision should be made with electrocautery to avoid bleeding. The soft tissue should be elevated in the subperiosteal plane off the front and lateral walls of the maxillary antrum while preserving the infraorbital nerve to avoid permanent anesthesia of the soft tissues of the face (Fig. 27-7). The maxillary antrum is entered with a small osteotome, and bone is removed with a Kerrison rongeur. This allows sufficient visualization of the maxillary antrum to evaluate the extent of the resection, which depends on whether the maxillary antrum is invaded (Fig. 27-8). A sagittal saw or powered instrumentation with reciprocating or sagittal blades is used for very precise osteotomies. The hard palate is transected to the midline and into the maxillary sinus while trying to avoid the lateral nasal wall and nasal cavity, although this is not always possible. The posterior osteotomy is reserved for the final step to avoid unnecessary blood loss because bleeding from the pterygomaxillary space can be completely controlled only after removal of the specimen. A large osteotome is placed behind the last molar tooth at a 90-degree angle to the hard palate in a superomedial direction (Fig. 27-9). Once the pterygoid plates are fractured, brisk bleeding will be encountered from the pterygoid plexus and internal maxillary artery. Curved Mayo scissors are used to complete the transection of the soft tissues and soft palate. Bleeding is then controlled with a clamp and ligature technique. Frozen section analysis of the soft tissue margins will confirm the adequacy of the resection. Unfortunately, there is no way of evaluating bone with the frozen section technique. While the margins are being examined, all the mucosa is removed from the maxillary antrum to avoid contamination by oral cavity microorganisms, which can result in edema of the sinus mucosa and interfere with the use of a palatal prosthesis. All sharp edges and bony spicules are removed, and a split-thickness skin graft (0.001 inch) is sewn in place to resurface the cheek flap (Fig. 27-10). The defect is packed with Xeroform gauze. The previously formed surgical obturator is then fixed to the hard palate with the use of a lag screw inserted through a hole made in the obturator, and thus there is no need to sew the prosthesis in place (Fig. 27-11). In patients who have residual dentition, clips can also be used to further stabilize the prosthesis.

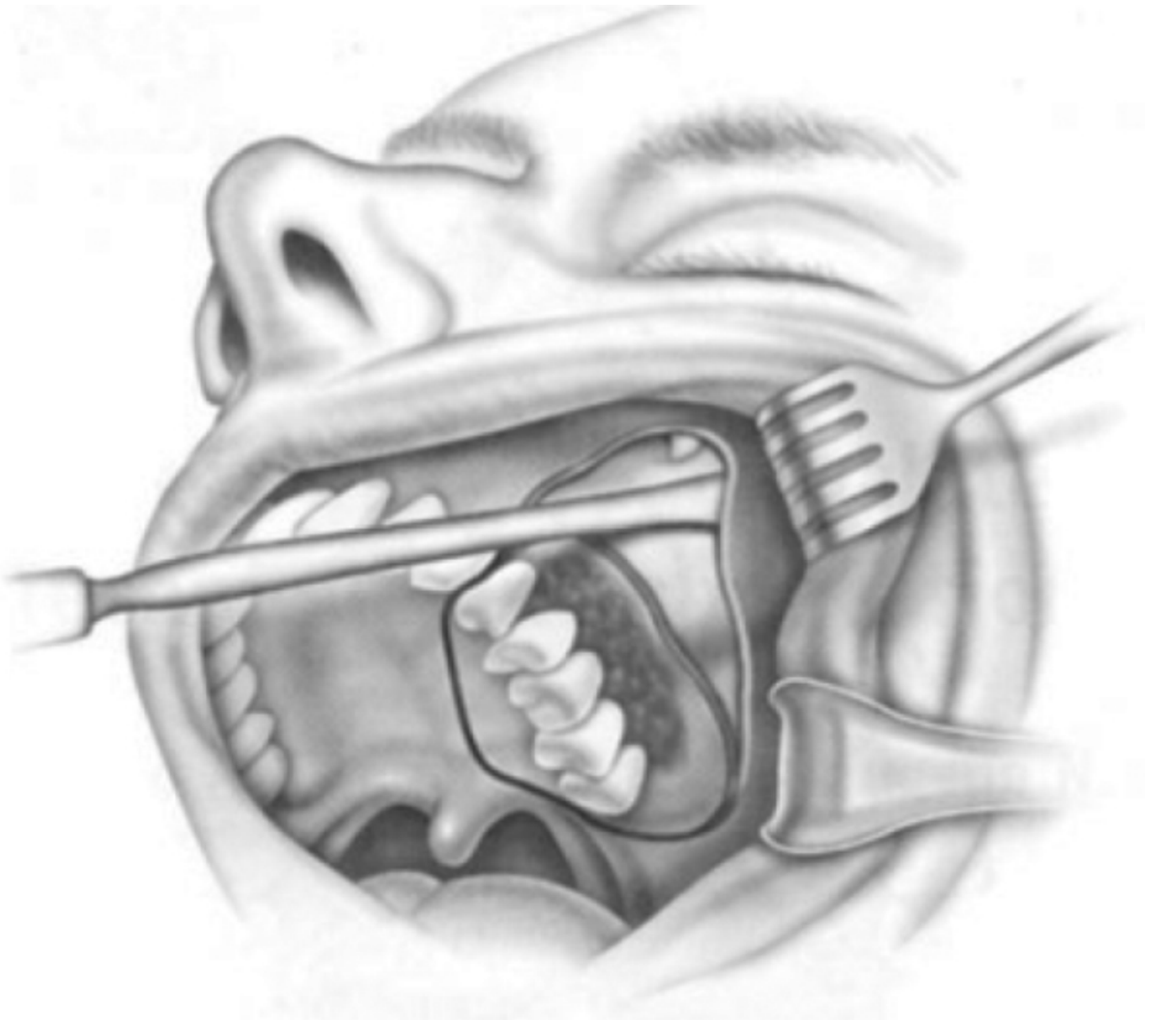

Figure 27-7 Gingivobuccal incision with a periosteal elevator used to elevate the periosteum up to the level of the inferior orbital nerve.
(Reprinted with permission from Simental AA Jr, Myers EN: Cancer of the hard palate and maxillary alveolar ridge: Technique and applications. Op Tech Otolaryngol Head Neck Surg 16:30, 2005.)

