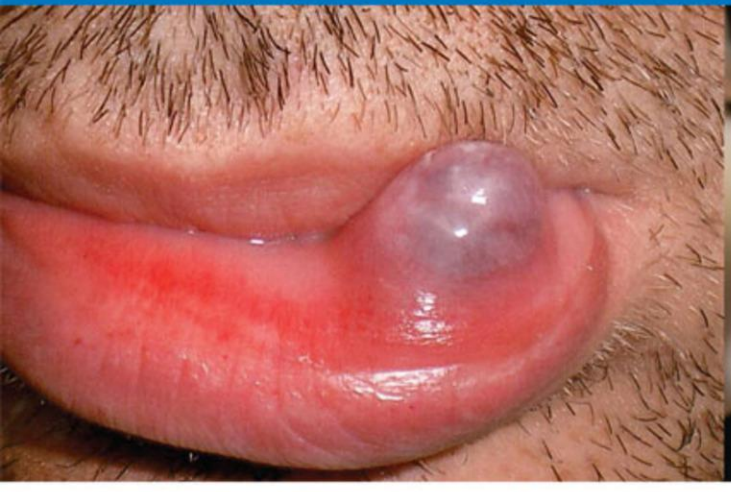
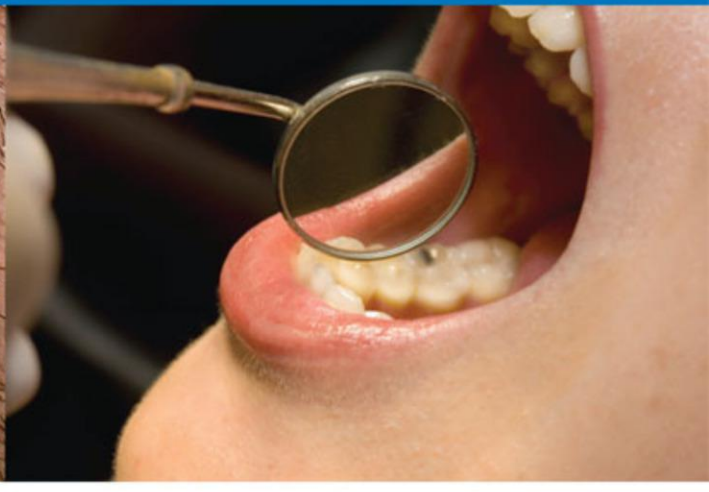
PRACTICAL GUIDE SERIES

The ADA Practical Guide to Soft Tissue Oral Disease

Michael A. Kahn and J. Michael Hall





ADA American Dental Association®
America's leading advocate for oral health

WILEY Blackwell

The ADA Practical Guide to Soft Tissue Oral Disease

The ADA Practical Guide to Soft Tissue Oral Disease

Michael A. Kahn, DDS
Diplomate and Director, American Board of Oral and Maxillofacial Pathology
Professor and Chair, Department of Oral and Maxillofacial Pathology,
Oral Medicine, and Craniofacial Pain
Tufts University School of Dental Medicine
Boston, MA

J. Michael Hall, DDS
Diplomate, American Board of Oral and Maxillofacial Pathology
Associate Professor, Department of Oral and Maxillofacial Pathology,
Oral Medicine, and Craniofacial Pain
Tufts University School of Dental Medicine
Boston, MA

WILEY Blackwell

ADA American Dental Association®
America's leading advocate for oral health

Editorial offices: 1606 Golden Aspen Drive, Suites 103 and 104, Ames, Iowa 50010, USA
The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK
9600 Garsington Road, Oxford, OX4 2DQ, UK

Library of Congress Cataloging-in-Publication Data
Kahn, Michael A., author.
The ADA practical guide to soft tissue oral disease / Michael A. Kahn and J. Michael Hall.
1 online resource.
American Dental Association practical guide to soft tissue oral disease
Practical guide to soft tissue oral disease
Includes bibliographical references and index.
Description based on print version record and CIP data provided by publisher; resource not viewed.
ISBN 978-1-118-27798-0 (Adobe PDF) – ISBN 978-1-118-27800-0 (ePub) – ISBN 978-1-118-27797-3 (pbk.)
I. Hall, J. Michael, author. II. American Dental Association. III. Title. IV. Title: American Dental Association practical guide to soft tissue oral disease. V. Title: Practical guide to soft tissue oral disease.
[DNLM: 1. Mouth Diseases. 2. Diagnosis, Oral. 3. Soft Tissue Neoplasms. WU 140]
RK307
617.5′22–dc23
2014001140

A catalogue record for this book is available from the British Library.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic books.

Cover image: iStock/© Tjerrie
Cover design by Nicole Teut

Set in 9.5/12 pt PalatinoLTStd by Toppan Best-set Premedia Limited

1 2014

To our families and mentors for their support, patience, dedication, and lessons taught.

Contents

Preface

This textbook is intended to be a practical guide and reference source for the basic clinical aspects of soft tissue oral and maxillofacial disease. It is not intended to be an all-encompassing tome of oral pathology but rather to include those aspects of this dental specialty that are its most important foundational information and the most frequently encountered orofacial soft tissue diseases. The book is intended for health-care practitioners whose occupation involves encountering a variety of conditions and diseases of the oral cavity and its contiguous anatomic structures; it is not intended to be a reference source for oral medicine (i.e., details of the medical aspects of a particular disease within the oral cavity).

We envision this book not as one to reside on a clinician's library shelf gathering dust and rarely referred to, but rather one used regularly within the dental operatory to help the clinician's decision making: that is, deciding what is the best thing to do for the patient when a pathologic condition is initially discovered, how to determine its most likely provisional diagnosis or differential diagnosis, whether to biopsy or refer for consultation by a dental or medical specialist, and how to most accurately and effectively communicate that information to the patient so the patient can give informed consent about his or her treatment course and management.

Since 1984, when we began our residency training in oral pathology at Emory University's School of Dentistry (Atlanta, GA), we have increasingly recognized specific essentials of oral pathology that need to be learned, understood, and used by all dentists; furthermore, we have witnessed common diagnostic pitfalls and management mistakes. This book is the culmination of our cumulative and collective experiential wisdom gained during our training as well as our subsequent years of being in teaching institutions. By interacting with dentists, with dental and dental hygiene students, and with physicians and patients in clinical and educational

settings as well as by participation in active oral pathology biopsy services and clinical consultation clinics, we have become aware of the lesions commonly encountered but misunderstood by them or unknown to them.

Michael A. Kahn
J. Michael Hall

Acknowledgment of a Career

I would like to recognize the many professionals who helped guide me in my quest to find my niche in health care, first as a general dentist and then an oral pathologist. Anyone who has graduated from dental school can attest to its trials and tribulations and I was fortunate to have a "big brother," Dr. Barry Kennedy, who as an upperclassman helped guide me over the many hurdles encountered. One of the Emory dental school faculty, Dr. Patricia Moultin, also offered words of encouragement when most needed to persevere and I am forever indebted to her. During my early general dentistry career, in the U.S. Army, yet another individual, Dr. Jack Edge (Lt. Col., retired), stepped up and taught me the "real-world" dental tricks of the trade and guided me into correct and wise decisions. I decided to return to Emory for my postgraduate training in oral pathology and am especially indebted to my two primary mentors, Dr. D. R. (Ronnie) Weathers and Dr. Steven Budnick, as well as two of my fellow residents, Dr. Craig Fowler and Dr. J. Michael Hall (the coauthor of this textbook). Dr. John Kalmar, at that time a Young Dental Scientist Award winner, also helped and taught me more than I can now remember. Following my stint at Emory, I did a one-year postdoctoral fellowship at Temple University, where Drs. J.C. Chen, Arthur (Art) Miller, and John Fantasia fine-tuned my 3-year postdoctoral training and helped my early transformation into a dedicated faculty member. A seminal moment in my career occurred near the completion of my fellowship when Dr. James Turner asked me to interview for an assistant professor position at UT–Memphis College of Dentistry. He took a chance on me and I am forever grateful as he, Dr. Harry Mincer, and Dr. Marjorie Woods gave me every opportunity to maximize my potential—I couldn't have been luckier and I am forever grateful. Soon after my arrival in Memphis I challenged the American Board of Oral Pathology examination and I am indebted to the oral pathologists of the AFIP, Dr. Fowler, and Dr. Robert Brannon for their willingness to share their education material and expertise. Approximately 11 years ago, my latest career phase began when Dr. Robert (Bob) Goode strongly supported my move to Tufts University

School of Dental Medicine. Bob was a wonderful mentor who served his country admirably in the U.S. Air Force as an oral pathologist, including a stint as a forensic odontologist. When our country experienced military mass disasters Bob was there to provide closure to the families of the deceased. Unfortunately, poor health forced Bob into early retirement. At Tufts, I learned much with Dr. Eleni Gagari, subsequently with Dr. Lynn Solomon, and most recently with Dr. Hall. A special tip of the hat to Drs. Solomon and Hall for the extra workload they endured as I became more and more active in organized dentistry, particularly within our specialty. Finally, through all these years, the love and support of my deceased parents (Sylvia and Leo) and my current nuclear family (Sandy, Greg, Matt, David), and most especially the time they allowed me to be preoccupied with my professional duties, is appreciated beyond description.

Michael A. Kahn, DDS
Tufts University School of Dental Medicine, Boston, MA

Acknowledgments

We are deeply indebted to the team at Wiley Blackwell who initiated contact with us to consider this endeavor. First, to Ms. Shelby Allen, Associate Commissioning Editor, whose vision and interest in our continuing education materials sparked a potential interest to share its content with a wider audience of dental practitioners. Subsequently, Ms. Melissa Wahl, Editorial Assistant, and Mr. Rick Blanchette, Commissioning Editor, Dentistry, helped guide us during the project's development. Lastly, Ms. Nancy Turner, Senior Development Editor, Heath Sciences, furnished consistently excellent guidance, encouragement, wisdom, and assistance throughout.

At the American Dental Association (ADA) we thank Dr. Pamela Porembski, DDS, Senior Manager, Council on Dental Practice, and Dr. Kathleen O'Laughlin, DMD, Executive Director, for their belief in this endeavor, supplying support and assistance, and working with many other members of the ADA to gain the project's acceptance and affiliation.

We also thank our colleagues at the various institutions we have worked at, as they have shared their knowledge and teaching materials with us. In particular, Drs. Goode, Solomon, and Gagari were involved in many of the materials used in constructing the content of Chapter 7. In addition, we are very grateful to our colleagues throughout the world who have shared their unrestricted-use clinical images with us at regional and national oral pathology meetings. We thank Heidi Price for creating the original line drawings of Chapters 1 and 2.

Last, we thank our many patients and their clinicians who shared their patients and/or their biopsied tissue with us and our students, whose pathology questions spurred us to either respond from memory or seek additional references in order to answer.

M.A.K.
J.M.H.

The ADA Practical Guide to Soft Tissue Oral Disease

Section I

Detection and Documentation

1 The Extraoral and Intraoral Soft Tissue Head and Neck Screening Examination

It is paramount that the dental clinician establish a repeatable, logical, sequentially organized, and systematic approach to screening the soft tissues of the head and neck region. It should be understood that this is not an "oral cancer screening," since all abnormal conditions should be detected. Performing an oral cancer screening means looking for a single condition, cancer, at a single point in time; the dental clinician performs a complete exam, looking for all soft tissue abnormalities at a single point in time. There is no universally acknowledged step-by-step approach; therefore, the following is the one we adhere to and it can be modified as desired. The important point is, whatever sequence is established, it should be strictly adhered to each time to ensure that no step is omitted. A suggested ideal sequence of steps for a complete oral mucosal screening procedure of a new patient includes the following:

- Introduction to the patient
- Patient's chief complaint
- History of the present illness
- Medical (including social) and dental histories
- Physical examination (to detect the site, morphology, and color of abnormalities)
- Review of data and formulation of a clinical differential diagnosis
- Additional clinical and laboratory tests ordered, as indicated
- Final definitive diagnosis with a treatment/management plan formulated

Certainly, the clinician should establish a pleasant rapport with the patient so that excellent communication and trust are established. Often, the most critical or

The ADA Practical Guide to Soft Tissue Oral Disease, First Edition. Michael A. Kahn and J. Michael Hall.

important piece of information a patient possesses does not get transmitted to the many forms filled out at the initial dental appointment. Once the patient's trust, confidence, and respect have been secured, the patient's chief complaint must be established. This can be a specific dental problem or a more generic goal such as "I need a checkup exam."

If the patient voices a specific reason for the dental appointment, it is very important to gather as much subjective information from him or her as possible. The collective sets of subjective information are the patient's symptoms. Symptoms include descriptions such as pain, burning, dry mouth, soreness, swelling, roughness, and paresthesia. Whatever the symptom, its specific nature should be questioned, such as onset, duration, periodicity, nature or character, severity, and triggering factors or association. This information helps establish the history of the present illness. The clinician gathers a pocketful of diagnostic clues provided by the patient and combines them with the clinician's pathology knowledge to guide him or her to ask appropriate and insightful follow-up questions. Thus, the clinician acts as a detective and must possess foundational knowledge of head and neck disease and pathology in order to learn more about the patient and gather more clues for the formulation of a well-honed clinical differential diagnosis. Subsequent chapters of this book provide foundational knowledge—both general and specific—of the most common soft tissue head and neck pathology.

Following determination of the history of the patient's present illness, the medical history is reviewed with the patient. Typically, the patient has previously completed a detailed form providing the clinician with basic information about childhood diseases; vaccinations; hospitalizations and prior surgeries; any current medical care; date of the last physical examination; and medications (i.e., prescription and over-the-counter, including herbs) being taken or previously used, especially in the past 6 months. Details about the medications, including name, dosage, and duration of use, are recorded. A complete review of systems (e.g., cardiovascular, pulmonary, renal, endocrine, nervous system) is performed to gather more details than the initial "yes" or "no" responses. In addition, the medical history also includes the patient's psychological and socioeconomic profiles as well as social habits (e.g., tobacco and alcohol abuse).

Next, the dental history, including details of any oral habits, is gathered. It is important to note decayed, missing, and restored teeth as well as any active caries; periodontal disease; history of extractions and other oral surgery procedures; tooth vitality status; and any need for patient premedication. Any previous problems during dental care are discovered and discussed. Oral habits include the patient's technique and frequency of flossing, brushing, use of mouthrinse, and occlusal disharmonies.

Physical Examination

It is popular to compare the left and right side for bilateral symmetry while understanding that perfect symmetry is often not present within the range of normal. This is particularly important in order to visualize enlarged lymph nodes or parotid glands.

Extraoral Sites

Specific sites include the following:

- Hair and facial skin
- External eyes
- External ears
- Temporomandibular joints
- Facial muscles
- Nasal vestibule
- Thyroid gland (anterior neck)
- Lymph nodes (lateral and posterior neck, supraclavicular notch)
- Parotid gland

Assess the hair for thickness and loss; carefully examine the sun-exposed facial skin for ultraviolet damage and lesion development, as well as the neck, ears, forehead, nasal bridge and alae, malar region, eyebrows/eyelids/eyelashes, vermilion of the lips, and the chin. Next, perform careful palpation of each of these sites to rule out the presence of deeper, mesenchymal and other types of tissue swellings.

Palpate all lymph nodes and note any enlargement for additional testing since normal lymph nodes are soft and not palpable (Fig. 1.1). Specifically, the subcutaneous tissue is digitally kneaded with a rotating motion in the areas of lymph nodes based on the clinician's knowledge of anatomy. This process can begin in the submental area, below and lingual to the chin, against the mylohyoid muscles. Next, palpate the submandibular nodes by pressing the tissue below the jaw against the medial side of the mandible or by bimanual palpation with one finger in the mouth and the other externally pushing up. Next, palpate the parotid gland and

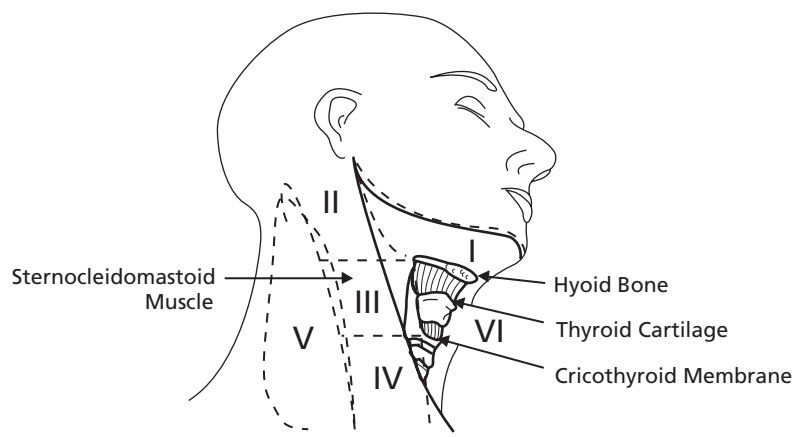


Figure 1.1 Cervical lymph node levels.

its associated lymph nodes—look and feel anterior and posterior to the ear. Next, palpate the cervical lymph node chain. The posterior cervical chain is along the back of the neck, and the anterior and deep cervical chain is along the front. An anatomical landmark for the latter nodes is the sternocleidomastoid muscle—trace from behind the ear to the clavicle, kneading deep and medial to it. The postauricular and retrosternomastoid region should also be palpated along with the back of the neck. Lastly, palpate the thyroid gland by placing fingers gently over it and have the patient swallow. Sometimes, in order to discover an enlargement, the grouped fingers are placed on one side of the larynx and pushed laterally while palpating the opposite side.

Intraoral Sites

Specific mucosal covered sites include the following:

Oral cavity (Fig. 1.2a,b)
- Tuberosity/hamular notch
- Attached gingiva
- Retromolar pad/trigone area
- Vestibule (also called the mucobuccal fold)
- Buccal mucosa
- Labial mucosa
- Tongue (dorsal, ventral, and lateral surfaces)
- Floor of mouth
- Hard palate
- Submandibular and sublingual glands

Oropharynx (Fig. 1.3a,b)
- Soft palate
- Tonsillar pillars and fossa
- Tongue (base)
- Pharynx (lateral and posterior walls)

It is recommended that the same examination sequence be followed each time, first by visual examination and then palpation. As mentioned previously, any sequence can be used as long as it is organized and there is understanding of the findings and the significance of deviations from normal. Palpation should be bimanual or bidigital and, whenever possible, by direct vision. The following is a detailed suggested descriptive narrative:

1. *Lips*—Have the patient slightly part his or her lips to examine the upper and lower vermilion borders and the left and right commissures. Then, with the patient's teeth occluded, evert both the upper and lower lips to expose the labial mucosa. Observe the maxillary frenum, which at times may exhibit a mucosal tag, a variation of normal. As the upper and lower labial mucosa become dry, observe the minor salivary glands and attempt to express mucin from them.

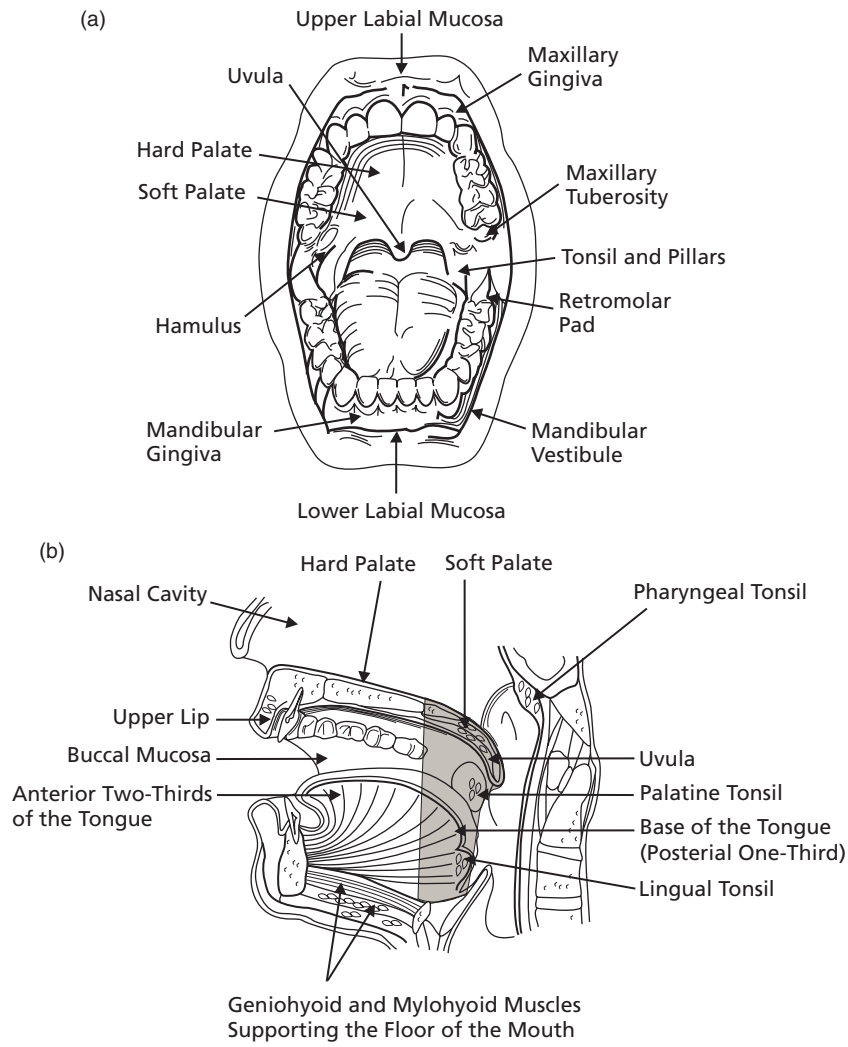


Figure 1.2 (a) Oral cavity proper, frontal view. (b) Major components forming the boundaries of the oral cavity proper, sagittal view. The oral cavity (unshaded area) is divided from the oropharynx (shaded area) anteriorly/posteriorly at the posterior extent of the anterior two-thirds of the tongue; the superior/inferior extent of the oral cavity is the hard palate and floor of mouth; the superior/inferior extent of the oropharynx is the nasopharynx and hypopharynx.

While the lips are everted, the anterior maxillary and mandibular vestibules can be observed.

2. *Labial and buccal mucosa/alveolar mucosa and attached gingiva/trigone*—Slide your fingers posterior on the left and right buccal mucosa as well as the posterior portion of the vestibules. The parotid papilla overlying Stensen's duct should be of normal coloration. To verify function, dry it, and then have the patient's

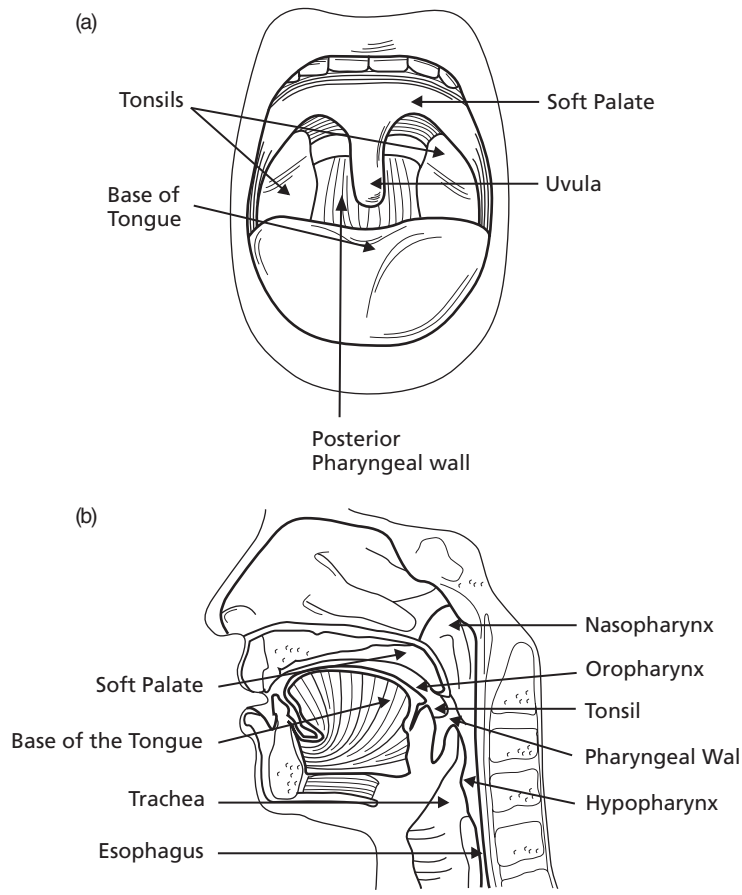


Figure 1.3 Oropharynx. (a) Frontal view, (b) sagittal view.

mouth wide open so that the cheek is stretched taut. Place four fingers flat on the face over the parotid gland in the preauricular area and milk the gland by using digital pressure to compress it against the masseter muscle or ramus area. Most patients exhibit a subtle white line at the occlusal plane of the buccal mucosa (i.e., linea alba), which is considered a variation of normal. While retracting the cheeks use mirror-assisted indirect vision to examine the tuberosity/hamular notch area and then, with direct vision, use the fingers and a mirror face to retract the buccal and labial mucosa, and observe the facial alveolar mucosa, mucogingival junction, attached gingiva, and free marginal gingiva on the maxilla and mandible as well as on the lingual mandible. Lastly, inspect and then palpate the retromolar pads and trigone area.

3. *Hard palate*—Examine its anterior portion, the rugae (firm folds), and then the posterior, which at times exhibits a subtle pink-white change due to slight amounts of extra keratin on the surface. Laterally, in the posterior hard palate area, many minor salivary glands (mucinous) are present and thus the palate

can have a subtle pink-blue appearance. Often, the most posterior extent of the hard palate's midline has two small paired depressions, the fovea palatine.

4. *Tongue*—Gently hold the anterior tip with gauze and pull forward and to the left and right. While the tongue is in this position examine the lateral and ventral surfaces of the tongue, including the most posterior lateral extent which is occupied by foliate papillae. The anterior two-thirds of the dorsum should demonstrate filiform papillae, and often there is a mild white coating caused by slough of the keratin from the filiform papillae. Note, among the filiform papillae, the larger and fewer dome-shaped fungiform papillae. At the junction with the posterior one-third, the dorsal surface exhibits an upside-down "V" linear series of circumvallate papillae. After freeing the tongue, instruct the patient to protrude the tongue, move it left and right, and touch the hard palate with its tip. In this way, the tongue's full mobility is confirmed and the latter movement enables further inspection of the tongue's ventral surface.
5. *Floor of mouth*—Examine the anterior portion with its left and right sublingual plicae (V-shaped caruncula with its vertex toward the face), which contain the opening of the sublingual glands. At the most anterior extent of the plicae, there are raised areas that possess the opening of the submandibular glands (i.e., Wharton's duct). The posterior portion of the floor is also examined. Palpate both the sublingual and submandibular glands by supporting the external chin with one hand and extending a finger downward in the floor of the mouth. To test salivary flow, dry the lingual carunculae, and then place one or two outstretched fingers under the chin and alongside the inferior mandible. Upward pressure directed to the submandibular gland area should produce saliva from Wharton's duct orifice.
6. *Oropharynx*—With the patient's mouth wide open, and using a tongue depressor, ask the patient to say "ah"; at this point the vibrating line (i.e., where the palatal bone ends) at the beginning of the soft palate moves and, centrally and posteriorly, the pendulous uvula should be present. In this area, a circular distribution of lymphoid tissue is present, Waldeyer's ring, which includes the palatine tonsils, lingual tonsils (intermixed with the foliate papillae), and scattered focal collections of lymphoid tissue on the pharyngeal wall, as well as on the posterior soft palate and floor of mouth. Visualize all aspects of the oropharynx, especially the posterior pharyngeal wall. The latter is particularly difficult to visualize in some patients and the adenoids and base of the tongue cannot be seen by direct or indirect vision with standard dental equipment. Particular attention should be paid to the tonsillar pillars (i.e., palatoglossal and palatopharyngeal folds) and tonsillar tissue fossa area. Lastly, examine the posterior wall of the oropharynx, taking note of any normal aggregates of lymphoid tissue.

Note: In patients who have undergone a tonsillectomy there is some residual tonsillar tissue as well as a whitish scar tissue at the site of the surgery.

Adjunctive Diagnostic Examination Methods and Devices

There has been a renewed interest in a more consistent and thorough head and neck soft tissue examination, particularly in an effort to detect potentially malignant

lesions at an earlier stage of development. Unfortunately, this has led to the misnomer of performing an "oral cancer screening examination" and many dental manufacturers have developed and marketed various devices in order to provide the clinician a purported "enhanced" screening method in addition to the conventional white-light and palpation method just described. No scientific studies to date have proven that these methods or devices improve detection of any type of oral mucosal disease.[1–5] Four categories of devices have been marketed: cytology, enhanced reflectance, narrowband imaging (autofluorescence), and saliva sampling.

Exfoliative Cytology

In the early 1950s the Pap smear was introduced in order to screen the cervical mucosa for earlier detection of cervical cancer. The technique was soon investigated by dental researchers for a possible similar use with oral mucosa; however, it was soon discovered that physically scraping the oral mucosa's upper-level epithelial cells and subsequently transferring them to a glass slide, stained and cover-slipped, resulted in an unacceptable number of false positives and false negatives. The crux of the matter is that, within the oral cavity, an inflammatory component often resides in the epithelium (i.e., inflammatory exocytosis) that causes keratinocytes to appear atypical due to a reactive change induced by the omnipresent inflammation; these atypical cells are then incorrectly interpreted as representing potentially malignant dysplasia—an abnormal maturation pattern of the stratified squamous epithelium.

Transepithelial (Full-Thickness Sampling) Cytology

In 1999, a new version of oral cytology, Oral CDx's "brush biopsy" (marketed in dentistry as the BrushTest), was marketed in the United States by Oral Scan Laboratories (Suffern, NY).[6] The dentist, a generalist or specialist, purchases the company's cytology kit, which contains bar-coded patient information forms and a patented nylon bristle brush designed to harvest an oral transepithelial specimen of disaggregated cells (Fig. 1.4, Fig. 1.5). Chairside, the clinician subsequently spreads these cells by brushing on a supplied bar-coded microscope slide. The cytology specimen is then immediately fixed with alcohol and sent, in a prepaid mailer, to the company's laboratory. A neural-net software program optically screens the slide specimen for atypical or malignant-appearing cells. Atypical cells are captured as digital images and reviewed by a cytopathologist who then issues a pathology report in one of three categories—normal, atypical, or malignant cells. If atypical or malignant cells are reported, then a mandatory gold-standard diagnostic tissue biopsy is recommended to obtain a definitive diagnosis. According to the company's information, lesions to be sampled include innocuous (i.e., unsuspicious) looking red or white "spots" within the oral cavity; in other words, lesions of the surface oral mucosa a clinician does not feel could be squamous cell carcinoma or potentially malignant (premalignant) lesions. Clinically suspicious lesions (e.g., erythroplakia in a high-risk site) are not an indication for the brush biopsy; rather, if that type of lesion has persisted for more than 14 days, then an incisional

Figure 1.4 A brush biopsy (cytology) kit as supplied by Oral CDx (Oral Scan Laboratories, Suffern, NY).

Figure 1.5 A close-up view of the Oral CDx proprietary brush biopsy nylon cellular collection device.

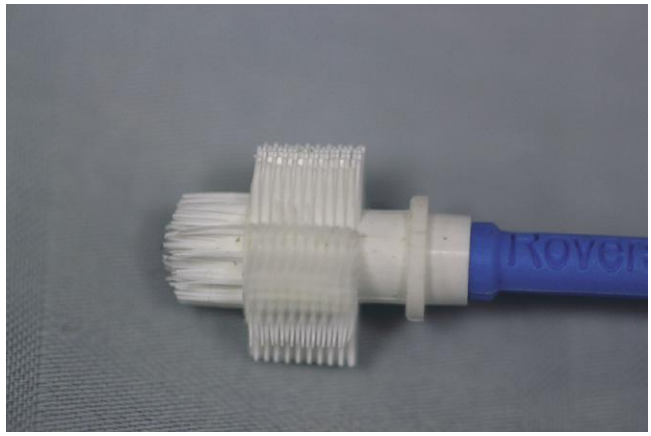


Figure 1.6 A close-up view of the Rovers cellular collection device (Rovers Medical Devices, The Netherlands).

surgical tissue biopsy must be performed. Since it was introduced, the validity and positive predictive value of this cytology procedure have been challenged by some investigators and promoted by others.[7–10] In addition, other companies in other countries (Second Step Laboratory Services—Perceptronix Medical Inc., Laboratories, Vancouver, BC, Canada) have offered similar morphological cytology tests with a different nylon bristle cytology brush (Rovers Medical Devices, The Netherlands; Fig. 1.6) and they also include DNA ploidy results.

