18. Tumors of the Head & Neck

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Cancer of the head and neck region is different from many other types in that, although diagnosis is relatively easy, the patient frequently presents with advanced disease, because pain is not an early symptom. The head and neck are an extremely complex anatomic unit, and cancer of any of its structures can be quite distinctive both physically and psychologically.

Most primary neoplasms of the head and neck region arise from the squamous epithelium in the oropharynx. There are about 37.000 new casea annually in the USA, representing 5% of all reported cancers. Less than half are cured.

Predisposing factors are varied, but inflammation is present in many cases. The irritating effects of tobacco and its association with oral cancer have been recognized since the early 18th century. The mortality rate from oral cancer in cigaretee smokers is 4 times greater than in nonsmokers. Alcohol abuse has a similar relationship, and the 2 together have a more than additive effect. The marked differences in rates of incidence of oral cancer around the world (Table 18-1) are almost certainly culturally determined.

Table 18-1. Incidence of oral cancer, 1974-1975. (Age-adjusted death rate per 100.000 population, 15 countries.)

	Males	**Females**
Canada	3.9	1.2
Denmark	1.9	0.9
England, Wales	2.7	1.3
France	14.5	1.1
Germany	2.6	0.7
Hong Kong	19.3	7.4
Ireland	3.9	1.8
Israel	1.3	1.2
Italy	5.8	0.8
Japan	1.7	0.7
Philippines	4.7	3.4
Portugal	4.9	0.9
Singapore	15.2	5.0
Switzerland	6.2	1.0
USA	4.7	1.6

Most primary neoplasms of the head and neck region occur in males, with the exception of thyroid cancer, benign salivary tumors, and hypopharyngeal carcinoma. The latter is common in Scandinavian women with Plummer-Vinson syndrome (achlorhydria, anemia, and mucosal atrophy). Recent epidemiologic studies have shown marked increases in intraoral cancer rates in women.

The immunology of head and neck cancer has become a major area of investigation. Squamous cell carcinoma results in a greater than expected impairment of the immune system, particularly cell-mediated immunity. Tumor-associated antigens (eg, CEA0 are sometimes found in oral and pharyngeal carcinomas, but their clinical relevance is uncertain. Virus-associated antigens and antibodies have been noted in certain head and neck carcinomas. Antibodies to EB virus are found in nasopharyngeal carcinoma and Burkitt's lymphoma of the oral cavity. A decrease in antibody titers correlates positively with successful therapy of these tumors. The EBV antigen has also been successfully employed to diagnose occult nasopharyngeal carcinomas. In laryngeal carcinoma, antibodies to herpes simplex virus have been reported. Although no virus has been isolated that will induce cancer in humans, the etiologic role of viral agents in the development of head and neck cancer deserves further investigation. Interestingly, recent studies have demonstrated elevated viral antibody titers in heavy smokers and alcoholics.

Diagnosis

A thorough history and physical examination is an essential first step in the assessment of patients with head and neck neoplasms, noting any predisposing historical features such as alcohol abuse or smoking, a family history of cancer, and any significant associated organic diseases. The patient's social, ethnic, and economic status should be explored and a preliminary judgment made about what effect therapy might have on his or her life-style.

In about 90% of primary tumors of the head and neck, the diagnosis can be made by an orderly examination including inspection, palpation, and biopsy of suspicious lesions. The examiner should be thoroughly familiar with the anatomy of the region and should have access to the basic instruments employed in head and neck examination.

Inspection of the head and neck region should be systematic. One should look for asymmetry of the face and neck, areas of color change, abnormal growths, and ulceration. Note the odor of the breath and abnormalities in phonation. Careful testing of facial motor and masticatory functions may disclose nerve involvement by tumor.

Intraoral examination includes inspection of the dentition, mucosa, and ductal orifices, Areas of periodontal inflammation, leukoplakia, and ulceration should be noted. Erythroplasia (raised red lesion) is felt to be a premalignant condition and deserves special consideration. The nasopharynx and hypopharynx should be examined indirectly with a laryngeal mirror. Familiarity with this technic is crucial in examining the 3 "blind" areas - nasopharynx, base of tongue, and piriform sinus. It is also employed in the assessment of vocal cord lesions.

Palpation should begin with a careful assessment of all triangles of the neck. The location, size, consistency, number, mobility, and tenderness of any masses should be recorded. If a primary neoplasm is known to be present, any neck mass is assumed to be a metastasis until proved otherwise. Bimanual palpation of the tongue and floor of the mouth may disclose lesions not apparent on inspection. This technic is also helpful in determining the size and extent of oral and pharyngeal tumors. When palpating the palate, the base of the tongue, and the tonsillar pillars, it is advantageous to anesthetize these areas with a topical anesthetic solution to abolish the gag reflex.

Anciallary diagnostic methods are used to supplement the basic physical examination. These include direct laryngoscopy, nasopharyngoscopy, fiberoptic endoscopy, roentgenography, arteriography, barium contrast studies, laminagraphy, radionuclide scans, and CT scans.

All suspicious areas should be **biopsied.** Regardless of the method used (incisional or excisional biopsy, punch biopsy, needle biopsy), the pathologist must be provided with enough tissue to examine the lesion adequately. It is often helpful to obtain a biopsy at the juncture of grossly normal and abnormal tissue. One should avoid performing a biopsy of obviously necrotic areas of tumor.

It is controversial whether an area of leukoplakia is a premalignant lesion, and when confronted with this condition the physician may experience difficulty in knowing exactly where to biopsy and, indeed, whether biopsy is even indicated. In these situations, cytologic screening studies may be helpful. A "mouthwash" specimen is collected and the centrifugate is examined by the Papanicolau method. While it does not reveal the location of a tumor, a positive test may indicate the need for closer examination and biopsy.

Topical application of toluidine blue dye to the oral mucosa is sometimes employed to differentiate areas of dysplasia or neoplasia from normal tissue. This technic has been used to determine margins of resection of malignant tumors, to differentiate traumatic or inflammatory lesions from cancer, and to demonstrate small second primary or satellite lesions in the presence of a large neoplasm. This technic is reliable, but it can only be applied to lesions involving the mucosa. Decisions on what type of definitive therapy should be used are properly based upon the results of tissue biopsy and ancillary diagnostic technics.

Appropriate diagnosis and therapy of head and neck cancer often necessitates a team approach. Often this is best achieved in a patient-oriented conference attended by the head and neck surgeon, radiotherapist, immunologist, chemotherapist, psychiatrist, prosthodontist, dietitian, and speech therapist. An individual approach is stressed, with therapeutic goals projected for the total patient and not just the isolated physical problem.

Tumors of the Skin

Both benign and malignant lesions of the skin are common on the head and neck. The incidence is much higher in sunny climates (5% of all cancers in England but 50% of all cancers in Australia) and in fair-skinned individuals (seldom seen in blacks).

Benign Tumors

Solar or actinic keratosis is the most common benign skin lesion. It appears grossly as an irregular gray area covered with fine scales. It is generally considered precancerous, and malignant change occurs in 1 out of 25 lesions. When excessive amounts of keratin are produced, a cutaneous horn results.

All premalignant lesions need definitive treatment. The skin of the face and neck should be carefully examined, and all suspicious areas excised and examined histologically.