Figure 27-8 Anterior maxillotomy with visualization of the maxillary sinus floor and infraorbital rim.
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Figure 27-9 Posterior osteotomy created by aiming superomedially. Great care is taken to not violate the orbital floor.
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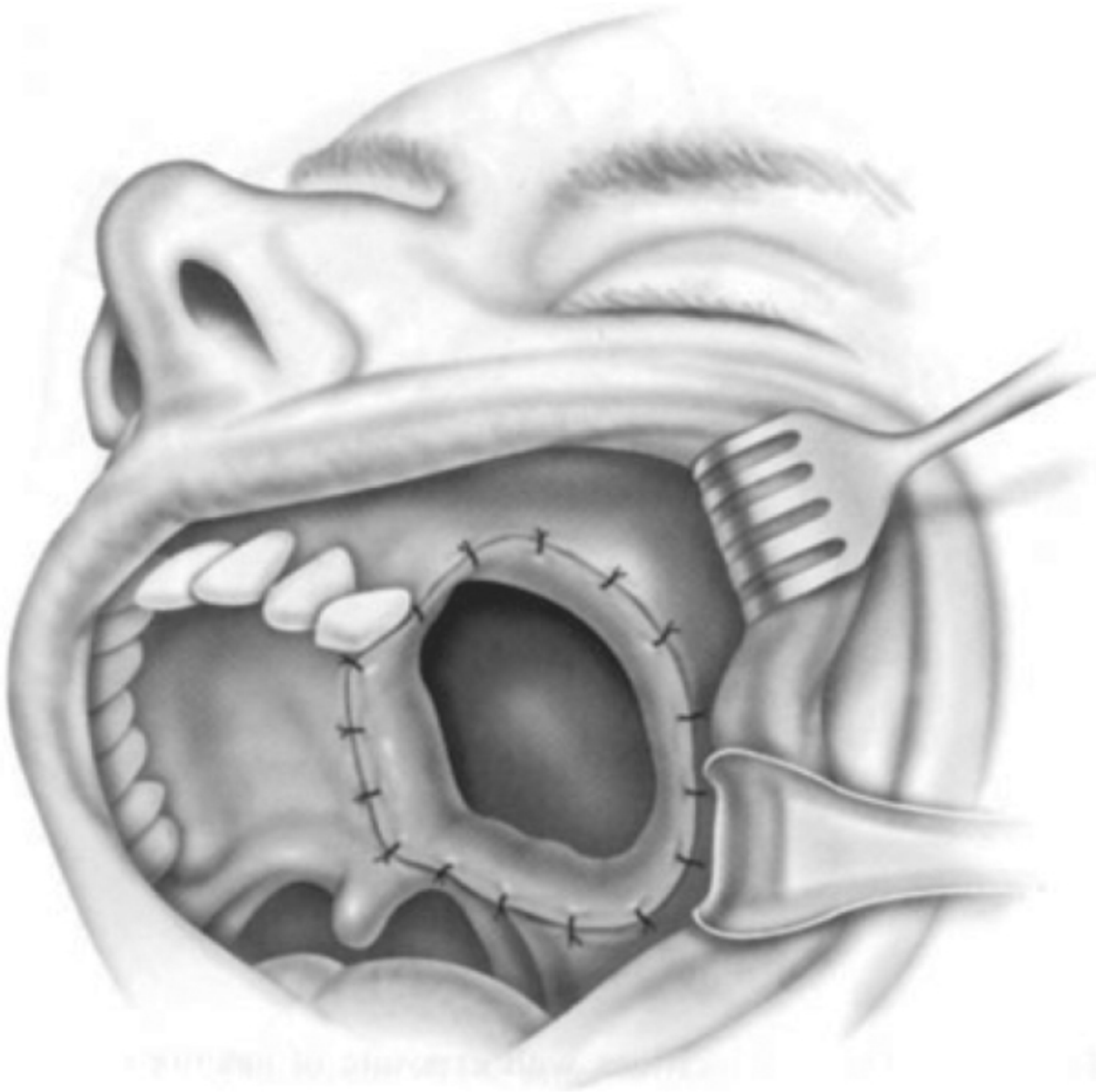

