Oral Examination

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Overview

The oral examination is an area of physical diagnosis that, for a variety of reasons, traditionally receives minimal emphasis in the predoctoral medical curriculum. Nevertheless, much information can be gained through a systematic evaluation of the oral hard and soft tissues. While the primary objective is to distinguish between health and disease, a comprehensive oral examination—in conjunction with a thorough medical and dental history—can also provide valuable insight into the overall health and well-being of the patient.[1, 2] In many cases, it is an essential component of patient assessment prior to cancer therapy. Oral examinations also have a significant impact on the classification of HIV-infected patients, the oral findings often determining the eventual antiretroviral therapy.[3]

While the vast majority of soft tissue lesions in the oral cavity represent infectious, traumatic, or reactive processes rather than neoplasms, the precise etiology can often be determined through a careful history and clinical examination. For example, medication adverse effects (eg, xerostomia) can have a profound effect on oral health. For that reason, a detailed drug history should be routinely obtained. Oral habits, toothpastes, and mouthwashes all can adversely affect oral tissues under the appropriate set of circumstances.[4]

When the clinical diagnosis of an oral lesion cannot be confirmed on the basis of its signs and symptoms, an oral examination can be supplemented by a biopsy of the oral soft tissues. In the vast majority of cases, the microscopic findings, in conjunction with the clinical examination, are sufficient to confirm the diagnosis.[5]

Depending on the nature of the practice and the circumstances surrounding the examination, documenting the clinical presentation of the oral tissues may be advantageous. This is especially useful when monitoring the progression of chronic diseases and the patient's response to treatment. Traditional 35-mm single lens reflex cameras can be easily adapted to record intraoral findings. Several models are available specifically for oral use (see the first 2 images below). More recently, digital cameras have evolved into a viable alternative to traditional clinical photography, especially in offices utilizing digital technology for record storage (see the third image below).

This traditional medical Nikon lens has superb optics; however, a very shallow depth of field occasionally makes intraoral photography difficult. A portable battery pack is necessary to power the ring flash.


The Yashica Dental Eye III is designed specifically for full-face and intraoral photography. It has a fixed macro lens and programmable data back and is very simple to operate, even by novice photographers.

Digital photographic equipment is available from Nikon and other manufacturers. While extraoral photography is relatively simple, intraoral use may be limited by magnification and lighting restrictions. The biggest advantages to digital photography are the instant feedback and ability to store images digitally.

For excellent patient education resources, see eMedicineHealth's patient education articles Cancer of the Mouth and Throat and Oral Herpes.

Relevant Anatomy

The oral cavity is oval shaped and is separated into the oral vestibule and the oral cavity proper. It is bound by the lips anteriorly, the cheeks laterally, the floor of the mouth inferiorly, the oropharynx posteriorly, and the palate superiorly. The oropharynx begins superiorly at the junction between the hard palate and the soft palate, and inferiorly behind the circumvallate papillae of the tongue. The bony base of the oral cavity is represented by the maxillary and mandibular bones. The oral cavity includes the lips, gingivae, retromolar trigone, teeth, hard palate, cheek mucosa, mobile tongue, and floor of the mouth.

For more information about the relevant anatomy, see Mouth Anatomy, Tongue Anatomy, Tooth Anatomy, Taste System Anatomy, and Lips and Perioral Region Anatomy.

Physical Examination

Always begin the evaluation of a patient with oral symptoms with an extraoral head and neck examination.[6] In many instances, the clinical information gained is invaluable in determining the etiology and progression of the oral disease for which the patient is seeking treatment. For example, the major oral manifestation of the multiple hamartoma syndrome is the presence of multiple oral papillomas. Histopathologic examination of an oral biopsy specimen in such patients does not reveal any characteristic microscopic changes; however, recognition of the associated cutaneous tricholemmomas establishes the diagnosis. Altered pigmentation of the oral mucosa (eg,

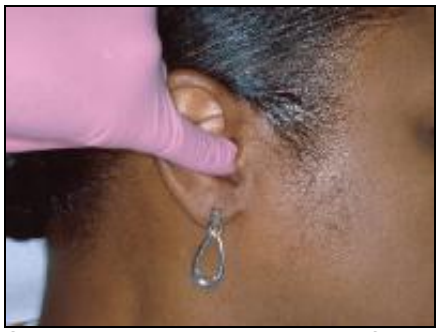
observed in adrenal cortical insufficiency, as a side effect of minocycline therapy) is mirrored by similar changes in the skin of the head and neck.