Malignant Tumors

Malignant lesions occurring on the skin of the head and neck are as follows: basal cell carcinoma, squamous cell carcinoma, adenocarcinoma (arising in sweat or sebaceous glands), melanoma, mycosis fungoides, Kaposi's disease, lymphomas, and metastatic lesions.

Basal cell and squamous cell carcinomas - the most frequent skin malignancies - occur principally in elderly individuals (60s and 70s) and infrequently in patients under 40. They may present as small nodular or superficial plaques with or without ulceration and with or without deep infiltration into underlying soft tissues and cartilage.

It is occasionally difficult to distinguish clinically between basal cell and squamous cell carcinomas. Lesions in and around the temple and preauricular area, although histologically having basal cell characteristics, behave more aggressively and should be treated as if they were squamous cell carcinomas. Both of these lesions may become large and invade vital structures.

Preventive measures for skin cancer consist of the followsing: (1) Avoidance of prolonged exposure to sunlight by susceptible individuals. (2) Careful observation of the skin to facilitate early diagnosis. (3) Use of protective sun skin creams. (4) Excision of precancerous lesions such as isolated solar keratoses.

Malignant lesions are curable if discovered early, because they are accessible, grow slowly, and metastasize late. Some lesions may develop over a period of 10-20 years and present as extensive, disfiguring, infected ulcerations. Metastases to lymph nodes from basal cell lesions are almost unknown. Particularly on the head and neck, squamous cell carcinoma of the skin metastasizes infrequently (5%).

Both radiation therapy and surgery are effective in the management of skin cancers. The selection of one method or the other depends upon the location and extent of the lesion, the feasibility of protection of vital structures (eye, middle ear, brain, cartilage, etc), previous treatment, the number of surgical procedures required for repair of the resulting defect, and patient factors such as availability for treatment and occupational hazard.

In most cases, surgical excision is preferred when it can be done simply. Primary closure of the surgical defect is more expeditious and results in a more satisfactory cosmetic effect. Larger surgical defects may require coverage with skin grafts or with flaps.

Although relatively advanced lesions can be successfully handled by radical surgery, radiation therapy, and plastic reconstructive procedures, some neglected lesions may be uncontrollable by the most radical surgery or radiation therapy.

Cancer of the Oral Cavity

The oral cavity extends from the vermilion border of the lips to and including the anterior faucial pillars, which separate it from the oropharynx.

Malignant tumors of the oral cavity are best classified by the **TNM classification.** T1 lesions are less than 2 cm; T2 lesions are 2-4 cm; and T3 lesions are massive growths greater than 4 cm. M refers to metastasis: M0 means no metastases; M1 means metastases beyond the head and neck (eg, liver or lungs). N refers to the clinical status of the lymph nodes: N0 means there are no palpable nodes present; N1 means ipsilateral nodes are enlarged; N2 means there is enlargement of contralateral or bilateral nodes; and N3 means that the nodal involvement is fixed (ie, not bovamble and attached to vital or deep structures). This classification is helpful in staging tumors and in determining prognosis.

When a patient is scheduled for preoperative radiation, it is helpful to tattoo a 1-cm margin around the tumor. Radiotherapy wil shrink the tumor, but the surgical extirpation must allow at least a 1-cm margin around the original limits of the tumor.

The important biologic differences between tumors of the mucosa lining the oral cavity and that lining the oropharynx are based on different degrees of cellular differentiation, tendency to infiltrate the adjacent tissues, and rate of spread to regional lymphatics.

Ninety percent of all tumors of the oral cavity are squamous cell carcinomas. They are usually better differentiated, more locally invasive, and less likely to metastasize to regional lymph nodes than malignant tumors of the oropharynx. One group of tumors - mucoepidermoid carcinomas - may be difficult to differentiate from epidermoid carcinoma, because of epithelial metaplasia.

Salivary gland adenocarcinomas occur in 8% of cases and constitute the next most frequent type of tumor. Along with mucoepidermoid carcinomas, they have a tendency to grow slowly, invade locally, and metastasize late to lymph nodes.

The remaining lesions are rare tumors originating in practically any tissue that is present in the oral cavity: muscle, blood vessels, nerves, connective tissue, etc.

Oral cancer usually occurs between the ages of 45 and 85 in individuals with associated vascular diseases, leukoplakia, heavy smoking and alcohol intake, and poor oral hygiene. Syphilis is not a significant contributing factor today.

Delay in diagnosis may be due to failure of the patient to seek medical help or to failure of the physician to appreciate the importance of early pathologic changes. The recent emphasis on oral cancer in the education of dentists has resulted in earlier detection of many lesions.

Although most lesions can be identified by their gross appearance, the diagnosis of intraoral cancer is established principally by biopsy. The physician who will provide definitive treatment should perform the biopsy in order to examine the lesion before it is surgically altered. This is especially important for small lesions that could be totally removed by an excisional biopsy. Difficult problems of management may arise later if the physician responsible for definitive treatment cannot detect a residual lesion or even find the site of biopsy.

It is important to evaluate the state of dentition at the time of the initial biopsy. Before starting radiotherapy, all carious teeth beyond repair should be extracted to prevent osteoradionecrosis. Teeth in a reasonable state of repair or those which can be corrected may be protected from radiation-induced caries with fluoride cap treatments.

All patients with cancer of the head and neck should have a thorough examination including bronchoscopy, nasal pharyngoscopy, esophagoscopy, and laryngoscopy, because more than one primary cancer is present in about 10% of cases.

T1 and T2 lesions have an excellent prognosis regardless of treatment. T3 lesions can be virulen and require aggressive treatment if the patient is to be cured. Much thought must be given to neck dissections or radiation therapy to the neck in these patients.

Biopsies should be obtained with a scalpel or biopsy forceps to avoid destruction or alteration of cellular detail and should be repeated if there is a suspicion of malignancy.

There is usually no need to biopsy palpable lymph nodes in the presence of a recognizable primary cancer. It may occasionally be necessary to do an aspiration biopsy of an involved cervical lymph node and, if negative, to do an excisional biopsy. Incisional biopsies should be avoided unless it is impossible to remove an intact lymph node because of its large size or infiltration into deeper structures.

Although cytology is never a substitute for an adequate biopsy, cytologic examination of exfoliated buccal cells is of great value in the early detection of cancer in the oral cavity.

Carcinoma of the Lip

Carcinoma of the vermilion border of the lip is an entity distinct from cancer of the skin and is the most frequent of all intraoral malignant cancers (20-30%). Most cancers of the lip are squamous cell carcinomas; fewer than 3% are basal lesions.

Cancer of the lip has the same relationship to exposure to actinic rays as cancer of the skin and is therefore more frequent in farmers, sailors, and individuals who are exposed to sunlight over long periods of time. Carcinoma of the lip is also more frequent in males than in females and occurs primarily in the sixth and seventh decades of life; although it usually occurs on the lower lip, an occasional cancer may occur on the upper lip - more often in women than in men.

Carcinoma of the lip is usually a well-differentiated lesion presenting as an infiltrating or an ulcerating or exophytic tumor. It is small initially but may eventually become quite large, involve the entire lip from commissure to commissure, and destroy the soft tissues of the chin.