Figure 27-10 A split-thickness skin graft is used to line the raw surfaces. The healthy maxillary sinus mucosa is left in situ.
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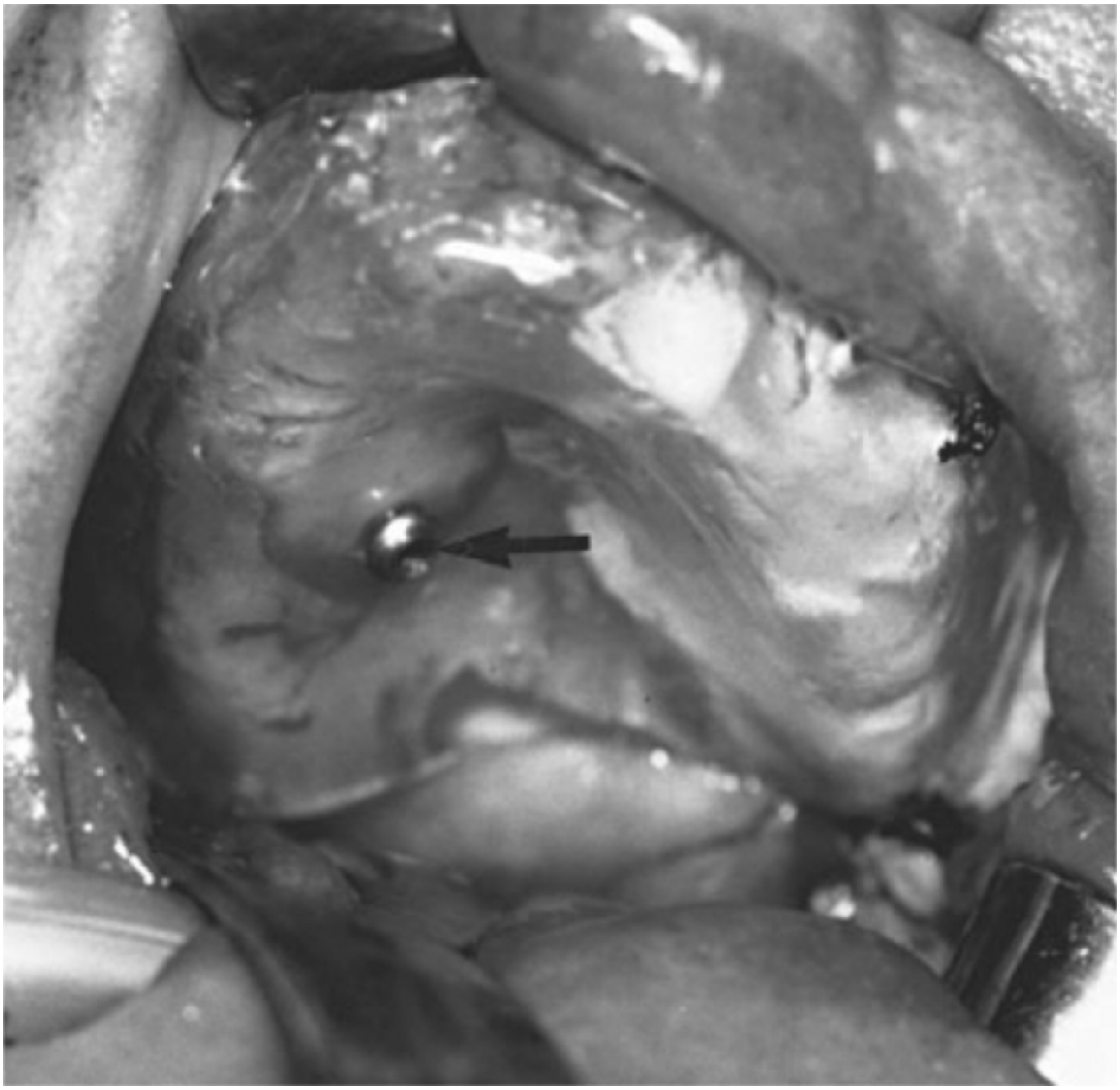

Figure 27-11 A lag screw *(arrow)* facilitates fixation of the acrylic splint.

Inferior Maxillectomy

This surgical approach is designed primarily for tumors of the hard palate that do not involve the floor of the maxillary sinus and nasal cavity. The extent of the tumor resection is drawn with a marking pen on the mucosa before beginning the actual osteotomies of the palate. The incisions are made in a manner similar to that described for tumors of the alveolar ridge (Fig. 27-12). The maxillary sinus is entered and the inferior aspect of the maxillary sinus is evaluated (Fig. 27-13). The sagittal saw is used for very precise osteotomies. The osteotomy is usually completed with the osteotome at the level of the pterygoid plates. The nasal cavity is entered and the septum is transected with heavy curved Mayo scissors. The soft palate is transected with electrocautery, and any residual soft tissue attachments are transected with scissors. After the mucosa of the maxillary antrum is removed as previously described, the inferior turbinate is also removed to prevent infection and edema, which interfere with the application of a palatal prosthesis. Once the specimen is removed, it is sent to the pathology laboratory for frozen section diagnosis.