More recently, a cytobrush technique involving liquid fixative has been introduced not only in hospitals and physician offices but also in some oral pathology laboratories. In this cytology technique, a nylon bristle cytology brush developed for gynecological ectocervical and endocervical scrapings is used to obtain a full-thickness epithelium specimen from the oral or oropharyngeal mucosal surface (clinically indicated by pinpoint bleeding spots as seen with the BrushTest), but instead of the clinician then smearing the harvested cells (i.e., keratinocytes) directly onto a glass slide (frosted or clear type), the bristle end of the brush is immersed directly into an alcohol-based fixative for transport to the oral pathology laboratory (Fig. 1.7). At the laboratory, the harvested cells in the fixative and retained on the brush's bristles are collected and then segregated from the debris and inflammatory cells in the fixative by being placed in one of several competing manufacturers' processing machines. The harvested cells are affixed in a monolayer to the slide in a confined area, are stained and cover-slipped, and then are examined by the pathologist for cellular atypia, fungal hyphae (i.e., superficial candidiasis), or herpes-family cytopathogenic change.

Tissue Reflectance

In the early 2000s, Zila Pharmaceuticals (Division of Tolmar Corporation, Phoenix, AZ) introduced a single-use, disposable chemiluminescent screening device,

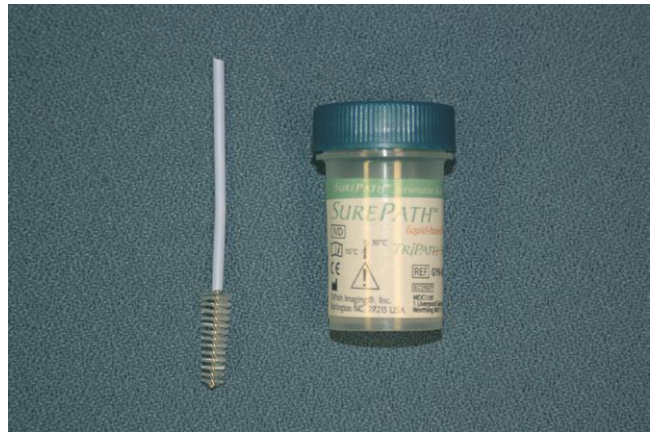


Figure 1.7 A liquid cytology kit composed of an alcohol-based fixative transport medium and gynecological-type nylon cellular collection device.

Figure 1.8 Microlux DL (AdDent, Inc., Danbury, CT) oral mucosa reflectance adjunctive light-emitting diagnostic device.

Vizilite®, for early detection of leukoplakia. This FDA-cleared 501(k) medical device is based on a similar device (i.e., Speculite®) used by physicians for uterine cervical screening (Pap smear) to rule out early, potentially malignant microscopic change (i.e., cervical dysplasia). Subsequently, two other companies marketed similar devices, Microlux/DL (AdDent, Inc., Danbury, CT; Fig. 1.8) and Orascoptic DK (Kerr Corporation, Middleton, WI).[11] After undergoing a conventional exam and agreeing to this additional test, the patient rinses his or her mouth for 30 seconds with, and then expectorates, a raspberry-flavored 2% acetic acid solution, which acts as a drying (desiccant) agent. Then a light stick is chemically activated that produces a diffuse, blue-white light (wavelength range 430–455 nanometers). As in the uterine cervix, the light is intended to highlight any subtle oral leukoplakias that may have been missed by the clinician during the previous conventional white-light soft

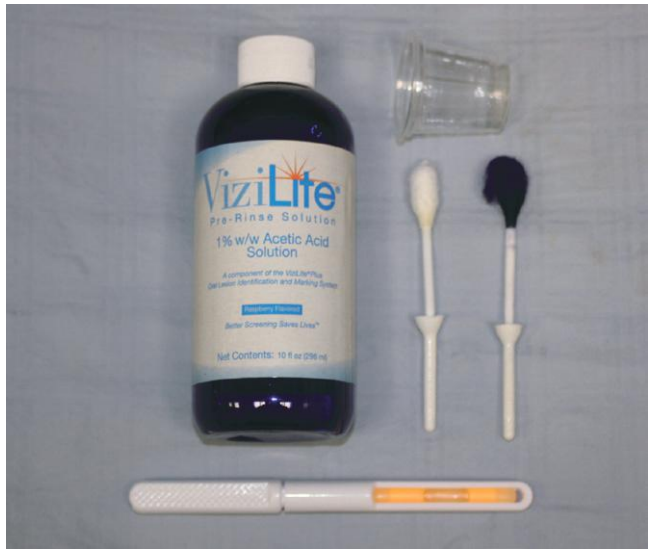


Figure 1.9 Vizilite Plus (Zila Pharmaceuticals, Division of Tolmar Corporation, Phoenix, AZ) oral mucosa reflectance adjunctive light-emitting diagnostic device with second-step marker system of trademarked toluidine blue.

tissue examination. A positive lesion is termed "acetowhite" and may indicate the need for invasive tissue biopsy. As with oral cytology screening, some investigators have found the specificity and sensitivity, as well as the positive predictive value, of this test is not sufficient enough for clinical use. False positives are due to increased DNA seen in reactive, atypical cells secondary to the concomitant and ubiquitous inflammation of the oral cavity.

A few years after the advent of Vizilite, Zila Pharmaceuticals gained FDA clearance to market Vizilite Plus® (Fig. 1.9). With this system, following a conventional light examination and the use of the Vizilite reflectance device, an additional marking step can be performed; it is not a standalone step. The marker is a large cotton swab of pharmaceutical-grade tolonium chloride (toluidine blue), marketed as TBlue630 (the numerical portion of the dye's trademark name represents the nanometer wavelength of the chemiluminescent blue-white light). Toluidine blue is a metachromatic dye with an affinity for DNA and can be used by the clinician to stain and subsequently photodocument a previously identified acetowhite lesion.[12, 13]

Narrowband Imaging (Autofluorescence)

Late in the first decade of the 2000s a new type of adjunctive screening device began to be marketed, predicated on the FDA 501(k) medical device clearance granted Vizilite. Current examples include the VELscope Vx® (L.E.D. Dental, Inc., White Rock, BC, Canada; Fig. 1.10), Sapphire Plus® LD (DenMat Holdings, LLC), Identafi

Figure 1.10 Narrowband emission autofluorescence VELscope Vx (L.E.D. Dental, Inc., White Rock, BC, Canada).

Figure 1.11 Narrowband emission (autofluorescence and vascular evaluation) and white-light emission Trimira Identifi (StarDental, DentalEZ Group, Inc., Malvern, PA).

(StarDental, DentalEZ Group, Inc., Malvern, PA; Fig. 1.11), and DentLight D.O.E.™ Oral Exam System (DentLight, Inc., Richardson, TX; Fig. 1.12). Each uses the principle of tissue fluorescence as opposed to tissue reflectance.[14–16]

Normal oral mucosa, both surface epithelium and the underlying lamina propria's connective tissue, contain cellular structures—chromophores—that are involved

Figure 1.12 Narrowband emission DentLight D.O.E. autofluorescence oral exam system (DentLight, Inc., Richardson, TX).

in normal biochemical reduction–oxidation reactions (e.g., NADH and FADH). These chemical reactions cause a pale green wavelength emission that cannot be seen with the naked eye under normal lighting conditions since it is extremely faint and overwhelmed by the absorbance, reflectance, and scattering of white light within the oral cavity. The VELscope and the similar devices just mentioned use light-emitting diodes (LEDs) to produce a narrow band of blue or violet (Identafi) wavelength light that stimulates the chromophore-related green autofluorescence. Through a series of filters either contained within the machine or worn by the clinician, all other wavelengths of white light are eliminated so that normal oral mucosal tissue appears green and an area of mucosa with loss of fluorescence indicates a loss of chromophores. The latter could indicate mucosal pathology including the presence of epithelial dysplasia. Thus, narrowband emitting lights can be used in formulating a clinical differential diagnosis of mucosal pathology that has already been examined by white light. It is very important to understand that these devices are not diagnostic but, at best, adjunctive clinical information that can be used by the knowledgeable clinician. A prerequisite for the adjunctive use of narrowband reflectance is the knowledge of oral mucosal conditions that can provide a false positive or a false negative result. Once a mucosal lesion is detected by white light and loss of fluorescence is demonstrated by one of these devices, the patient should return in two weeks to confirm the lesion's persistence. If the lesion persists, then an incisional biopsy should be performed in order to provide the patient with an accurate definitive diagnosis and subsequent treatment based on that diagnosis.

Saliva Samples

There are two commercially available tests that claim to be helpful to the clinician in deciding whether to assign a patient over the age of 18 into a low-risk or high-risk group with respect to the development of oral cancer and, although unstated, specifically squamous cell carcinoma. It is very important to understand that, as of

2013, these tests do not have any research study results in peer-reviewed publications that confirm their reliability and validity and that both possess some "fatal flaws" with regard to their marketing claims about the detection or risk of development of oral cavity and oropharyngeal squamous cell carcinoma.[17]

The first test, OraRisk HPV (OralDNA Labs, Inc., Brentwood, TN) analyzes a resting saliva sample by polymerase chain reaction (PCR) to determine if human papilloma virus (HPV) type 16 is present in the patient's oral saliva. HPV16 is well known to cause uterine cervix squamous cell carcinoma (as well as vaginal and anal) as well as some cases of male anal and penile squamous cell carcinoma. It is a sexually transmitted DNA virus that persists within the mucosa's surface epithelium for years and may eventually invade the basal layer cells with possible integration into the host cell's DNA. If this sequence of cellular events occurs, the rate-controlling genes of the normal cell cycle undergo mutation and this results in cancerous growth.

The OraRisk manufacturer has established a proposed follow-up protocol for a patient who initially tests positive for HPV16 in their saliva. Unfortunately, too little is known about the association of HPV and oropharyngeal cancer of the base of tongue and tonsils as well as its life cycle in the oropharynx to know what a positive HPV16 saliva sample means. The presence of HPV in a person's saliva does not necessarily indicate infection much less cellular invasion or DNA integration, and in cervical mucosa over 90% of HPV16 infections subsequently clear on their own. Additionally, it is very important to know that none of the preceding has been proven to be a cause–effect relationship for oral cavity squamous cell carcinoma, which includes the known high-risk sites of lateral and ventral tongue as well as floor of mouth. Epidemiological studies to date indicate HPV16-related squamous cell carcinomas are overwhelmingly located in the oropharynx, much of which is not visible during the course of a general dentistry examination.

The other saliva test recently made available in the United States (except pending in New York State) is a saliva biomarker test (Advanced Laboratory Services, Sharon Hill, PA). The test claims to successfully screen for three biomarkers associated with oral squamous cell carcinoma. Since the company is based in Pennsylvania the medical practitioner ordering the test must be on that state's approved list, which includes a degree of MD, DO, CRNP, PA-C, and Certified Nurse Midwife but not a DDS or DMD. If an oral lesion deemed suspicious for oral squamous cell carcinoma is discovered, then 5 mL of resting saliva is obtained from the patient and placed in a testing tube that is submitted to the company. The PCR test initially screens for interleukin type 8 (IL-8). If the test is positive, then the person is considered to be in a high-risk group and a second PCR analysis for biomarkers IL-6 and IL-1 alpha is performed. If those biomarkers are also present, then the patient is referred for biopsy of the oral lesion; if negative, then the patient is put under increased oral cavity monitoring. Unfortunately, the three biomarkers screened for in this test are also seen in all types of inflammation within the oral cavity and thus their sensitivity, specificity, and positive predictive values are poor. Furthermore, if this test is employed as a screening test (i.e., all adult patients), where would one biopsy if the three biomarker levels are higher than the company's reference levels but no oral lesion is visible? The company's brochure and Web site claim

the biomarker levels are also indicative of oral salivary gland cancer (i.e., adenocarcinoma) but there are no peer-reviewed references listed that support that claim.

Research is also being conducted on various salivary biomarkers, including using direct saliva transcriptome analysis or solcd44 levels as a possible screening tool for head and neck squamous cell carcinoma.[18–20]

Conclusion

The adjunctive oral mucosa pathology screening aids described in this chapter could possibly provide some additional information in the diagnostic and decision-making process, but they do not provide a diagnosis and are only to be performed after a routine conventional head and neck extraoral and intraoral examination has been completed. The latter examination under bright white light, with palpation, remains the highest standard in patient care.

The following chapters of this book are intended not only to aid the dentist in proper examination and documentation of detected oral and oropharyngeal (and possible facial skin) pathology but also to enhance differential diagnosis skills and aid in the decision of whether to observe, refer, or biopsy the lesion.

Cited References

1. Fedele S. Diagnostic aids in the screening of oral cancer. *Head & Neck Oncology* 2009;1:5. Available at: http://www.headandneckoncology.org/content/1/1/5 (accessed March 29, 2009).
2. Lingen MW, Kalmar JR, Karrison T, Speight PM. Critical evaluation of diagnostic aids for the detection of oral cancer. *Oral Oncol* 2007. DOI: 10.1016/j.oraloncology.2007.06.011.
3. Patton LL, Epstein JB, Kerr AR. Adjunctive techniques for oral cancer examination and lesion diagnosis: a systematic review of the literature. *JADA* 2008;139:896–905.
4. Rethman MP, Carpenter W, Coehn EEW, et al. Evidence-based clinical recommendations regarding screening for oral squamous cell carcinomas. *JADA* 2010;141(5):509–520.
5. Siegel MA, Kahn MA, Palazzolo M. Oral cancer: a prosthodontics diagnosis. *J Prosthodontics* 2009;18:3–10.
6. Sciubba JJ. Improving detection of precancerous and cancerous oral lesions: computer-assisted analysis of the oral brush biopsy. *JADA* 199;130:1445–1457.
7. Bhoopathi V, Kabani S, Mascarenhas AK. Low positive predictive value of the oral brush biopsy in detecting dysplastic oral lesions. *Cancer* 2009;115:1036–1040.
8. Mehotra R, Mishra S, Singh M, Singh M. The efficacy of oral brush biopsy with computer-assisted analysis in identifying precancerous and cancerous lesions. *Head and Neck Oncology* 2011;3:39.
9. Reddy SG, Kanala S, Chigurupati A, et al. The sensitivity and specificity of computerized brush biopsy and scalpel biopsy in diagnosing oral premalignant lesions: a comparative study. *J Oral Maxillofac Pathol* 2012;16:349–353.
10. Svirksy JA, Burns JC, Carpenter WM, et al. Comparison of computer-assisted brush biopsy results with follow up scalpel biopsy and histology. *Gen Dent* 2002;50:500.
11. McIntosh L, McCullough MJ, Farah CS. The assessment of diffused light illumination and acetic acid rinse (Microlux/DL) in the visualization of oral mucosal lesions. *Oral Oncology* 2009;45:e227–e231.

12. Arwan KH, Yang YH, Morgan PR, Warnakulasuriya S. Utility of toluidine blue as a diagnostic adjunct in the detection of potentially malignant disorders of the oral cavity—a clinical and histological assessment. *Oral Diseases* 2012;18:728–733.
13. Ujaoney S, Motwani MB, Degwekar S, et al. Evaluation of chemiluminescence, toluidine blue and histopathology for detection of high risk oral precancerous lesions: a cross-sectional study. *BMC Clin Pathol* 2012;12.
14. Jayaprakash V, Sullivan M, Merzianu M, et al. Autofluorescence-guided surveillance for oral cancer. *Cancer Prev Res* 2009;2(11):966–974.
15. Lane PM, Whitehead TGP, Zeng H. Simple device for the direct visualization of oral-cavity tissue fluorescence. *J Biomedical Optics* 2006;11(2):024006-1–7.
16. Poh CF, Ng SP, Williams PM, et al. Direct fluorescence visualization of clinically occult high-risk oral premalignant disease using a simple hand-held device. *Head and Neck Pathology* 2006:28. Available at: http://www3.interscience.wiley.com/cgi-bin/jissue/89011929 (accessed November 2, 2006).
17. Lingen MW. Can saliva-based HPV tests establish cancer risk and guide patient management? *Oral Surg Oral Med Oral Pathol Oral Radiol Endodontol* 2010;110:273–274.
18. Streckfus CF. Salivary diagnostics: are we there yet? Available at: http://medscape.com/viewarticle/7744239 (accessed December 20, 2012).
19. Franzmann EJ, Reategui EP, Pereira LHM, et al. Salivary protein and solcd44 levels as a potential screening tool for early detection of head and neck squamous cell carcinoma. *Head and Neck*. DOI: 10.1002jhed.21810.
20. Lee YH, Zhou H, Reiss JK, et al. Direct saliva transcriptome analysis. *Clin Chem* 2011;57(9):1295–1302.

Recommended Reading

Cawson RA, Binnie WH, Barret AW, Wright JM. *Oral Disease*, 3rd edition. St. Louis, MO: Mosby; 2001.

Eversole LR. *Oral Medicine: A Pocket Guide*. Philadelphia: W.B. Saunders; 2006.

Eversole LR. *Clinical Outline of Oral Pathology*, 4th edition. Shelton, CT: People's Medical Publishing House—USA; 2011.

Malamed SF. Knowing your patients (guest editorial). *JADA* 2010;141;3s–5s.

Newland JR, Meiller TF, Wynn RL, Crossley HL. *Oral Soft Tissue Diseases*, 5th edition. Hudson, OH: Lexi-Comp, Inc.; 2011.

Silverman S, Eversole LR, Truelove EL. *Essentials of Oral Medicine*. Hamilton, Ontario: BC Decker, Inc.; 2002.

Wood NK, Goaz PW. *Differential Diagnosis of Oral and Maxillofacial Lesions*, 5th edition. St. Louis, MO: Mosby; 1997.

2 Soft Tissue Head and Neck Pathology Description and Documentation

There are five main descriptive features of head and neck soft tissue pathology[1]:

- Site
- Morphology
- Color
- Size
- Consistency

A complete and accurate description of these features is required for concise and specific documentation of the observed soft tissue pathology. Failure to do so is tantamount to a potential failure of risk management for the dental practitioner.

It is critical to determine and document as precisely as possible the specific anatomical location from which the pathology arises (i.e., epicenter) as well as the other single, or multiple, additional component(s) of the disease process. The overall shape(s) and morphology(ies) of the lesion must be determined by a combination of visual examination and digital palpation. There are three basic morphological types:

- *Elevated*—surface is above the normal plane of the mucosa.
- *Depressed*—surface is below the normal plane of the mucosa.
- *Flat*—surface is level with the normal plane of the mucosa.

The sole hue, or the predominant hue and additional hues, of the lesion must be assessed and recorded in the dental record. The lesion's size, expressed in metric system units (length and width at their greatest dimension and, in some cases,

The ADA Practical Guide to Soft Tissue Oral Disease, First Edition. Michael A. Kahn and J. Michael Hall.

height), must be documented. As noted in the section "Morphology of Lesions," some morphological terms' definitions include a measurement, which is an additional reason to determine the pathology's size. Lastly, by digital palpation of the lesion, the consistency and surface topography are evaluated and recorded. The clinician should record all of these descriptors of the soft pathology lesion with the mindset that this information will be conveyed to another person without that person having the benefit of ever seeing the lesion. Thus, precise and extremely accurate clinical descriptions must be recorded for the benefit of the patient's clinical differential diagnosis and resultant planned treatment and/or management of the soft tissue lesion. There is no excuse for a dental practitioner who fails to do this important and fundamental initial prediagnostic step.

Anatomical Site of Lesions

The exact anatomical site or sites that a soft tissue lesion(s) occupies is critical for the medicolegal record and diagnostic process. The following is a partial list of potential sites of the oral cavity proper, oropharynx, and immediate adjacent cutaneous structures. For additional anatomic sites the clinician is referred to numerous excellent head and neck anatomy texts. The clinician should always refrain from using colloquial or layman's terms for these sites when entering them in a medicolegal document. Accurate and effective patient communication is important; however, terms such as buccal gutter, gums, cheeks, and roof of mouth are inappropriate entries in a dental chart.

Perioral skin—left; right; bilateral; upper; lower
Lip—left; right; bilateral; upper; lower

1. Vermilion border
2. Wet–dry line, not including the wet (i.e., labial mucosa)
3. Commissure (angle)
4. Skin of lip

Oral cavity proper—left; right; bilateral

1. Tongue
   - **a.** Dorsum, anterior/posterior
   - **b.** Lateral, anterior/posterior
   - **c.** Ventral, anterior/posterior
2. Floor of mouth
   - **a.** Sublingual plica and caruncle
   - **b.** Lingual frenum
   - **c.** Wharton's ducts
3. Gingiva, anterior/posterior
   - **a.** Attached
   - **b.** Marginal (free)
   - **c.** Interdental papillae (between teeth #'s _ and _)
   - **d.** Location
     - **i.** Labial
     - **ii.** Facial

iii. Buccal
iv. Palatal
v. Edentulous alveolar ridge (see number 6)

4. Vestibule/mucobuccal fold
   a. *Maxillary*—anterior/posterior
   b. *Mandibular*—anterior/posterior
5. Buccal mucosa (mucous membrane cheek)
   a. Occlusal plane
      i. Superior
      ii. Inferior
   b. Anterior, middle, and posterior one-thirds
   c. Stensen's duct
6. Edentulous alveolar ridge mucosa
   a. Maxillary, anterior/posterior
   b. Mandibular, anterior/posterior
7. Retromolar pad
8. Trigone area
9. Hamular notch
10. Maxillary tuberosity
11. Hard palate
    a. Palatine papilla
    b. Midline
    c. Lateral
    d. Junction with soft palate

Oropharynx—left; right; bilateral

1. Soft palate
   a. Uvula
   b. Lateral
2. Anterior tonsillar pillar
3. Tonsil and fossa (pharyngeal tonsil)
4. Posterior tonsillar pillar
5. Posterior pharyngeal wall
6. Base of tongue
7. Posterior and lateral walls

Morphology of Lesions

Elevated Lesions

Blisterform

Blisterform lesions contain a bodily fluid and are usually referred to by the layman as a "blister." They are usually identified by a characteristic translucent appearance and upon palpation feel soft, with a variable amount of rebound and a fluctuant sensation. They are given specific descriptive names depending on their greatest diameter and the type of fluid material contained.

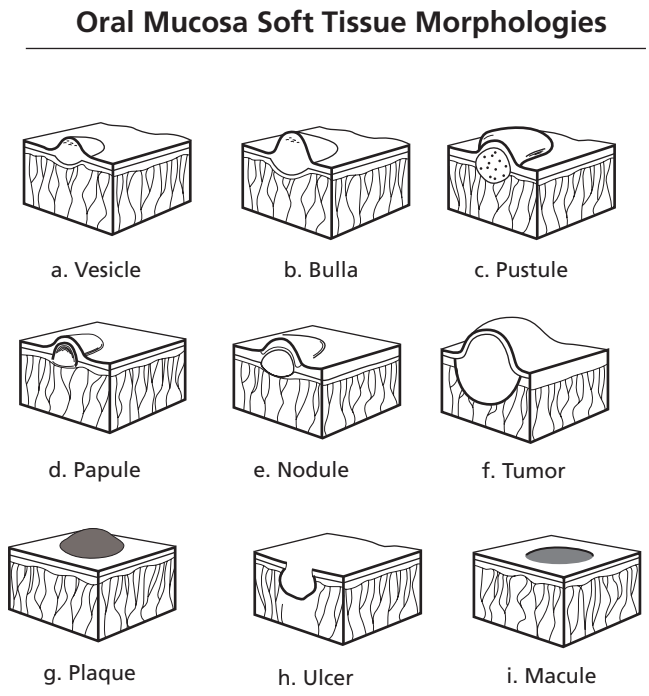


Figure 2.1 (a) Vesicle, an elevated blisterform lesion equal to or less than 0.5 cm in diameter. (b) Bulla, an elevated blisterform lesion greater than 0.5 cm in diameter. (c) Pustule, an elevated blisterform lesion exclusively containing a purulent exudate. (d) Papule, an elevated nonblisterform lesion equal to or less than 0.5 cm in diameter. (e) Nodule, an elevated nonblisterform lesion greater than 0.5 cm but equal to or less than 2.0 cm in diameter. (f) Tumor, an elevated nonblisterform lesion greater than 2.0 cm in diameter. (g) Plaque, a very slightly raised lesion usually greater than 0.5 cm in diameter with a broad, flat top. (h) Ulcer, a depressed lesion with loss in continuity of the surface epidermis or epithelium and extending beyond the basal cell layer into the connective tissue. (i) Macule/patch, a flat lesion of the epidermis or epithelium with an abnormal color.

a. *Vesicle* (Fig. 2.1a)—equal to or less than 0.5 cm (5 mm) in greatest diameter. A vesicle contains serum or mucin, and the color is usually clear or translucent; however, it is sometimes slightly whitish or bluish.
b. *Bulla* (Fig. 2.1b)—greater than 0.5 cm in greatest diameter. A bulla usually contains serum or mucin but may occasionally contain extravasated blood; the color may be clear, reddish, or bluish depending on the fluid content.
c. *Pustule* (Fig. 2.1c)—any size. A pustule exclusively contains a purulent exudate ("pus") and the color is yellowish.

Nonblisterform

Nonblisterform lesions are solid and thus have no fluid component; they are opaque and feel firm upon palpation. They are given specific descriptive names depending on their diameter and pattern.

a. *Papule* (Fig. 2.1d)—consists of tissue and is equal to or less than 0.5 cm in greatest diameter.
b. *Nodule* (Fig. 2.1e)—consists of tissue and is greater than 0.5 cm but equal to or less than 2.0 cm in largest diameter.
  i. *Sessile*—broad-based. The greatest diameter is at the base.
  ii. *Pedunculated*—connected to the surface by a stalk. The greatest diameter is above the base.
c. *Tumor* (Fig. 2.1f)—consists of tissue and is greater than 2 cm in greatest diameter. A tumor is usually sessile but can be pedunculated.
d. *Plaque* (Fig. 2.1g)—usually greater than 0.5 cm in greatest diameter. A plaque is usually only very slightly raised and thus can be mistaken for a flat lesion; it has a broad, flat top such as the plateau landform. Its characteristics often result in a "pasted on" or "stuck on" appearance and it is never pedunculated.

Depressed Lesions

Ulcer

An ulcer (Fig. 2.1h) is an uncovered wound of cutaneous or mucosal tissue that exhibits gradual tissue disintegration and necrosis with loss in the continuity of the epidermis or epithelium that extends beyond the basal layer into the connective tissue (i.e., dermis of skin or lamina propria of oral mucosa). Most depressed lesions are ulcers, and scarring may follow healing. They are usually painful (due to nerve endings within the exposed connective tissue) with a center that is often yellow to gray but occasionally red; the periphery is usually red. There are five descriptive attributes of an ulcer that the clinician should observe and document:

- Number
- Outline
- Margin
- Depth
- Size

Number—Solitary versus Multiple

a. *Solitary*—ulcer is described by outline, margin, depth, and diameter.
b. *Multiple*—ulcers are described by outline, margin, depth, and diameter and by whether the ulcers remain separate or coalesce.
  i. *Separate*—ulcers are few in number or widely spaced. They are not likely to merge or blend into one another, even if enlarged; they remain distinct.
  ii. *Coalesced*—ulcers are numerous and in close proximity. After minor enlargement they merge or blend into one another, which results in a single lesion; the original outline of the initial ulcers may or may not still be detectable.

Outline

The outline is determined at normal viewing distance (i.e., 30–40 cm).

i. *Regular*—the border is continuous and linear, and it resembles a circle or oval.
ii. *Irregular*—the border has numerous deviations from a circular or oval pattern.

Margins

i. *Raised*—margins are above the plane of the normal mucosa.
ii. *Smooth*—margins are on the same plane as the normal mucosa.

Depth

Depth is defined and measured as the distance from the base of the depression to the plane of the margin of the depression. If a measuring device is lacking, an estimated depth is determined by comparing that distance to the known size of adjacent anatomic landmarks.

i. *Superficial*—depth is equal to or smaller than 0.3 cm.
ii. *Deep*—depth is greater than 0.3 cm.

Diameter

Diameter is arbitrarily classified as 0.5 cm or less versus greater than 5.0 cm.

Atrophy and Scarring

Some depressed lesions are the result of atrophy or scarring and have an intact epithelial surface (Note that one variant of the scarring process is called a *keloid*, which is an exuberant exophytic process.)

Pits or Blind Pouches

Blind pouches are rare, depressed lesions caused by failure of complete fusion during embryologic development.

Flat Lesions

At all cutaneous and oropharyngeal sites, flat lesions can be single or multiple, with a regular or irregular outline. Multiple lesions almost always exhibit an irregular outline.

Macule or Patch—All Oral and Oropharyngeal Sites Except Dorsolateral Tongue

A macule or patch (Fig. 2.1i) is a flat (nonelevated, nondepressed) lesion of the epidermis or mucosa with an abnormal color (usually blue, brown, or black) that is not the result of the loss of lingual papillae. It is a focal, circumscribed area of color change that is not elevated or depressed in relation to its surroundings.

a. *Macule*—lesion is equal to or less than 1.0 cm.
b. *Patch*—lesion is greater than 1.0 cm.

Macule or Patch—Dorsolateral Tongue

Special consideration must be given to flat lesions occurring on the dorsum and lateral border of the tongue, due to specialized surface structures (i.e., papilla). A depapillated (i.e., loss of filiform and fungiform papillae) dorsal and/or lateral border clinically mimics a depressed lesion but in reality is a flat lesion; since it does not involve an abnormality of color, it is not a macule.

Color of Lesions

Introduction

Humans perceive color variation in viewing the oral mucosa because of the translucent quality of epithelium allowing incident light to strike each layer of tissue under the epithelium (i.e., the lamina propria and submucosa). Observed white light is proportionally transmitted, absorbed, scattered, and reflected, which results in several possible colors: red; pink; white; red and white; gray; blue; purple; brown; black; and yellow. The latter six colors are known as the *pigmented lesions*. In normal tissues there are four primary endogenous pigments, or biochromes:

- *Oxyhemoglobin* imparts a bright red color.
- *Reduced hemoglobin* imparts a bluish red color.
- *Melanin* imparts a brown to bluish-black color; it is a brown pigment formed by specialized cells called melanocytes.
- *Carotene* imparts a yellow color; it is found in fat, cornified epithelium, sebaceous glands, and blood plasma.

Red

Eighty percent of oral soft tissue lesions are entirely red or have some red component. The red color change results primarily from the hemoglobin of blood inflammation most commonly due to trauma or infection. The factors affecting the degree of redness include the number of vessels concentrated in the area; the relative proportion of oxyhemoglobin versus reduced hemoglobin in vessels; the degree of dilation or constriction of vessels; and the thickness of overlying connective tissue or proximity of vessels to the surface. An increased quantity of blood is due to intravascular change or extravascular event.

a. Intravascular
  i. Dilation (hyperemia)
  ii. Proliferation (developmental anomaly or neoplasm)
b. Extravascular = extravasation (submucosal hemorrhage)
  i. *Petechia*—macule; 0.1–0.2 cm
  ii. *Purpura*—macule; 0.3–2.0 cm
  iii. *Ecchymosis*—macule; >2.0 cm
  iv. *Hematoma*—macule or elevated mass

Note: As the red blood cells undergo lysis, ecchymoses and hematomas change from red to other colors. The hemoglobin breakdown products result in bluish-red (bilirubin), bluish-green (biliverdin), yellow-green, brown (hemosiderin), and purple.

Red lesions may be any morphologic form.

Pink

Fifty percent of oral soft tissue lesions are entirely pink or have some pink component. The pink or normal color of the mucosa results from reflection of light after it strikes the underlying capillary bed. Dark-skinned races normally possess varying amounts of melanin pigment locally scattered as macules or patches diffusely within the pink mucosa, most often of the buccal mucosa, attached gingiva, and hard palate.