Metastases occur via the lymphatics in an orderly manner to the regional lymph nodes. First the submental, then the submaxillary, and eventually the cervical lymph nodes are involved. Distant metastases occur rarely. Carcinoma of the upper lip is less common but more aggressive; it metastasizes to the facial and submaxillary lymph nodes - occasionally to the preauricular and parotid nodes. Metastases occur in 15% of cases and are related to age

of the patient, the size of the primary lesion, its histologic differentiation, and the presence of fixation to the mandible.

Treatment

Both surgery and radiation therapy are most effective in the control of carcinoma of the lip. For most lesions, surgery is preferable.

Small lesions are ordinarily best treated by localized surgical excision - a method that is simple, expeditious, and cosmetically satisfactory. Recurrence of disease in scar or in previously irradiated areas or involvement of bone ordinarily precludes the use of radiation therapy.

Cervical lymphadenectomy (radical neck dissection) is effective in the control of disease that involves the lymph nodes. Most patients who develop palpable nodes do so within 2 years after discovery of the primary tumor. Whereas 25% are found to have microscopically involved lymph nodes when the adenectomy is elective, tumor is found in 85% of patients undergoing therapeutic neck dissection.

Prognosis

The prognosis depends on the size of the tumor, the location of the lesion, the degree of differentiation, and the presence or absence of metastatic disease. Surgery and radiation therapy are about equally effective for comparable "curable" lesions.

The reported 5-year survival rates for cancer of the lip treated by surgery or by radiation therapy vary between 85 and 95% for lesions up to 2 cm in size. The cure rates are lower for larger lesions. The presence of metastases to the regional lymph nodes reduces the cure rate by 50% regardless of whether the neck dissection is elective or therapeutic.

Carcinoma of the Buccal Mucosa

The buccal mucosa lines the inner side of the cheek from the anterior commissures of the lip to the ascending ramus of the mandible and from the upper to the lower gingiva. This epithelium gives rise to carcinomas that are usually well differentiated and locally infiltrating. Larger lesions may extend from the superior to the inferior gingivobuccal sulci and gingivae, anteriorly to the commissure, and posteriorly to the "retromolar trigone"; they may infiltrate deeply through the buccinator muscle and be confused with tumors arising primarily in these regions.

Lesions of the buccal mucosa may be ulcerated, exophytic, or verrucous. Verrucous carcinomas are low-grade squamous carcinomas and offer the best prognosis. The metastatic rate from buccal carcinoma is about 50%.

Treatment

Smaller lesions, particularly those surrounded by leukoplakia, can be excised surgically and closed primarily, After larger excision, the resulting defect must be covered with flaps.

Large skin grafts should be used only rarely to replace the buccal mucosa, because they contract and may restrict opening of the mouth (trismus). Deeply infiltrating lesions may need a full thickness excision of the cheek with reconstruction with flaps that replace mucosal lining and skin.

Radiation therapy has been found to be as effective as surgery in the management of carcinoma of the buccal mucosa. It appears, however, that for highly differentiated tumors surgical extirpation is the treatment of choice. Verrucous carcinoma should not be treated by radiation therapy, because this may increase its malignant potential. The highest cure rate for verrrucous carcinomas have been reported after surgical treatment.

Metastases to the cervical lymph nodes are best managed surgically.

The reported 5-year survival rates for both methods of treatment vary from 30 to 70%. Histologic involvement of the lymph nodes reduces the prospect of curability by about two-thirds.

Cancer of the Oral Tongue

For purposes of discussion, the tongue should be considered as composed of an oral portion (mobile anterior two-thirds) and a pharyngeal portion (posterior third). The circumvallate papillae constitute the line of demarcation between the 2 segments.

Carcinoma of the oral tongue occurs from the fourth to the eighth decade of life, usually in males, in association with heavy smoking and alcohol intake and poor oral hygiene. Three-fourths of all cancers of the tongue occur in the oral portion. Carcinoma of the tongue most often occurs on the lateral border of the middle third, although it may also occur on the tip, the dorsum, or the undersurface. Multiple primary carcinomas of the tongue are uncommon (3%). The lesion may progress in any direction and extend into the floor of the mouth to involve laterally the dental alveoli or posteriorly the anterior tonsillar pillar. Some lesions may be so large that it is impossible to determine the primary site of origin.

Metastases to the regional lymph nodes are frequent and may first appear on the contralateral side. At the time of initial diagnosis, 40-45% of patients have palpable lymph nodes. Another 20% will develop metastases to the cervical lymph nodes within a short time after control of the primary lesion.

Treatment

The location and size of the lesion, the condition of the adjacent tissue, the availability of treatment, and the general health of the patient determine the selection of treatment. In general, surgery and radiation therapy appear to be equally effective. However, radiation therapy has the advantage of permitting preservation of tissue, which results in better function than after resection.

Surgical excision is the treatment of choice for small lesions, particularly those located at the tip of the tongue, because it is expeditious, effective, and produces negligible impairment of function.

Planned preoperative irradiation followed by surgery has been of great benefit in prolonging life in patients with large lesions.

If their location permits, smaller lesions can be treated by means of peroral irradiation.

In selecting the initial mode of treatment for the primary lesion, one should appreciate that surgery can still be utilized if radiation fails. Many experienced clinicians advocate prophylactic cervical lymphadenectomy, because the lymph nodes are involved in 40-45% of cases before the disease is clinically apparent. However irradiation therapy is as effective as surgery as a prophylactic measure for possible microscopic lymph node metastases.

Prognosis

The rate of local control of the tumor depends on its location and size. Whereas the 5-year survival rate for lesions of the tip of the tongue is 75-80%, it decreases to 55% for those at the lateral margins and to 40% for those on the dorsum. The 5-year survival rate is 78% for patients without metastases but drops to 14% for those with involved lymph nodes.

Carcinoma of the Floor of the Mouth

The anterior and the 2 lateral gingivolingual sulci constitute the floor of the mouth. They are continuous posteriorly with the glossopharyngeal sulci and the piriform sinuses. The mucosa of the floor of the mouth has important anatomic relationships to the underlying musculature, the submaxillary gland, the lingual nerve, and the lingual artery.

Carcinomas of the floor of the mouth constitutes 15-20% of all intraoral malignant lesions. The tumor is usually a squamous cell carcinoma that is usually less well differentiated than tumors occurring on the oral tongue. It may extend medially to involve the undersurface of the tongue, laterally to involve the gingivae, the underlying periosteum, or the mandible itself to produce bone destruction. Inferior extension may involve the submaxillary duct, the lingual nerve, and the lingual artery, or the tumor may spread between muscle planes.

Most of these cancers arise in the anterior floor of the mouth. Invasion of lymphatics occurs early; 50-60% of patients have palpable lymph nodes at first examination. In some series, lymph nodes involvement has been reported in 90% of patients within 12 months after diagnosis. Metastases occur to the submaxillary, subdigastric, and upper deep cervical lymph nodes. Metastases to the contralateral side occur in 10-15% of cases.

Treatment

The propensity for carcinoma of the floor of the mouth to extend to the tongue and gingivae and to infiltrate deeply into the musculature of the submental and submaxillary regions makes most of these lesions unsuitable for local surgical or radiotherapeutic management as the primary treatment method.