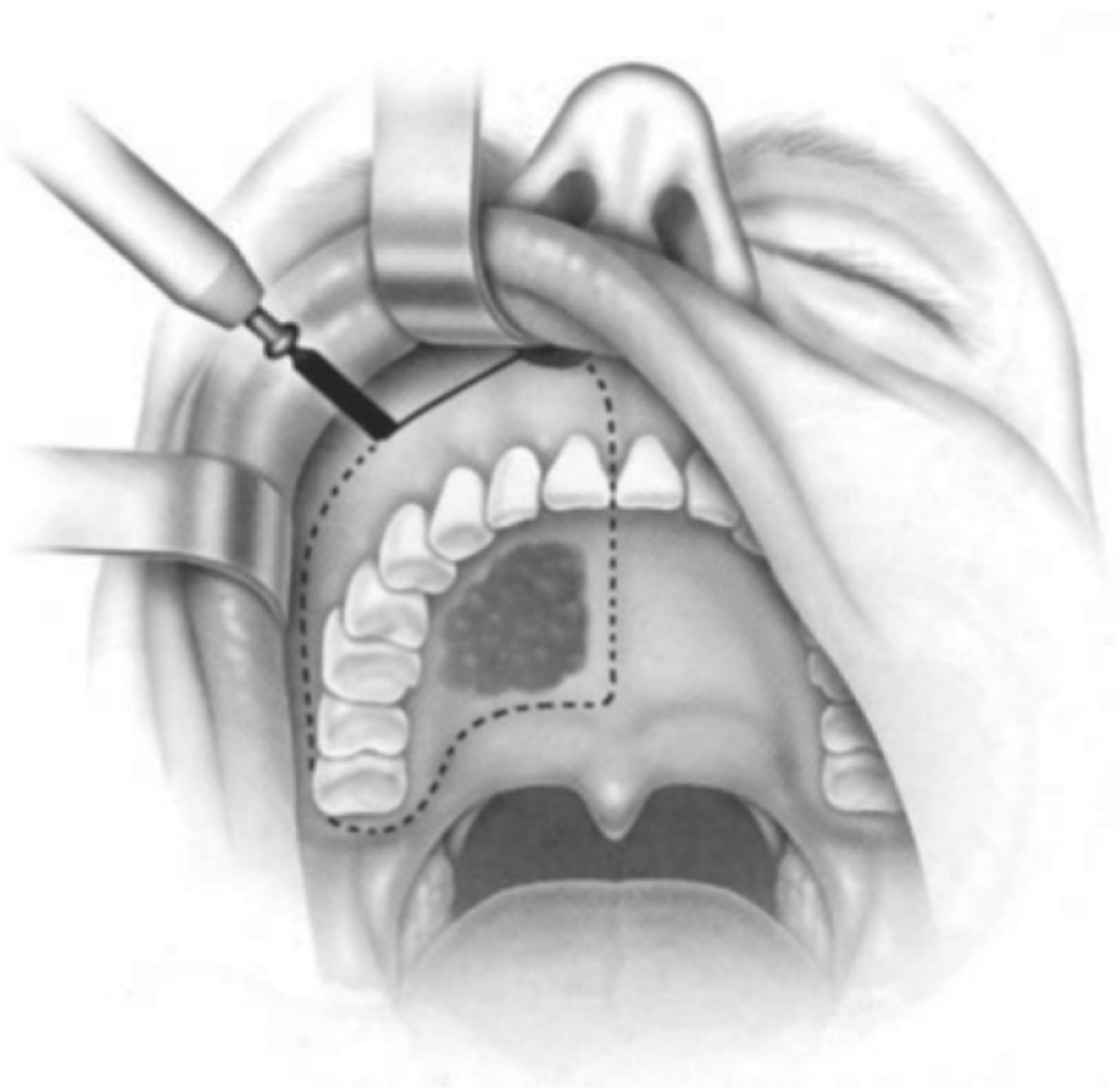

Figure 27-12 Mucosal incisions with exposure of the anterior maxilla and infraorbital nerve.

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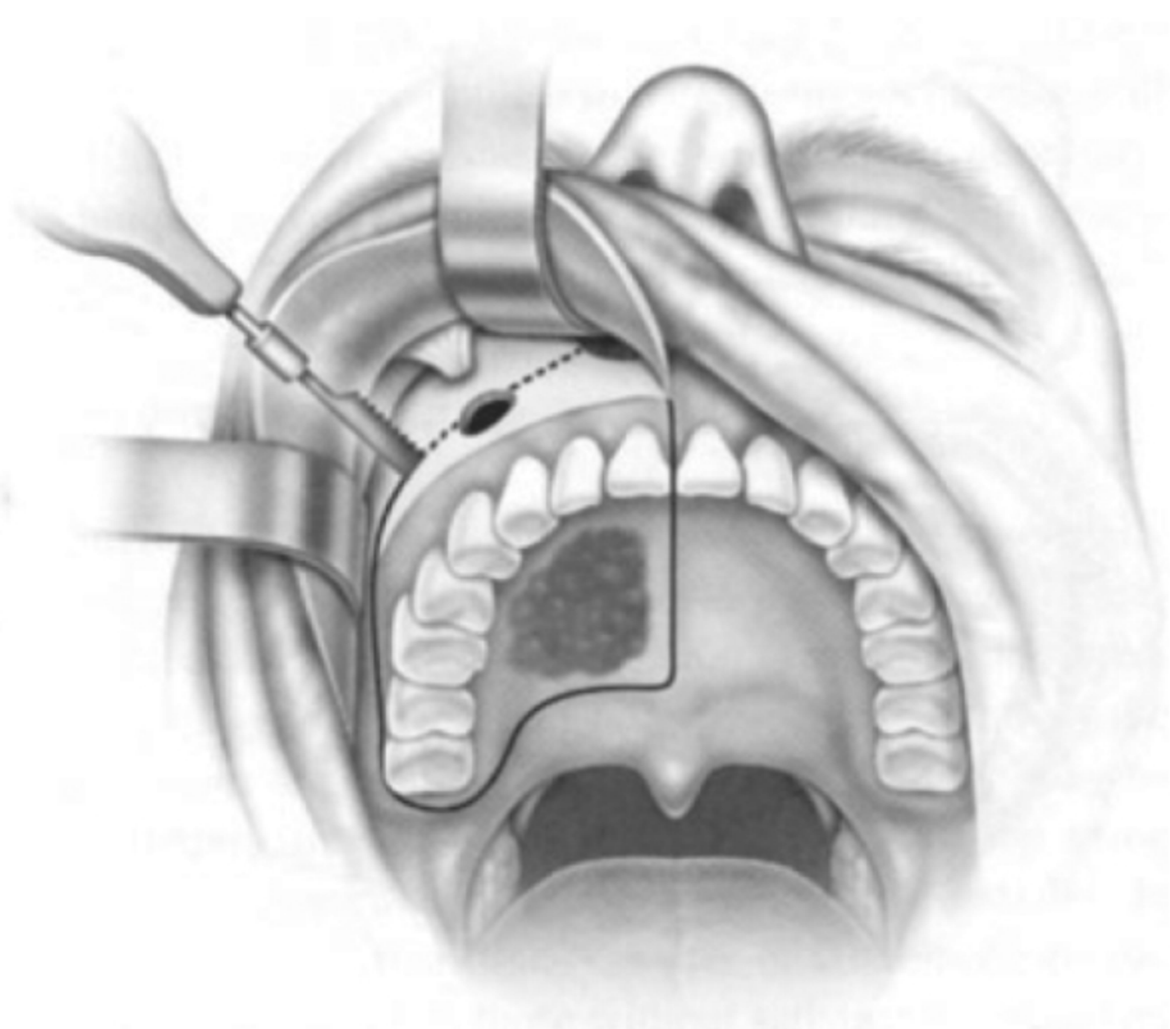

Figure 27-13 Anterior maxillotomy to visualize the floor of the maxillary sinus.
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More extensive tumors limited to the hard palate and alveolar ridge can be removed by simply extending the osteotomies.