The presence of neck masses is not an uncommon finding, especially in patients with oral infections or advanced malignancies. The anterior cervical chain is most commonly involved, although other regional lymph nodes may be enlarged as well. Lymphadenopathy secondary to infection generally is both mobile and tender, while metastatic lymphadenopathy is asymptomatic and fixed to the underlying structures; however, a significant amount of variation exists in both subjective and objective findings (see the first image below). The next most common extraoral mass that may be found on palpation is a salivary gland neoplasm. Parotid neoplasms, in particular, are best detected by careful palpation of the preauricular skin (see the second image below). Extraoral palpation of the submandibular glands can often reveal enlargement and tenderness; however, bimanual palpation frequently is more effective.


The anterior cervical chain of lymph nodes is frequently involved in both inflammatory oral conditions and metastatic disease. Nodal changes are palpable all along the sternocleidomastoid muscle.

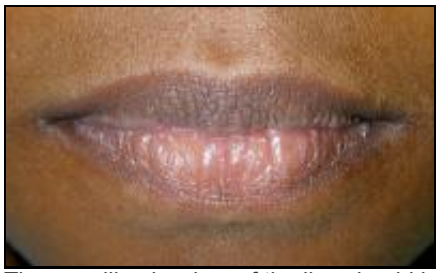

Parotid masses (especially in superficial lobe) are easily detected by digital palpation.

Patients frequently report temporomandibular joint pain and dysfunction. While the origin of such discomfort often is multifactorial and difficult to localize, the presence of crepitation, clicking, and popping of the temporomandibular joints can initially be detected by placing the tips of the little fingers in the external auditory canals and having the patient open and close the mouth and move the mandible laterally from side to side (see the picture below). Atypical facial pain may be due to causes other than temporomandibular joint dysfunction (eg, myofascial pain dysfunction syndrome, reflex sympathetic dystrophy, tic douloureux, related conditions). The definitive diagnosis of such conditions often is complicated and difficult and requires the combined expertise of physicians, dentists, and other health professionals (eg, physical therapists).


Crepitation, clicking, and popping of the temporomandibular joints are most easily detected by placing the tips of the little fingers in the external auditory canals and having the patient perform a series of excursive mandibular movements. A stethoscope placed anterior to the pinna of the ear can achieve the same result.

Examine the lips both visually and by palpation. The vermilion border should be smooth and pliable (see the picture below). Actinic damage to the lips (actinic cheilitis), especially the lower lip, manifests either as an atrophic change with associated erythema or a leukoplakia with marked thickening of the epithelium. Both of these changes

can often be observed simultaneously in adjacent areas of the vermilion border.



The vermilion borders of the lips should be smooth and pliable. Ask female patients to remove any lipstick, which may obscure underlying surface changes.

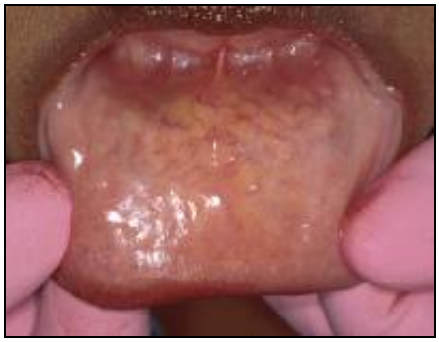
Maceration and cracking of the corners of the mouth (angular cheilitis) was traditionally thought to be due to the following:

- Localized infection, primarily involving *Candida albicans*
- Nutritional deficiency, especially B vitamin complex[7]
- Overclosure of the jaws due to loss of tooth structure (eg, bruxism, teeth, worn dentures)

While nutritional deficiencies and loss of vertical dimension of the jaws contribute to angular cheilitis, the vast majority of cases respond adequately to topical antifungal agents, often without any additional intervention.