Most pink lesions are elevated with a relatively normal-appearing surface but have underlying pathosis such as hyperplasia, neoplasia, or fluid accumulation with or without cyst formation.

White

Fifty percent of oral soft tissue lesions are entirely white or have some white component. White lesions may be due to alterations in the epithelium, the lamina propria, or both.

a. Epithelial changes
  i. Hyperkeratosis (excess surface keratin)
  ii. Acanthosis (increased thickness of the stratum spinosum)
  iii. Necrosis
  iv. Fluid accumulation (edema/spongiosis)
b. Lamina propria changes
  i. Increased quantity of collagen
  ii. Alterations in the maturity of collagen

White lesions are predominantly plaques or papules.

Red and White

Thirty-four percent of oral soft tissue lesions are entirely red and white or have some red-and-white component. They commonly result from inflammation. A red lesion can acquire white changes from necrosis and sloughing, and a white lesion can acquire red changes from secondary inflammation and/or trauma. White lesions that rub off usually result in red color due to exposure of a capillary bed.

Red-and-white lesions are predominantly depressed lesions (i.e., ulcerations).

Blue

Thirteen percent of oral soft tissue lesions are entirely blue or have some blue component. Blue lesions usually indicate vascular lesions or cystic lesions containing

clear fluid. Vascular lesions' bluishness varies due to the amount of reduced hemoglobin, thickness of the overlying mucosa, and the quantity of blood present.

Blue lesions are predominantly bullae.

Purple

Eight percent of oral soft tissue lesions are entirely purple or have some purple component. Purple lesions may be vascular or may result from deposition and interaction of pigments (e.g., breakdown products of extravasated blood); the presence of oxygenated and reduced hemoglobin may also be a factor. Blue vascular lesions may be modified by pink or reddish mucosa to appear purple.

Purple lesions are predominantly bullae, nodules, or tumors

Gray

Seven percent of oral soft tissue lesions are entirely gray or have some gray component. A grayish hue most commonly results from foreign material in the connective tissues rather than a biologic pigment. Heavy metal poisoning (e.g., silver, lead, bismuth, and mercury) can cause a gray to black pigmentation in the free marginal gingiva and, occasionally, natural brown pigments (i.e., melanin, hemosiderin) may appear gray due to reflected light.

Gray lesions are predominantly macules.

Yellow

Seven percent of oral soft tissue lesions are entirely yellow or have some yellow component. Yellow lesions can be due to the biologic pigment carotene; also they may be due to accumulation of pus, aggregation of lymphoid tissue, sebum, exudation of serum, degeneration of blood pigments, lipid-containing structures and tumors, extrinsic stains, and breakdown of bile pigments (jaundice).

Yellow lesions are of any morphology, with the possible exception of a bulla; however, the bullous type of impetigo can have a clear yellow fluid content.

Black

Seven percent of oral soft tissue lesions are entirely black or have some black component. Black lesions are most commonly due to foreign-body deposition; altered blood pigment; necrosis and gangrene; and dense concentrations of melanin.

Black lesions are predominantly macules.

Brown

Five percent of oral soft tissue lesions are entirely brown or have some brown component. Brown lesions usually result from melanin or hemosiderin. Increased melanin synthesis can result from benign or malignant neoplasms, radiant energy

stimulation, systemic diseases increasing production of ACTH, and unknown factors.

Brown lesions are predominantly macules but may also occur as nodules, tumors, and, occasionally, in the crust of depressed lesions.

Translucent

Translucent lesions are blisterform lesions and are distinctively different from non-blisterform lesions. Translucent lesions are predominantly bullae and vesicles.

- *Translucent pink*—accumulation of clear fluid such as serum, mucin, or lymph
- *Translucent blue*—clear fluids or blood
- *Translucent red or purple*—blood accumulation, either intra- or extravascular in origin (Extravascular lesions are translucent only in their initial stage; once blood is coagulated and degraded the translucency disappears.)

Size of Lesions

Lesions are measured by their greatest dimension in length and width based on actual measurement or on approximation using known average size of adjacent normal anatomic structures as a frame of reference (e.g., teeth). Dimensions are always expressed in metric units (i.e., centimeters or fractions thereof).

Consistency of Lesions

- Fixed (to underlying tissue; matted)
- Freely movable (mobile)
- Indurated (hard)
- Firm, doughy, rubbery
- Soft
- Fluid, fluctuant, rebounding

Methodology for Documenting an Extraoral or Intraoral Soft Tissue Lesion

Ideally, the clinician should have a prepared a template (paper or electronic) that can either be populated with the clinical information about the soft tissue lesion or can be used as a visual cue in entering the information as a list or narrative in the patient's dental chart. The following is a sample template that includes the major components described in this chapter as well as the patient's chief complaint and a brief clinical differential diagnosis:

- Patient's chief complaint:
- Specific site(s):
- Morphology(ies):
- Color(s):

- Consistency:
- Size: [length and width expressed in metric units that must correlate with morphology, such as "0.3 cm papule, not nodule"]
- Miscellaneous findings:
- Differential diagnosis:
- Management: [e.g., incisional biopsy, excisional biopsy, observation, prescription]

Example

Patient's chief complaint: "a sore on the side of my tongue"
Specific site: posterior one-third of the left lateral border of the tongue
Morphology: solitary, irregular, superficial, 0.6 cm deep ulcer with raised margins
Color(s): yellow-gray center with red periphery
Consistency: indurated margins
Size: 0.8 cm × 1.2 cm
Miscellaneous findings: six months' duration, nonpainful
Differential diagnosis: squamous cell carcinoma versus traumatic ulcerative granuloma with stromal eosinophilia (TUGSE) versus deep fungal infection (e.g., histoplasmosis)
Management: incisional biopsy

Cited Reference

1. Halstead CL, Weathers DR. Differential diagnosis of oral soft tissue pathoses: site unit(s)-3379: instructional materials for health professional education. *U.S. Department of Health, Education, and Welfare*. Washington, DC: National Library of Medicine/National Medical Audiovisual Center; 1997.

Recommended Reading

Alexander RE, Wright JM, Thiebaud S. Evaluating, documenting and following up oral pathological conditions: a suggested protocol. *JADA* 2001;132:329–335.

Newland JR, Meiller TF, Wynn RL, Crossley HL. *Oral Soft Tissue Diseases*, 5th edition. Hudson, OH: Lexi-Comp, Inc.; 2011.

Scully C, Bagan JV, Carrozzo M, Flaitz CM, Gandolfo S. *Pocketbook of Oral Disease*. Edinburgh, UK: Churchill Livingstone Elsevier; 2012.

Silverman S, Eversole LR, Truelove EL. *Essentials of Oral Medicine*. Hamilton, Ontario: BC Decker, Inc.; 2002.

Wood NK, Goaz PW. *Differential Diagnosis of Oral and Maxillofacial Lesions*, 5th edition. St. Louis, MO: Mosby; 1997.

Section II

Diagnosis and Management

3 Common Oral Soft Tissue Lesions

White Lesions

1. **White coated tongue** (Fig. 3.1)
   - *Site*—tongue dorsum.
   - *Morphology*—thin film or plaque from sloughing keratin.
   - *Color*—white.
   - *Signs and symptoms*—can be scraped off with difficulty. Some diffuse lesions cannot be scraped off.
   - *Treatment*—brush tongue daily to minimize accumulation of bacterial debris and keratinized slough.
2. **Candidiasis**

   Acute pseudomembranous type (also called thrush) (Fig. 3.2)
   - *Site*—buccal mucosa, palate, and dorsal tongue are most common.
   - *Morphology*—plaques composed of tangled masses of hyphae, yeasts, desquamated epithelial cells, and debris.
   - *Color*—creamy-white.
   - *Signs and symptoms*—resembles cottage cheese or curdled milk; *can be scraped or rubbed off* with dry gauze, leaving an underlying pink or red mucosa. There may be no symptoms or a mild burning sensation or an unpleasant "salty" or "bitter" taste. Thrush can be initiated by impairment of the immune system or by broad-spectrum antibiotics, which eliminate competing bacteria.
   - *Treatment*—prescription antifungal agents: cream, ointment, liquid, and tablets.

The ADA Practical Guide to Soft Tissue Oral Disease, First Edition. Michael A. Kahn and J. Michael Hall.

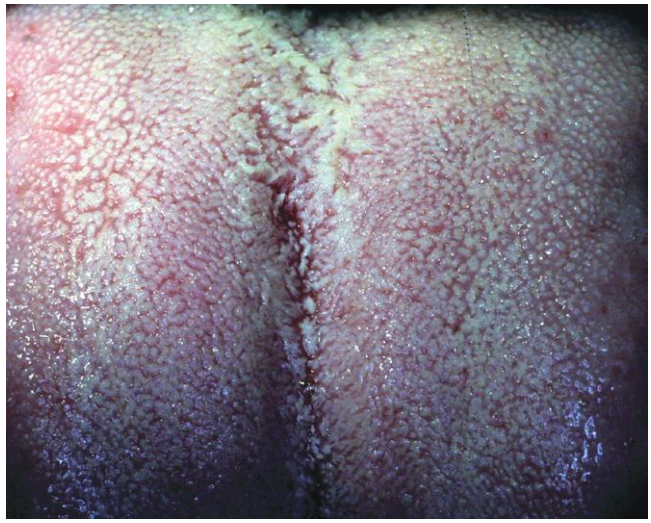


Figure 3.1 Common white coating of the dorsal tongue.

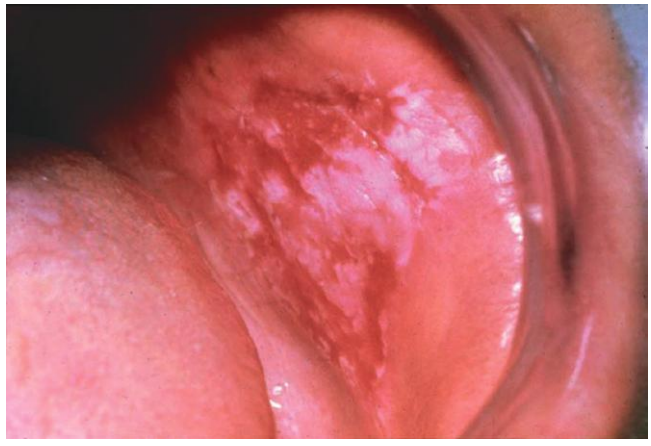


Figure 3.2 Acute pseudomembranous candidiasis of the buccal mucosa with a portion removed, revealing a red underlying base.

Chronic hyperplastic type (candidal leukoplakia) (Fig. 3.3)

- *Site*—usually anterior buccal mucosa; tongue.
- *Morphology*—plaque.
- *Color*—white.
- *Signs and symptoms*—cannot be scraped off and so cannot be clinically distinguished from leukoplakia. Candidal leukoplakia often can have a red component intermingled (i.e., speckled leukoplakia).
- *Treatment*—antifungal agents (cream, ointment, liquid, tablets). If the lesion fails to resolve (essentially confirming the diagnosis), then a biopsy is mandatory.

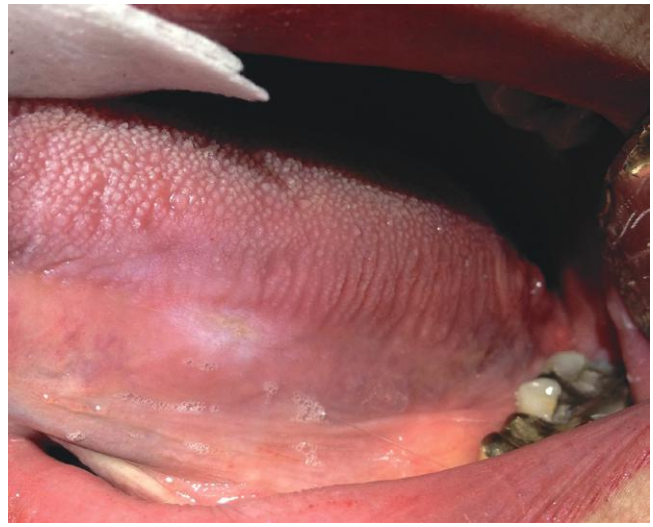


Figure 3.3 Chronic hyperplastic candidiasis with no wipeable white surface.

3. **Morsicatio** (nibbling habit) (Fig. 3.4a,b,c)
   - *Site*—most often buccal mucosa (morsicatio buccarum) centered along occlusal plane; also labial mucosa (morsicatio labiorum), lateral tongue (morsicatio linguarum).
   - *Morphology*—roughened, ragged, thickened surface plaque; may also see ulceration and erosion intermixed.
   - *Color*—white.
   - *Signs and symptoms*—a conscious or subconscious chronic nibbling habit or, rarely, suction; asymptomatic. The superficial portion (i.e., tissue tags) can be scraped or peeled off but the remainder cannot. Lesions are usually bilateral, with or without other site involvement.
   - *Treatment*—none required.
4. **Thermal burn** (Fig. 3.5a,b)
   - *Site*—palate or posterior buccal mucosa.
   - *Morphology*—red macule (erythema) with ulcer, often with remnant of epithelium at the periphery.
   - *Color*—white.
   - *Signs and symptoms*—usually results from history of accidental ingestion of hot foods or beverages. Superficial white change can be scraped off or is wipeable due to surface coagulative necrosis.
   - *Treatment*—resolves without treatment.
5. **Chemical burn** (aspirin burn) (Fig. 3.6a,b)
   - *Site*—all oral mucosal sites.
   - Morphology
     - *Short exposure time*—superficial wrinkled plaque.
     - *Longer exposure time*—surface epithelium becomes separated from underlying tissue, easily desquamates into erosion.

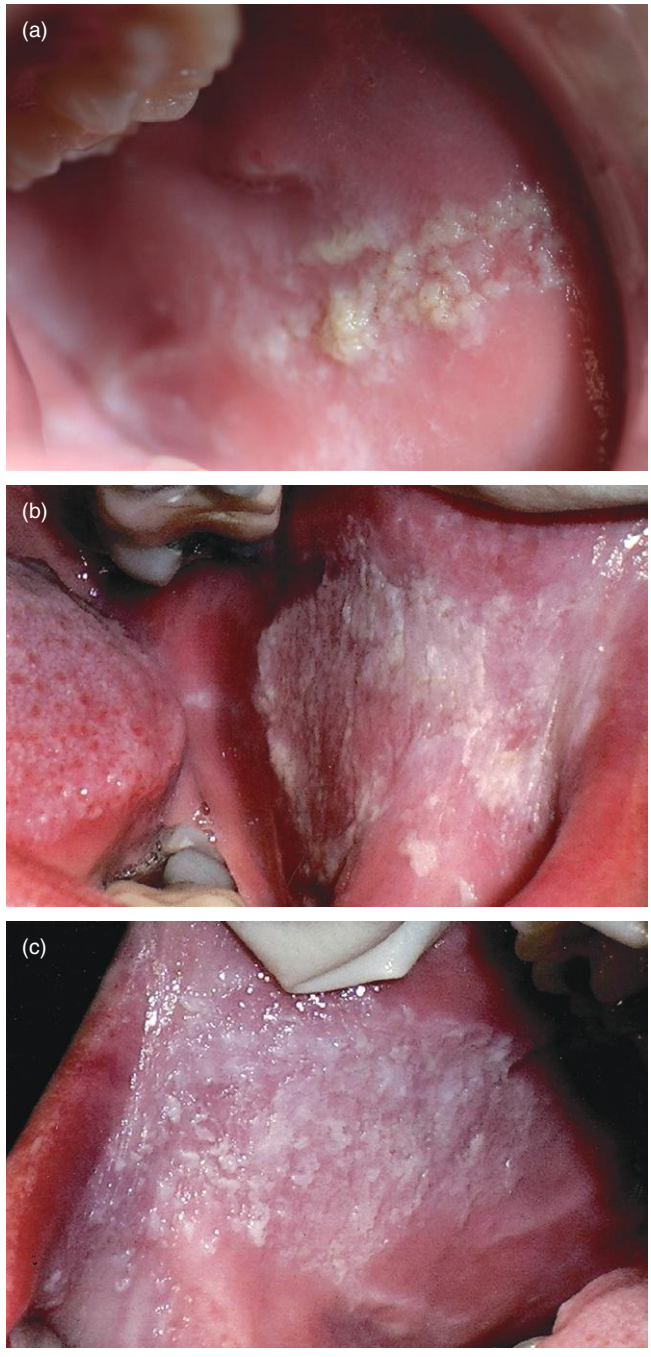


Figure 3.4 (a) Mild case of chronic cheek nibbling (i.e., morsicatio buccarum) above and below the occlusal plane. (b and c) Extensive chronic cheek nibbling with numerous white wipeable tissue tags and nonwipeable white base.

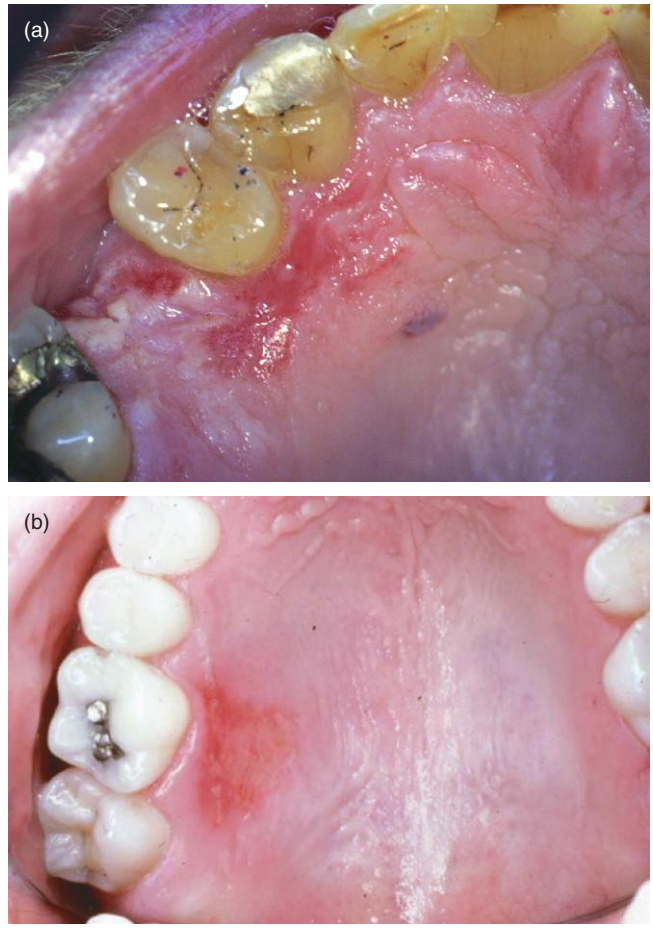


Figure 3.5 (a) Thermal burn of the lateral anterior hard palate secondary to hot food. (b) Thermal burn of the lateral posterior hard palate.

- Color
  - *Short exposure time*—white.
  - *Longer exposure time*—white surface removed, leaving necrotic red, bleeding connective tissue.
- *Signs and symptoms*—history of accidental oral mucosal contact with caustic agents such as aspirin, hydrogen peroxide, silver nitrate, phenol, and endodontic materials. Overuse of mouthwashes with high alcohol content can also cause a superficial white slough of the mucosa. If the exposure time was long, then the surface is removable, leaving red bleeding connective tissue with subsequent formation of a yellow-gray fibrinopurulent membrane (can be scraped off).

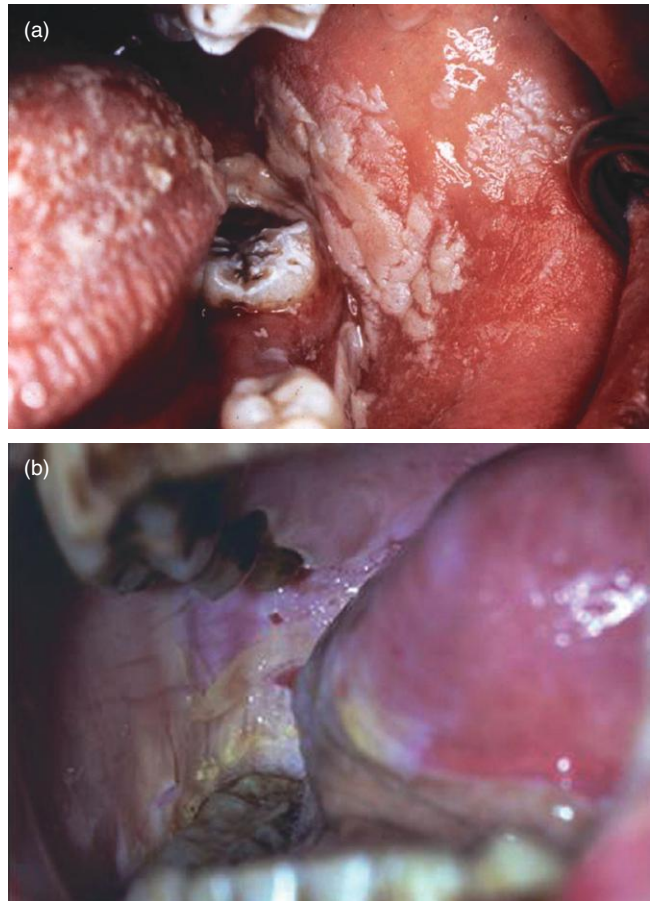


Figure 3.6 (a) Chemical burn (i.e., aspirin burn) secondary to direct application of analgesic to the oral mucosa due to odontogenic pain. (b) Extensive chemical burn (i.e., aspirin burn) secondary to direct application of analgesic to the oral mucosa due to pericoronitis.

- *Treatment*—prevention of exposure. Superficial damage resolves without scarring in 10–24 days, during which a protective emollient paste or a hydroxypropyl cellulose film can be applied; for larger, deeper damage surgical debridement and antibiotic coverage are used.

6. **Linea alba** (Fig. 3.7)
   - *Site*—buccal mucosa, occlusal plane; unilateral or bilateral and symmetrical distribution.
   - *Morphology*—thin linear plaque.
   - *Color*—white.
   - *Signs and symptoms*—asymptomatic; caused by frictional irritation, pressure, or sucking trauma from the facial surfaces of the teeth; cannot be wiped off.
   - *Treatment*—none. It is considered a common variation of normal.

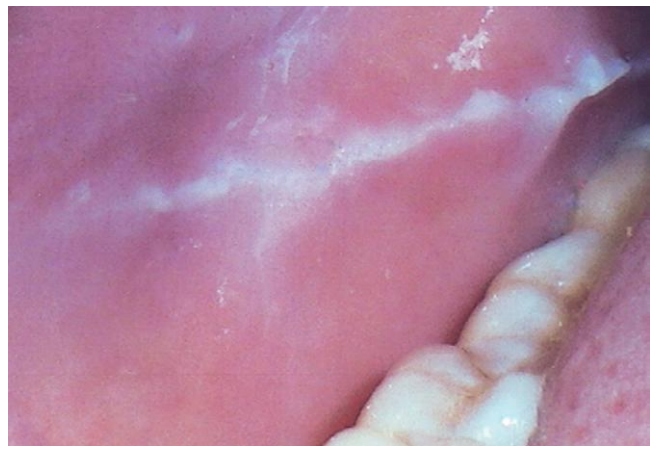


Figure 3.7 Linea alba due to mild frictional keratosis of the buccal mucosa's occlusal plane.

7. **Leukoedema** (Fig. 3.8a,b,c)
   - *Site*—buccal mucosa; bilateral and symmetrical distribution.
   - *Morphology*—diffuse, plaquelike; often has delicate overlapping curtainlike mucosal folds.
   - *Color*—translucent white-gray.
   - *Signs and symptoms*—asymptomatic. Leukoedema is significantly more common in Blacks and other dark-skinned persons. The abnormal color tends to dissipate or disappear when the buccal mucosa is stretched.
   - *Treatment*—none.
8. **Leukoplakia** (Fig. 3.9)
   - *Site*—lip vermilion, buccal mucosa, gingiva; also tongue, floor of mouth, soft palate, and hard palate.
   - *Morphology*—patch or plaque; thin or homogeneous (thick) or nonhomogeneous (nodular, granular, verruciform), proliferative; distinct margins.
   - *Color*—gray to gray-white to white; may be intermixed with red (i.e., speckled leukoplakia).
   - *Signs and symptoms*—clinical term, defined as white patch or plaque that cannot be characterized clinically or pathologically as any other disease (i.e., diagnosis of exclusion); asymptomatic; may show keratosis, dysplasia, or invasive carcinoma; caused by tobacco, alcohol, ultraviolet radiation, microorganisms (e.g., *Treponema pallidum*, *Candida albicans*, and HPV types 16 and 18[1–8]), and trauma; there is also an idiopathic form; occurs more often in older individuals. A variant, known as "hairy" leukoplakia, is seen most commonly on the lateral tongue, in an uncontrolled HIV-positive patient; it results from an Epstein–Barr infection, and its name is based on roughened elongations of the surface epithelium.
   - *Treatment*—biopsy is mandatory to obtain a histopathologic diagnosis. If dysplasia is present, then complete removal should be verified with long-term follow-up since a 4% transformation rate to squamous cell carcinoma has been reported.

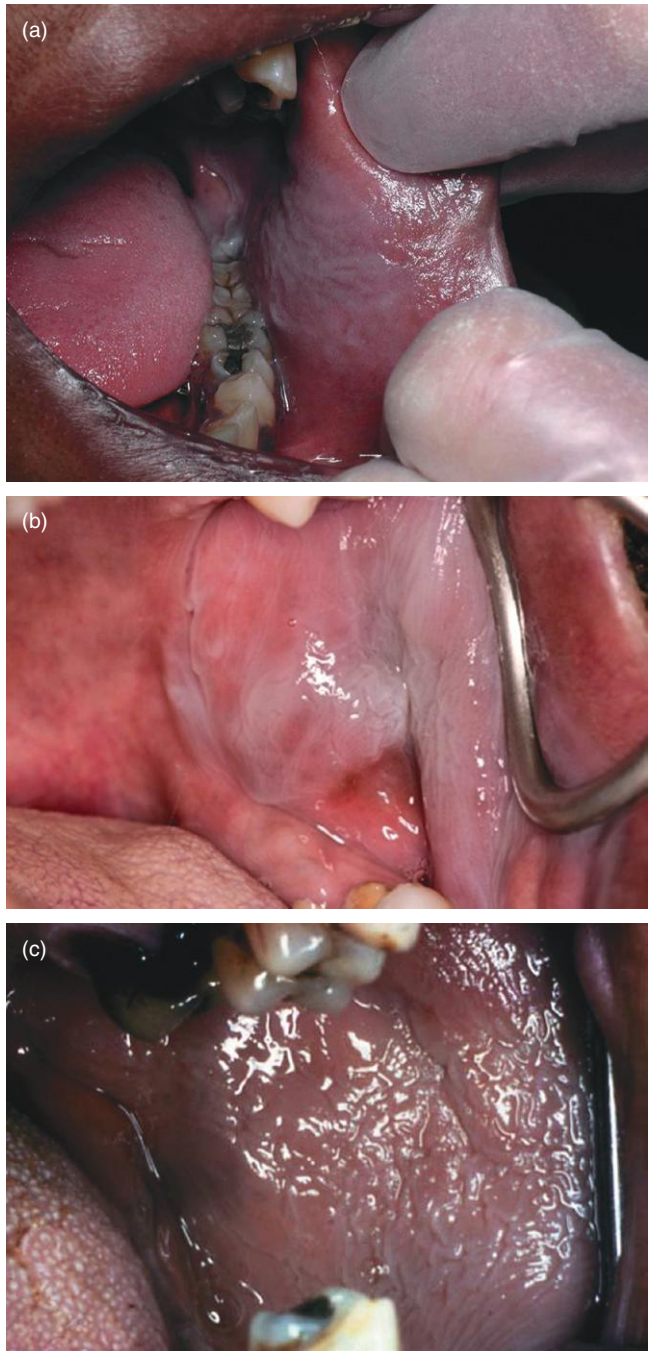


Figure 3.8 (a–c) Leukoedema (spongiosis) of the buccal mucosa.

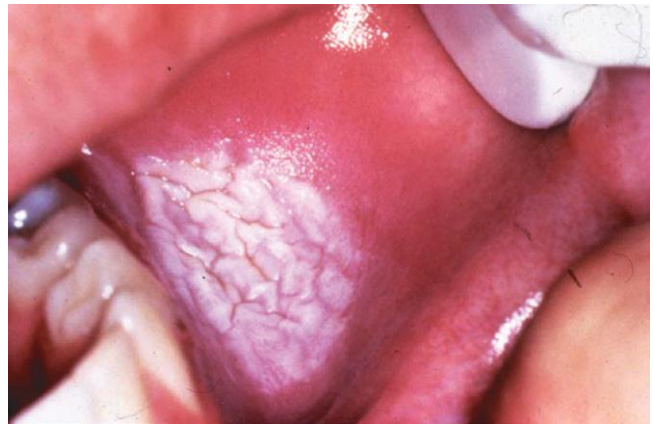


Figure 3.9 Snuff dipper's keratotic leukoplakia of the posterior buccal mucosa at the site where the smokeless tobacco product is held.

9. **Actinic cheilitis** (cheilosis) (Fig. 3.10a,b,c,d)
   - *Site*—lower lip vermilion border.
   - *Morphology*—rough plaque and scale, which thickens with time; ulcer late.
   - *Color*—blotchy, pale gray-white.
   - *Signs and symptoms*—usually seen in older men (10:1 male-to-female ratio) with a history of chronic or excessive ultraviolet exposure from sun, tanning salons, and so on, especially those with light complexion and easily sunburned; considered a potentially malignant (i.e., precancerous) lesion. There is blurring of the margin between the vermilion zone and the cutaneous lip. The scale can, at times, be peeled off with some difficulty and then recurs within days. Actinic cheilitis is similar to actinic keratosis of the skin.
   - *Treatment*—Indurated, thickened scale or ulcer should be biopsied to rule out dysplasia or carcinoma (6–10% transformation rate reported). If malignant transformation occurs, then treat with lip shave (i.e., vermilionectomy) surgically or with laser ablation, electrodesiccation, topical chemicals (e.g., topical 5-fluorouracil, imiquimod), photodynamic therapy, or chemoexfoliation with trichloroacetic acid. Long-term follow-up is recommended. Preventive measures include lip balm and sunscreen.
10. **Lichen planus**

    Reticular type (Fig. 3.11)
    - *Site*—chronic cutaneous disease that can also affect the oral mucosa. Posterior buccal mucosa is most often affected; also, gingiva, palate, labial mucosa, and lateral/ventral tongue; distribution is usually bilateral and symmetrical.
    - *Morphology*—papules; solitary and multiple lesions that coalesce into an interlacing network of white lines known as Wickham's striae.
    - *Color*—white.