Management of the Neck in Squamous Cell Carcinoma of the Hard Palate and Alveolar Ridge

The incidence of occult metastasis from the hard palate and maxillary alveolar ridge has not been studied systematically. There are very limited clinical data published on the actual incidence of cervical metastasis from these individual subsites, but the rate is generally perceived to be low. Over the past 2 decades we have observed that delayed cervical metastasis has occurred in some patients after resection and control of a primary cancer in the upper alveolar ridge and hard palate. Some of these patients have died of regional or distant metastasis despite control of their primary cancer.

Few data have been reported specifically on metastasis from squamous cell carcinoma arising in the maxillary alveolar ridge and hard palate. A high incidence of cervical metastasis (30%) in the subsites of tongue and floor of the mouth cancer has been well documented.[18–20] Simental and colleagues studied a series of patients with squamous cell carcinoma confined to the maxillary alveolus and hard palate in an effort to specifically evaluate the risk of regional metastasis from these subsites.[21] Our observed data suggest the rate of metastasis to the neck from squamous cell carcinoma of the hard palate and alveolar ridge to be 37%, which is similar to that in other sites in the oral cavity, such as the tongue and floor of the mouth.

We usually dissect the neck before the oral cavity because resection in this area is considered clean. If the tumor is isolated to one side, we perform a unilateral selective neck dissection. Midline lesions or lesions involving the entire hard palate require bilateral neck dissection. Once the neck dissection is completed, we redrape and isolate the neck dissection wound from the oral cavity procedure.

REHABILITATION OF A PATIENT WITH LOSS OF ORAL-NASAL SEPARATION

Patients treated by inferior maxillectomy require a means of restoring the oral-nasal separation lost by removal of the palate and alveolar bone. Not doing so results in patients who can neither speak nor swallow, which gives rise to an unacceptable quality of life.

The four major means of rehabilitation include

- Dental prosthetic management
- Local flaps
- Regional flaps
- Microvascular free tissue transfer

Dental Prosthetic Management

A patient with a limited lesion of the alveolar ridge alone or the alveolar ridge and palate that does not involve more than half the hard palate can be rehabilitated relatively easily. The expertise of a prosthodontist is indicated early in the course of evaluating the patient.[11] Preoperative dental impressions are made and a palatal prosthesis is fashioned and inserted at the time of resection as described earlier. A lag screw is inserted through a hole in the prosthesis into the remaining palatal bone to hold the prosthesis in place (see Fig. 27-11). The screw is removed and the prosthesis taken out. The packing is removed on the fifth postoperative day. The skin graft is healed by that time and the sutures holding the skin graft may be removed (Fig. 27-14). The intraoperative prosthesis will be modified by the prosthodontist at that time to provide adequate speech and swallowing. It will be modified by the prosthodontist over the ensuing months as the surgical site matures. These prostheses are designed according to the Aramany classification.[14–16] The final prosthesis will have teeth similar to a denture; it can be removed and cleaned by the patient as the patient also tends to hygiene of the defect (Fig. 27-15). It is essential for the surgeon and prosthodontist to coordinate their efforts to restore the quality of the patient's immediate postsurgical healing period and ultimate prosthetic rehabilitation. Patients undergoing partial inferior maxillectomy can expect to enjoy a good quality of life after such surgery and rehabilitation.

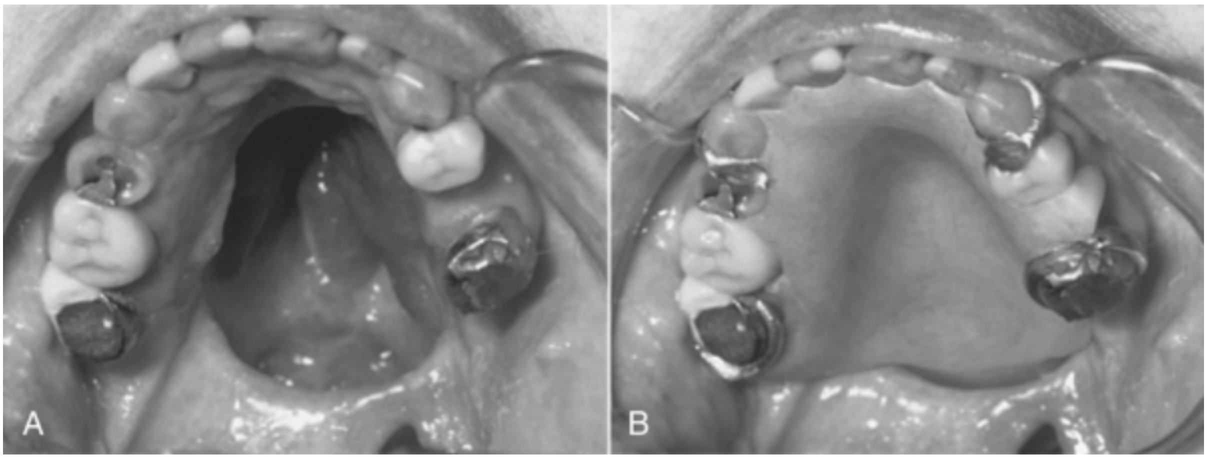

Figure 27-14 **A,** This patient underwent resection of an adenocarcinoma of the hard palate. The defect is demonstrated. **B,** Retention of the prosthesis is facilitated by residual dentition. The final prosthesis achieves good oral-nasal separation.