As with any other portion of the physical examination, the examination of the oral cavity should be conducted in a uniform and consistent manner. For many individuals, the examination of the oral cavity is a clinical skill that is acquired only through repetition. Of greatest importance to the clinician in examining the oral cavity is adequate lighting. Dental offices are equipped for such examinations; however, medical practitioners who do not normally utilize fixed or head-mounted examination lights may be forced to rely on hand-held flashlights or a penlight, supplemented by the ambient room lighting.

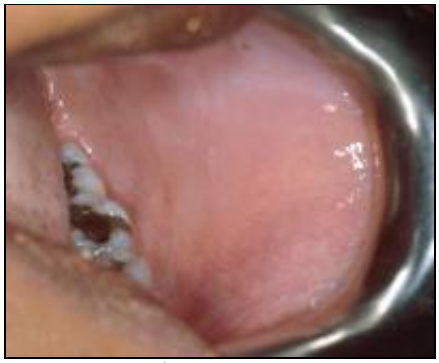
Carefully evaluate the color of the oral mucous membranes. Oral mucosa has traditionally been described as being salmon-pink in color; however, great variation exists in the level of racial pigmentation and vascularity and keratinization. The amount of cutaneous pigmentation present generally is proportional to the amount of oral mucosal pigmentation; however, unanticipated changes in the color of the oral tissues may indicate systemic disease. Evert the lips and inspect the labial mucosa (see the image below).



The labial mucosa should be smooth and glistening. If the mucosa is wiped dry, pinpoint mucosal secretions from the minor salivary glands may become apparent.

In healthy individuals, the labial mucosa is smooth, soft, and well lubricated by the minor salivary glands. Anxiety regarding the examination may result in a transient xerostomia. In such cases, the mucosa becomes tacky to the touch. The minor salivary glands of the lower lip frequently are palpable. The lower lip is frequently subjected to injury that can cause trauma to the minor salivary gland ducts, resulting in the formation of a mucocele, a lesion most frequently found in this location.

Examination of the buccal mucosa is most easily accomplished by having the patient partially open the mouth, followed by stretching of the buccal mucosa with a mouth mirror or tongue blade. Persons of color frequently have a milky cast to the buccal mucosa that disappears when the cheek is stretched. This leukoedema is an anatomic variation that represents hydration of the buccal mucosal epithelium and requires no treatment.



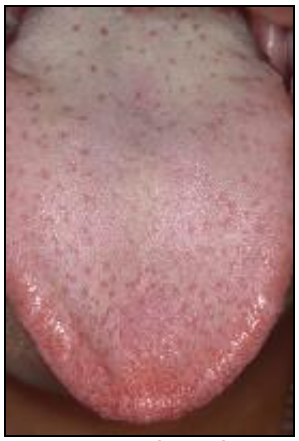
Leukoedema of the buccal mucosa is most commonly noted in persons of color. The milky-white appearance of the mucosa represents tissue hydration and disappears when the cheek is stretched.

Ectopic sebaceous glands (Fordyce granules) are present in the majority of patients and manifest as bilateral whitish-yellowish papules on the buccal mucosa. They may also be observed, albeit with less frequency, on labial mucosa. A horizontal ridge can often be found on the buccal mucosa at the level of the interdigitation of the teeth (ie, the linea alba), which represents a benign hyperkeratosis secondary to mild long-term irritation from the teeth cusps. The orifice of the parotid gland (ie, the Stensen duct) can be found as a small punctate soft tissue mass on the buccal mucosa adjacent to the maxillary 6-year (first permanent) molar teeth.