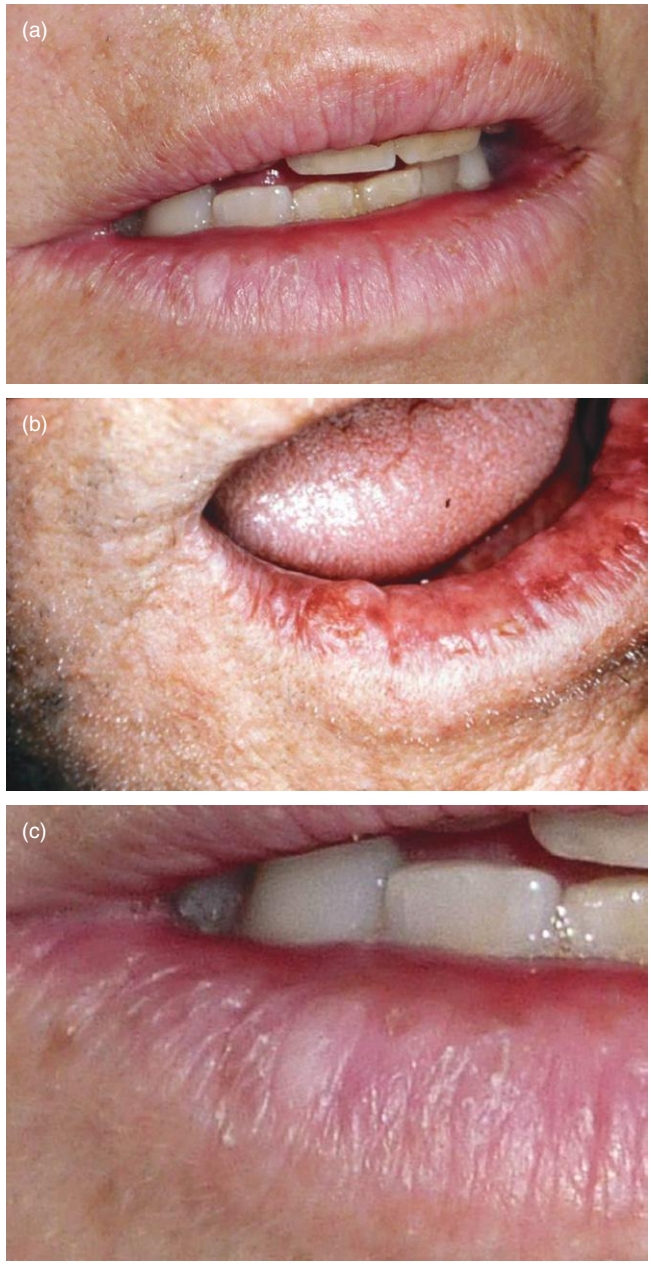


Figure 3.10 (a) Sun-damaged lower lip vermilion with actinic cheilitis. (b) Actinic cheilitis of the lower lip vermilion. (c) Actinic cheilitis of the lower lip vermilion exhibiting mottled colors and indistinct border with the skin. (d) Actinic keratosis with epithelial dysplasia and early invasive squamous cell carcinoma.

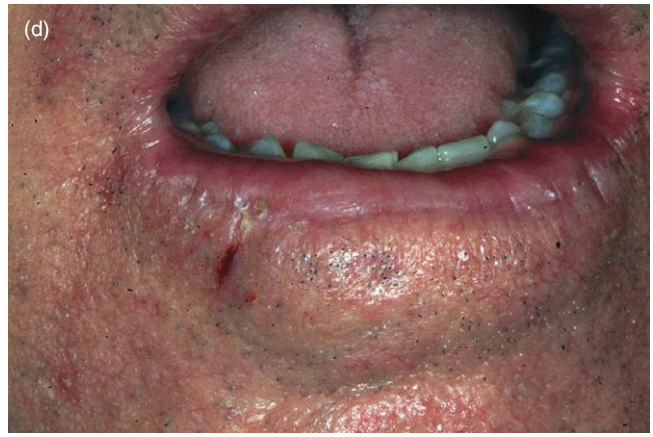


Figure 3.10 (Continued)

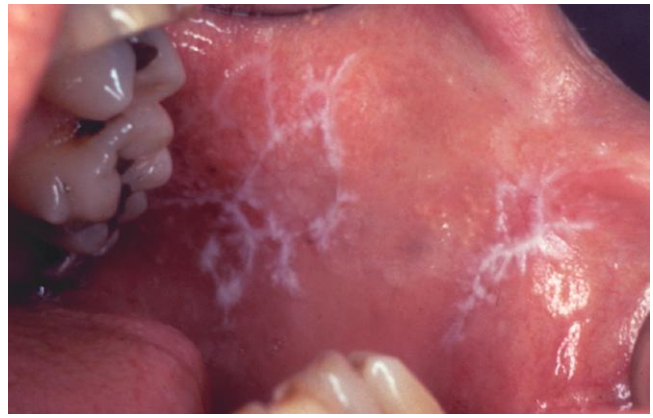


Figure 3.11 Classic reticular oral lichen planus of the anterior and posterior buccal mucosa.

- *Signs and symptoms*—cannot be scraped off; usually asymptomatic. Reticular lichen planus occurs more often in middle-aged adults, women 3:2 over men. The condition waxes and wanes over weeks to months.
- *Treatment*—biopsy often needed for diagnosis confirmation. If asymptomatic, no treatment is needed; if mild burning sensation, usually due to secondary candidiasis, then antifungal therapy is needed. Some clinicians advocate annual reevaluations even if asymptomatic.

Hypertrophic type (Fig. 3.12)

- *Site*—most often on dorsal tongue.
- *Morphology*—plaque.
- *Color*—white.
- *Signs and symptoms*—cannot be scraped off; asymptomatic. Hypertrophic lichen planus occurs more often in middle-aged adults, women 3:2 over men. The condition waxes and wanes over weeks to months.

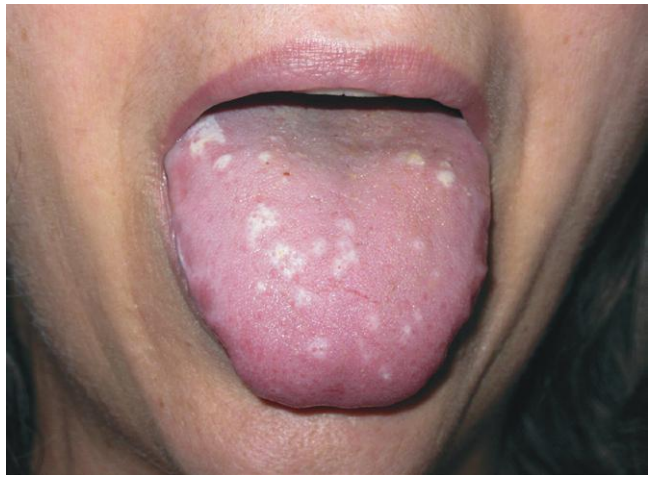


Figure 3.12 Hyperplastic (leukoplakic) lichen planus of the dorsal tongue.

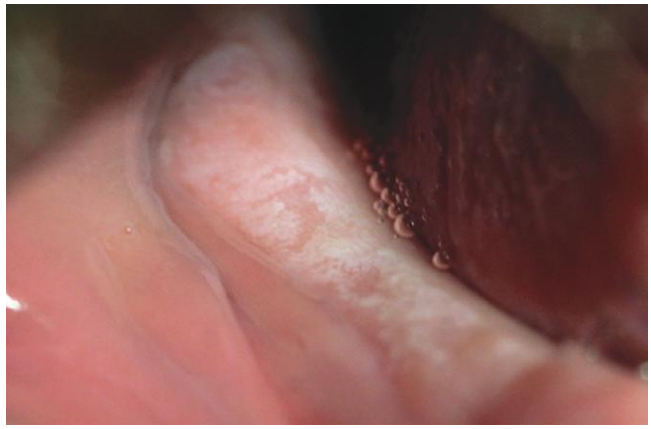


Figure 3.13 Benign alveolar ridge keratosis, which microscopically will demonstrate hyperkeratosis without dysplasia.

- *Treatment*—if asymptomatic, no treatment is needed; if mild burning sensation, usually due to secondary candidiasis, then antifungal therapy is needed. Some clinicians advocate annual reevaluations even if asymptomatic.

11. **Alveolar ridge keratosis** (Fig. 3.13)
    - *Site*—edentulous maxillary or mandibular alveolar mucosal areas especially without removable prosthesis present.
    - *Morphology*—plaque with variable surface roughness.
    - *Color*—white.
    - *Signs and symptoms*—painless; due to friction of mastication.
    - *Treatment*—usually observation. However, the lesion can be biopsied to rule out dysplasia.

Red-and-White Lesions

1. **Geographic tongue** (benign migratory glossitis, erythema migrans) (Fig. 3.14a,b)
   - *Site*—anterior two-thirds of dorsal tongue, also lateral and ventral. It is much rarer on other sites such as buccal mucosa, labial mucosa, and soft palate (but with the same morphology and colors) and is referred to as ectopic geographic tongue.

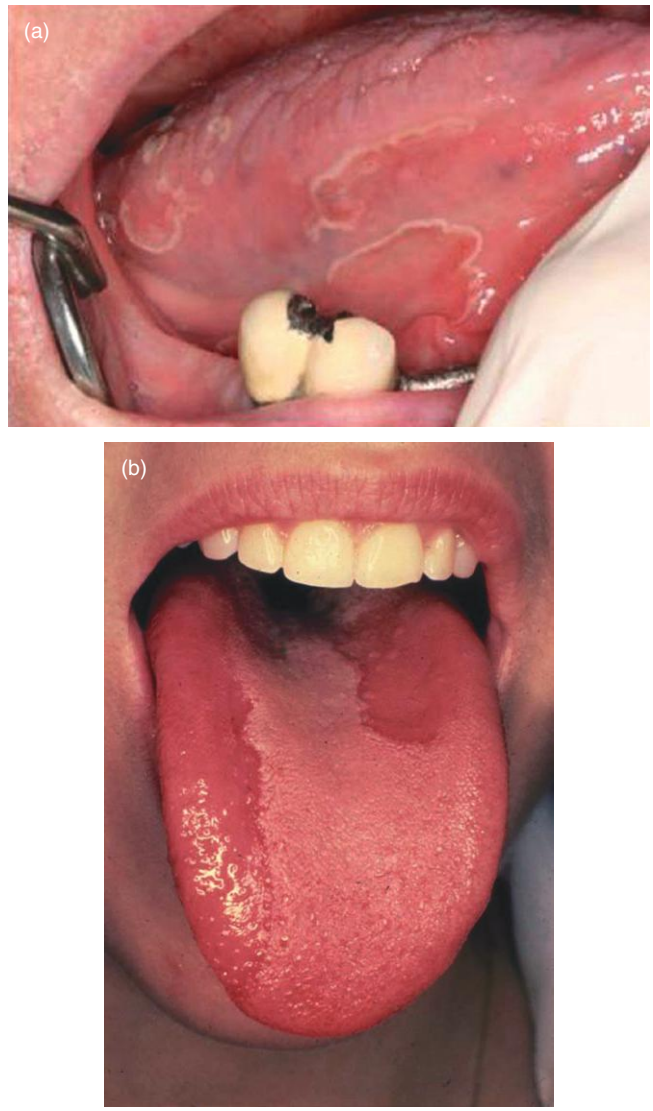


Figure 3.14 (a) Geographic tongue (also called benign migratory glossitis, erythema migrans) with flat red areas encircled by raised white rim. (b) Geographic tongue with red flat areas but lacking classic white raised border.

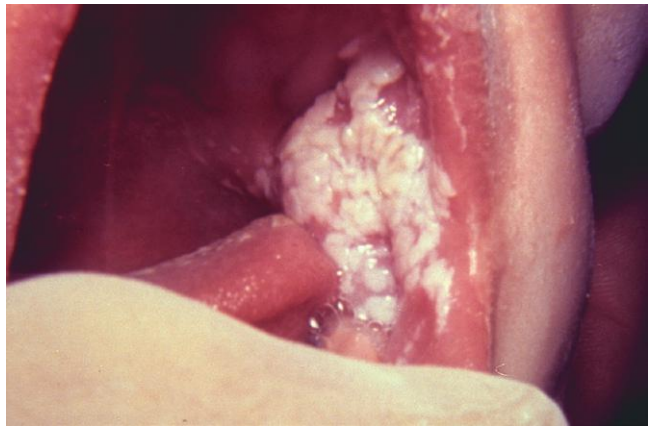


Figure 3.15 Chronic multifocal type of candidiasis.

- *Morphology*—multiple, well-demarcated macule(s) from atrophy of filiform papillae surrounded completely or partially by a slightly elevated, scalloped border.
- *Color*—red macule and yellow-white border.
- *Signs and symptoms*—occurs 2:1 female-to-male ratio; asymptomatic or variable burning sensation or tongue sensitivity to hot or spicy foods. Lesions usually quickly develop in one area, heal in days to weeks, then develop in a different area; geographic tongue is often associated with fissured tongue.
- *Treatment*—usually none. If there is a burning sensation and lifestyle is disrupted, then prescribe topical steroids (gel or rinse formulations).

2. **Candidiasis, chronic multifocal type** (Fig. 3.15)
   - *Site*—posterior dorsal tongue. Other sites include the labial commissures and the posterior hard palate, the latter due to swallowing in which the posterior tongue "kisses" the hard palate.
   - *Morphology*—macules and plaques.
   - *Color*—red macules and white plaques.
   - *Signs and symptoms*—associated with immunosuppression or idiopathic; removable white plaque; asymptomatic or burning sensation.
   - *Treatment*—antifungal agents.
3. **Lichen planus, atrophic and erosive types** (Fig. 3.16a,b)
   - *Site*—posterior buccal mucosa, usually bilateral; gingiva; also lateroventral tongue, floor of mouth, soft palate.
   - *Morphology*—plaque, macule; shallow ulceration, erosion; periphery of white lines.
   - *Color*—red macules, erosions; white papules, plaques.
   - *Signs and symptoms*—pain. In severe cases an epithelial separation from the underlying connective tissue may occur, resulting in ulceration.
   - *Treatment*—usually a biopsy is necessary to rule out lupus erythematosus as well as the presence of dysplasia. Medications usually include topical corticosteroids and, in recalcitrant cases, systemic corticosteroids.

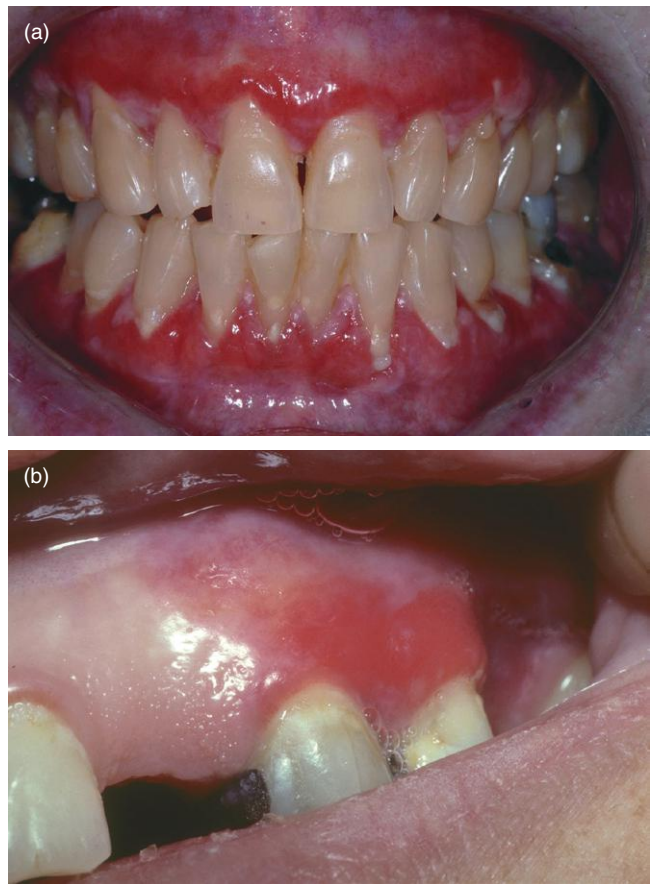


Figure 3.16 (a) Bilateral and symmetrical distribution of erosive lichen planus of the facial attached gingiva. (b) Focal lesions of erosive lichen planus of the left maxillary facial attached and marginal gingiva.

4. **Nicotine stomatitis** (Fig. 3.17)
   - *Site*—hard palate; bilateral and symmetrical distribution.
   - *Morphology*—palate has slightly elevated papules, often with cobblestone or pebbly surface. Advanced lesions may have a "dried mud" or fissured appearance; plaques on gingiva and buccal mucosa.
   - *Color*—diffuse gray to white with punctate red centers on hard palate (inflamed minor salivary gland ductal orifices).
   - *Signs and symptoms*—usually seen in pipe smokers (heat-induced) but in some ethnic groups "reverse smoking" (lit end of cigarette within the oral cavity) can be the cause. It also can be seen with a chronic habit of hot beverage consumption.
   - *Treatment*—completely reversible (1–2 weeks) with tobacco habit cessation. Nicotine stomatitis is not a premalignant lesion.

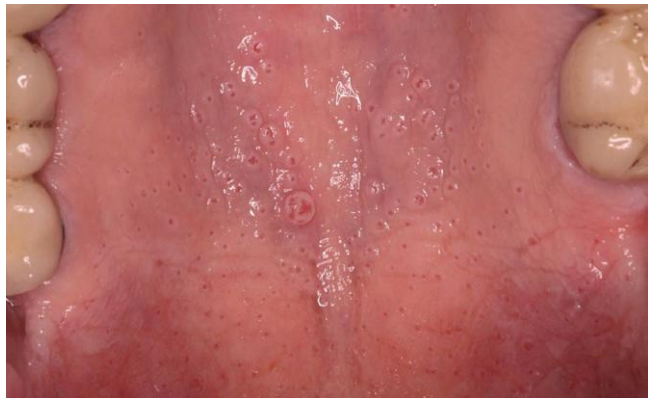


Figure 3.17 Bilateral nicotine stomatitis of the hard palate.

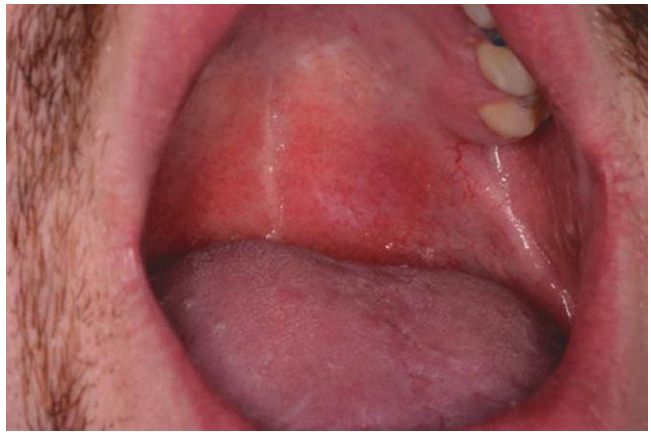


Figure 3.18 Extensive erythroplakia of the soft palate.

5. **Erythroleukoplakia** (speckled leukoplakia) (Fig. 3.18)
   - *Site*—any oral mucosal surface.
   - *Morphology*—patch or plaque intermixed with soft, velvety texture; distinct margins.
   - *Color*—gray-white to white intermixed with red.
   - *Signs and symptoms*—clinical term, defined as a white-and-red patch or plaque that cannot be characterized clinically or pathologically as any other disease (i.e., diagnosis of exclusion); asymptomatic; caused by tobacco, alcohol, microorganisms (e.g., *Treponema pallidum*, *Candida albicans*, HPV types 16 and 18[1–8]), and trauma. There is also an idiopathic form. Erythroleukoplakia occurs more often in older individuals.
   - *Treatment*—biopsy, particularly including the red component, is mandatory to obtain a histopathologic diagnosis. If dysplasia is present, then complete

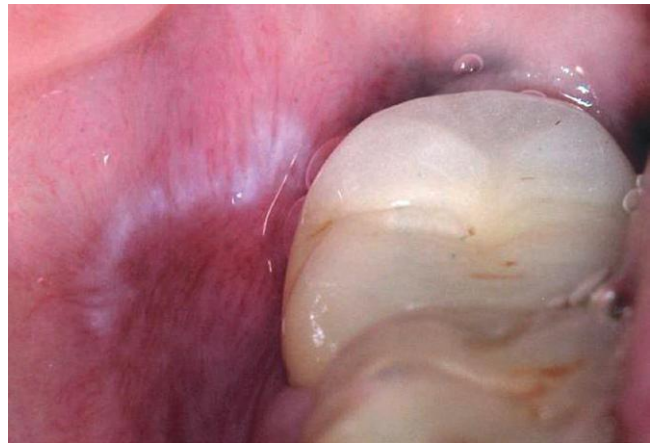


Figure 3.19 Lichenoid contact allergic reaction (i.e., stomatitis venenata) of the posterior buccal mucosa secondary to cinnamon aldehyde flavoring agent.

removal should be verified with long-term follow-up since the red component has a significant transformation rate to severe dysplasia or worse (i.e., 90% or greater).

6. **Allergic reactions** (Fig. 3.19)
   - *Site*—posterior buccal mucosa and posterior lateral border of tongue are most commonly involved, usually with bilateral and symmetrical distribution; any other mucosal site, including labial vermilion or dorsal tongue. In fixed drug eruption reaction the site of involvement is the same each exposure time.
   - *Morphology*—macule, vesicles (temporary), erosions, superficial ulcerations (red); local contact may also have white patches and plaques. Artificial cinnamon flavoring and dental restorative materials as well as drugs (i.e., lichenoid mucositis) are common triggers.
   - *Color*—red and white.
   - *Signs and symptoms*—systemic drugs, contact with substances and dental restorative materials; usually burning sensation, paresthesia, or variable pain; edema may be present (systemic drugs). Allergic reactions may have the clinical appearance of pemphigus, pemphigoid, lichen planus, lupus erythematosus, chronic ulcerative stomatitis, or aphthouslike ulcers.[9]
   - *Treatment*—eliminate allergen; supplement with topical or systemic corticosteroid; epinephrine or antihistamine therapy for edema; depending on acute or chronic onset nature.

Red Lesions

1. **Candidiasis**

   Chronic atrophic type (denture stomatitis, denture sore mouth) (Fig. 3.20a,b)
   - *Site*—denture-bearing mucosa of maxillary removable dental prosthesis, especially the palate.

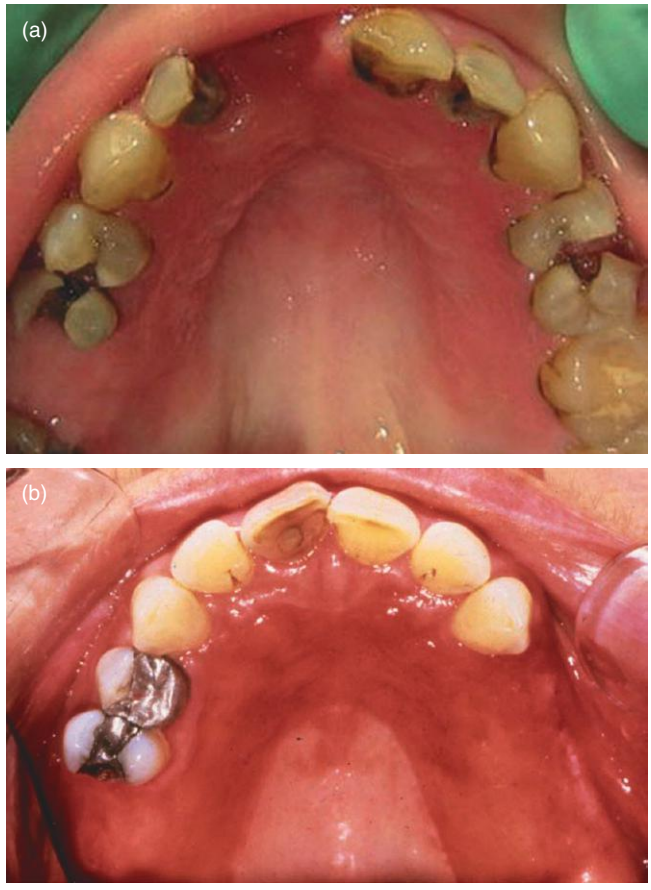


Figure 3.20 (a) Chronic atrophic candidiasis of the maxilla beneath an acrylic removable denture. (b) Chronic atrophic candidiasis of the hard palate beneath a removable partial denture.

- *Morphology*—well demarcated macule.
- *Color*—red
- *Signs and symptoms*—rarely symptomatic. The patient usually wears the prosthesis continually, only removing it to clean. It is somewhat controversial if this is truly a fungal infection or is just an association since biopsied tissue does not demonstrate the hallmark of an infection: host tissue invasion by the organism (i.e., the denture but not the mucosa has a positive culture result).
- *Treatment*—treat both mucosa and prosthesis base with antifungal agents.

Chronic erythematous type, median rhomboid glossitis (central papillary atrophy) (Fig. 3.21a,b)

- *Site*—midline dorsal surface of tongue just anterior to the circumvallate papillae.

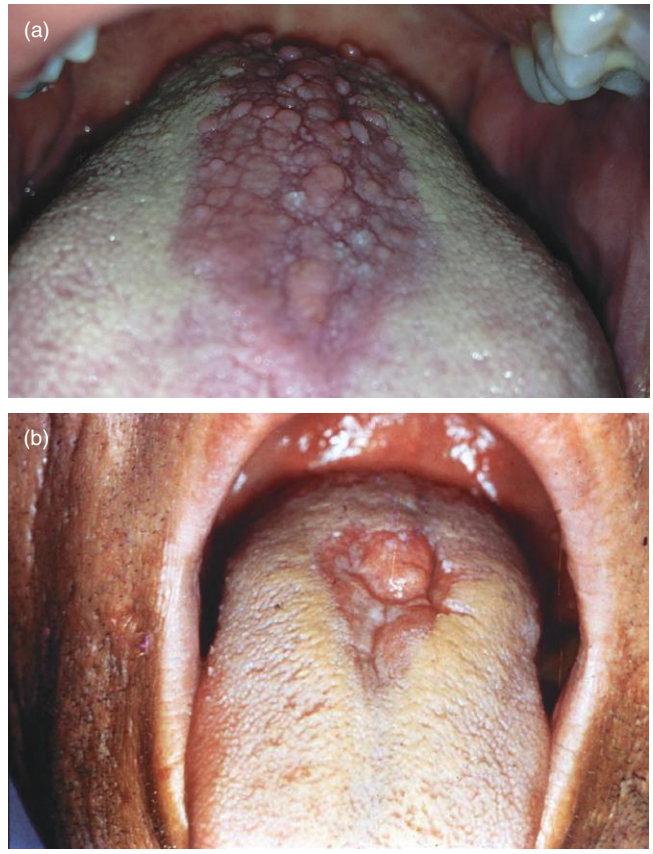


Figure 3.21 (a) Median rhomboid glossitis (chronic erythematous candidiasis), flat and raised, at the midline junction of the anterior two-thirds and posterior one-third of the dorsal tongue. (b) Median rhomboid glossitis (chronic erythematous candidiasis) of the posterior dorsal tongue.

- *Morphology*—smooth macule or lobulated papule.
- *Color*—red.
- *Signs and symptoms*—often asymptomatic; results from loss of the filiform papillae. Distribution is usually symmetrical.
- *Treatment*—usually resolves completely with antifungal agent but often recurs.

Angular cheilitis (perleche) (Fig. 3.22)

- *Site*—commissures (angles) of the lip.
- *Morphology*—fissures and scales within folds of tissue.
- *Color*—red.
- *Signs and symptoms*—unilateral or bilateral; caused by persistent wetness (e.g., loss of vertical dimension), immunosuppression, nutritional deficiencies (e.g., vitamins), and infections of, commonly, *Candida albicans* or, rarely, *Staphylococcus aureus*. There is also an idiopathic form. Severity can wax and wane.

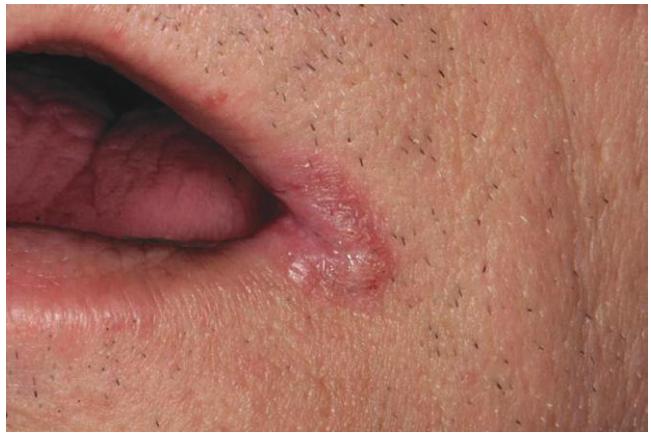


Figure 3.22 Angular cheilitis (perleche) of the left commissure due to chronic erythematous candidiasis.

- *Treatment*—usually resolves completely with an occlusive dressing, to block moisture, and an antifungal agent. Sometimes it requires antibiotic as well as antifungal agent to eliminate *Staphylococcus aureus* presence.

2. **Geographic tongue** (Fig. 3.23a,b,c)
   - Lesions have the same characteristics as described previously ("Red-and-White Lesions," number 1) except that the white, slightly raised elevated periphery is lacking.
3. **Erythroplakia** (Fig. 3.24a,b,c,d)
   - *Site*—tongue, floor of mouth, soft palate.
   - *Morphology*—macule, patch, or plaque with soft, velvety texture.
   - *Color*—red.
   - *Signs and symptoms*—clinical term, defined as a red patch or plaque that cannot be characterized clinically or pathologically as any other disease (i.e., diagnosis of exclusion); usually asymptomatic; atrophy with usually severe dysplasia, *in situ* carcinoma, or invasive carcinoma; caused by tobacco, alcohol; idiopathic form also; occurs more often in middle-aged to older adults. Multiple lesions may be present.[1–3]
   - *Treatment*—biopsy is mandatory to obtain a histopathologic diagnosis and 90% or more have at least severe dysplasia. There should be long-term follow-up for treated patients since there is the likelihood of recurrence or a new primary lesion at the same site or other oral mucosal site.
4. **Hemangioma** (vascular malformations) (Fig. 3.25)
   - *Site*—head and neck skin; tongue, buccal mucosa, labial mucosa.
   - *Morphology*—macule, vesicle, or bulla.
   - *Color*—red, red-blue, blue.
   - *Signs and symptoms*—present at birth (i.e., congenital) or during infancy although may not be clinically apparent until later. Cherry hemangiomas of

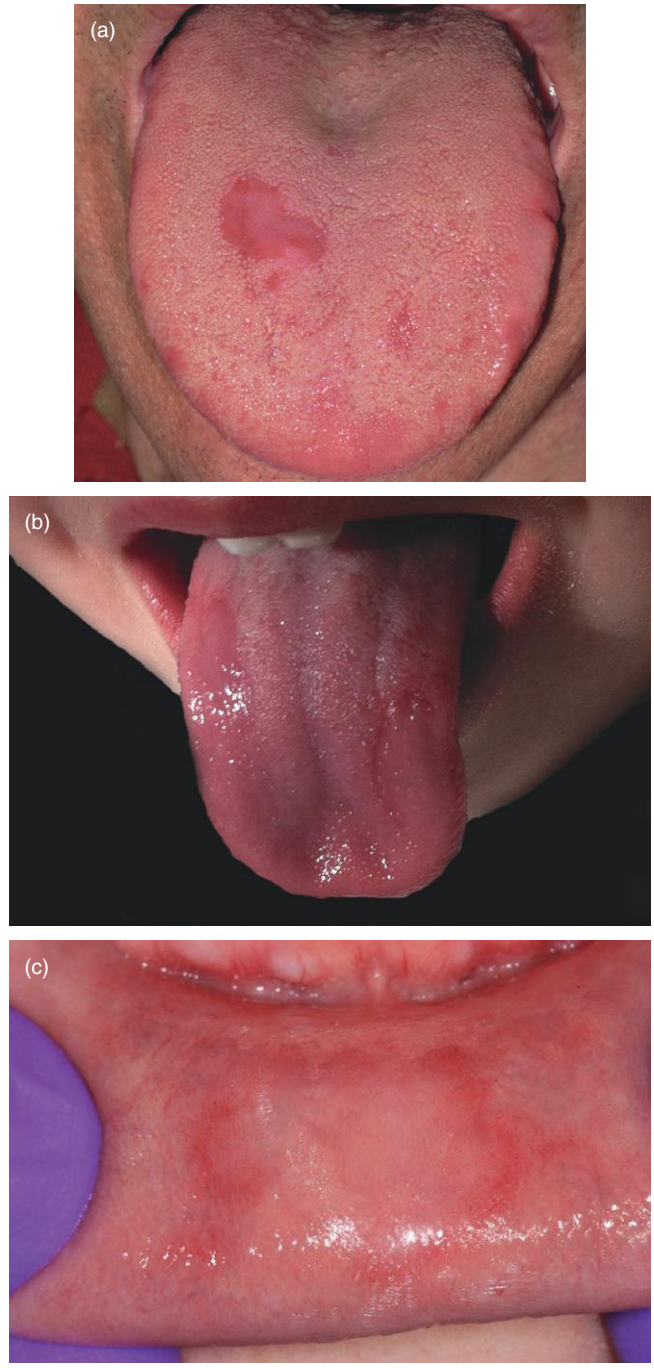


Figure 3.23 (a) Flat, irregular, discontinuous areas of geographic tongue. (b) Flat red areas of geographic tongue in a child. (c) Ectopic geographic tongue (erythema migrans) of the middle lower labial mucosa.