The selection of treatment depends to a great extent on the size of the lesion and the presence or absence of involvement of the adjacent structures. Occasionally, a small lesion can be controlled by wide local excision or by peroral roentgen therapy or interstitial

irradiation. Larger lesions may require either (1) wide excision in continuity or (2) external irradiation over the entire floor of the mouth and adjacent regional lymphatics, followed by a radical neck dissection. Extensive lesions of the floor of the mouth have been successfully treated using preoperative irradiation followed by radical surgery through tissues whose margins have been sterilized of tumor.

The treatment of choice of involved lymph nodes is therapeutic radical neck dissection.

Prognosis

Five-year survival rates between 40 and 75% have been reported, depending upon the size of the lesion and the presence or absence of cervical lymphadenopathy at the time of primary treatment.

Cancer of the Soft Palate & Anterior Faucial Pillars

The most frequent malignant tumors arising in these structures are squamous cell carcinomas. They are usually well-differentiated tumors with various degrees of local infiltration of the underlying musculature. They remain localized for a long time and metastasize late to regional lymphnodes. The presence of extensive adenopathy renders the prognosis grave.

The long period of localization of these tumors renders them amenable to wide surgical excision. Radiation therapy is frequently utilized as definitive treatment for superficial lesions or as preoperative treatment for those too extensive to be treated by surgery or radiation therapy alone. Planned preoperative irradiation of an extensive tumor may reduce its size significantly and permit its resection through margins sterilized of tumor cells. The size of a soft palate carcinoma is most important in estimating prognosis. Lesions under 3 cm have a 5-year survival rate of 55%; those over 3 cm have a 15% 5-year survival rate. The presence of cervical metastases decreases the overal 5-year survival rate to 15% despite control of the primary tumor.

Adenocarcinomas of salivary gland origin may occasionally arise in the soft palate. They are locally invasive and are best treated by surgical resection followed by irradiation therapy.

Carcinoma of the "Retromolar Trigone"

Lesions originating in the mucosa behind the last molar teeth consitute a special class of tumors presenting serious problems of management. Epidermoid carcinoma arising in this site is particularly radioresistant. It has a tendency to involve bone early, to infiltrate adjacent musculature, and to travel along nerve structures such as the mandibular and the lingual nerves. It may extend early along the pterygoid plate to the base of the skull. All of these features frequently make primary surgery of these tumors a futile effort. It is often difficult to distinguish these lesions from those originating from adjacent structures.

The 5-year survival rate has been increased in recent years by using preoperative radiation therapy followed by resection of the primary lesion and the underlying mandible with an incontinuity neck dissection.

Carcinoma of the Lower Gingivae

It is important to distinguish between carcinoma of the gingivae and cancer of the jaw. The first is an epidermoid carcinoma arising in the epithelium covering the alveolus, whereas the latter signifies bone tumor arising in the mandible.

Epidermoid carcinoma of the mucosa of the lower gingivae is usually well differentiated and infiltrates underlying bone early and frequently (40-50%). It may first become apparent as a small ulceration adjacent to a tooth that was extracted after failure to recognize the true cause of local symptoms. The open socket then constitutes an avenue for invasion of bone by the cancer. The tumor may extend laterally to involve the buccal mucosa or medially to involve the floor of the mouth.

Metastases to the regional lymph nodes occur frequently (35-40% of cases). Extensive tumors involving the floor of the mouth to the midline may metastasize to the contralateral side.

Small superficial verrucous lesions of the gingivae can be controlled with radiation therapy.

Resection of the primary lesion by rim resection of the mandible with radical lymphadenectomy is the treatment of choice for moderate-sized lesions of the alveolus with or without palpable lymph nodes.

For more extensive lesions, planned preoperative irradiation followed by combined resection yields the best results.

The overall 5-year survival rate is 35-45%.

Carcinoma of the Upper Gingivae & Hard Palate

Cancers arising in the mucosa of the upper gingivae and the hard palate are usually well-differentiated epidermoid carcinomas that metastasize late. Tomograms are necessary to distinguish between primary maxillary carcinomas and oral palate lesions. Tomograms also show invasion of the base of the skull and the pterygoid plates. Bone involvement may be extensive. The rare metastases are found in retropharyngeal, submaxillary, or subdigastric lymph nodes.

Wide surgical resection of the involved tissues is the treatment of choice. The resulting extensive surgical defects can be easily covered by prosthetic appliances. Five-year survival rates are about 60%.

Cancer of the Oropharynx

The oropharynx extends from the soft palate to the level of the hyoid bone and is delineated anteriorly by the lingual circumvallate papillae and the anterior faucial pillars. Epidermoid carcinomas, lymphoepitheliomas, and lymphosarcomas are the most common malignancies found in this region.

The epidermoid tumors are poorly differentiated, bulky lesions that metastasize early to both sides of the neck. A separate TNM classification system is used for the pharynx.

These tumors tend to be noninvasive but produce local symptoms by compression. These lesions may be treated by surgery, radiation, or combined therapy.

Cancer of the Base of the Tongue (Pharyngeal or Posterior Third)

The pharyngeal tongue originates from a different anlage than the anterior two-thirds and is covered by a squamous epithelium that is less well differentiated. The base of the tongue is infiltrated with lymphoid tissue and has abundant lymphatics that drain directly to the subdigastric lymph nodes. Because they are initially silent, tumors of the base of the tongue are usually detected late, after extensive infiltration has occurred into the deep musculature. The extent of infiltration is difficult to delineate clinically, and examination under general anesthesia is occasionally necessary to judge the size of the lesion and the extent of local spread. Pain, dysphagia, and voice changes may occur but are often preceded by unilateral or bilateral cervical lymphadenopathy. Lymph node involvement ranges from 40 to 90% depending on the stage of the lesion.

These lesions are often responsible for producing metastatic neck nodes with an inapparent primary tumor.

Treatment is controversial. Lesions that do not involve the circumvallate papilla may be amenable to supraglottis laryngectomy. More extensive lesions may be treated by radiation therapy.

The overall 5-year survival rate is about 15%.

Carcinoma of the Vallecula

Lesions originating in the vallecula are often difficult to detect by inspection. Palpation and a lateral soft tissue x-ray film of the area may be necessary to establish the diagnosis. The characteristic roentgenographic finding is a pocket of air in the musculature of the tongue.

Lesions of this area are usually superficial rather than deeply infiltrating, and they spread in all directions to involve the pharyngeal wall and the tongue. They metastasize early to the cervical lymph nodes. These lesions may be amenable to supraglottic laryngectomy, although radiation therapy has been advocated by some.

Carcinoma of the Tonsil

Malignancies of the tonsil are often mistaken for inflammatory lesions until incontrovertible proof of tumor slowly appears. Both the anterior and posterior faucial pillars may be involved, and the tumor may spread into the soft palate and the uvula. Inferiorly, the tumor may extend into the glossopharyngeal sulcus and into the base of the tongue. Trismus may result from invasion of the pterygoid muscles. The tumor may spread to the base of the skull along nerve channels.

Histologically, malignant tumors of the tonsil are poorly differentiated epidermoid carcinomas (75%), lymphosarcomas (15%), and lymphoepitheliomas (10%).