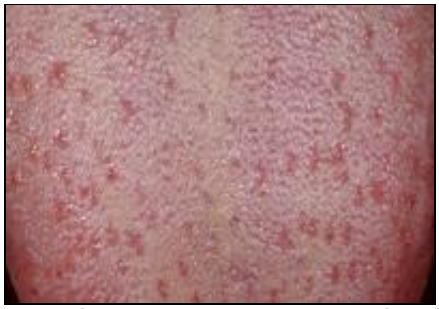
The linea alba is a horizontal ridge (often hyperkeratinized) that is located bilaterally on the buccal mucosa at the level of the interdigitation of the teeth. The orifice of the Stensen duct is superior to the linea alba, adjacent to the maxillary 6-year molars. Gentle palpation of the parotid gland results in the expression of serous saliva from the duct.

Saliva should be able to be expressed from the duct; however, extraoral massaging of the gland may be necessary. The saliva should be clear and watery, and the patient should not experience any discomfort with the procedure. As with the lips, the buccal mucosa should also be well lubricated with saliva. Minor salivary glands and Fordyce granules may impart a granular texture to the buccal mucosa. With the exception of recurrent intraoral human herpes virus type I lesions, which are limited to keratinized mucosa, vesiculo-erosive diseases most frequently involve the buccal mucosa.

The dorsal surface of the tongue is most easily visualized by having the patient protrude the tongue and attempt to touch the tip of the chin. Alternatively, the tip of the tongue can be grasped by the fingers and a 2 X 2-in gauze sponge. The dorsal surface of the tongue should be uniformly covered by numerous hairlike filiform papillae, shown below. Interspersed among the filiform papillae are dozens of mushroom-shaped fungiform papillae, each of which contains one or more taste buds, as shown below.



The dorsal surface of the tongue is an admixture of thin, keratinized, filiform papillae interspersed with pink mushroom-shaped fungiform papillae.


Each of the pink mushroom-shaped fungiform papillae is associated with several taste buds.

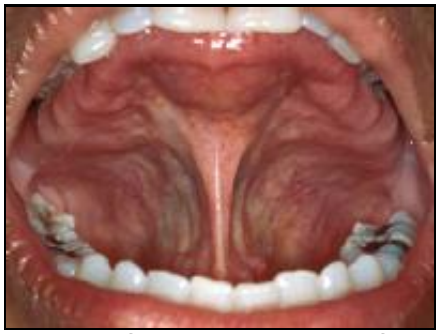
The circumvallate papillae are at the junction of the anterior two thirds and posterior one third of the tongue. These structures normally are 8-12 in number and are arranged in a V-shaped pattern. Like the fungiform papillae, the circumvallate papillae also contain numerous taste buds. The filiform papillae occasionally become elongated (hairy tongue) and collect oral debris, which can lead to halitosis. The elongated papillae can also cause an uncomfortable palatal sensation that may lead to gagging. Fissuring of the dorsal surface of the tongue has been described in a number of disease states (eg, trisomy 21); however, the presence of fissuring is of no clinical significance in the vast majority of cases.

Atrophy of the dorsal surface of the tongue can result from a variety of causes. Nutritional deficiencies have historically been associated with atrophy of the dorsal surface of the tongue; however, oral manifestations of mucocutaneous diseases often are the underlying cause. In addition to discomfort, patients often report altered taste sensations or complete loss of taste.

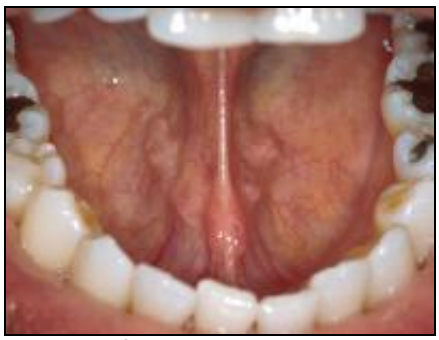
The lateral borders of the tongue can be examined by grasping the tip of the tongue with a gauze sponge, extending it, and rotating it laterally.[8] The lateral borders of the tongue are not covered by a large number of papillae. The mucosa is more erythematous and, as one moves more posteriorly along the lateral border of the tongue, vertical fissuring becomes more prominent. Collections of mucosal-colored tissue with a bosselated surface can be found at the base of the tongue. This accessory lymphoid tissue (lingual tonsil) is a component of the Waldeyer ring and may become enlarged in the presence of infection or inflammation.