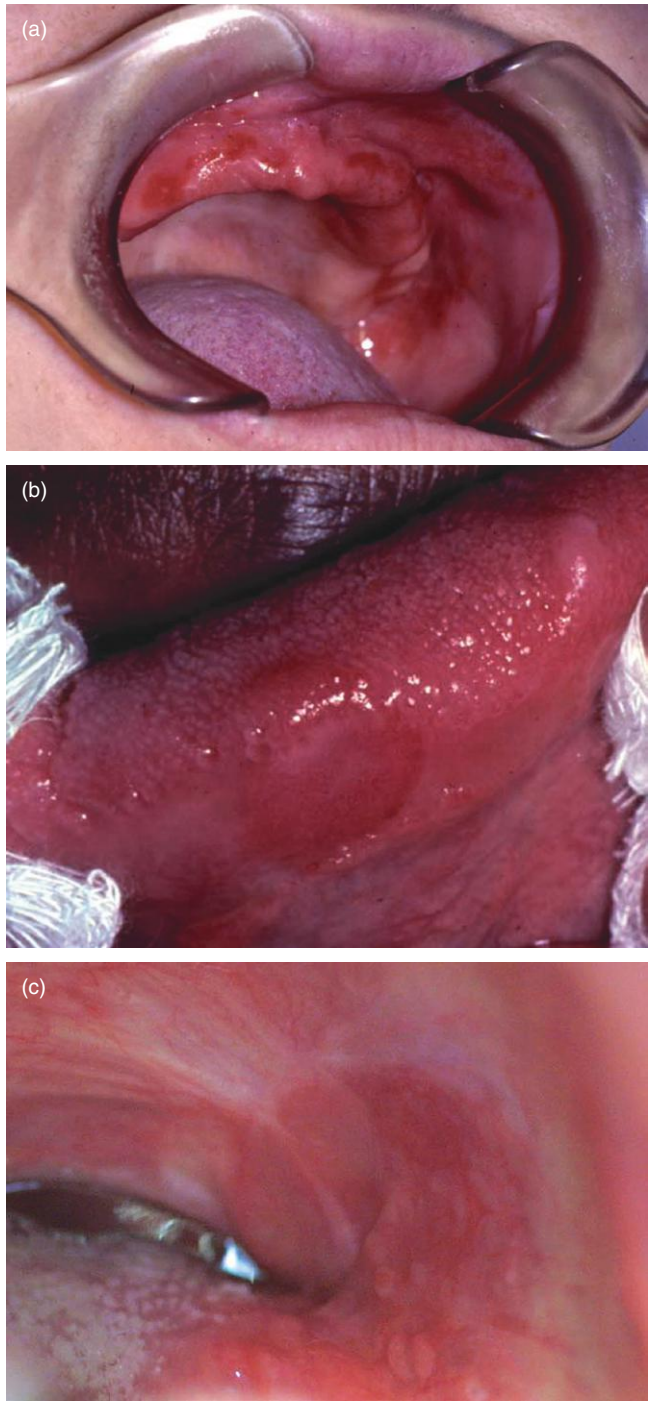


Figure 3.24 (a) Erythroplakia (also called speckled leukoplakia) with microscopic carcinoma-in-situ in a patient immunosuppressed following a bone marrow transplant. (b) Erythroplakia of the middle one-third lateral border of the tongue. (c) Erythroplakia of the left tonsillar fossa area. (d) Subtle erythroplakia at the mucogingival junction of the left maxillary central incisor area.

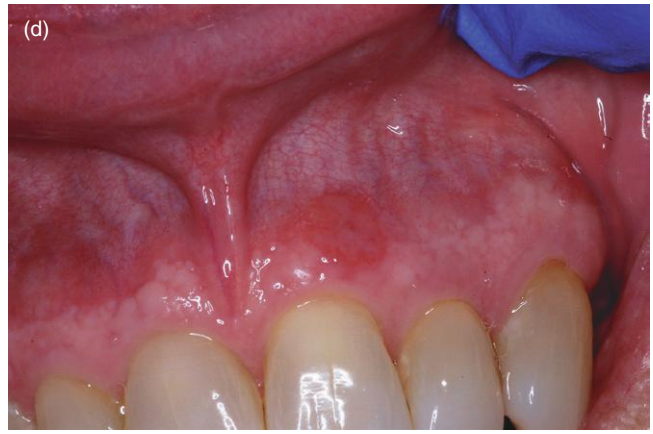


Figure 3.24 (Continued)

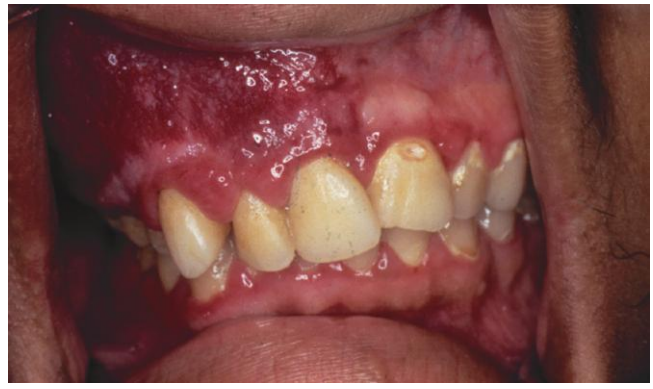


Figure 3.25 Unilateral hemangioma of a patient with Sturge–Weber syndrome.

the lips typically arise in middle age. Hemangiomas are compressible and blanchable.

- *Treatment*—spontaneous involution sometimes; systemic corticosteroid, laser, or sclerotherapy and surgical excision.

5. **Extravasated blood**
   - *Site*—any oral mucosal site.
   - *Morphology*—macule or elevated.
   - *Color*—red, red-blue, blue.
   - *Signs and symptoms*—usually due to trauma. Lesions do not blanch with pressure.
   - *Treatment*—spontaneously resolve unless due to systemic disease (i.e., control the associated disease). Large hematomas may require several weeks to resolve.

Macular type—submucosal hemorrhage resulting in entrapment of a thin layer (i.e., not a mass) of extravasated blood within the tissues. Lesions do not blanch with pressure and are named based on size of the greatest diameter:
- *Petechia*—0.1–2 cm; round pinpoint area of hemorrhage (Fig. 3.26)
- *Purpura*—0.3–2.0 cm; nonelevated area of hemorrhage larger than a petechia (Fig. 3.27)
- *Ecchymosis*—greater than 2.0 cm; nonelevated area of hemorrhage larger than a purpura (Fig. 3.28)

Elevated type—submucosal hemorrhage resulting in entrapment of a thick layer (i.e., elevated mass) of extravasated blood within tissue. The lesion does not blanch with pressure; the name is not size dependent:
- Hematoma (Fig. 3.29)

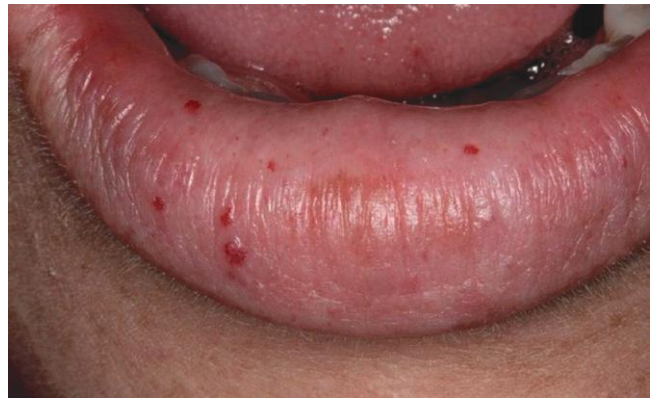


Figure 3.26 Multiple pinpoint petechiae of the lower lip vermilion and labial mucosa.

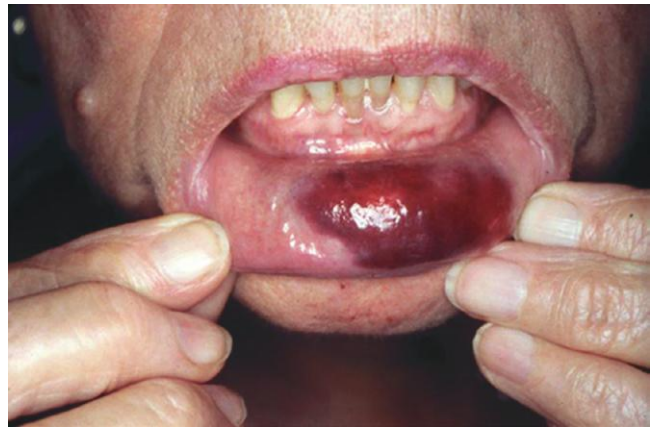


Figure 3.27 Purpura of the lower lip secondary to trauma.

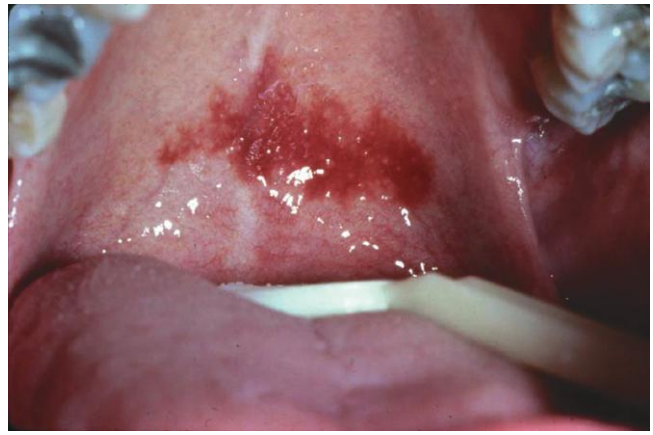


Figure 3.28 Petechiae and ecchymosis at the junction of the soft and hard palate.

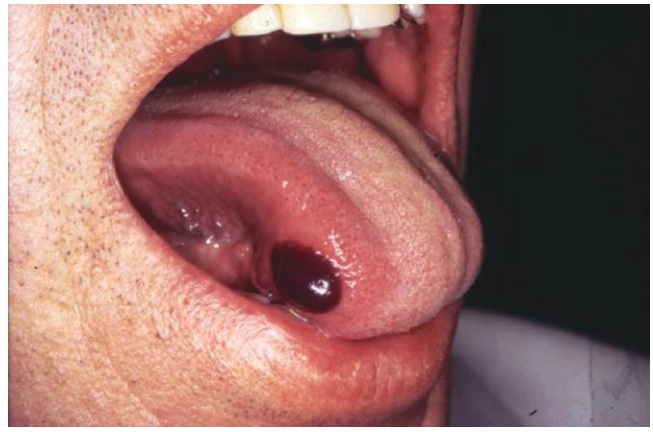


Figure 3.29 Elevated hematoma (bulla) of the right anterior lateral tongue.

6. **Telangiectasia** (Fig. 3.30)
   - *Site*—lip vermilion, tongue, buccal mucosa; any other oral mucosal site.
   - *Morphology*—papules (1–2 mm).
   - *Color*—red.
   - *Signs and symptoms*—caused by dilatation of small capillaries close to the surface. Lesions blanch when compressed (positive diascopy).
   - *Treatment*—no treatment except if hereditary hemorrhagic telangiectasia disease (nosebleeds, gastrointestinal bleeding), then moderate cases require cryosurgery, electrocautery, or laser ablation; and severe cases, surgery.
7. **Plasma cell gingivitis** (Fig. 3.31)
   - *Site*—entire free and attached gingiva; can extend into palate; also may occur on tongue and lip vermilion. Site is dependent on type of allergen (toothpaste, candy, gum, mouthwash, peppers).

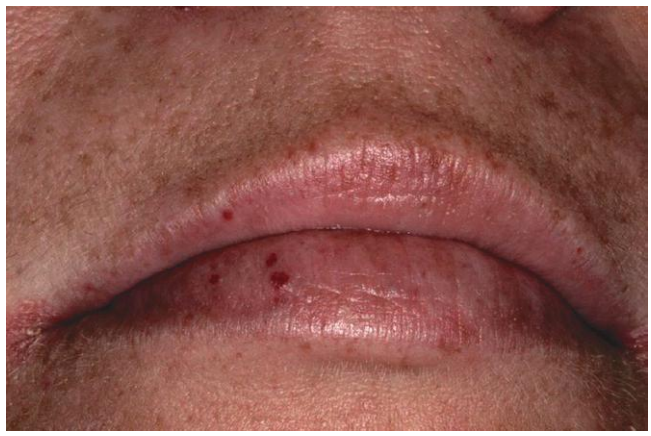


Figure 3.30 Telangiectasias of the lips in a patient diagnosed with hereditary hemorrhagic telangiectasia.

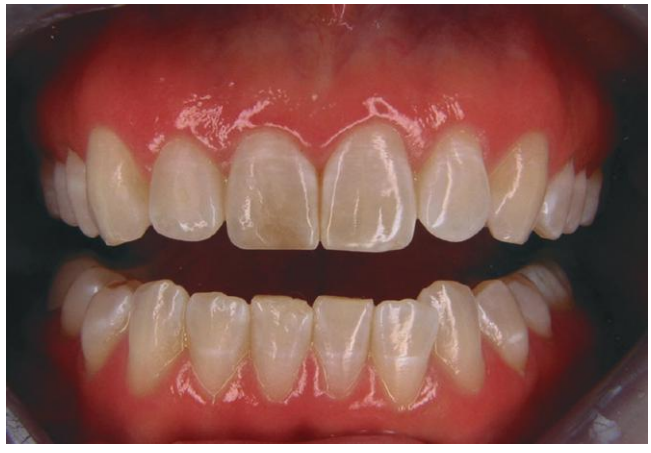


Figure 3.31 Plasma cell gingivitis of the entire maxillary and mandibular facial attached gingiva and alveolar mucosa.

- *Morphology*—diffuse elevated enlargement with loss of stippling.
- *Color*—bright red.
- *Signs and symptoms*—rapid onset of sore mouth; usually related to flavoring agents (e.g., cinnamon).
- *Treatment*—remove contact with allergen. For idiopathic type treat with topical or systemic immunosuppressive medications.

8. **Allergic reactions** (Fig. 3.32)
   - See "Red-and-White Lesions," number 6, for description and treatment.

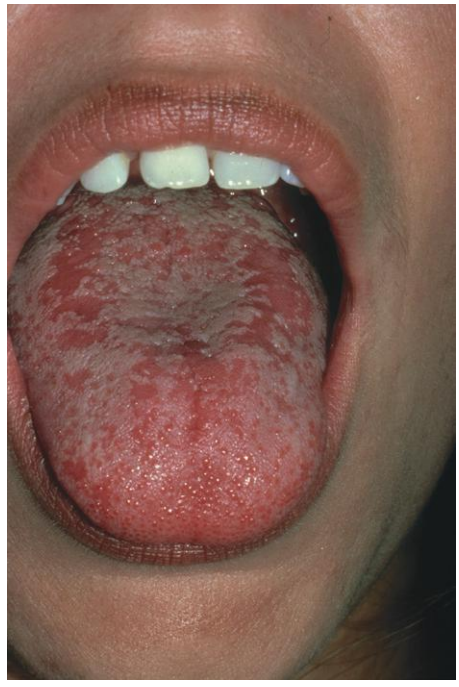


Figure 3.32 An allergic reaction of the dorsal tongue secondary to a systemic medication regimen (i.e., stomatitis medicamentosa).

Blue and/or Purple Lesions

1. **Varicosity** (Fig. 3.33 and Fig. 3.34)
   - *Site*—ventral/lateral tongue, lips, buccal mucosa.
   - *Morphology*—elevated or papular blebs; if thrombosis, then papule/nodule.
   - *Color*—blue-purple.
   - *Signs and symptoms*—abnormally dilated and tortuous veins; usually asymptomatic. It is most common in those greater than 45 years of age.
   - *Treatment*—no treatment is needed for clinically diagnosable sublingual type. Biopsy is needed on lips and other sites to confirm diagnosis, secondary thrombus formation, or esthetic concern.
2. **Amalgam tattoo** (Fig. 3.35)
   - *Site*—gingiva, alveolar mucosa, and buccal mucosa. Any other oral site is possible.
   - *Morphology*—macule; rarely slightly raised; well-defined or diffuse borders.
   - *Color*—blue to blue-gray to slate gray to black
   - *Signs and symptoms*—asymptomatic. It is usually adjacent to an amalgam filling or where one used to be.
   - *Treatment*—biopsy to rule out melanocytic neoplasia unless presence of amalgam is confirmed radiographically or by written documentation when created.

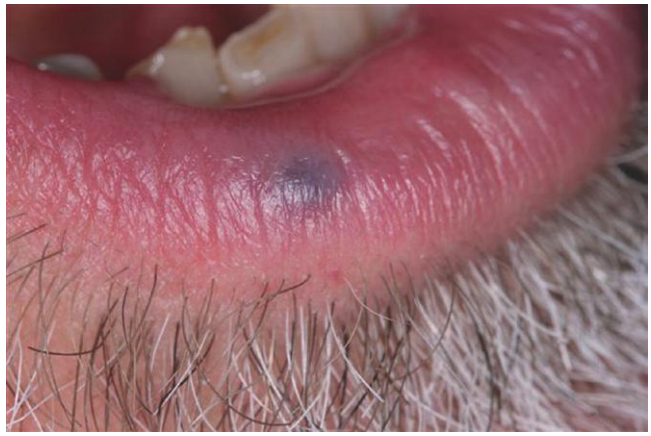


Figure 3.33 A solitary varix of the left lower vermilion border.

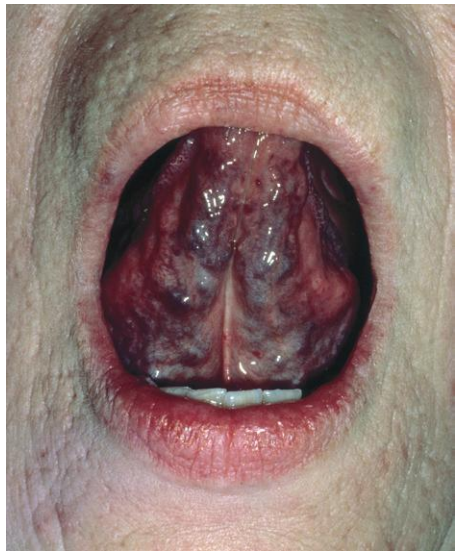


Figure 3.34 Sublingual varices seen in an elderly patient.

3. **Mucocele** (Fig. 3.36a,b,c)
   - *Site*—lower labial mucosa and floor of mouth most often; also anterior ventral tongue, buccal mucosa; very rare on palate, retromolar pad. Occurrence on upper lip is extremely rare.
   - *Morphology*—vesicle, bulla; deeper ones are nodules.
   - *Color*—translucent blue. A deeper one may be normal color (i.e., pink).
   - *Signs and symptoms*—trauma induced; most common in children and young adults; usually fluctuant; often recurrent swelling that periodically ruptures; known as a *ranula*, a clinical term, when it occurs in the floor of the mouth.

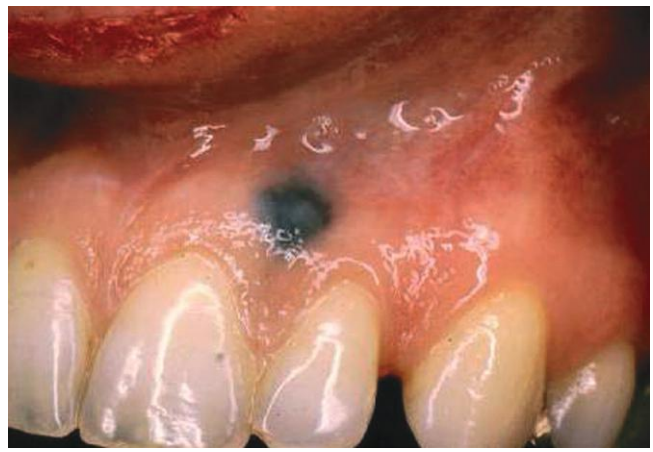


Figure 3.35 An amalgam tattoo of the facial attached gingiva in the area of the maxillary left central and lateral incisors.

Mucoceles on the hard palate are typically tender superficial vesicular swellings with cyclical rupture resulting in a painful ulcer.

- *Treatment*—a few self-resolve but most require local surgical excision including feeder minor salivary gland lobule and duct.

4. **Eruption cyst** (eruption hematoma) (Fig. 3.37)
   - *Site*—gingiva.
   - *Morphology*—vesicle, bulla.
   - *Color*—translucent blue to purple-brown.
   - *Signs and symptoms*—associated with an erupting tooth's crown; most often primary mandibular central incisors and maxillary incisors; permanent first molars.
   - *Treatment*—none usually required since the cyst ruptures spontaneously; if not, then simple excision of the cyst's roof.
5. **Hemangioma** (Fig. 3.38)
   - See "Red Lesions," number 4, for description and treatment.
6. **Kaposi's sarcoma** (Fig. 3.39)
   - *Site*—gingiva and hard palate, tongue; head and neck skin.
   - *Morphology*—macules develop into plaques or nodules.
   - *Color*—brown or reddish-purple.
   - *Signs and symptoms*—multiple lesions usually. Lesions do not blanch with pressure; pain, bleeding, and necrosis may develop. Lesions typically arise in immunocompromised patients.
   - *Treatment*—biopsy to confirm diagnosis; chemotherapeutic agents. Also, for smaller lesions, surgical removal, cryotherapy, and intralesional injection with vinblastine or sclerosing agents are used, also laser ablation and electrosurgery.
7. **Salivary gland tumor** (Fig. 3.40)
   - *Site*—major gland sites (parotid most common overall site) and intraoral minor salivary gland sites: lateral junction soft and hard palate (most

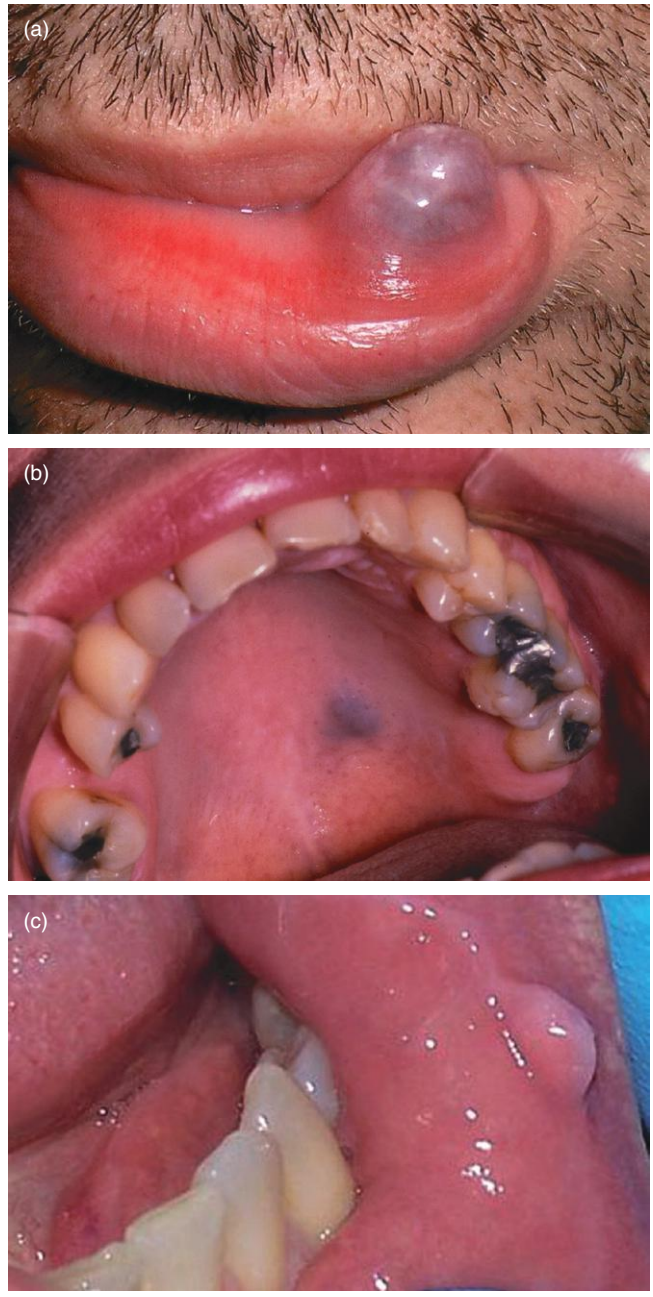


Figure 3.36 (a) A large mucocele of the left lower labial mucosa. (b) A superficial mucocele of the hard palate. (c) A mucocele of the left lower lip with the extravasated mucin farther from the surface.

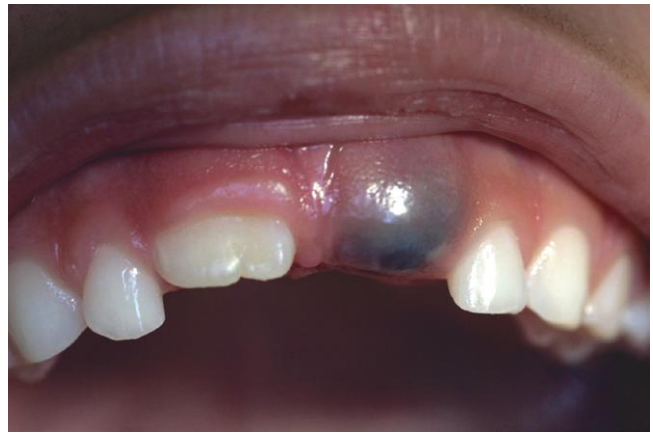


Figure 3.37 An eruption cyst (eruption hematoma) overlying and prior to the eruption of the left maxillary permanent central incisor.

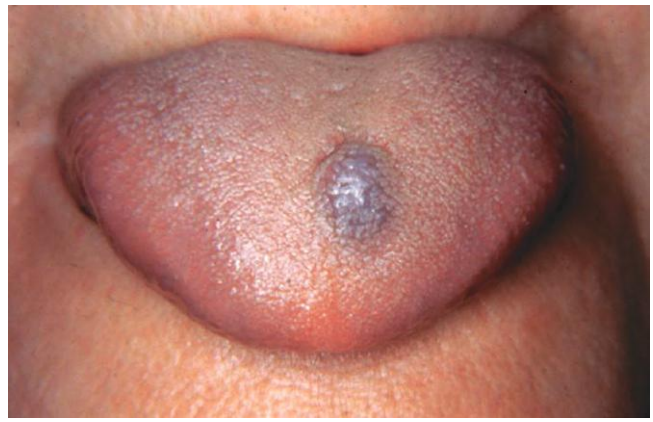


Figure 3.38 A hemangioma of the anterior dorsum of the tongue.

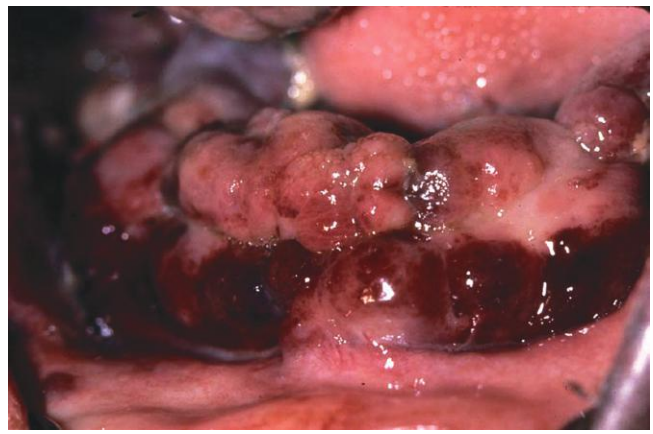


Figure 3.39 A large, multifocal Kaposi's sarcoma of the mandibular gingiva.

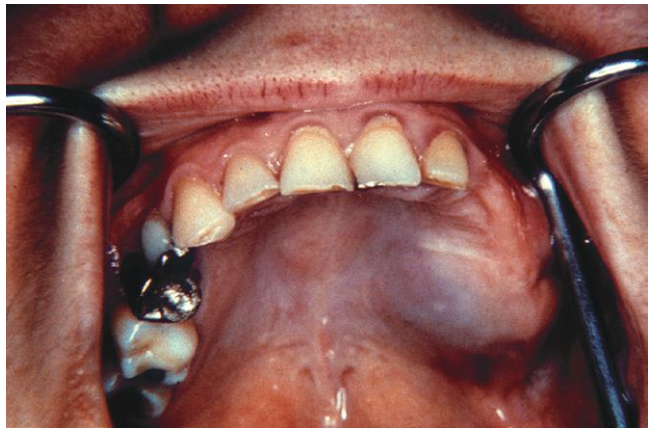


Figure 3.40 An adenoid cystic carcinoma of the left posterior hard palate.

common) followed in descending order of incidence by labial mucosa, buccal mucosa, retromolar pad, floor of mouth, and tongue.
- *Morphology*—papule, nodule, tumor.
- *Color*—pink to pale blue (if mucin producer).
- *Signs and symptoms*—unilateral, firm; slowly enlarging early and may have growth spurt; asymptomatic early and may develop pain; with or without ulceration. Cannot clinically distinguish benign (e.g., pleomorphic adenoma) from malignant lesion (e.g., mucoepidermoid carcinoma) including surface ulceration, but the latter is more likely if fixed, pain, paresthesia, and/or rapid growth spurt.
- *Treatment*—complete surgical excision. Malignant tumors may have adjunctive treatment (e.g., irradiation).

8. **Gingival cyst of the adult** (Fig. 3.41)
   - *Site*—facial gingiva or alveolar mucosa, especially mandibular canine and premolar area; occurs most often in people aged in their 40s and 50s.
   - *Morphology*—vesicle, bulla.
   - *Color*—translucent blue to blue-gray.
   - *Signs and symptoms*—asymptomatic; may cause superficial cupping resorption of the alveolar bone.
   - *Treatment*—simple surgical excision.
9. **Blue nevus** (Fig. 3.42)
   - *Site*—intraoral almost always on hard palate; facial skin.
   - *Morphology*—macule or papule, nodule.
   - *Color*—blue.
   - *Signs and symptoms*—children, young adults; painless.
   - *Treatment*—conservative surgical excision.
10. **Malignant melanoma** (Fig. 3.43)
    - *Site*—vast majority on hard palate and maxillary alveolus; sun-exposed facial skin, scalp, and neck.

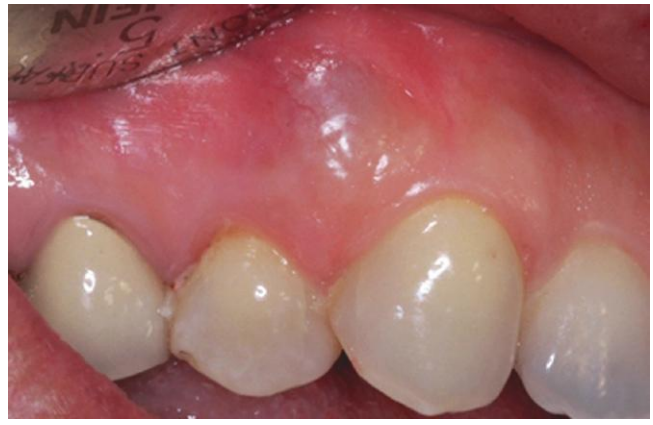


Figure 3.41 A gingival cyst of the adult on the right anterior maxillary gingiva.

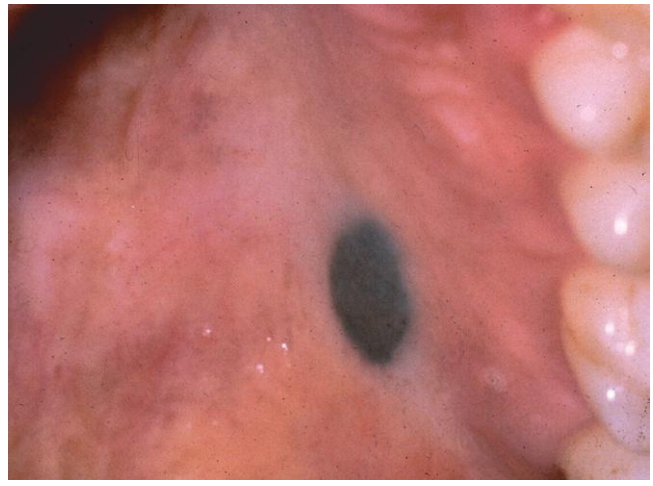


Figure 3.42 A large blue nevus of the hard palate.