It is most important to separate malignant lesions arising in the tonsil and tonsillar bed from those arising in the anterior tonsillar pillar, since the 2 have entirely different biologic characteristics. This differentiation is not always possible, because of the tendency of tonsillar carcinomas to spread widely into adjacent structures in all directions. In cancer of the tonsil, massive involvement of the ipsilateral lymph nodes is often the first clinical manifestation of the disease. Three-fourths of patients have palpable lymph nodes at the time of first examination. Distant metastases to bone, lungs, and liver occur frequently, particularly with lymphoepitheliomas.

Metastatic disease is occasionally found in a cervical lymph node even when the most meticulous examination has failed to detect a primary lesion. Histologic survey of a previously removed tonsil may reveal a small "occult" carcinoma.

Small lesions (T1) may be treated by radiation therapy. T2 and T3 lesions are best treated by preoperative radiation followed by surgery that may often necessitate removal of part of the mandible combined with an incontinuity neck dissection.

Survival following treatment varies according to the extent of the primary lesion and the presence and extent of metastatic disease inthe neck. Reported 5-year survival rates are 62% for patients without cervical adenopathy and 26% for patients with cervical adenopathy. The overall survival rate varies between 30 and 35%.

Carcinoma of the Oropharyngeal Walls

Lesions arising in the walls of the oropharynx are usually poorly differentiated carcinomas presenting a central ulceration surrounded by wide infiltration of the adjacent walls. They arise in the lateral or the posterior pharyngeal walls and have a tendency to metastasize early to the regional lymph nodes. They may extend to the nasopharynx superiorly or the hypopharynx inferiorly. Lesions arising in the lateral pharyngeal wall frequently extend to the epiglottis and piriform fossa and may exhibit an almost continuous induration with the involved midcervical lymph nodes. The deep prespinal fascia is rarely involved and is penetrated only late in the disease. Tumor may involve the ninth cranial nerve and extend to the base of the skull.

Exophytic lesions of the pharyngeal wall that are noninfiltrative and present discrete borders can be treated either by radiation therapy or by surgery if laryngectomy is not necessary for complete eradication of the tumor.

Infiltrating lesions are best treated by radiation therapy, which has the advantage of sparing the larynx. This is particularly true in patients with bilateral involvement of the cervical lymph nodes.

Larger lesions with wide involvement of the adjacent structures are treated surgically by means of laryngopharyngectomy and neck dissection, unilateral or bilateral as indicated. Tumors of the posterior pharyngeal wall have a higher rate of distant metastases. Many of these oropharyngeal lesions are best treated by combined irradiation therapy and surgery. Reconstruction using skin grafts and regional pedicle flaps may be necessary in the larger tumors.

No end results from large series have been reported. A 5-year survival rate of 32% has been reported in one series of 48 patients.

Cancer of the Epiglottis

Malignant lesions of the epiglottis are usually ulcerating or bulky tumors that may completely destroy the epiglottis. The lesions are usually well-differentiated epidermoid carcinomas and have a tendency to metastasize late.

Lesions of the epiglottis are best considered in conjunction with cancers of the larynx. Small lesions confined to the epiglottis may be treated with radiation therapy. Larger lesions that extend into the endolarynx may be treated with supraglottic laryngectomy or total laryngectomy.

Tumors of the Nasopharynx

The nasopharynx has been called a "blind spot", because tumors occurring in this area usually are diagnosed late and in an advanced stage. There is a predilection for nasopharyngeal tumors to develop in Orientals. Carcinoma of the nasopharynx is associated with high titers of Epstein-Barr virus. This fact may be used to follow the patient's course.

There is usually a delay of 8-10 months from the onset of signs to the time when the diagnosis is established. The initial signs and symptoms may vary, depending on involvement by tumor of one or more of the following: cranial nerves III-VII and IX-XII, the mandibular and the auriculotemporal nerves, the levator muscle of the soft palate, the pterygoid muscles, the foramen lacerum and the carotid canal, and the auditory tubes. No other tumor of the head and neck can present with such a variety of symptoms: nasal (obstruction), aural (hypoacusia, deafness, earache, tinnitus, pain, and headache), ocular (proptosis, diplopia, even blindness), neurologic (diplopia, facial paresthesias, Horner's syndrome), and olfactory.

Cervical adenopathy is the presenting symptom in over one-third of cases, and well over three-fourths may have lymphadenopathy at the time of the initial examination. The nasopharyngeal mucosa and submucosa are richly supplied by lymphatics that drain into the

jugulodigastric chain (70%) and the upper deep cervical lymph nodes (65%). Lymph nodes in the spinal accessory and inferior cervical areas may also be involved. Lymphadenopathy - particularly if bilateral - in the absence of an obvious primary tumor should direct the search to the nasopharynx.

Epidermoid carcinoma, transitional cell carcinoma, and lymphoepithelioma are the most common nasopharyngeal tumors. Lymphosarcoma, adenocarcinoma, plasmacytoma, miscellaneous sarcomas, malignant melanomas, and other types also occur. Although the principal route of metastasis is via the lymphatics to the lymph nodes, regional or even distant hematogenous spread may occur with lymphomas and lymphoepitheliomas.

Treatment

The nasopharynx is surgically inaccessible except for biopsy, and the distribution of cervical metastases makes effective neck dissection impossible. Fortunately, these tumors are radiosensitive; treatment of the primary and its metastases consists of radiation. The entire nasopharynx is treated with fields that cover all possible areas of extension and the 2 sides of the neck down to the level of the clavicles.

Complications of treatment may include dry mouth, pharyngitis, epidermatitis, and bone necrosis. A dread but infrequent complication is cervical spinal cord myelitis, which can occasionally result in death.

Curability depends on the stage of the lesion and the extent of tumor at the time of treatment. The overall 5-year survival in major centers in the USA is 30-35%. Lymphosarcomas have the best survival rate. Bilateral involvement of the cervical lymph nodes and of bone or nerves makes the prognosis poor. Local reappearance of the tumor may occur several years after the initial treatment and can sometimes be controlled with intracavitary radiation.

Cancer of the Hypopharynx

The hypopharynx is directly behind the larynx and is composed of the piriform sinuses, the aryepiglottic folds, the lateral and posterior pharyngeal walls, and the postcricoid mucosa.

Malignant lesions of the hypopharynx comprise approximately 4% of all malignant oropharyngeal tumors in humans. Cancer of the hypopharynx is more frequent in men than in women but shows a peculiar geographic distribution in that it is more frequent in Scandinavian women in association with the Plummer-Vinson syndrome.

Unlike carcinomas occurring in the oral cavity, tumors of the hypopharynx have a tendency to be highly undifferentiated. Metastases occur to the regional lymph nodes along lymphatics that exit between the hyoid bone and the upper edge of the thyroid cartilage to the upper deep cervical lymph nodes.

Lesions arising in the hypopharynx are ordinarily silent in the early stages and may reach considerable size before they cause symptoms. Cervical adenopathy is occasionally the

first clinical manifestation of the disease. Disturbances of the swallowing mechanism usually precede impairment of respiration or speech, the latter being symptoms of advanced lesions.

Malignant lesions of the hypopharynx can be divided into 2 groups: (1) carcinomas arising in the aryepiglottic folds and the upper lateral and posterior hypopharynx (prognostically more favorable); and (2) lesions that arise in the piriform sinus, the postcricoid and postarytenoid areas, and the lower reaches of the hypopharynx (prognosis is poor).