The lateral border of the tongue occasionally has some associated vertical corrugations, but it may appear smooth and glistening. Lingual tonsils at the posterior-lateral base of the tongue represent the anterior extension of the Waldeyer ring. These tissues may become enlarged secondary to inflammation, infection, or neoplasia.

The ventral surface of the tongue is most easily visualized by having the patient touch the tip of the tongue to the roof of the mouth. The sublingual vasculature often is prominent, especially in older individuals. Fronds of tissue, the plica sublingualis, can frequently be observed extending from the ventral surface of the tongue, as shown below. The floor of the mouth, similar to the buccal mucosa, is salmon-pink in color. The ostia of the submandibular glands (ie, the Wharton ducts) are present as 2 midline papillae on either side of the lingual frenum, shown below.


The lingual frenum is the primary soft tissue attachment of the tongue to the floor of the mouth. Overattachment of the frenum may

result in speech impediments ("tongue tied").

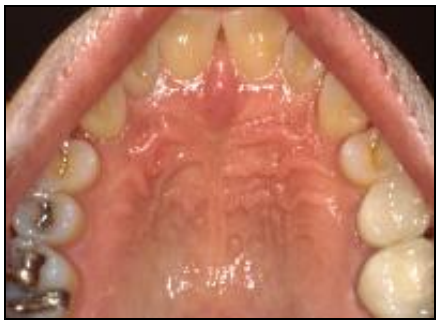


The ostia of the Wharton ducts, which are located at the base of the lingual frenum, appear as 2 bilateral punctate structures. Mucous saliva can be expressed from the ducts with bimanual palpation of the submandibular glands.

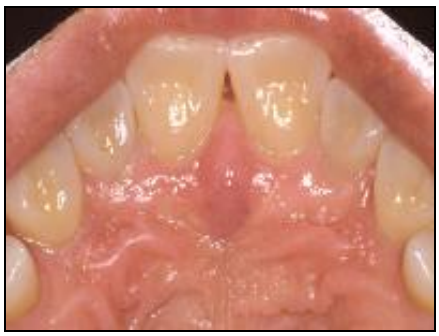
Saliva frequently pools in the floor of the mouth during an oral examination. This pooled saliva is removed most easily with a gauze sponge. Subsequent bimanual palpation of the submandibular glands should result in the expression of saliva from Wharton ducts. This saliva generally is more viscous than that found in parotid glands because of the higher percentage of mucous saliva.

Both the ventral lateral surface of the tongue and the floor of the mouth are common sites for intraoral squamous cell carcinoma. For this reason, the index of suspicion for soft tissue lesions should be heightened, including otherwise innocuous appearing red or white lesions. Unless convincing history and compelling clinical evidence exists to the contrary, biopsies should always be obtained from chronic alterations and obvious masses to rule out the possibility of premalignancy or malignancy.

Direct visual inspection of the hard palate is accomplished most easily with the use of an intraoral mirror. The hard palate, similar to the attached gingiva, normally is less pink than other oral mucosal sites because of its increased keratinization, as in the first image below. These are the only 2 intraoral sites that are usually affected by recurrent intraoral herpes simplex virus infections. The anterior hard palate is covered by numerous fibrous ridges or rugae, as in the second image below.



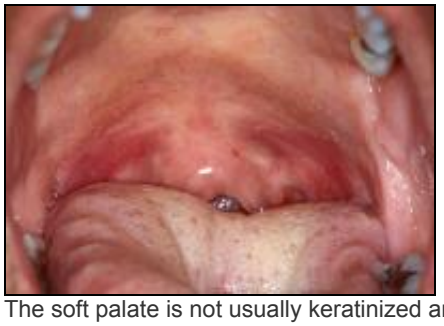
The hard palate is keratinized and covered by a series of fibrous ridges or rugae. The mucosa overlays a number of minor salivary glands.