- *Morphology*—early, macule; later, papule or nodule with or without ulceration (only painful if ulcerated).
- *Color*—blue to brown to black, irregular borders; asymmetrical; may have satellite lesions.
- *Signs and symptoms*—asymptomatic but pain if there is ulceration.
- *Treatment*—complete surgical excision.

Brown, Gray, and/or Black Lesions

1. **Acquired melanocytic nevus** (nevus, mole) (Fig. 3.44)
   - *Site*—facial skin; palate, vestibule, and attached gingiva most common; any other oral site.

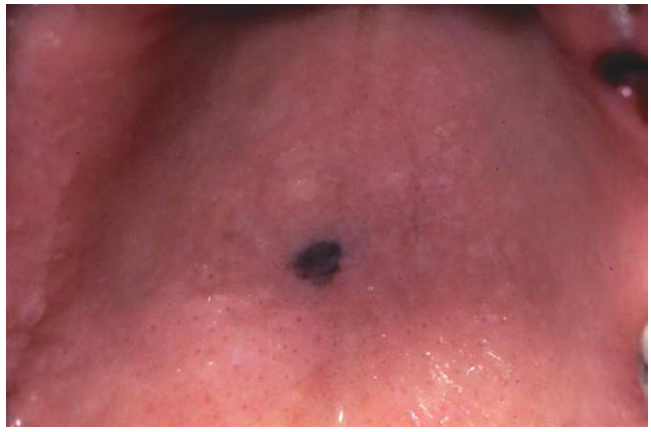


Figure 3.43 A small malignant melanoma of the hard palate.

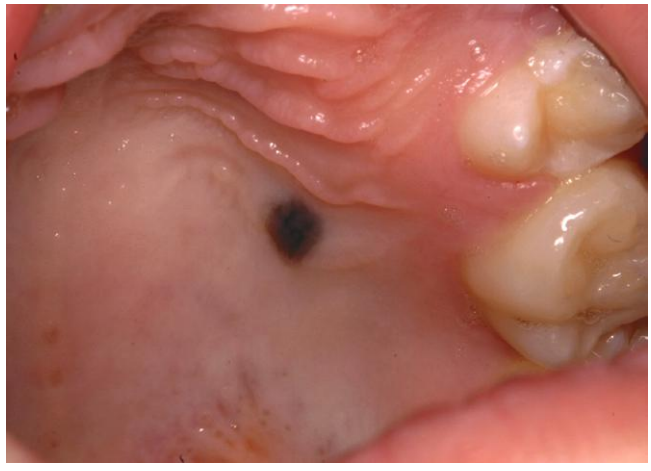


Figure 3.44 A small melanocytic nevus of the hard palate.

- *Morphology*—macule or papule/nodule.
- *Color*—brown or tan.
- *Signs and symptoms*—asymptomatic. On the skin it will elevate with time, become papillated, and may acquire central hairs.
- *Treatment*—on the skin, usually involute. Perform excisional biopsy to rule out melanoma.

2. **Malignant melanoma** (Fig. 3.45)
   - See "Blue and/or Purple Lesions," number 10, for description and treatment.
3. **Racial pigmentation** (physiologic) (Fig. 3.46)
   - *Site*—attached gingiva.
   - *Morphology*—macule.

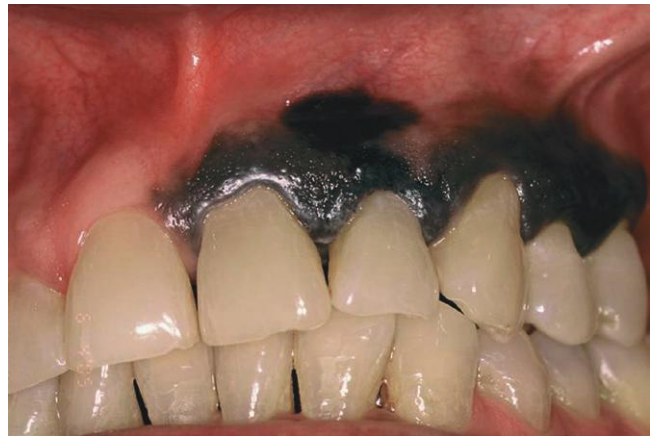


Figure 3.45 A large malignant melanoma of the anterior maxillary gingiva.

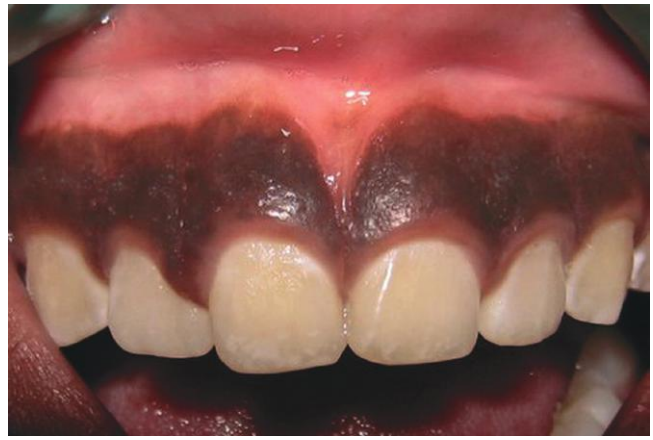


Figure 3.46 Bilateral and symmetrical distribution of racial pigmentation of the attached gingiva.

- *Color*—diffuse tan to brown.
- *Signs and symptoms*—typically seen in darker-skinned patients; persistent; asymptomatic. Distribution is bilateral and symmetrical.
- *Treatment*—none. It is considered a normal variant and definitive diagnosis can be made clinically.

4. **Amalgam tattoo**
   - See "Blue and/or Purple Lesions," number 2, for description and treatment.

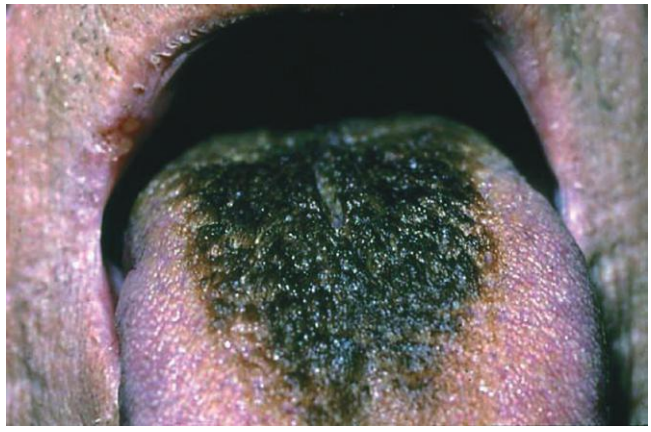


Figure 3.47 Black hairy tongue of the dorsal surface.

5. **Hairy tongue** (Fig. 3.47)
   - *Site*—tongue dorsum, midline just anterior to the circumvallate papilla; usually spares anterior and lateral borders although entire dorsum can at times be involved.
   - *Morphology*—thick, matted macule and slightly elevated plaque.
   - *Color*—brown to yellow to black.
   - *Signs and symptoms*—numerous, hairlike, elongated filiform papillae with growth of pigment-producing bacteria or staining from tobacco and food. Hairy tongue is usually asymptomatic, although patients can complain of a gagging sensation or a bad taste in their mouth.
   - *Treatment*—clinical diagnosis with no biopsy needed. Possible predisposing factors such as heavy smoking and general debilitation should be eliminated and excellent oral hygiene maintained, including periodic scraping of the hyperkeratotic papillae and surface debris.
6. **Melanotic macule** (focal melanosis) (Fig. 3.48a,b)
   - *Site*—most common on lower lip; any oral mucosal site is possible.
   - *Morphology*—macule.
   - *Color*—brown.
   - *Signs and symptoms*—asymptomatic.
   - *Treatment*—excisional biopsy to rule out melanoma.
7. **Drug ingestion** (Fig. 3.49)
   - *Site*—facial skin; facial attached gingiva, hard palate, lips, tongue, and buccal mucosa; any other oral site also. Site(s) is dependent on the medication used.
   - *Morphology*—macule.
   - *Color*—diffuse brown to muddy brown to blue-gray to gray to blue-black.
   - *Signs and symptoms*—single or multiple lesions; more common in women. Discoloration may be a result of the pigment from the drug or its metabolites deposited in the tissue.

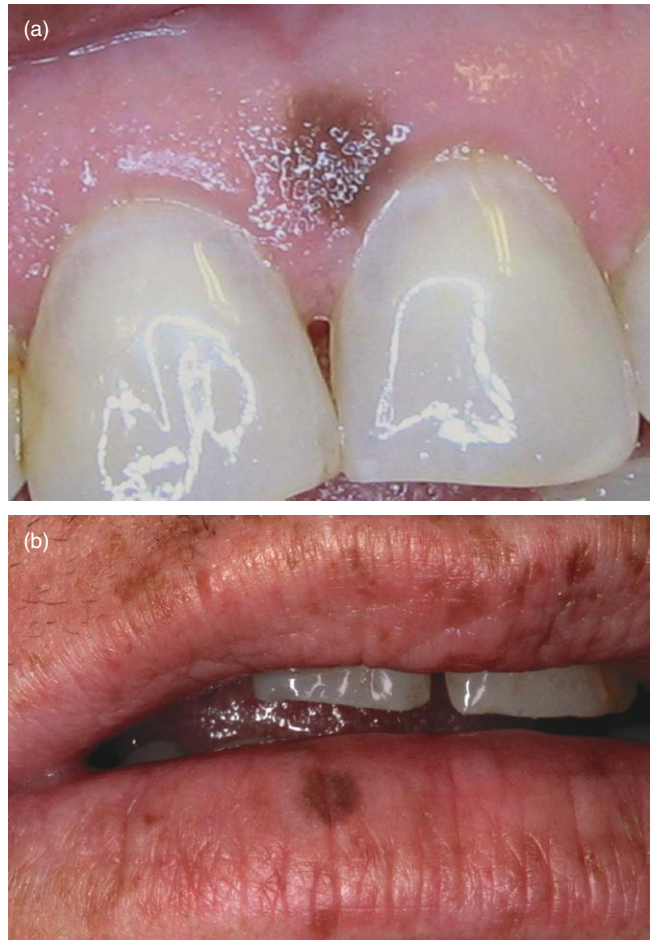


Figure 3.48 (a) A melanotic macule (focal melanosis) of the maxillary anterior attached gingiva. (b) A labial melanotic macule of the right lower lip.

- *Treatment*—causes no long-term problems. Discontinuation of the medications results in gradual fading of the discoloration.

8. **Smoker's melanosis** (Fig. 3.50)
   - *Site*—anterior facial gingiva most often; any other oral site.
   - *Morphology*—macule.
   - *Color*—brown.
   - *Signs and symptoms*—increased pigmentation during first year of smoking; occurs more often in women.
   - *Treatment*—a clinical diagnosis and cessation of smoking results in its gradual disappearance. If an unexpected site is involved, such as the hard palate, or if an unusual clinical change is observed (e.g., enlargement, increased density, surface elevation), then biopsy is indicated.

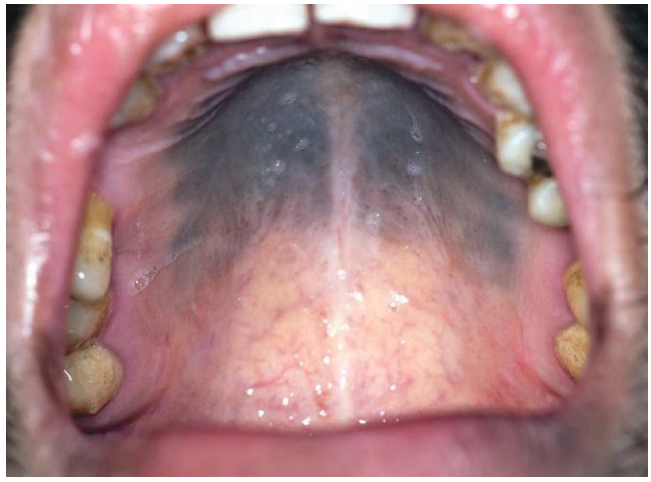


Figure 3.49 Palatal pigmentation secondary to chronic myeloid leukemia treated by protein kinase inhibitor systemic imatinib.

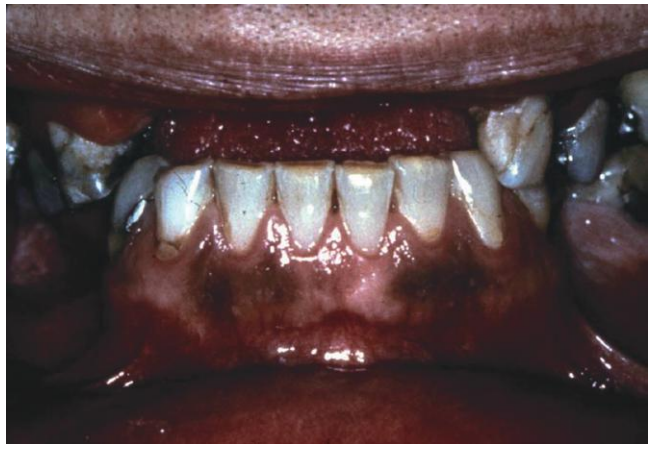


Figure 3.50 Smoker's melanosis of the anterior facial mandibular gingiva.

9. Oral manifestation of HIV infection

- *Site*—skin, nails, and oral mucosa.
- *Morphology*—macule.
- *Color*—brown.
- *Signs and symptoms*—similar to focal melanosis. Several AIDS medications can cause pigmentation; also, adrenocortical destruction from infections (such as tuberculosis) can result in Addisonian pigmentation (destruction of adrenal medulla of Addison's disease, an adrenal cortical insufficiency).
- *Treatment*—biopsy to confirm benign nature.

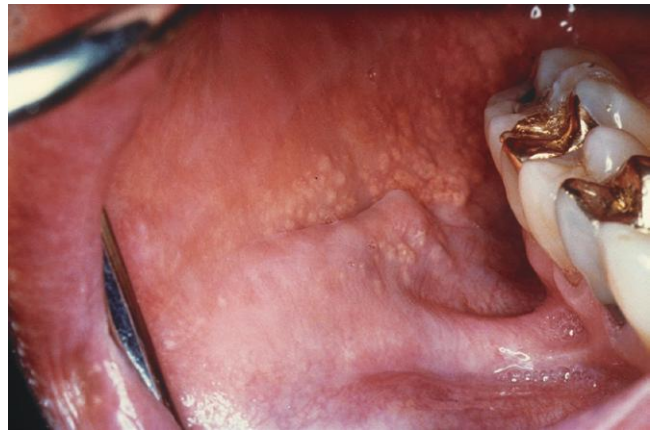


Figure 3.51 Fordyce granules of the buccal mucosa.

Yellow Lesions

1. **Fordyce granules** (Fig. 3.51)
   - *Site*—buccal mucosa and labial mucosa.
   - *Morphology*—papules and plaques (coalescing papules).
   - *Color*—yellow.
   - *Signs and symptoms*—clinical diagnosis; asymptomatic.
   - *Treatment*—none; variation of normal (ectopic sebaceous glands).
2. **Abscess** (parulis; gum boil) (Fig. 3.52a,b)
   - *Site*—attached gingiva; more often on the facial than lingual surface except mandibular molars, maxillary lateral incisors, and palatal roots of maxillary molars.
   - *Morphology*—pustule.
   - *Color*—yellow; red if not pus-filled.
   - *Signs and symptoms*—usually due to either a periodontal infection or a periapical infection. If yellow, due to accumulation of large collection of neutrophils besides vascular granulation tissue; asymptomatic if drainage is achieved. If there is blockage at the drainage site, then increased swelling and pain will ensue; if systemic advancement, then fever, lymphadenopathy, and malaise are seen.
   - *Treatment*—drainage and elimination of the source of infection. When more than localized, incisional drainage of the swelling should also be considered. NSAIDs may be given but antibiotic coverage reserved for medically compromised patients and for patients with cellulitis or systemic dissemination.
3. **Accessory lymphoid aggregate** (reactive hyperplasia) (Fig 3.53 and Fig. 3.54)
   - *Site*—posterior lateral and ventral tongue, buccal mucosa, floor of mouth, soft and hard palate, and oropharyngeal wall.
   - *Morphology*—papule, nodule.

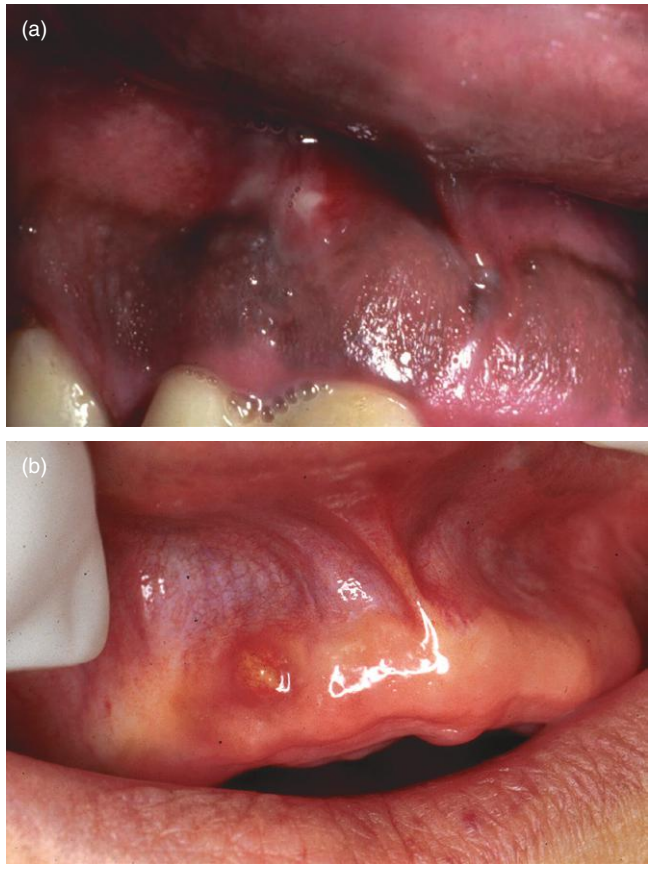


Figure 3.52 (a) A yellow parulis (gum boil) associated with the fistula of a nonvital tooth. (b) A red-yellow parulis (gum boil) due to lessened neutrophilic component following tooth extraction.

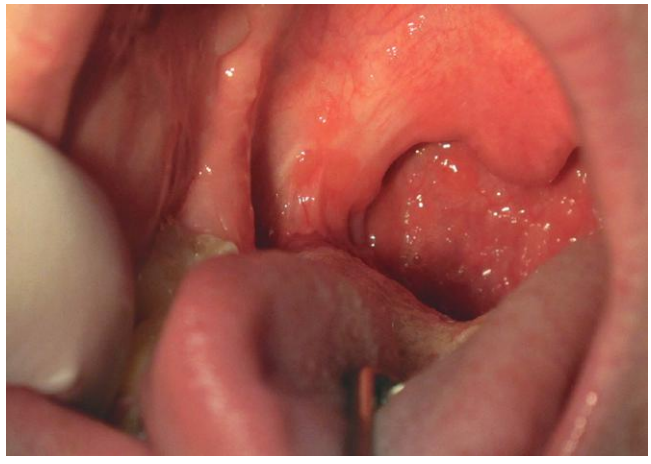


Figure 3.53 Accessory lymphoid hyperplasia aggregates of the oropharynx.

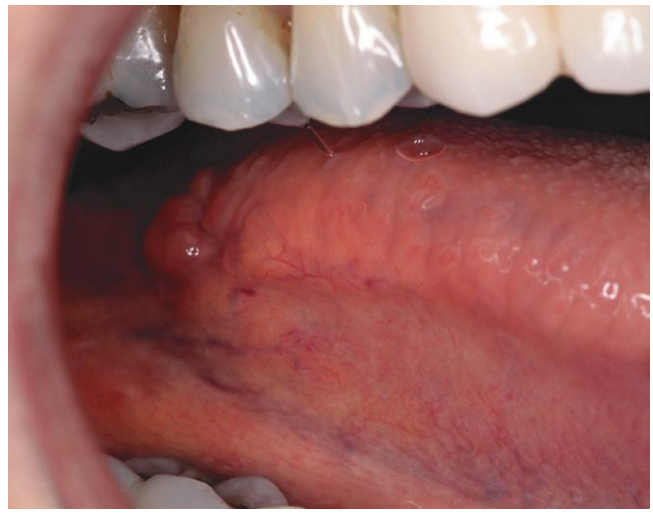


Figure 3.54 Accessory lymphoid hyperplasia aggregates of the posterior lateral tongue (i.e., lingual tonsil).

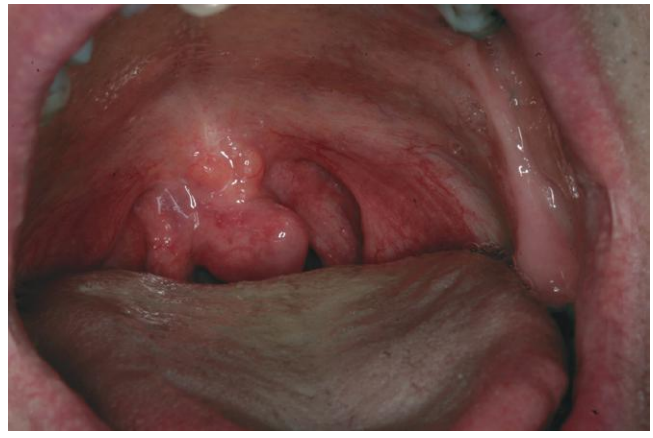


Figure 3.55 Oral lymphoepithelial cyst of the soft palate.

- *Color*—creamy yellow-orange (more superficial location) to deep pink (deeper location).
- *Signs and symptoms*—discrete, nontender, submucosal swellings usually less than 1 cm in diameter. On the tongue distribution is often bilateral and symmetrical; buccal lymph node can cause swelling to appear on buccal mucosa.
- *Treatment*—usually can be clinically diagnosed. However, posterior hard palate swelling should be removed for prosthesis or to rule out salivary gland tumor or extranodal non-Hodgkin's lymphoma.

4. **Lymphoepithelial cyst** (Fig. 3.55)
   - *Site*—floor of mouth, posterior or lateral tongue, soft palate, palatine tonsil area.
   - *Morphology*—vesicle, bulla; papule, nodule.

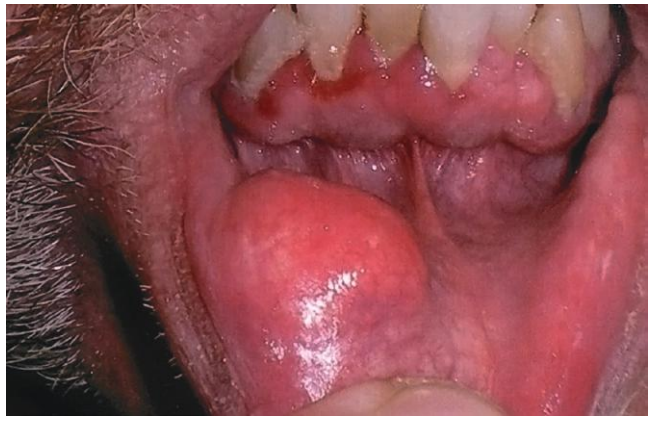


Figure 3.56 Lipoma of the right lower labial mucosa.

- *Color*—white to yellow to yellow-pink.
- *Signs and symptoms*—similar to reactive lymphoid hyperplasia with an epithelial lined cyst within the lymphoid aggregate; asymptomatic usually; however, pain secondary to trauma can occur; firm or soft to palpation; seen most often in young adults.
- *Treatment*—simple surgical excision.

5. **Lipoma** (Fig. 3.56)
   - *Site*—buccal mucosa, buccal vestibule; tongue, floor of mouth, and lips also.
   - *Morphology*—papule, nodule with smooth surface.
   - *Color*—yellow to pink.
   - *Signs and symptoms*—asymptomatic; soft to palpation; uncommon in children, most common in middle age and older; on the buccal mucosa can be confused with a herniated buccal fat pad.
   - *Treatment*—conservative local excision.

Acute Ulcerations (Erosions) and Vesicles

1. **Traumatic ulcer** (Fig. 3.57a,b)
   - *Site*—buccal mucosa, tongue, lips most common; any other mucosal site.
   - *Morphology*—ulcer or shallower erosion.
   - *Color*—yellow to gray center.
   - *Signs and symptoms*—mild to moderate pain; history of local trauma.
   - *Treatment*—should heal in 7–10 days in an immunocompetent person except for the special variant known as **t**raumatic **u**lcerative **g**ranuloma with **s**tromal **e**osinophilia (TUGSE; see "Chronic Ulcers (Erosions) and Vesicles," number 5).
2. **Minor and major recurrent aphthous stomatitis** (also called canker sores) (Fig. 3.58a,b,c)

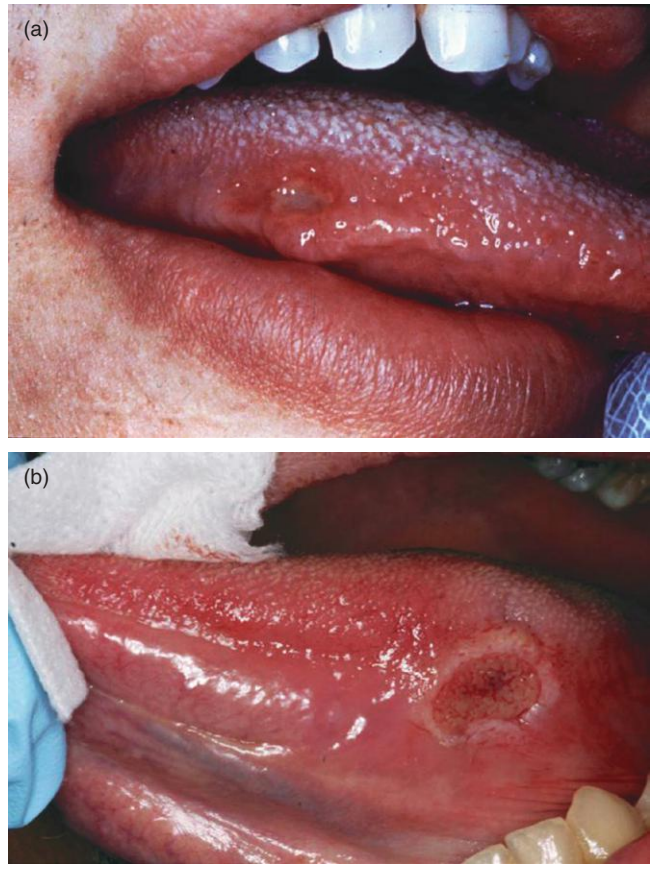


Figure 3.57 (a) A slow-to-heal traumatic ulcerative granuloma with stromal eosinophilia of the lateral tongue. (b) A nonspecific traumatic ulceration of the lateral tongue.

- *Site*—movable mucosa (i.e., minor type occurs on buccal mucosa and labial mucosa most often; major type occurs on soft palate, tonsillar pillars, and labial mucosa most often); also seen in vestibule, lateroventral tongue, floor of mouth, and oropharynx.
- *Morphology*—minor type forms shallow, small (0.3–1 cm diameter) ulcer; major type forms deep, larger (>1 cm diameter) ulcer.
- *Color*—yellow/gray/white center with red periphery.
- *Signs and symptoms*—about 25% of the population affected. Cause is unknown; mild prodrome of dysthesia/burning; very sharp pain. Canker sores often first appear in children and adolescents; they are slightly more common in females. Etiology is an immune system temporary dysfunction, not infectious etiology. Minor type is by far the most common type.
- *Treatment*—minor type resolves in 7–10 days; major type resolves in 4–6 weeks with scarring. Topical or systemic corticosteroids are often helpful for

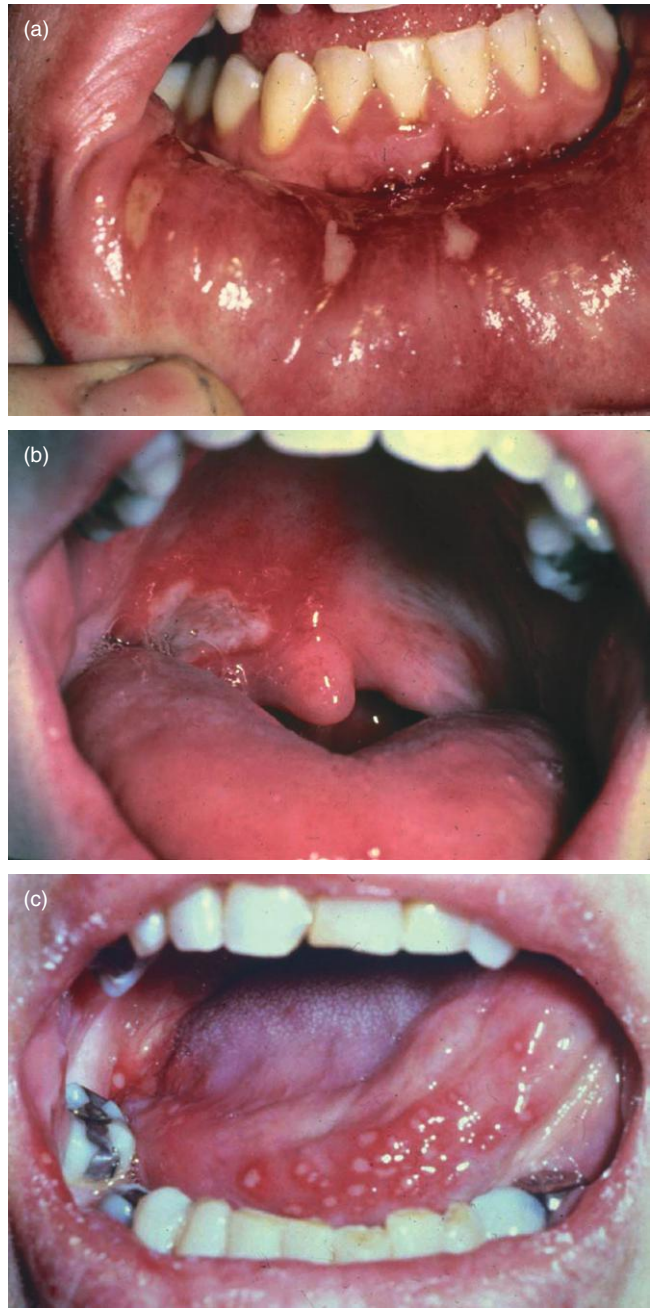


Figure 3.58 (a) A minor aphthous ulcer of the lower labial mucosa (movable mucosa site). (b) A major aphthous ulcer of the soft palate (deeper and larger than the minor type). (c) Herpetiform aphthous ulcers of the tongue.

patients who suffer from frequent bouts. Numerous over-the-counter topical medicaments are available for temporary palliative relief.

Note: A rare third type, herpetiform, has the greatest number of lesions at one time. Any oral site can be affected with similar morphology and color. Each of the 10–30 very painful, coalescing, shallow ulcers are 0.1–0.3 cm in diameter. Topical steroids are the indicated treatment. Diagnosis of aphthae is based on clinical presentation and the absence of ulcerations at other sites. Numerous systemic diseases (e.g., Behcet's disease, celiac disease, cyclic neutropenia, and nutritional deficiency disorders) can have aphthouslike ulcers with identical clinical features. In Behcet's disease, the classic triad distribution of lesions involves the mucosa of the eyes, mouth, and genitalia.