Attempts to control lesions arising in the hypopharynx by surgery or radiation therapy usually meet with little success. Survival rates have greatly improved since the advent of radical surgery, whereby laryngectomy, hypopharyngectomy, and radical neck dissection are performed in continuity at one stage. When these tumors are treated by radiation, surgery can be performed later in the event of radiation failure. Lesions involving the piriform sinus, sparing the apex of the sinus, may be treated with supraglottic laryngectomy. The same is true for lesions of the aryepiglottic folds.

As for other lesions arising in the upper respiratory and digestive tracts, the combination of preoperative irradiation and surgery offers considerable promise for some of these lesions, but its exact value is yet to be established.

Cancer of the Nasal Fossa

Although cancers of the nasal fossa represent only 1% or less of tumors of the head and neck, many are lethal and morbidity is great in patients who do not die. Individual problems depend upon the areas in which the tumors arise.

Primary tumors arising in the nasal fossa must be distinguished from those arising in adjacent sinuses, the nasopharynx, the oral cavity, and the skin and those extending into the nasal fossa because of uncontrolled growth. The lateral walls of the nose are the most frequently involved sites. Fifty percent of the carcinomas arise in the inferior turbinate.

According to the stage of the lesion, the symptoms vary from abnormal nasal discharge to bleeding, obstruction, and eventually pain.

Most are squamous cell tumors that are either bulky, obstructive, and exophytic tumors or deeply infiltrating and painful. Other types of tumors are lymphosarcomas, malignant melanomas, olfactory neuroblastomas (esthesioneuroepitheliomas) arising in the olfactory mucosa, plasmacytomas, sarcomas, and adenocarcinomas of salivary gland origin.

Malignant lesions of the nasal fossa chiefly present problems of local invasion, although they do sometimes metastasize to the regional lymph nodes and occasionally to distant sites via the bloodstream.

Lesions involving the vestibule or septum may be treated equally well with radiation or surgery. Lesions involving the lateral nasal wall are best treated by surgery.

Radical surgery is the treatment of choice for mucous or salivary gland adenocarcinomas and malignant melanomas of the nasal cavity.

The treatment of choice of nasal carcinomas and many sarcomas is combined irradiation therapy and surgical excision.

Considerable palliation can frequently be achieved with radiation therapy for nonresectable tumors.

Cancer of the Paranasal Sinuses

Tumors of the paranasal sinuses are more frequent in men than in women and constitute less than 1% of all head and neck tumors.

Histologically, most of these tumors are of the epidermoid squamous cell type. However, other types of tumors such as transitional cell carcinoma, lymphoepithelioma, adenocarcinoma, and lymphosarcoma may occur. These tumors spread by local invasion to adjacent areas and metastasize to the cervical lymph nodes and eventually to distant sites.

Most of these tumors arise in the maxillary sinus; an occasional tumor arises in the ethmoid sinus. Tumors arising in the frontal and sphenoid sinuses are extremely rare.

The symptoms of pain, nasal obstruction, and nasal discharge occur only when the tumor is relatively locally advanced and has destroyed surrounding structures. Radiologic findings usually are not conclusive until bone destruction has taken place. Early diagnosis is important, since death is usually due to local growth. Often the patient has been treated for a long time with antibiotics for sinusitis while the underlying cause of symptoms is carcinoma.

Local spread causes the following symptoms: (1) Anterior extension: bone erosion and swelling. (2) Posterolateral extension into the infratemporal fossa: trismus and swelling. (3) Posterior extension into the pterygopalatine fossa: erosion of the base of the skull. (4) Medial extension into the ethmoid sinuses superiorly and into the nasal fossa medially: obstruction and bleeding. (5) Direct extension superiorly: erosion of the floor of the orbit, resulting in ocular signs. (6) Inferior extension: may involve the upper canines and molars, producing toothache, loosening of the teeth, and eventual protrusion into the gingivobuccal sulcus

Treatment

Surgical excision is the major treatment for carcinoma of the maxillary sinuses, but it is utilized primarily for well-differentiated squamous cell carcinomas and adenocarcinomas. Radiation therapy rarely controls these tumors and is usually utilized only for palliation. The trend in recent years has been to treat patients with maxillary sinus carcinoma by radical surgery after preoperative radiation.

Orbital exenteration is sometimes necessary when tumors arising in the superior portion of the maxillary sinus invade the floor of the orbit.

Because these tumors metastasize late, prophylactic neck dissection is not indicated. However, therapeutic neck dissections are indicated for clinically involved lymph nodes. Radiation therapy to the cervical region is used only for palliation.

The role of radiation therapy in palliation cannot be underestimated in a disease where a significant number of patients die of uncontrollable local tumor. It is most effective in controlling pain, discharge, proptosis, bleeding, etc. Preservation of the eye by protection of the cornea is feasible when management is by palliative radiation therapy.

Prognosis

Tumors involving the lower half of the maxillary sinus have a much better prognosis than those involving the superior half of the maxillary sinus. Preoperative irradiation and radical surgery yields 5-year survivals of about 40-45%.

Cancer of the Salivary Glands

Salivary gland tissue is both ectodermal and endodermal in origin and is divided into 2 groups: (1) major salivary glands (parotid, submaxillary, sublingual) and (2) minor salivary glands (small deposits of salivary tissue scattered throughout the mucosa of the oral cavity, maxilla, and the nasopharynx). About 80% of tumors occurring in major salivary glands are found in the parotid. Considering all salivary gland tumors, the parotid is the site of 50%.

The mixed tumor is a benign lesion that has a potential for malignant transformation even after many years.

Benign tumors may become large without invasion of the adjacent areas. Malignant tumors grow by local invasion of facial muscles, facial nerve, mandible, pterygoid muscles, or the base of the skull. They may enter the skull along the facial nerve or the mandibular branch of the trigeminal nerve.

Parotid carcinomas, especially epidermoid and mucoepidermoid lesions, tend to metastasize to the cervical lymph nodes. Hematogenous metastases may occur, particularly to lungs and bones. Peculiar cases have been reported where lung metastases progress slowly for 10-20 years.

Major Salivary Glands

The parotid gland is the salivary gland that is most commonly involved with neoplasm. The ratio of benign to malignant tumors varies with the location:

	Benign	**Malignant**
Parotid	85%	15%
Submandibular	50%	50%
Minor salivary glands	25%	75%

The vast majority of benign tumors are mixed tumors; mucoepidermoid and adenoid cystic carcinomas are the most frequent malignant ones. Since even the benign mixed tumors tend to have multiple recurrences if not completely removed, wide local excision of all salivary gland tumors is the initial primary treatment of choice. Most malignant tumors are also treated with tumoricidal doses of irradiation therapy.

In general, limited biopsies of parotid and submandibular tumors are not helpful in planning treatment. They also involve a risk of tumor seeding and injury to important surrounding structures. Therapeutic excisional biopsy with a satisfactory margin of surrounding gland tissue is generally considered the biopsy technic of choice. Special care should be taken to avoid injury to the facial nerve in the parotid gland and the lingual and hypoglossal nerves beneath the submandibular gland unless these nerves are clearly invaded by malignant tumor.