The incisive papillae are immediately posterior to the maxillary incisor teeth. They represent the inferior aspect of the nasopalatine duct and overlay a substantial neurovascular bundle that supplies the anterior hard palate.

Minor salivary glands are abundant in the hard palate; because of this, a high incidence of minor salivary gland neoplasms, both benign and malignant, is found in this location. The incisive papillae are immediately posterior to the maxillary incisor teeth on the hard palate. This normal anatomic structure appears as a small firm nodule that is located directly below the ostia of the nasopalatal duct, from which a prominent neurovascular bundle exits the maxilla to supply the palatal mucosa.

In contrast to the hard palate, the soft palate is nonkeratinized and salmon-pink in color. It is easily visible on direct examination by depressing the posterior tongue with a tongue blade and instructing the patient to say "Ahhh." Deviation of the soft palate to one side or the other may indicate a neurologic problem or an occult neoplasm. Once the posterior tongue has been depressed and the patient has elevated the soft palate, examining the oral pharynx is possible. This can occasionally be complicated in patients who have a hyperactive gag reflex; however, in such cases, the gag reflex can be suppressed through the use of topical anesthetics. The tonsillar pillars are visualized most easily by moving the tongue laterally with a tongue blade.

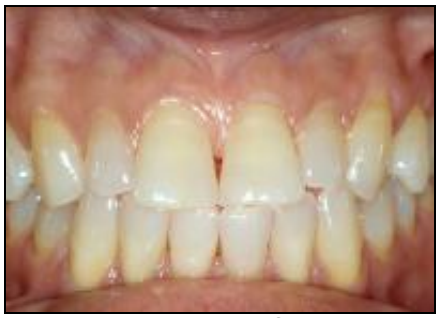


The soft palate is not usually keratinized and is more vascular than the hard palate, creating the darker red color.

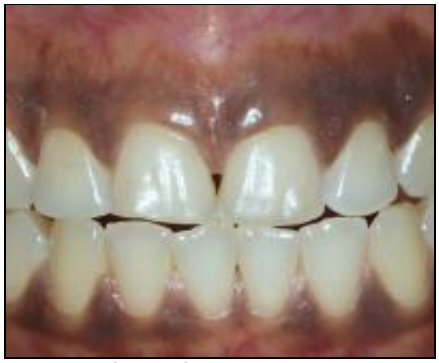
The tonsillar crypts are highly vascular and appear more erythematous than the surrounding tissues. Patients often have accumulations of desquamated epithelial cells, food, and other debris present in the tonsillar crypts, which can lead to a scratchy sensation in the throat and halitosis. Accessory lymphoid tissue on the posterior oral pharynx (adenoids) is normal and appears as pale irregular mucosal papules. These tissues may enlarge in the presence of inflammation or infection. Oral pharyngeal alterations are not uncommon, especially with oral viral infections (eg, herpangina; hand, foot, and mouth disease).

The gingivae are examined most easily with the mouth partially closed and the lips retracted with the fingers, a tongue blade, or plastic lip retractors. The attached gingiva (ie, gingiva adjacent to the crowns of the teeth[9]) is keratinized and appears paler than other oral mucosa (see the first image below). This tissue usually is firm, stippled, and firmly attached to the underlying bone. The alveolar mucosa extends from the attached gingiva to the vestibule. In contrast to the attached gingivae, alveolar mucosa is not keratinized and is darker in color (see the second image below). The attached gingivae are frequently pigmented, the intensity of which is somewhat proportional to the presence of cutaneous pigmentation; however, alveolar mucosa is rarely pigmented, even in persons of color (see the third image below).

The attached gingiva adjacent to the teeth is keratinized and tightly bound to bone. Healthy noninflamed gingiva is stippled and resembles citrus rind (peau d' orange).



Alveolar mucosa extends from the mucogingival junction to cover the mucobuccal fold. It is not keratinized and often appears darker than the alveolar mucosa.



Persons of color frequently have intraoral pigmentation, including the attached gingiva. The amount of pigmentation generally is proportional to the amount of cutaneous pigmentation. When present, racial pigmentation is bilateral.