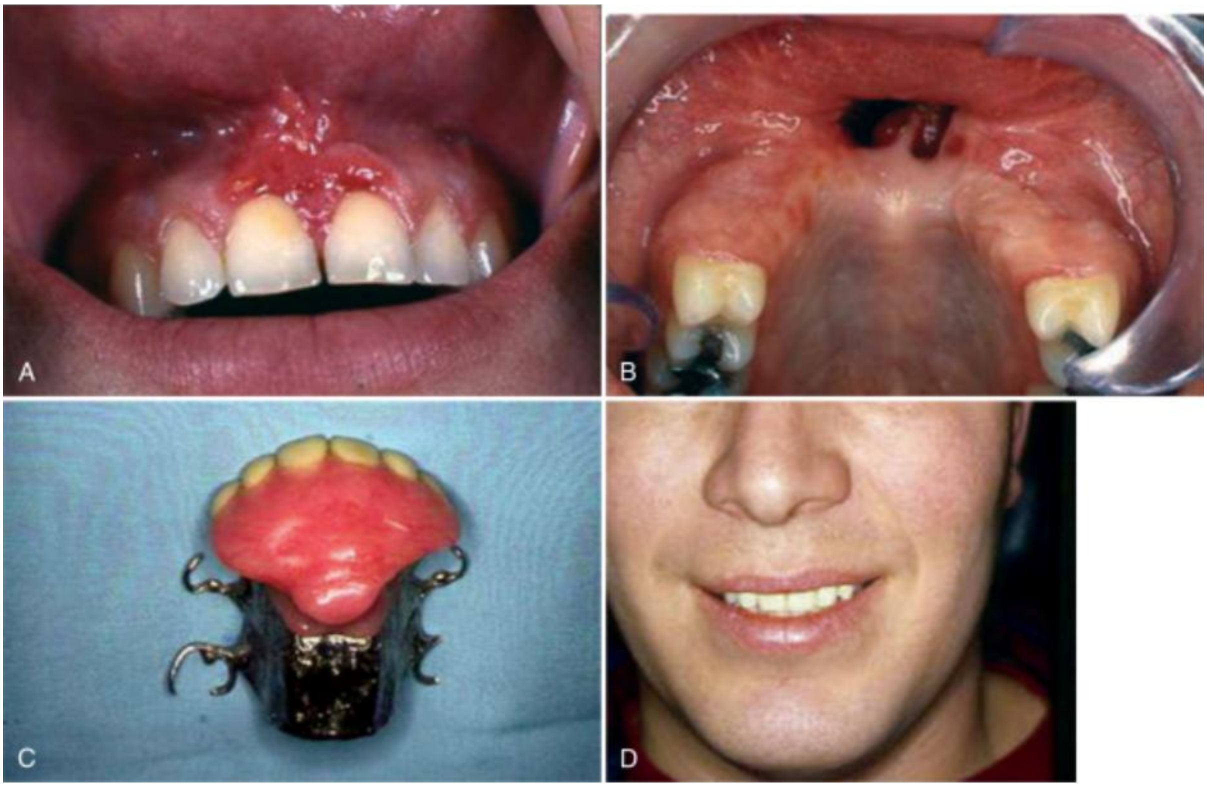

Figure 27-15 Patient with a removable denture that provides good oral-nasal separation and restores a good cosmetic appearance. **A,** Preoperative appearance. **B,** Surgical defect. **C,** Removable prosthesis with clasps. **D,** Good cosmetic result with restoration of oral-nasal separation.

Local Flaps

Local flaps have also been described. The palatal island flap for reconstruction of palatal lesions was originally described by Gullane and Arena in 1977.[22] This single-stage mucoperiosteal flap offers a reliable source of regional vascularized soft tissue that obviates the need for prosthetic rehabilitation. Genden,[23] Moore,[24] and their colleagues also concluded that the palatal island mucoperiosteal flap provides an effective means of reconstructing hard and soft palate defects with few complications and low morbidity.

Guzel and Altintas[25] described repairing large anterior palatal fistulas with thin tongue flaps in cleft palate patients, and from the description of their procedure it would appear that these flaps could also be used in patients with very limited lesions after resection for cancer of the palate and maxillary alveolus.

Regional Flaps

The temporalis flap has the advantage of immediate reconstruction with minimal morbidity for patients who have undergone total excision of the hard palate and alveolar ridge. The first use of the temporalis muscles as donor tissue was reported in 1898 by Golovine.[26] The temporalis muscle is an attractive option for reconstruction after inferior maxillectomy for the following reasons: (1) the donor site and the defect are within the same operative field and therefore the need for more complex free tissue transfers can be avoided; (2) there is considerable tissue available; (3) the flap is well vascularized; (4) the resulting functional defect is negligible; (5) the cosmetic deformity is limited to a mild concavity in the area of the temporalis fossa, which in women is covered by hair; and (6) the flap can be used to correct unilateral and bilateral defects. This reconstruction can be carried out in less time than it takes for a free flap.

The limitation associated with use of this flap is that no prosthetic rehabilitation with provision of teeth to improve the cosmetic effect can be achieved. It also has the disadvantage that direct vision of this area to monitor for recurrent tumor is no longer possible. This latter disadvantage has been largely overcome in recent years with the use of PET/CT scanning and a nasal endoscope.