Special clinical hallmarks of malignancy in salivary gland tumors are facial paralysis or paresis in parotid malignancies and tongue numbness and paresis in submandibular malignant tumors. Most malignant salivary gland tumors are tender to palpation; they are also frequently painful.

Classification

A. Parotid Gland: The parotid gland is the largest of the 3 major salivary glands. It is bounded by the masseter muscle, the ascending ramus of the mandible, and the pterygoid muscles. Inferiorly, the parotid may extend along the posterior belly of the digastric muscle. The gland is divided into 2 major portions, a superficial and a deep lobe joined by a bridge of tissue called the isthmus. The structure most closely related to the parotid gland is the facialnerve. In its course between the 2 lobes, it subdivides into 2 trunks, the zygomaticofacial and the cervicofacial. These in turn subdivide at the periphery of the gland into branches that supply the temporal, zygomatic, buccal, maxillary, and mandibular areas. The plane in which the main trunks of the facial nerve lie is not always easy to identify, and dissection of the nerve may be difficult.

The main lymphatics of the parotid gland drain first into the deep and superficial parotid lymph nodes and then into the superficial posterior cervical chain. The deep parotid lymph nodes drain to the subparotid node located below the angle of the mandible and ultimately into lymph nodes along the spinal accessory nerve or the deep jugular chain.

B. Submaxillary Gland: The submaxillary gland is located in the submaxillary triangle between the anterior and posterior bellies of the digastric muscle. The submaxillary duct lies close to the lingual and hypoglossal nerves, and tumor may spread along perineural spaces into the cranial cavity. The marginal mandibular nerve also lies close to the submaxillary gland and must be avoided during resection of the gland.

C. Sublingual Gland: The smallest of the 3 major salivary glands is located in the floor of the mouth beneath the deep buccal mucosa. It is rarely the site of a malignant process.

Types of Tumours

A. Mixed Tumors: "Mixed tumors", the most frequent neoplasms of salivary glands, comprise 85% of benign parotid tumors. The epithelial cells may be spindle-shaped or stellate and arranged in sheets or in glandular patterns. The stroma may be myxoid, hyalinized, and even cartilaginous. Areas of necrosis can often be observed. Metaplasia of the epithelium into well-differentiated squamous cells occasionally occurs. The distinction between histologically

benign and malignant tumors is often difficult, in which case the diagnosis can only be established by the slinical course.

B. Mucoepidermoid Carcinoma: The division of these tumors into low-grade and high-grade malignancy depends on the relative amounts of mucoid material secreted by the ductal cells and on the squamous cell component, which predominates in the more highly malignant lesions.

C. Squamous Cell or Epidermoid Carcinoma: These tumors evolve from squamous metaplasia of the ductal epithelium. Occasionally, the diagnostic dilemma arises of distinguishing a primary epidermoid carcinoma of the parotid gland from metastatic squamous cell carcinoma of an intraparotid lymph node.

D. Papillary Cystadenoma Lymphomatosum (Warthin's Tumor): This is the second most common benign tumor and is found only in the parotid. It is composed of proliferating salivary gland cells in lymphoid tissue and grossly appears as cystis with multiple papillary projections from the wall within the parotid gland. It is often multicentric and tends to recur postoperatively. It is 9 times more common in men than in women, is bilateral in 10% of cases, and is uncommon in blacks. This tumor may be identified preoperatively by ^{99m}Tc, since it is the only parotid lesion that concentrates this isotope. On clinical examination, the mass may seem to be separate from the parotid, in which case it may not be recognized as a parotid tumor.

E. Adenocarcinoma:

1. Adenoid cystic carcinoma (cylindroma). This tumor consists of small nests or strands of epithelial cells with relatively large nuclei and poorly defined cytoplasm. Mucicarmine stains are usually positive, and hyalin is often present.

2. Acinic cell carcinoma. This uncommon tumor resembles the acinic cells of the parotid gland. The cells are usually polygonal, with large eccentric nuclei, arranged in alveolar groups. They may metastasize to local lymph nodes and distant sites.

3. Miscellaneous adenocarcinomas varying according to the histologic pattern of the tumor. A small group of malignant lesions have been classified as trabecular, anaplastic, mucus carcinomas, etc. They are highly malignant tumors with great propensity for local and distant metastases.

F. Oxyphil Adenoma (Oncocytoma): These lesions are composed of pleomorphic eosinophilic cells, arranged in small groups separated by thin fibrovascular septa.

G. Benign Lymphoepithelial Tumors (Godwin's Tumor): These tumors consist essentially of a parotid gland enlargement containing a mixture of inflammatory cells such as plasma cells and lymphocytes containing scattered reticulum cells. Islands of epithelial cells are found with zones of hyalinization.

Clinical Findings

The diagnosis of parotid tumors depends on the ability to differentiate inflammatory lesions from primary and metastatic neoplasms. Viral or bacterial parotitis and sialolithiasis are characterized by recurrent fever, pain, tenderness, and other symptoms that are not present with malignant lesions. Unless nerve structures are invaded, malignant lesions are asymptomatic.

The possibility of metastatic spread to the parotid lymph nodes from primary tumors located elsewhere in the head and neck should always be recognized.

The definitive diagnosis is established by histologic examination of the specimen. Needle or incisional biopsies must be performed with the utmost care to avoid seeding of malignant cells and eventual local recurrence. Biopsies should be planned so as not to interfere with the definitive cancer operation.

Treatment

Treatment of benign or malignant salivary gland tumors is surgical. Enucleation, particularly with mixed tumors, leads to a high rate of local recurrence.

A. Surgical Treatment: The entire parotid gland is exposed, the superficial lobe elevated, the facial nerve dissected, and the lobe excised en bloc with the intraglandular and paraglandular lymphatics and lymph nodes.

Occasionally, a tumor may be located deeply within the deep lobe and appear in the tonsillar fossa. In such cases it is always possible to preserve the facial nerve while removing the deeply located tumor. The facial nerve should never be sacrificed unless it is directly involved with malignant tissue.

Radical cervical lymphadenectomy is indicated whenever a malignant tumor of the parotid gland is accompanied by enlarged cervical lymph nodes. The yield of positive lymph nodes with prophylactic neck dissection is low, so that one may defer this operation until nodes become palpable.

B. Radiotherapy: Radiotherapy is indicated (1) when the primary tumor is not resectable, (2) for recurrent tumors not amenable to surgical extirpation, (3) when tumor is present at the surgical margins, and (4) for control of residual tumor in the surgical bed.

Complications of Surgery

The most frequent complications following surgery of the parotid gland are those resulting from temporary or permanent injury to the facial nerve and a peculiar set of symptoms grouped under the name of auriculotemporal syndrome (Frey's syndrome).

Dysfunction of facial muscles may occur following extensive manipulation of the facial nerve even when the latter is not sectioned and may last from a few weeks to a few months. Function can be satisfactorily restored after accidental section of the facial nerve by

immediate direct anastomosis. Function following the intentional sacrifice of the facial nerve can occasionally be reestablished by grafting from the greater auricular nerve.

Following parotidectomy, a few patients develop flushing and increased sweating in the parotid region at mealtime **(Frey's syndrome).** There is no satisfactory explanation for the symptoms, but it has been postulated that it is due to injury of the auriculotemporal nerve followed by abnormal regeneration of parasympathetic fibers which are carried in this nerve. It may appear from a few weeks to a year or more after operation.