Alterations in the clinical appearance of the gingivae can be an indicator of both localized and systemic disease. The most common cause of erythema of the gingivae is poor dental hygiene. Retained dental plaque and calculus result in gingival inflammation and, if not removed, involvement of the underlying supportive structures of the teeth. The presence of retained dental plaque and calculus also serves as a nidus for a number of reactive gingival lesions (eg, pyogenic granuloma). The gingivae also frequently are the initial site of occurrence of mucocutaneous diseases (eg, lichen planus, cicatricial pemphigoid, pemphigus vulgaris). Finally, the gingiva is often affected in HIV infection and may be the first indicator of immunosuppression.

Examination of the teeth should be the final part of the oral examination. Any number of developmental defects of the teeth may be apparent. Partial anodontia is a common occurrence, especially involving the maxillary lateral incisors. Supernumerary teeth (eg, mesiodens) also are commonly noted. Missing teeth and supernumerary teeth are commonly found in a variety of inherited disorders (eg, Gardner syndrome, oral facial digital syndrome). Gross decay of the occlusal (biting) surfaces of the teeth usually appears as discolored cavitations and represents the sequelae of poor oral hygiene. Decay involving the interproximal (ie, tooth-to-tooth contact) surfaces may not be clinically apparent without the aid of dental radiographs. The decay at the gingival margins of the teeth adjacent to the attached gingiva may be the first manifestation of xerostomia. Root surface caries are also commonly observed in geriatric patients withgingivalrecession.[10, 7, 11, 12, 13, 14]

Laboratory Studies

Bacterial culturing is not routinely performed for oral lesions because of inherent problems with cross contamination. Viral culturing is performed with increasing frequency, especially in immunosuppressed patients with oral lesions of presumptive viral origin (see the image below). The Tzanck test, which looks for evidence of acantholysis in viral diseases (eg, herpes labialis) and autoimmune mucocutaneous diseases (eg, pemphigus vulgaris), is also occasionally used. Both tests unfortunately require that an intact blister be present, which often is not the case. Specific viral antigens can also be detected in biopsy specimens using various immunohistochemical techniques.

Culturing of oral lesions is conducted most often when a viral etiology is being considered. Fungal cultures can also be taken; however, more cost-effective diagnostic procedures are available. Bacterial cultures are of limited value because of the difficulty in obtaining a pure specimen.

Fungal infections also are very common in the oral cavity. Potassium hydroxide digestion of a mucosal smear has classically been used to make that diagnosis; however, a dark-field or phase contrast microscope is necessary for in-office diagnosis. Smears can also be stained with one of several histochemical stains to reveal the presence of fungal organisms. These techniques often are more time consuming and expensive. Fungal culturing is of little value in most cases because of the slow growth rate of the organism. Rapid chair-side diagnosis is inexpensively achieved through the use of latex agglutination–based test kits developed for the diagnosis of vulvovaginal candidiasis (see the image below). These test kits are relatively inexpensive, highly accurate, and provide a diagnosis within 2 minutes.

Latex agglutination–based diagnostic tests for Candida albicans have been available for use in gynecology for several years. While not specifically marketed for use in the diagnosis of oral candidiasis, such tests have proven to be very accurate, easy to use, and cost effective.

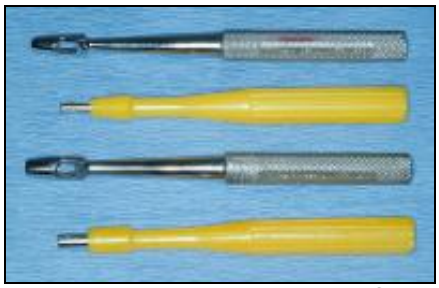
Other Tests

A number of diagnostic tests are routinely used in conjunction with a comprehensive oral examination to provide supplemental information necessary to arrive at a definitive diagnosis and institute treatment. As with any diagnostic process, the tests and procedures employed should be based on their diagnostic value, relative risks (eg, morbidity), and expense. Earlier diagnosis generally corresponds to earlier treatment and a better prognosis for the patient.