3. **Primary herpes simplex infection** (herpes simplex type 1) (Fig. 3.59a,b)
   - *Site*—all oral and oropharyngeal sites, including lip vermilion; gingiva is always affected as erythematous swelling (i.e., herpetic gingivostomatitis).
   - *Morphology*—a crop or cluster of vesicles that rapidly de-roof into shallow, multiple coalescing ulcers.
   - *Color*—red, clear/white (vesicles); yellow/gray/white center and red periphery (ulcer).
   - *Signs and symptoms*—preceded by prodromal symptoms of tingling, burning, mild pain at site of viral enanthem. Rare to have full-blown, abrupt onset of clinical manifestations of chills, fever, malaise, nausea, cervical lymphadenopathy, and gingivostomatitis. Ulcers are very painful. Transmission is through saliva or active lesions. Herpes simplex type 1 and type 2 (genital) are similar but have antigenic differences; the latter is transmitted through sexual contact; clinical lesions look identical and either type can occur in either location.
   - *Treatment*—supportive local analgesics, antipyretics, and force fluids. Within the first 48–72 hours of outbreak, systemic antiviral medications (e.g., acyclovir, valacyclovir, famciclovir) can be helpful in reducing discomfort and duration of painful ulcers.
4. **Recurrent herpes simplex infection labialis** (also called fever blister, cold sore) or intraoral (Fig. 3.60a,b,c)
   - *Site*—lip vermilion and nonmovable mucosa of the hard palate, especially, and attached gingiva in immunocompetent patients. In immunocompromised patients any site can be involved. Lesions can also involve perioral skin (nose, cheek, chin).
   - *Morphology*—a crop or cluster of papules that become vesicles that rapidly de-roof into shallow, multiple coalescing ulcers.
   - *Color*—red, clear/white (vesicles); yellow/gray/white center and red periphery (ulcer).
   - *Signs and symptoms*—all ages with a preceding initial herpes simplex infection; usually subclinical; pain, preceded by prodromal symptoms of tingling, burning, mild pain at site of viral enanthem. Trigger factors include excessive sunlight, anxiety, lack of sleep, hormonal levels, and decreased immune status.

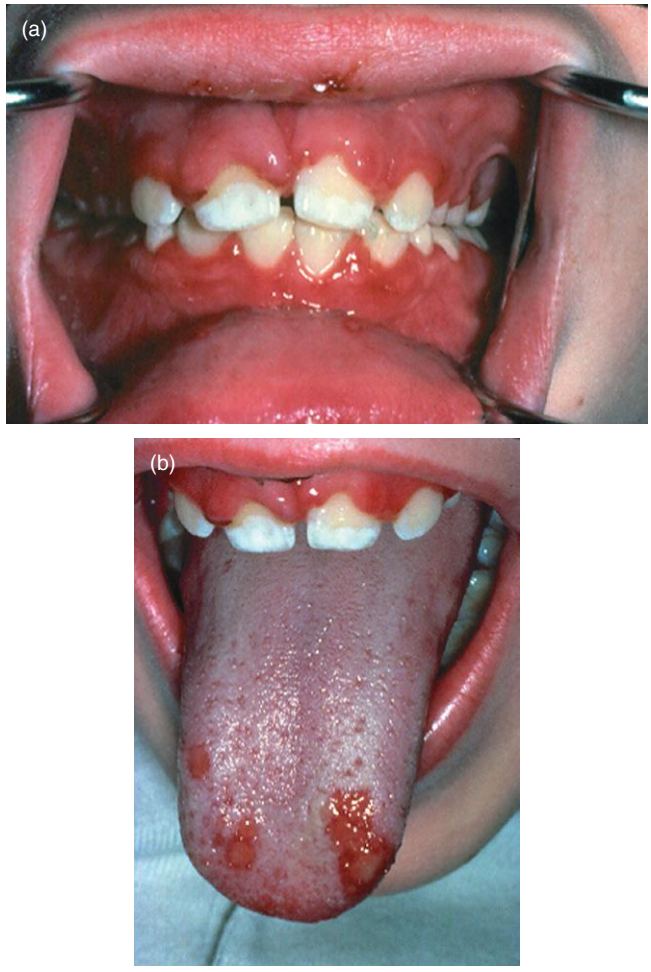


Figure 3.59 (a) A patient with symptomatic primary herpetic gingivostomatitis. (b) A patient with primary herpetic gingivostomatitis demonstrating vesicles and shallow ulcerations on both movable and nonmovable mucosa.

- *Treatment*—within the first 48–72 hours of outbreak, topical or systemic antiviral medications (e.g., acyclovir, valacyclovir, famciclovir) can be helpful in reducing discomfort and duration of painful ulcers. Generally speaking a systemic form will be more efficacious than a topical one. Over-the-counter medicaments such as Abreva have also been reported to be of benefit for lip vermilion (fever blister, cold sore).

5. **Acute necrotizing ulcerative gingivitis** (ANUG; Fig. 3.61)
   - *Site*—attached gingiva beginning at interdental papilla.
   - *Morphology*—edematous papule that becomes an ulcer.
   - *Color*—red with yellow/gray (pseudomembrane).

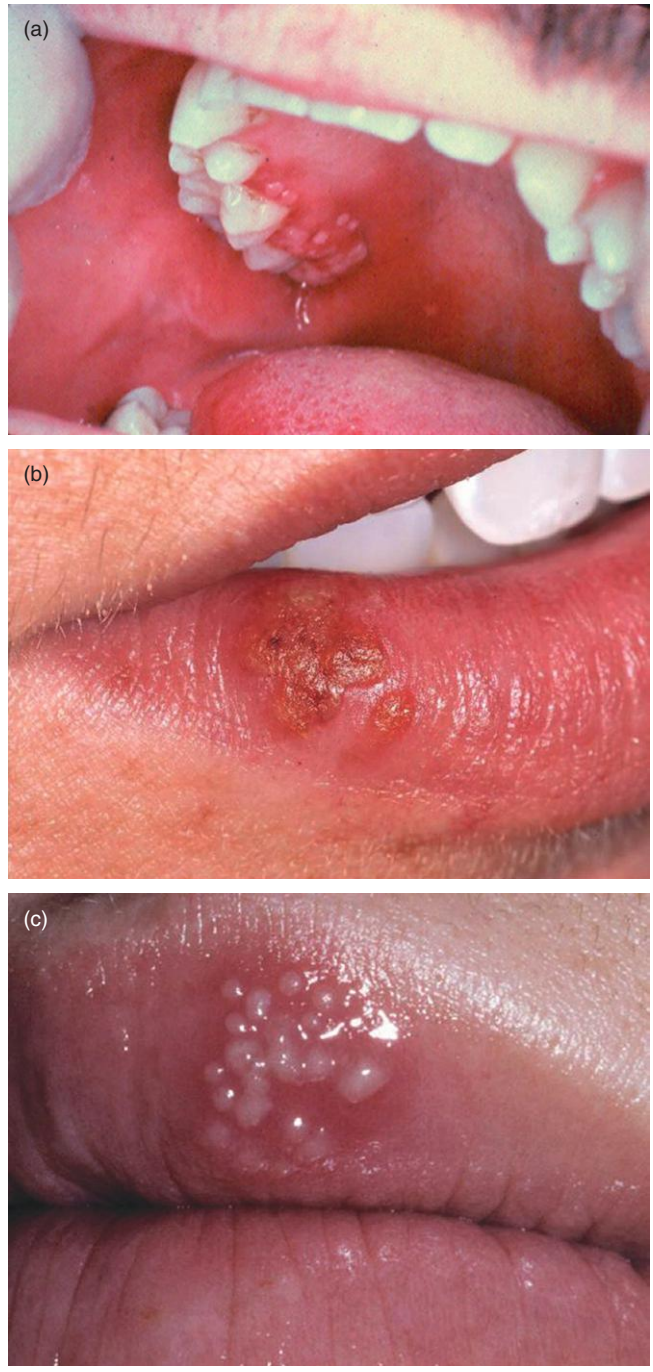


Figure 3.60 (a) Recurrent herpes simplex infection of the hard palate. (b) Recurrent herpes labialis of the lower vermilion border. (c) Recurrent herpes labialis of the upper vermilion border demonstrating intact and ruptured vesicles.

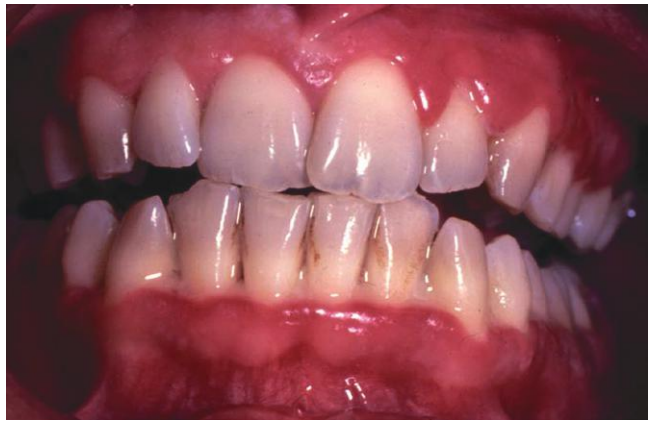


Figure 3.61 Acute necrotizing ulcerative gingivitis with punched-out, necrotic interdental papillae.

- *Signs and symptoms*—most often in teenagers and young adults; fetid odor (very bad halitosis); very painful ulcers; swollen and reddened gingiva. ANUG is triggered by poor sleep and lack of adequate nutrition as well as poor oral hygiene with onset of an opportunistic, commensal infection by fusospirochetal organisms.
- *Treatment*—debridement with systemic antibiotic and chlorhexidine oral rinse followed by thorough dental prophylaxis.

6. **Allergic reactions** (stomatitis venenata; stomatitis medicamentosa) (Fig. 3.62a,b,c,d)
   - *Site*—most common on lateral tongue and buccal mucosa; any other oral site.
   - *Morphology*—vesicles rupture followed by erosions and ulcerations.
   - *Color*—red and white.
   - *Signs and symptoms*—occurs more often in females; can be caused by topical medicaments and foods, food additives, chewing gums, candies, dentifrices, and mouthwashes as well as contact with various dental materials (e.g., rubber dam, gloves). Within 30 minutes variable intensity of erythema is present and burning sensation is most common; also itching, stinging, tingling, and edema may be noted.
   - *Treatment*—removal of suspected allergen. In more severe cases antihistamine combined with topical anesthetic can be helpful. Sometimes if the allergen cannot be determined, then cutaneous patch testing may be helpful.
7. **Erythema multiforme** (EM; Fig. 3.63a,b,c)
   - *Site*—skin and all oral mucosal sites (although rare on gingiva and hard palate).
   - *Morphology*—multiple red patches that evolve into bullae that undergo necrosis into large, shallow erosions and ulcers with irregular borders and slough; on lips, hemorrhagic crusts; may have cutaneous "target lesions" that are flat, round, concentric dusky-red rings that become elevated into

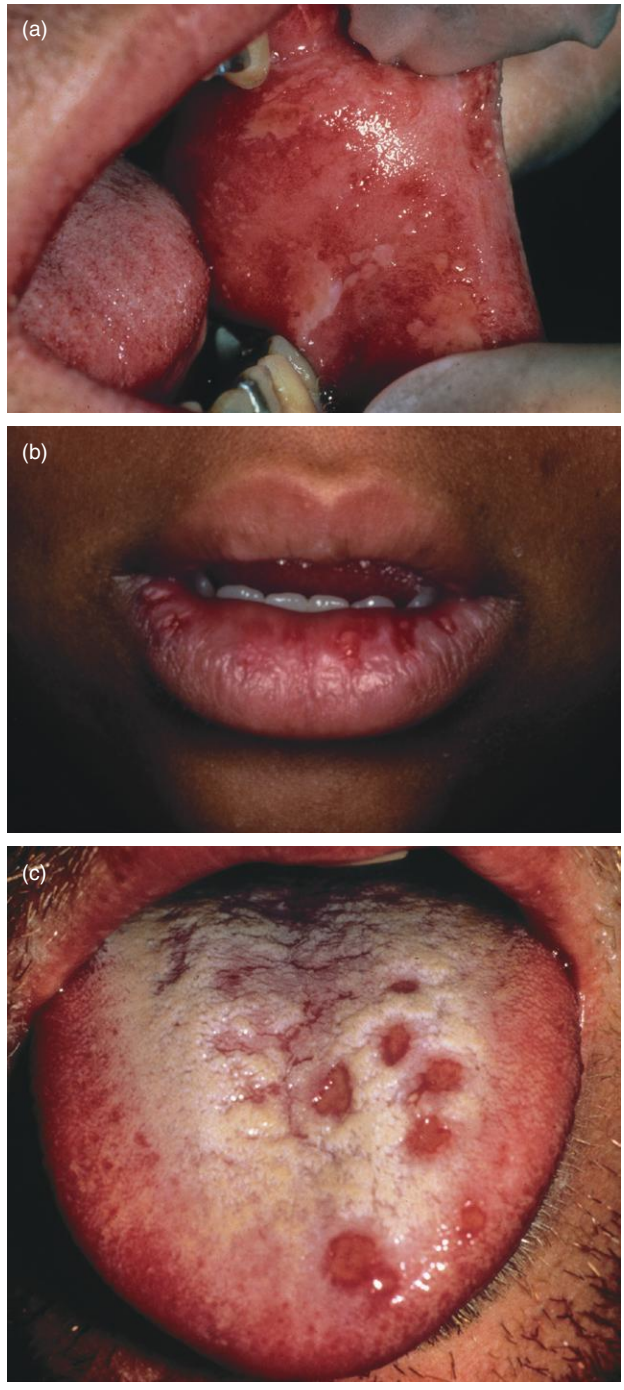


Figure 3.62 (a) An ulcerative allergic reaction of the buccal mucosa. (b) A vesiculoulcerative allergic reaction of the lower lip. (c) A cluster of dorsal tongue ulcerations due to an allergic reaction (stomatitis medicamentosa). (d) A facial rash secondary to a latex allergy from a clinician's glove.

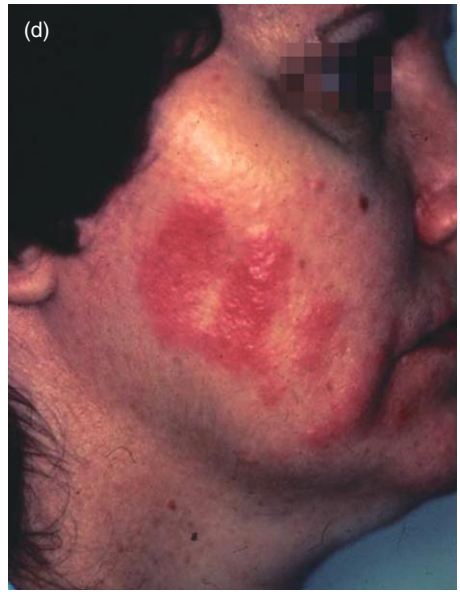


Figure 3.62 (Continued)

bullae with necrotic centers. If it is severe EM major form (Stevens–Johnson syndrome), then there is also ocular and genital involvement.

- *Color*—red.
- *Signs and symptoms*—probably immune-mediated derangement often preceded by herpes simplex infection, *Mycoplasma pneumoniae*, or a variety of medications or drugs; occurs predominantly in children and young adults (more in males); very explosive onset after prodrome of fever, malaise, headache, cough, and sore throat; usually self-limiting (2–6 weeks) but can be life-threatening.
- *Treatment*—usually self-limiting with no treatment needed except supportive therapy for dehydration and pain. Causative agent should be identified and eliminated, if possible. Often acylovir is prescribed because of the likely herpes infection trigger. In advanced cases, topical or systemic steroid is sometimes used.

8. **Herpangina** (Fig. 3.64)
   - *Site*—soft palate and tonsillar pillars only.
   - *Morphology*—multiple, small (2–4 mm) macules then vesicles then ulcers.
   - *Color*—red (macules) and clear to yellow (vesicles).
   - *Signs and symptoms*—caused by an enterovirus (coxsackie) especially common in children; subclinical to mild pain, usually. Herpangina can have acute onset of sore throat, dysphagia, fever, and sometimes also cough, rhinorrhea, anorexia, vomiting, diarrhea, myalgia, and headache.
   - *Treatment*—self-limiting, spontaneous healing of ulcers in 7–10 days.

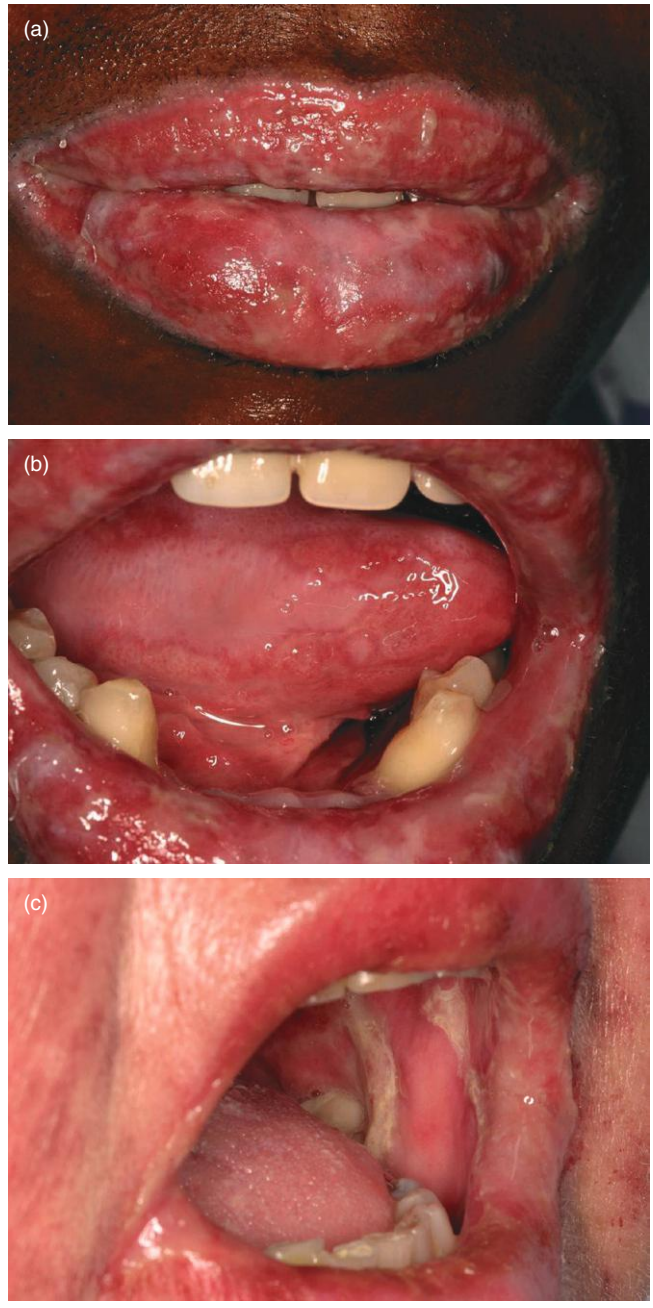


Figure 3.63 (a) An erythema multiforme patient with ulcers, hemorrhage, and crusts of the upper and lower lips. (b) Same patient as (a), with intraoral vesicles, erosions, and ulcerations. (c) Intraoral ulcerative lesions of erythema multiforme.

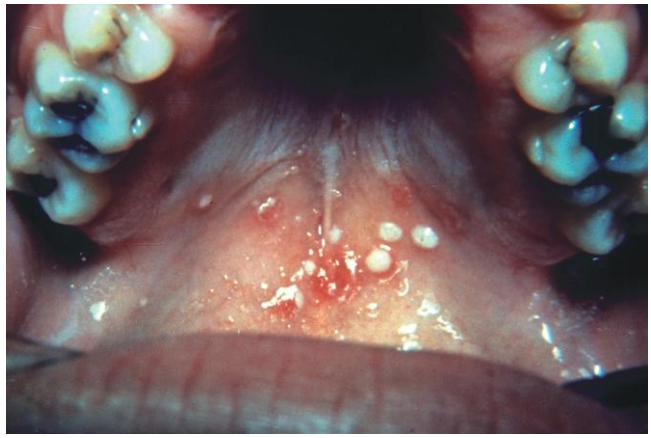


Figure 3.64 Herpangina vesicles and ulcers confined to the oropharynx.

9. **Varicella** (chicken pox) (Fig. 3.65a,b,c)
   - *Site*—lip vermilion and hard palate most often, then buccal mucosa; rarely gingiva; usually relatively painless.
   - *Morphology*—oral: several opaque vesicles that rupture into small ulcers.
   - *Color*—white.
   - *Signs and symptoms*—usually in children. Varicella begins with malaise, pharyngitis, rhinitis, and then often headache, myalgia, nausea, anorexia, and vomiting; then intensely pruritic skin rash (exanthem of multiple crops of erythema, vesicles, and ulcers), often accompanied by a fever; sometimes there is a painless preceding and variable oral involvement (i.e., enanthem) depending on the severity of the infection.
   - *Treatment*—antiviral medications in patient older than 13 years or infected family members; acetaminophen antipyretic; for cutaneous lesions, calamine lotion and diphenhydramine for pruritus relief. Live attenuated vaccine is now available.
10. **Herpes zoster** ("shingles") (Fig. 3.66a,b)
   - *Site*—skin, oral mucosa, ocular mucosa.
   - *Morphology*—depends on location:
     - *Exanthem*—vesicles on erythematous base followed by pustules and ulcers with crusting in 7–10 days (terminate at sensory nerve endings midline)
     - *Oral movable or nonmovable mucosa*—opaque vesicles to the midline that rupture into shallow ulcerations
   - *Color*—white.
   - *Signs and symptoms*—usually occurs in middle-aged and older adults; reactivation of the virus that caused the previous varicella (chicken pox) infection; unilateral involvement (i.e., does not cross the midline) along a sensory nerve's distribution from a dorsal spinal ganglion; very painful exanthem

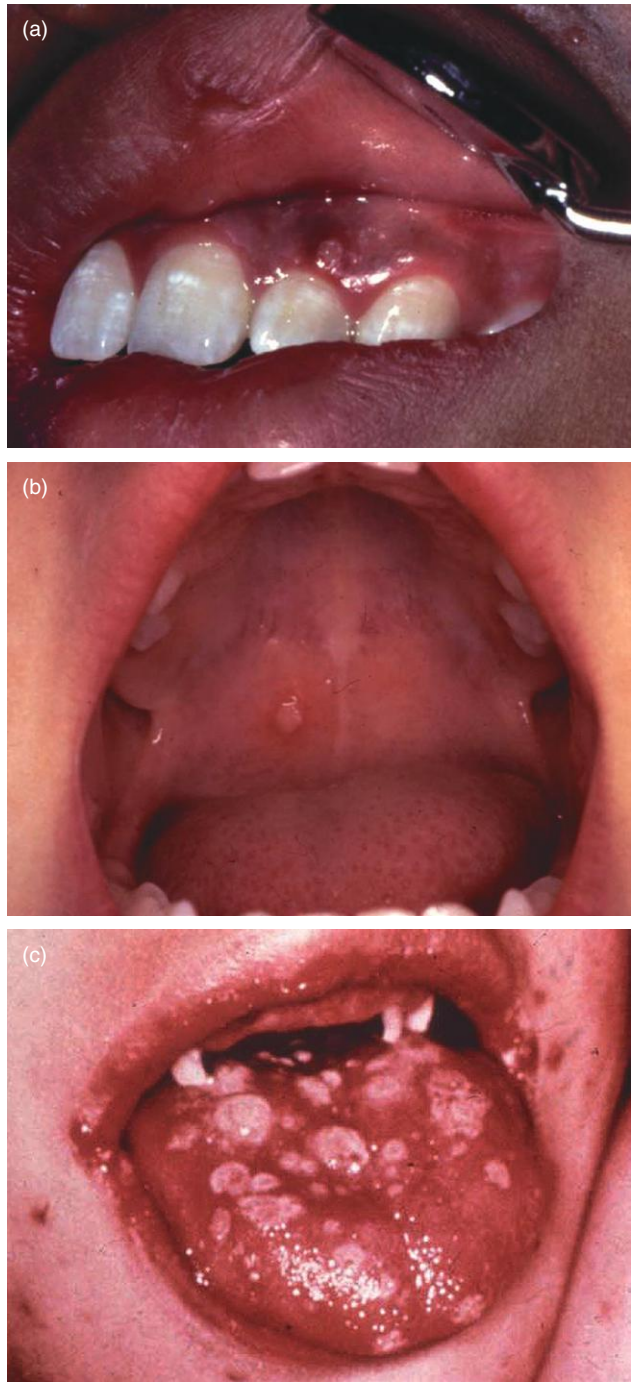


Figure 3.65 (a) Gingival vesicular-ulcerative enanthem prodrome of varicella (chicken pox). (b) Palatal vesicular prodrome of varicella (chicken pox). (c) Extensive vesicular-ulcerative prodromal outbreak of varicella (chicken pox).

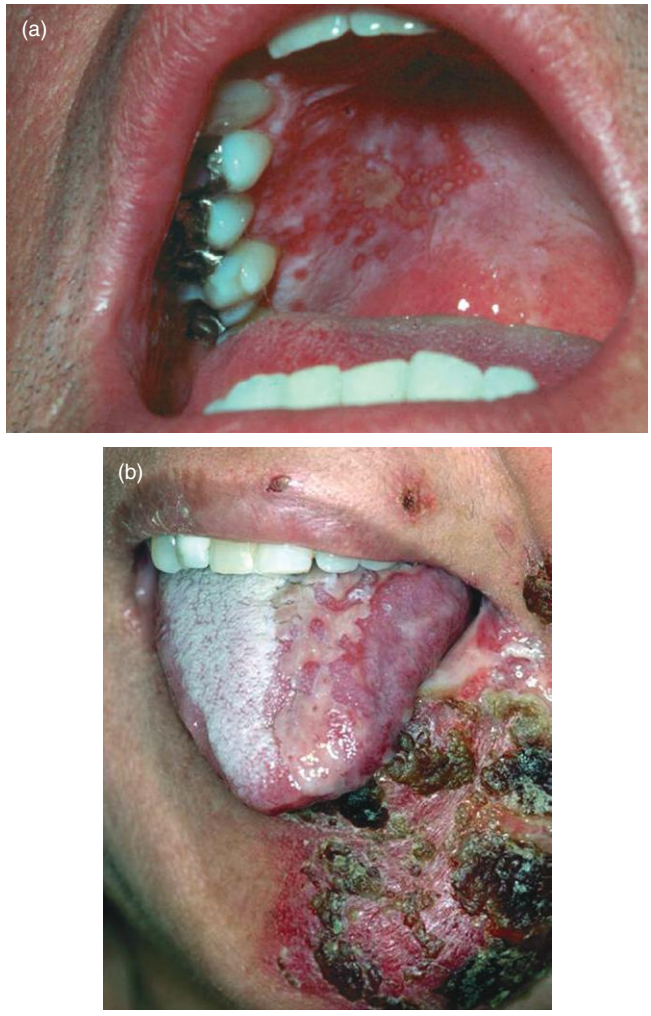


Figure 3.66 (a) Unilateral distribution on the hard palate of oral herpes zoster (shingles). (b) Unilateral distribution of cutaneous facial herpes zoster (shingles).

(in one or more dermatomes) preceded by intense pain described as burning, tingling, itching, boring, prickly, or knifelike.

- *Treatment*—antiviral medication given in first 24–48 hours; antipruritics, antipyretics, and analgesics. Live attenuated vaccine is available and recommended for those over age 60.

11. Necrotizing sialometaplasia (Fig. 3.67a,b,c)

- *Site*—posterior lateral hard palate (75%); other mucosal sites and major salivary glands.
- *Morphology*—slight swelling then deep craterlike ulceration; unilateral or bilateral.

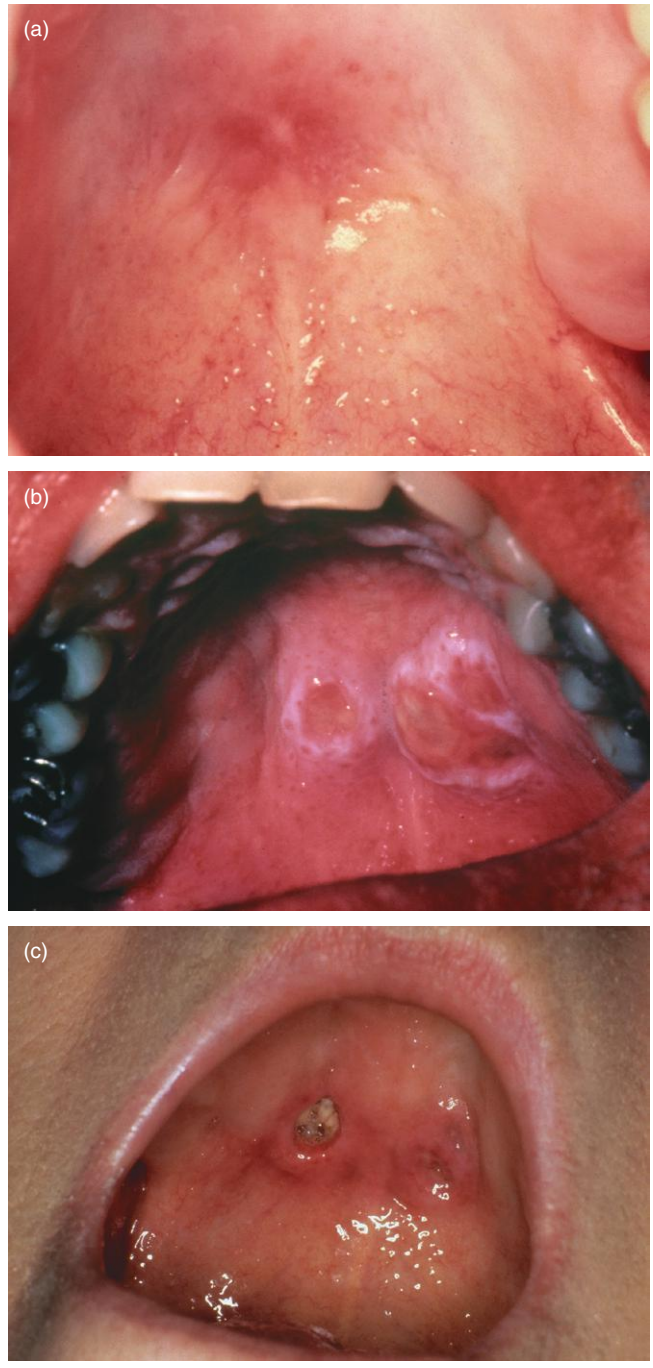


Figure 3.67 (a) Dusky red swelling of early onset of necrotizing sialometaplasia. (b) Rapidly appearing bilateral deep ulcerations of necrotizing sialometaplasia. (c) Bilateral necrotizing sialometaplasia ulcerations.

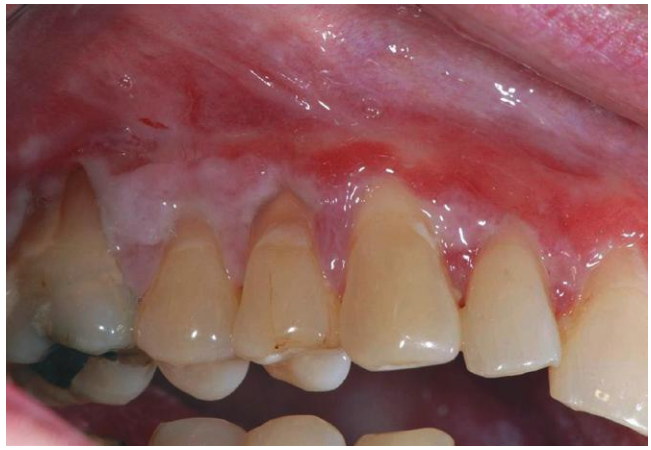


Figure 3.68 Extensive erosive lichen planus of the posterior maxillary gingiva.

- *Color*—erythema swelling followed by white/gray ulcer.
- *Signs and symptoms*—rapid onset of 2–3 weeks (thought to be ischemic event of unknown cause) with no pain or minimal pain most often; adults; occurs more in males. Onset triggers include trauma, dental local anesthetic injections, tumors, surgery, and ill-fitting dentures.
- *Treatment*—biopsy to confirm diagnosis and then self-resolving in 5–6 weeks.