A special feature of malignant tumors of the submaxillary gland is the 3-4 times higher incidence of metastases to the regional lymph nodes than for similar lesions occurring in the parotid. Radical neck dissection is therefore indicated whenever the submaxillary gland is removed for a malignant lesion.

Minor Salivary Glands

The 2 most frequent sites of origin of minor salivary gland carcinomas are the hard palate and the sinuses. These tumors may also occur at the base of the tongue, in the gums, the buccal mucosa, the larynx, the inner surface of the lip, the pharynx, the floor of the mouth, the nasopharynx, the soft palate, etc. Histologically, these tumors may be (in order of frequency) adenoid cystic carcinomas, mucoepidermoid carcinomas, benign mixed tumors, malignant mixed tumors, or various types of adenocarcinomas. Most tumors of minor salivary glands are malignant.

If left untreated, these tumors spread locally by invasion of muscle, bone, and nerves to areas inaccessible to surgical extirpation.

Contrary to common belief, a significant number of tumors arising in minor salivary glands metastasize to the cervical lymph nodes - an occurrence of grave portent. Hematogenous spread to lung and bones is frequent.

The tumors consist usually of a bulky mass covered by an overlying intact mucosa of firm, rubbery consistency. They are diagnosed by direct or indirect visualization and occasionally - in the case of the paranasal sinuses - by x-ray examination. Radiologic examination may also help detect enlargement of the respective foramens when tumors extend to the cranial cavity along the mandibular or maxillary nerves.

Treatment

The treatment of choice for minor salivary gland tumors, whether benign or malignant, is surgical excision. For malignant tumors, the excision should be radical and should include removal of adjacent nerves and tissues. Examination of the cut ends of nerves and the surgical margins is of paramount importance.

Radical cervical lymphadenectomy is indicated when there is lymphadenopathy.

Radiotherapy is reserved for postoperative management of lesions that are suspected to have been incompletely removed; recurrent tumors when surgery is not longer feasible; and

for palliation of bulky tumors considered unresectable. The role of radiotherapy is thus limited to an adjuvant or palliative function.

Benign Tumors

Benign tumors of the head and neck are comparatively common. **Pigmented nevi, hemangiomas, dermoid cysts, inclusion cysts (nevi),** and **keratoses** are particularly apt to be seen on the skin of the face, neck, and scalp. Surgical excision, often under local anesthesia, is usually appropriate (see Chapter 46).

Dermoid cysts occur frequently at the angle of the jaw, and particular care should be taken not to mistake an early parotid tumor for a dermoid cyst. In fact, a "dermoid cyst" at the angle of the jaw should be regarded as a parotid tumor until proved otherwise. Excisional biopsy should be done under circumstances permitting resection of the parotid gland if necessary.

A variety of **benign tumors and cysts** occur in the neck. Congenital cysts, branchial cleft cysts, and cystic hygromas are discussed in Chapter 48.

Benign peripheral nerve tumors are fairly common. Excision is usually required to establish the diagnosis and exclude other lesions, including lymph node metastasis from unknown sites.

Carotid body tumor is a painless neck mass attached to the carotid bifurcation. It is diagnosed by palpation and carotid arteriography (vascular "blush" and separation of internal and external carotid arteries by the mass). Its treatment is discussed in Chapter 38.

Malignant Neck Tumors With Unknown Primary

In the presence of a solitary neck node thought to harbor a metastatic tumor, the physician must search for the primary. This involves a most careful examination of the nasopharynx, larynx, oral cavity, esophagus, and bronchi. The examination should include direct inspection, palpation, x-rays, indirect mirror examination, and direct endoscopies. If no obvious lesions are found, blind biopsies should be taken from the nasopharynx near the auditory tube, the base of the tongue, and the piriform sinus. If these biopsies are negative, then lung tomograms, upper gastrointestinal series, intravenous urograms, and gallbladder series should be done. If the results of these studies and the general medical work-up are negative, the suspected metastatic node should be treated adn the patient observed for later appearance of the primary lesion.

The incision should allow both a biopsy and a radical neck dissection. A biopsy is obtained, and if it is positive for epidermoid carcinoma, radical neck dissection is done.

Operations on the Head & Neck

A multitude of operations are performed on the head and neck for the control of tumors. Although the description of the procedures is beyond the scope of this chapter, 2 operations deserve special mention: radical neck dissection and combined resection.

Radical Neck Dissection (Radical Cervical Lymphadenectomy)

This operation was originally standardized by Crile in 1906 and was designed for the removal and control of metastatic deposits to the cervical lymph nodes from various primaries occurring in the head and neck. The deep cervical lymphatics and the cervical lymph nodes are removed from the level of the mandible superiorly to the level of the clavicle inferiorly, and from the midline anteriorly to the anterior border of the trapezius muscle posteriorly. The specimen usually includes the sternocleidomastoid muscle, the omohyoid muscle, the internal jugular vein, and frequently the spinal accessry nerve. The contents of the submental and submaxillary triangle are removed, along with the submaxillary gland and the tip of the parotid gland. The carotid vessels, the vagus and phrenic nerves, the sympathetic chain, the brachial plexus, the hypoglossal nerve, and the digastric muscle are preserved. Occasionally, the thoracic duct must be transected and ligated.

Modified types of neck dissection done with the intention of preserving one or more structures listed above are presently under evaluation. A modified neck dissection attempts the removal of the investing neck fascia with all of the lymph node-bearing tissue of the neck. It spares the sternocleidomastoid muscle, the internal jugular vein, and the spinal accessory nerve.

The aesthetic and functional deformity for this operation is minimal. It is most applicable for the control of metastatic tumors of thyroid origin (papillary carcinoma) and has also been used in patients with carcinoma of the larynx or malignant melanoma of the face.

When radical neck dissection is performed alone, control of the primary lesion by surgery or radiation therapy is a necessary prerequisite. The operation is not performed when there is extension of disease below the level of the clavicles or to more distant sites.

For midline lesions, bilateral neck dissection is occasionally indicated. The morbidity and mortality rates are higher for this operation, and the postoperative course is marked by profound facial edema. Sparing the jugular vein on one side or staging the operation by delaying the procedure on the second side for a period of several weeks reduces the morbidity and the mortality rate significantly.

Combined Resection

The removal of the primary tumor in continuity with a radical neck dissection constitutes a combined resection (also called "composite operation", "commando operation"). The principle underlying the combined resection is one of in-continuity removal of the primary lesion and the areas of lymphatic drainage. The mandible is frequently removed for lesions involving the floor of the mouth and the tonsillar fossa. For tumors involving the larynx, the latter is removed in continuity with the contents of the neck. The deformity resulting from mandibular resection depends on the extent and location of the resection: the more anteriorly the mandible is resected, the greater the resulting deformity. A temporary tracheostomy is usually indicated in combined operations.

For lesions that are too extensive to be safely removed with the combined operation, planned preoperative radiation therapy has been found to be most useful in reducing the size

of the lesion and permitting resection through tumor-free margins. The advent of supervoltage and modern technics of irradiation permit major operative procedures with morbidity rates that are no greater than those following surgery through nonirradiated tissues.