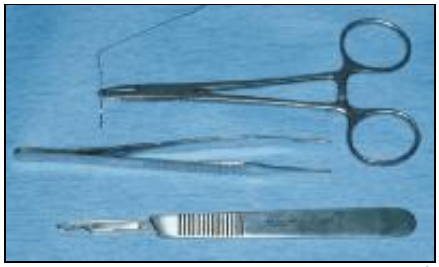
An oral soft tissue biopsy is one of the most commonly used diagnostic tests. While the oral soft tissue biopsy is relatively simple, individuals with some experience in performing intraoral procedures usually obtain it. Adequate lighting and suction are essential. Antibiotic premedication is essential for patients at risk for infective endocarditis and patients with prosthetic joint replacement. A vasoconstrictor (epinephrine) containing local anesthetic is preferred to control surgical bleeding and retard diffusion of the anesthetic into the surrounding tissues; however, in some patients, a vasoconstrictor is contraindicated because of hypersensitivity or other complicating factors. Topical lidocaine is routinely applied to the area of needle insertion to minimize the discomfort associated with needle insertion (see the image below).

Local infiltration anesthesia for intraoral biopsies generally is easy to administer. Use of topical anesthesia prior to needle insertion has not been shown to provide any significant relief of actual discomfort; however, it does decrease patient anxiety regarding local anesthesia.

The selection of the specific biopsy site and biopsy technique is determined on the basis of the presumptive diagnosis and location of the lesion. For example, mucocutaneous diseases require an incisional biopsy to determine the specific diagnosis and appropriate treatment. In such cases, an incisional mucosal punch biopsy (3-4 mm in diameter) is sufficient (see the image below). Space-occupying lesions (eg, mucocele on the floor of the mouth) require a scalpel excision (see the second image below).



Biopsy punches come in a variety of sizes and in both reusable and disposable forms. Disposable biopsy punches are lighter and more easily manipulated than their metal counterparts. Most incisional intraoral biopsies can be performed with a 3- or 4-mm punch without suturing. Larger punches can be used for small excisional biopsies but usually require suturing for hemostasis.



A No. 15 Bard-Parker blade, atraumatic forceps, and suture material are used for many oral biopsies and other soft tissue procedures. Take care to avoid the use of nonresorbable suture material for submucosal closure.

Because of the vascularity of this particular anatomic site, perform scalpel incisions in an anterior-posterior direction to minimize severing neurovascular structures. Avoid inclusion of the marginal gingiva in gingival biopsies for esthetic reasons, especially in the anterior maxilla. Handle small biopsy specimens with atraumatic Adson forceps rather than mouse-toothed forceps, which can damage the integrity of small mucosal specimens. The small size of most oral biopsy specimens requires that the specimen be placed in the appropriate fixative immediately after removal from the mouth. Ten percent neutral buffered formalin is used for most routine biopsies, and Michel solution is an excellent transport medium for specimens intended for direct immunofluorescence staining (see the image below).

Tissue removed from the mouth must be placed in a fixative solution (except for the submission of material for frozen section in the hospital). For routine biopsies, 10% neutral buffered formalin is the fixative of choice. For direct immunofluorescence, Michel solution is an excellent transport medium. Consult the pathology laboratory for any anticipated special procedures to ensure that the tissue is handled properly.

The most recent development in oral biopsy technique is the oral mucosal brush biopsy, shown below. This technique uses a disposable brush to collect a transepithelial sampling of cells. The sample is screened by a neurally networked computer that is programmed to detect cytologic changes associated with premalignancy and squamous cell carcinoma. The specimen is reviewed by a pathologist for final diagnosis. This technique is ideal for determining the need for scalpel biopsy in benign-appearing oral mucosal leukoplakias.

The brush biopsy is an excellent procedure to screen benign-appearing oral mucosal leukoplakias to determine the need for subsequent scalpel biopsy. The procedure can be performed without anesthesia.

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