Browne and Holland[27] reported a procedure for resection of palatal malignancies that involves the use of a combined intraoral and lateral temporal fossa approach to remove the primary tumor, resect tumors spreading perineurally from the skull base, and reconstruct the tissue defect with a temporalis muscle rotation flap (Fig. 27-16). In 16 patients with a variety of malignant tumors, the amount of palate resected varied from 25% to 100%, with the average being 30% to 50%. All the flaps in their series survived, and the wounds were mucosalized within

3 to 4 weeks of surgery. Patients were typically allowed to start oral intake of fluids on the second postoperative day.

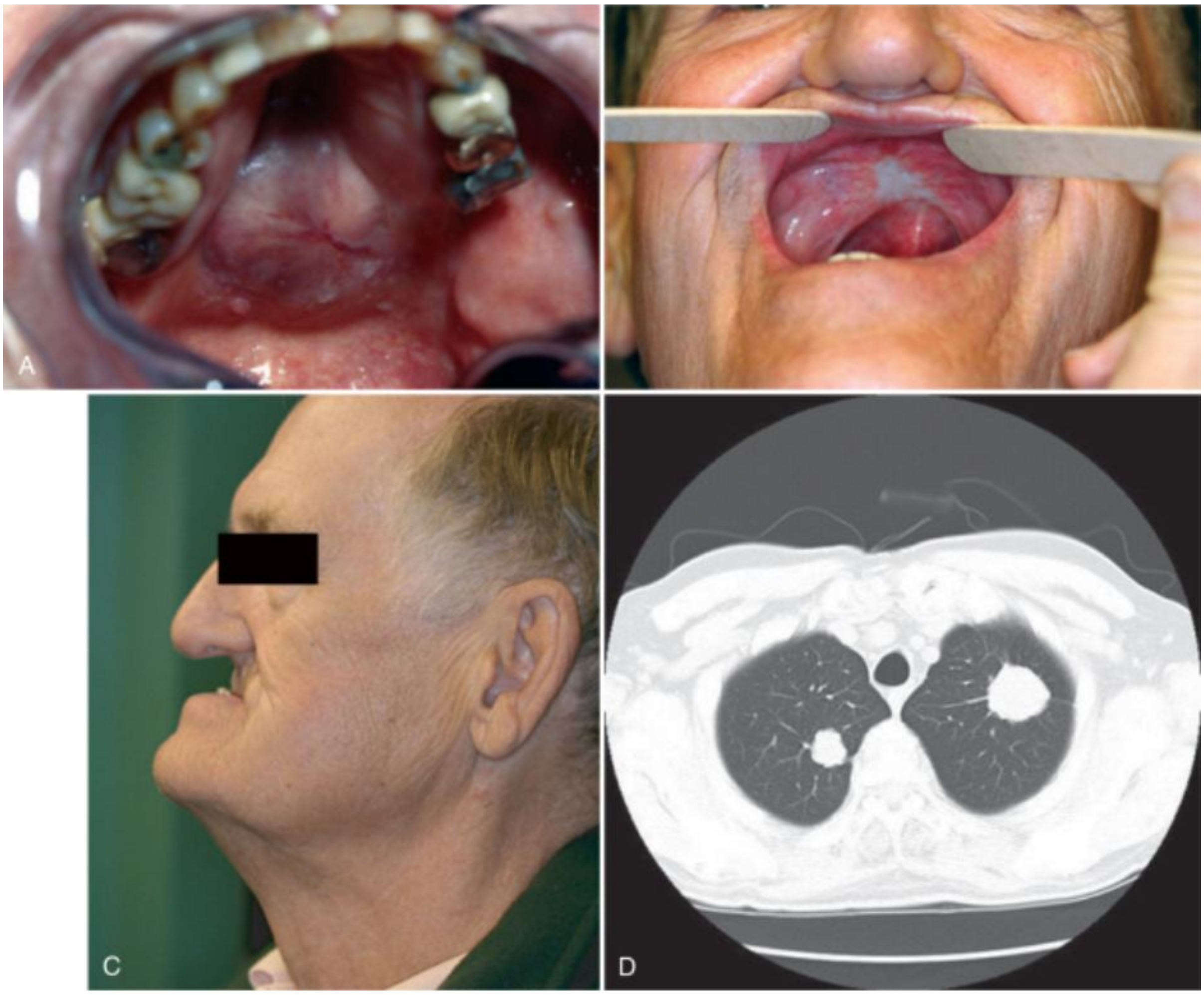

Figure 27-16 **A,** Patient with adenoid cystic carcinoma of the palate. **B,** After total inferior maxillectomy, the defect was reconstructed with a temporalis muscle flap, which quickly became mucosalized. Complete healing was followed by a full course of radiation therapy. **C,** Removal of the maxilla resulted in recession of the upper lip. **D,** Computed tomography scan disclosing multiple metastatic nodules that were discovered 13 years after the surgery and radiation therapy and were treated with radiation therapy. It has now been 15 years since the patient completed his surgery, and he is asymptomatic despite the lung metastasis.

Microvascular Free Tissue Transfer

Reconstruction of defects after inferior maxillectomy has recently been very well summarized by Urken and colleagues under the theme of functional palatomaxillary reconstruction.[17] The authors state that palatomaxillary defects are inherently more complex than defects of the mandible because of their three-dimensional shape and location in the midface region. The defects are also at a distance from most of the recipient vessels used in free tissue transfer. The authors divide the defects into classes I, II, and III (Table 27-1) and discuss them in detail. They include the use of dental restoration with dental implants for support and anchorage to provide the foundation for functional dental rehabilitation. Urken's group rehabilitated patients with limited defects of the palate (Ia and Ib) with either an obturator or a soft tissue flap. These flaps included a palatal island flap for smaller defects and a radial forearm flap for larger defects. The critical point that they make is that placement of soft tissue into these defects eliminates the midline palatal shelf and the lateral scar band necessary for retention of a maxillary obturator and the remaining dentition therefore becomes critical for prosthetic retention.

Table 27-1 -- DEFECT CLASSIFICATION SCHEME

Defect Class	Criteria
Ia	Limited defect in the central portion of the palate that does not involve the alveolus
Ib	Defect in the palate that involves the alveolus but is located posterior to the canine or is limited to the premaxilla with preservation of the canine teeth bilaterally

Defect Class	Criteria
II	Hemipalatal defect that does not cross the midline in a “conventional” longitudinal resection and does not extend posterior to the midpoint of the palate for a defect that is created in the horizontal orientation, thus preserving at least half of the palatal surface
III	Subtotal or total palatectomy involving more than half of the palatal surface
f	Indicates a defect in the floor of the orbit
z	Indicates a defect in the body of the zygoma

Reprinted with permission from Urken ML, Buchbinder D, Okay D: Functional palatomaxillary reconstruction. Op Tech Oto-laryngol Head Neck Surg 16:36-39, 2005.

In larger class II defects, it has been their policy to provide restoration with either an obturator, if the remaining bony and dental support is adequate, or a free flap. The free flap must include vascularized bone from either the fibula, iliac crest, or scapula. Class III defects are all restored with an osseocutaneous free flap.

Other types of free flap reconstruction have been reported by Gellrich and coworkers,[28] who described the lateral upper arm flap for intraoral reconstruction, and by Genden and associates,[29] who described iliac crest internal oblique osseomusculocutaneous free flap reconstruction of the postablative palatomaxillary defect and considered it a reliable method of primary reconstruction that allows complete orodental rehabilitation without the use of a prosthetic obturator. Futran and Haller[30] described the use of fibular, rectus abdominis, radial, and latissimus dorsi free flaps for reconstruction of the hard palate. They concluded that free flap reconstruction of the palate provides reliable permanent separation of the oral and sinonasal cavities in one stage. In addition, the potential for dental rehabilitation with restoration of masticatory function and normal phonation exists. The choice of flap is tailored to specific palatal defects, as well as patient needs.

POSTOPERATIVE MANAGEMENT

Patients who have undergone removal of benign or low-grade malignant tumors in which the bone was preserved may ingest a bland pureed diet beginning on the first day. Frequent irrigation of the oral cavity, in particular, the use of half-strength hydrogen peroxide—swish and spit—would be very useful in helping the defect to heal. The use of a dental splint will also help protect the raw surface while it is re-epithelializing and make the patient more comfortable. Patients who have undergone prosthetic rehabilitation may be fed a liquid or pureed diet on the first postoperative day. The prosthesis should be removed and the bolus taken out on postoperative day 5. The prosthesis should then be removed after each meal, the oral cavity irrigated, and the prosthesis cleaned. Patients who have undergone reconstruction with a temporalis flap should resume irrigation as described earlier. They may also be fed on the first postoperative day.

Patients who have undergone free flap reconstruction will begin to swallow at a later date after the suture lines have healed satisfactorily and then can receive a pureed diet with the aforementioned oral cavity hygiene.

Patients who have undergone neck dissection in conjunction with resection of the primary cancer will have the neck wound managed as described in the chapter on neck dissection (see Chapter 78).

Patients with bone invasion as part of their tumor (T4 lesions) or with high-grade salivary gland cancers are referred for postoperative chemoradiation therapy. Patients who have perineural involvement in their primary should be referred for chemoradiation therapy. Similarly, patients who have more than two positive nodes or extracapsular spread in the neck dissection will be referred for chemoradiation therapy.

COMPLICATIONS

When palatal bone is removed as a deep margin of resection for a limited tumor, great care is taken to avoid perforation of the soft tissue on the nasal side of the palate. Trauma to the mucosa of the floor of the nose invariably results in an oral-nasal fistula. When the floor of the nose has been violated, immediate repair with soft tissue is appropriate. An alternative is to achieve oral-nasal separation with a prosthesis.

Resurfacing soft tissue defects with a split-thickness skin graft when the hard palate is intact is rarely necessary. The defect will heal by secondary intention. The exception to this generalization is a situation in which buccal mucosa is resected with adjacent alveolar bone. In these circumstances, resurfacing the cheek flap with a split-thickness skin graft serves to prevent excessive contracture of the soft tissue. Additionally, the scar band at the junction between the split-thickness skin graft and the residual mucosa helps provide good retention for subsequent use of a prosthesis.

Complications in healing may occur. Loss of the split-thickness skin graft used to line the cheek flap is quite unusual but it is followed by healing by second intention, which unfortunately may produce contracture of the upper lip. The fundamental success of free tissue transfer is dependent on frequent examination of the anastomosis by Doppler signal. This requires dedicated and experienced nursing care so that if the signal is lost, the patient can be taken back to surgery to salvage the flap.

PEARLS

- A biopsy to obtain a diagnosis for making a rational plan of management is essential because of the wide variety of tumors, both benign and malignant, found in the hard palate.
- Computed tomography is very helpful in evaluating the extent of the tumor and whether it has infiltrated bone.
- Selective neck dissection should be part of the surgical treatment because of the high rate of metastasis to the neck.
- A maxillofacial prosthodontist should see the patient for preoperative evaluation so that a surgical obturator can be available in the operating room.
- A temporalis flap or free flap may be used for immediate reconstruction of a total palatal defect.

PITFALLS

- Lack of an accurate pathologic diagnosis may result in a flawed plan of management.
- Failure to have imaging studies may lead to understaging the disease, which may result in undertreating the patient.
- Failure to include selective neck dissection will result in a recurrence rate in the neck of greater than 30% in patients with squamous cell carcinoma of the hard palate.
- Not having a prosthesis available at the time of surgery will deprive the patient of regaining immediate oral-nasal separation.
- Not including postoperative radiation therapy or chemoradiation therapy in the treatment of high-grade cancer downgrades the possibility of achieving locoregional control and survival.