Chronic Ulcers (Erosions) and Vesicles

1. **Erosive lichen planus** (Fig. 3.68)
   - *Site*—posterior buccal mucosa and gingiva most often; usually bilateral.
   - *Morphology*—peripheral multiple coalescing small papules (white striae) and atrophic mucosa (red) with central erosions and ulcerations.
   - *Color*—white and red.
   - *Signs and symptoms*—middle-aged and older adults. Ulcerative areas are painful.
   - *Treatment*—lacking erosions/ulcerations usually asymptomatic. Painful lesion is treated with topical or systemic corticosteroids as first-line choice for the immunologically mediated disease. Alternatives for refractory cases include topical retinoids, tacrolimus, and cyclosporine.
2. **Squamous cell carcinoma** (Fig. 3.69a,b,c)
   - *Site*—any mucosal site but most common on posterior lateral and ventral tongue, floor of mouth, and soft palate complex; also sun-exposed lower lip vermilion.
   - *Morphology*—usually ulcer with rolled, indurated border; rarely nodular papillary form or verrucous (small percentage due to smokeless tobacco use); typically preceded by leukoplakia, erythroplakia, or erythroleukoplakia.
   - *Color*—white and/or red.

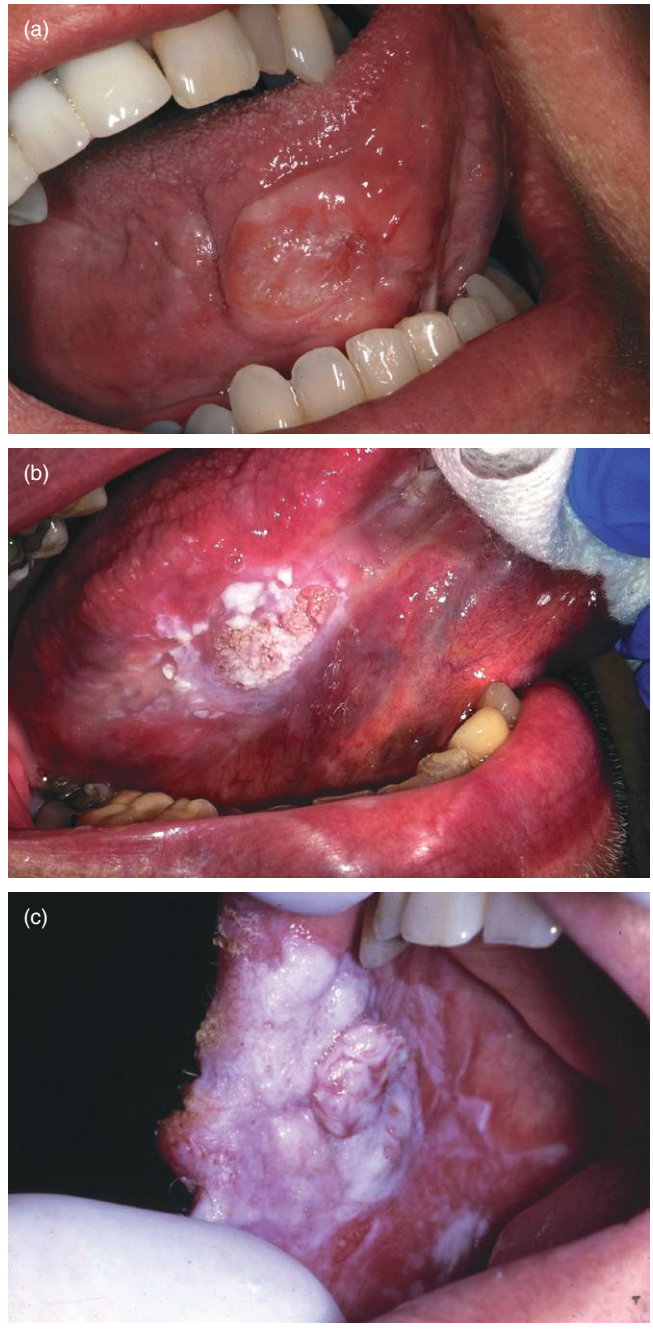


Figure 3.69 (a) Squamous cell carcinoma of the lateroventral tongue. (b) Leukoplakia of the right lateral tongue that upon biopsy was determined to have epithelial dysplasia and invasive squamous cell carcinoma. (c) Verrucous carcinoma of the right anterior buccal mucosa.

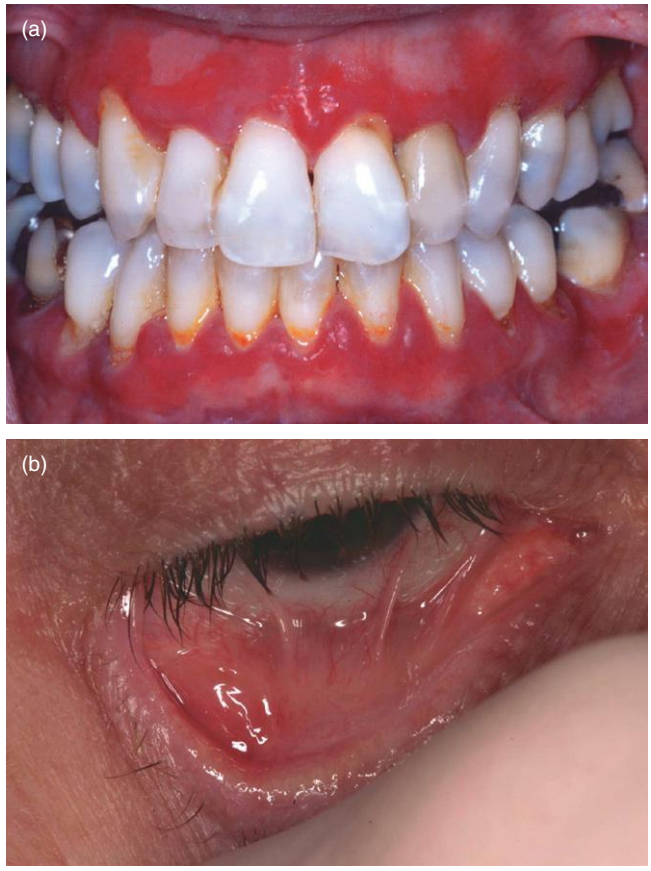


Figure 3.70 (a) Gingival vesicles, erosions, and ulcerations of oral mucous membrane pemphigoid. (b) Ocular involvement of mucous membrane pemphigoid resulting in scarring with symblepharon formation.

- *Signs and symptoms*—usually middle-aged and older adults; occurs more often in males; often painless until late stages.
- *Treatment*—surgical removal; adjunctive radiation and/or chemotherapy depending on staging, patient's age and health, and lesions' specific location.

3. **Mucous membrane pemphigoid** (Fig. 3.70a,b)
   - *Site*—most common on attached gingiva; all other oral mucosal sites also possible.
   - *Morphology*—vesicles and bulla that subsequently become erosions and ulcerations.
   - *Color*—red.
   - *Signs and symptoms*—most common in middle-aged and older adults; more common in females; painful; can also involve eye and genitals. There is a cutaneous type also.

- *Treatment*—topical and systemic corticosteroids are mainstay medications. Ophthalmic consultation to rule out eye involvement.

4. **Pemphigus vulgaris** (Fig. 3.71a,b,c,d)
   - *Site*—soft palate and tonsillar region common, as well as gingiva. Any other oral mucosal site can also be involved.
   - *Morphology*—thin-walled vesicles and bullae subsequently become erosions and ulcerations.
   - *Color*—red.
   - *Signs and symptoms*—usually in middle-aged and older patients; painful lesions. Oral lesions usually precede skin lesions.
   - *Treatment*—topical and systemic corticosteroids are mainstay treatment.
5. **Traumatic ulcerative granuloma with stromal eosinophilia** (TUGSE; eosinophilic ulcer; traumatic granuloma) (Fig. 3.72)
   - *Site*—tongue most common; any other oral site that can easily undergo deep trauma.
   - *Morphology*—deep ulceration (nonhealing).
   - *Color*—red with a yellow to gray center (fibrinopurulent membrane overlying the ulcer's bed).
   - *Signs and symptoms*—mild to moderate pain; history of local trauma.
   - *Treatment*—granulation tissue healing delayed weeks to months. Perform an incisional biopsy to confirm benign nature of nonhealing ulceration, which often then triggers resolution.
6. **Factitial ulcer** (Fig. 3.73)
   - *Site*—any oral cavity site; attached gingival and hard palate often involved.
   - *Morphology*—deep, irregular outline ulceration with smooth margins.
   - *Color*—yellow to gray center.
   - *Signs and symptoms*—mild to moderate pain; local trauma caused by patient usually with psychological overtones to achieve attention and social engagement; ulceration fails to heal indefinitely.
   - *Treatment*—incisional biopsy to confirm benign nature of nonhealing ulceration.

Lumps and Bumps

1. **Mucocele** (mucous extravasation phenomenon, mucous retention phenomenon) (Fig. 3.74)
   - See "Blue and/or Purple Lesions," number 3, for description and treatment.
2. **Fibroma** (fibrous nodule, irritation fibroma, traumatic fibroma, focal fibrous hyperplasia) (Fig. 3.75a,b,c)
   - *Site*—most commonly found on tongue, lip, buccal mucosa from accidental tooth biting; can occur on any other oral mucosal site secondary to trauma or irritation.
   - *Morphology*—papule or nodule; smooth surface; sessile or pedunculated.
   - *Color*—pink.
   - *Signs and symptoms*—painless; considered a reactive hyperplastic connective tissue growth rather than a true neoplasm; equal gender incidence and any age of occurrence.

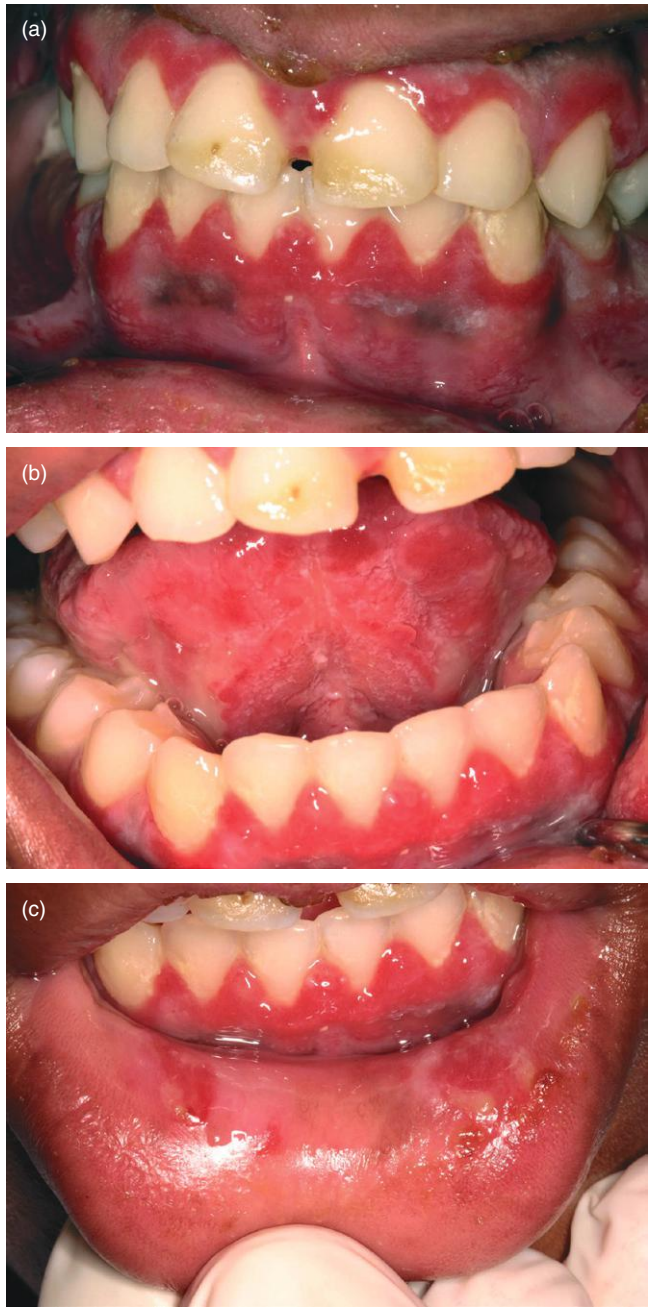


Figure 3.71 (a) Gingival erosions and ulcerations of pemphigus vulgaris. (b) Gingival and lingual involvement of pemphigus vulgaris. (c) Same patient as (b) with lower labial mucosal involvement also. (d) Extensive oral involvement of pemphigus vulgaris.

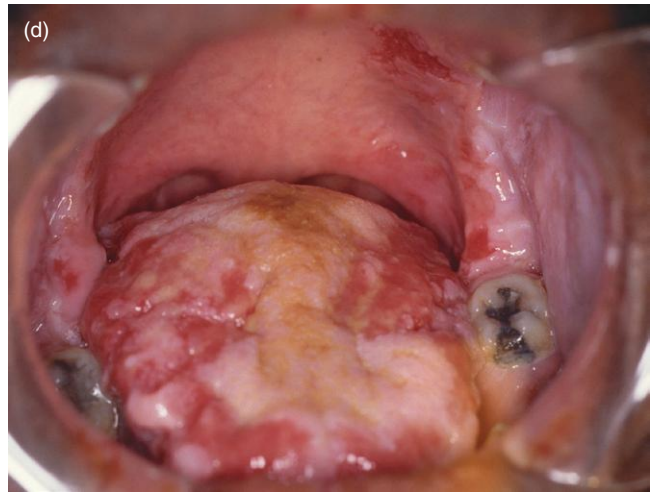


Figure 3.71 (Continued)

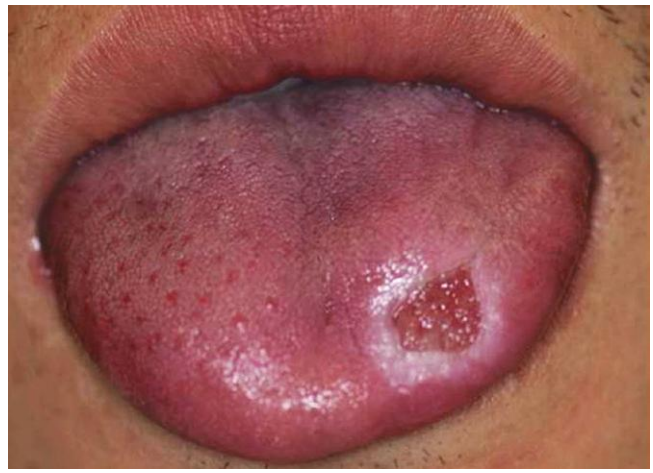


Figure 3.72 Traumatic ulcerative granuloma with stromal eosinophilia (TUGSE) of the tongue.

- *Treatment*—complete surgical excision for diagnosis with no recurrence expected.

3. **Salivary gland tumor** (Fig. 3.76a,b,c)
   - *Site*—major salivary glands (parotid > submandibular > sublingual); for oral minor salivary glands, posterior hard palate most common site; other possible sites, upper labial mucosa, retromolar pad, floor of mouth, and buccal mucosa; very rare on gingiva, tongue, and lower lip (mucoepidermoid carcinoma).

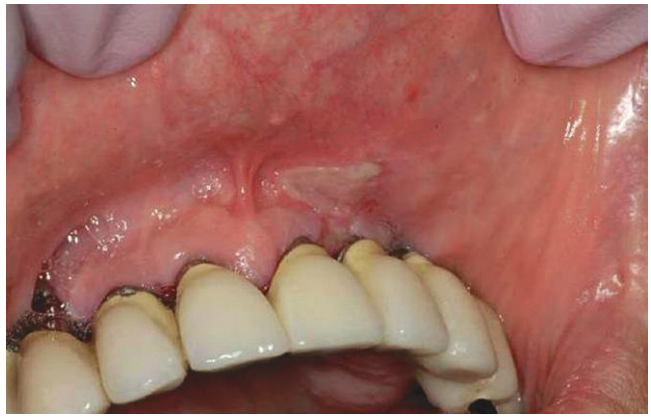


Figure 3.73 Self-inflicted (factitial) ulcer of the left anterior maxillary vestibule.

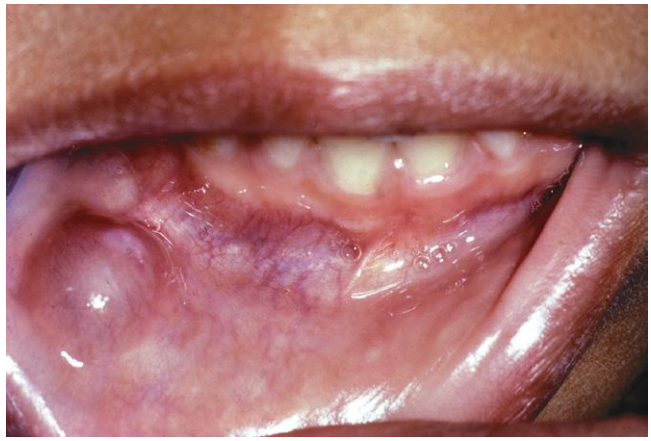


Figure 3.74 Traumatic bite of the lower lip resulting in a mucocele (mucous extravasation phenomenon).

- *Morphology*—papule, nodule, or tumor; smooth surface; sessile or pedunculated; may have secondary ulceration due to trauma or malignant transformation.
- *Color*—pink to blue.
- *Signs and symptoms*—painless or becomes painful. Rapid swelling, pain, and/or paresthesia indicate possible malignancy. The most common intraoral occurrences are pleomorphic adenoma and polymorphous low-grade adenocarcinoma (hard palate) and canalicular adenoma (upper lip); most common major glands are pleomorphic adenoma, Warthin's tumor, mucoepidermoid carcinoma, and adenoid cystic carcinoma.

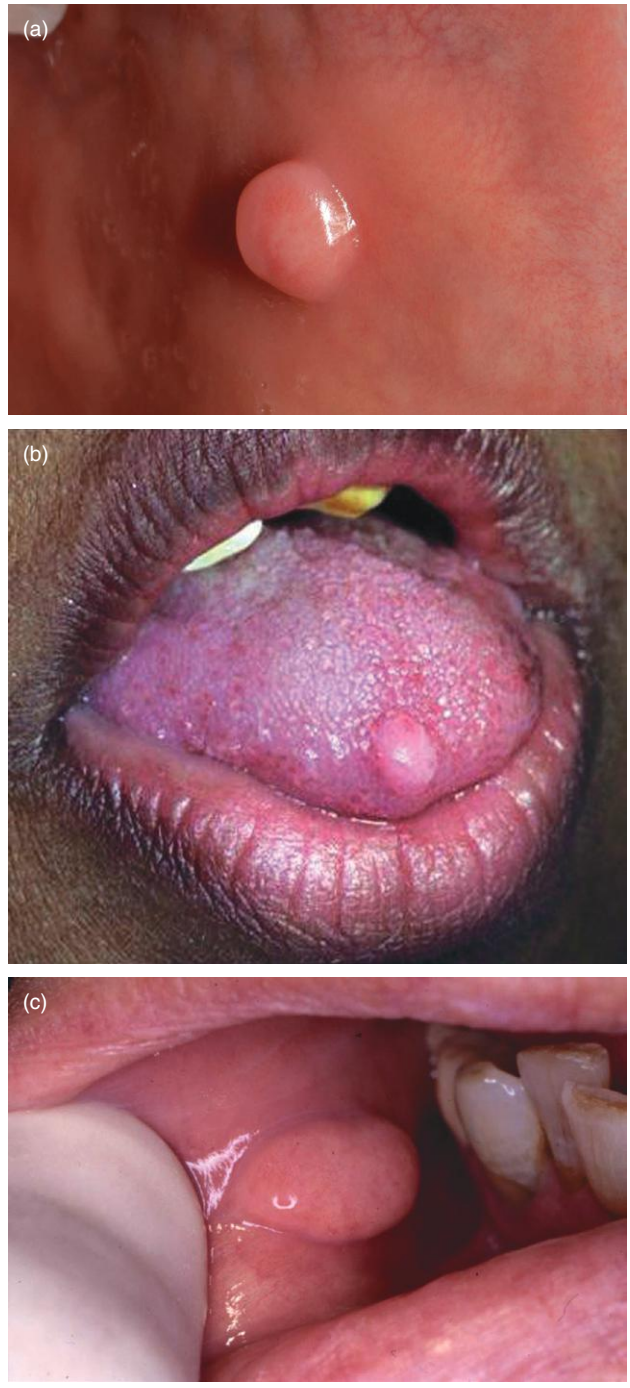


Figure 3.75 (a) Traumatic (irritation) fibroma of the buccal mucosa secondary to accidental biting. (b) Traumatic fibroma of the tip of the tongue secondary to biting. (c) Traumatic fibroma slightly inferior to the right occlusal plane of the buccal mucosa.

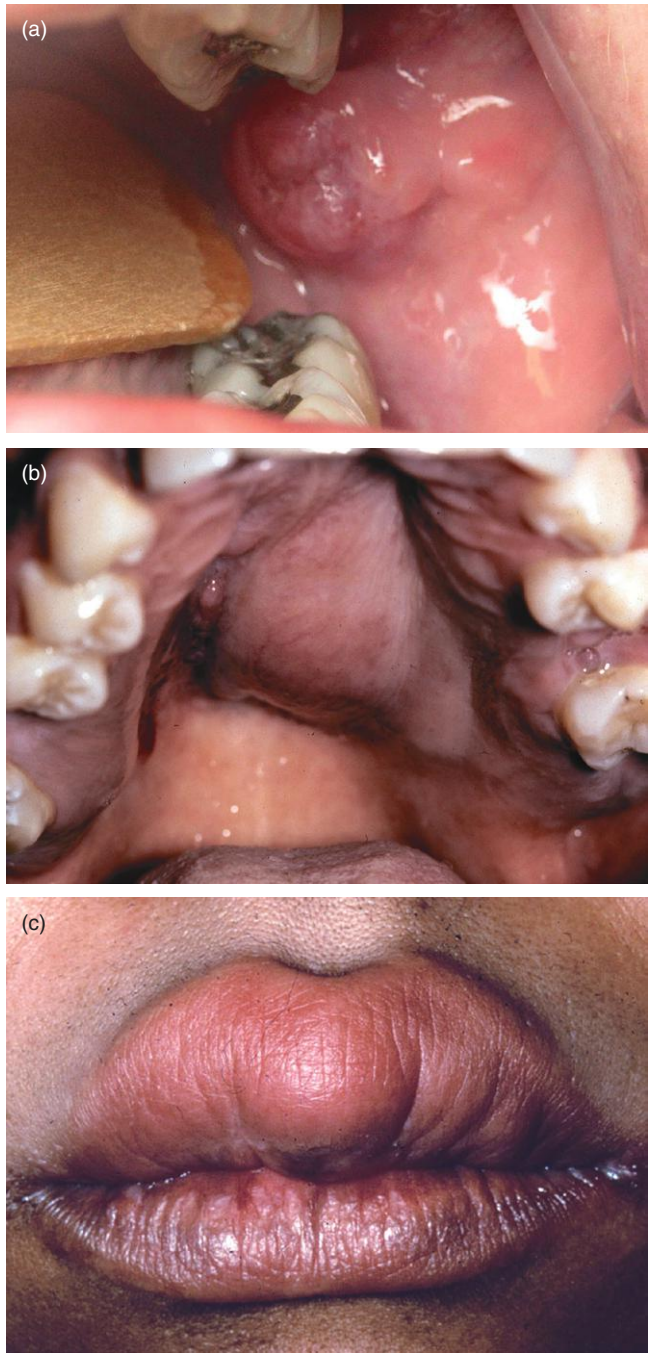


Figure 3.76 (a) Large, firm swelling of mucoepidermoid carcinoma of the buccal mucosa. (b) Large, unilateral, firm, and slightly tender posterior swelling of the hard palate near the junction with the soft palate diagnosed as adenoid cystic carcinoma. (c) Firm, mobile submucosal swelling of the upper lip's midline diagnosed as monomorphic adenoma (canalicular adenoma).

- *Treatment*—complete excision with conservative normal tissue margin for benign tumors and wider excision for malignant lesions.

4. **Sialolith, minor and major salivary glands** (Fig. 3.77a,b,c)
   - *Site*—floor of mouth (submandibular gland—Wharton's duct > sublingual gland); upper lip and buccal mucosa (parotid gland—Stensen's duct).
   - *Morphology*—small hard submucosal mass; sometimes palpable.
   - *Color*—pink to yellow-white.
   - *Signs and symptoms*—calcium salt deposition with nidus of debris, bacteria, and so on. Sialolith is usually painless but the patient can have sensation of fullness or tenderness, especially prior to eating (i.e., episodic); severity of swelling and/or pain depends on degree of obstruction. Secondary ascending acute sialadenitis may occur. Radiopaque mass is seen on radiographic image.
   - *Treatment*—removal of large stone by surgery; if small, sometimes it can be "milked" to extrude it through the duct's orifice. Lithotripsy has also been effective.
5. **Parulis** (gum boil; abscess) (Fig. 3.78)
   - *Site*—at terminus of a fistula that has perforated the cortical bone in the area of a nonvital tooth; facial usually, or lingual or palatal gingiva/alveolar mucosa most common site; also vestibule depending on tooth root's length and/or muscle insertion points.
   - *Morphology*—papule/pustule.
   - *Color*—pink (fibrotic) to yellow (purulent exudate) to red (if active inflammation).
   - *Signs and symptoms*—painless. If pain is present, then it is from infection associated with the nonvital tooth; establishment of drainage will relieve pain.
   - *Treatment*—establish drainage and eliminate source of infection by extraction or root canal therapy on the infected, nonvital tooth.
6. **Epulis fissuratum** (Fig. 3.79)
   - *Site*—vestibule adjacent to ill-fitting denture flange.
   - *Morphology*—multiple nodules, tumor (hyperplastic tissue folds); may have secondary ulceration.
   - *Color*—pink to pink-red.
   - *Signs and symptoms*—painless; composed of epithelial and fibrous hyperplasia due to reactive growth from low-grade, chronic trauma.
   - *Treatment*—remake/reline/rebase denture and surgically remove excess tissue.
7. **Pyogenic granuloma** (Fig. 3.80)
   - *Site*—gingiva at interdental papilla is most common site; any other oral mucosal site.
   - *Morphology*—papule, nodule; may be secondarily ulcerated.
   - *Color*—red.
   - *Signs and symptoms*—painless, red, firm, vascular reactive growth that easily bleeds; secondary to chronic irritant such as restoration overhang, calculus,

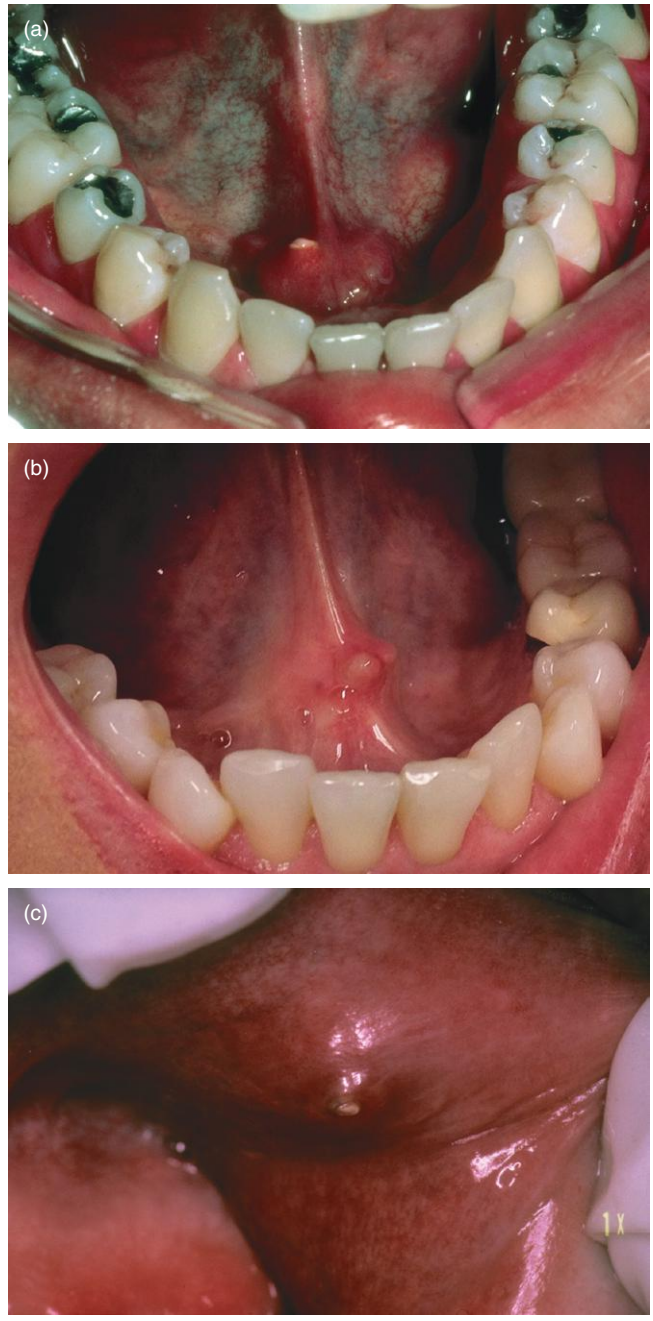


Figure 3.77 (a) Focal swelling of the right anterior floor of mouth adjacent to the midline with salivary stone and acute sialadenitis. (b) Patient reported a sense of floor-of-mouth fullness prior to eating; biopsy yielded Wharton's duct sialolith. (c) Sialolith of Stensen's duct near the buccal mucosal orifice.

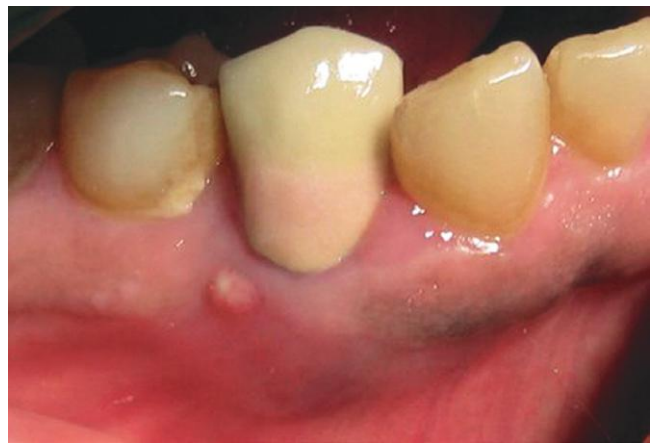


Figure 3.78 Nonvital right mandibular canine with associated parulis (gum boil).

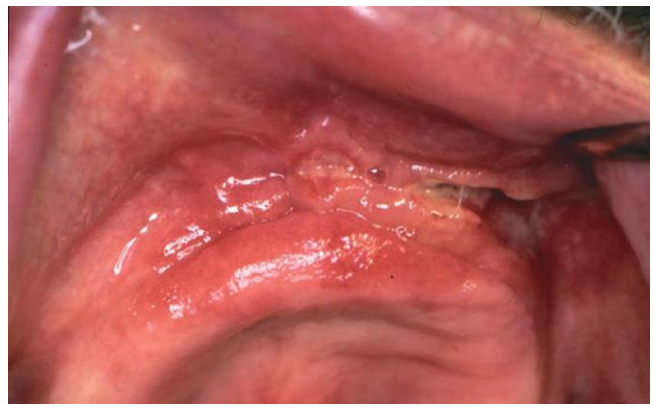


Figure 3.79 Ill-fitting complete maxillary removable denture with epulis fissuratum of the vestibule.

foreign body material, or nonspecific traumatic event. Pyogenic granuloma occurs more frequently in pregnant woman.

- *Treatment*—complete removal and elimination of trigger factor.

8. **Peripheral ossifying fibroma** (Fig. 3.81)
   - *Site*—exclusively on attached gingiva, usually interdental papilla.
   - *Morphology*—papule, nodule; may be secondarily ulcerated.
   - *Color*—pink to red.
   - *Signs and symptoms*—firm, painless reactive lesion.
   - *Treatment*—complete removal (to periosteum) and elimination of trigger factor from adjacent tooth.

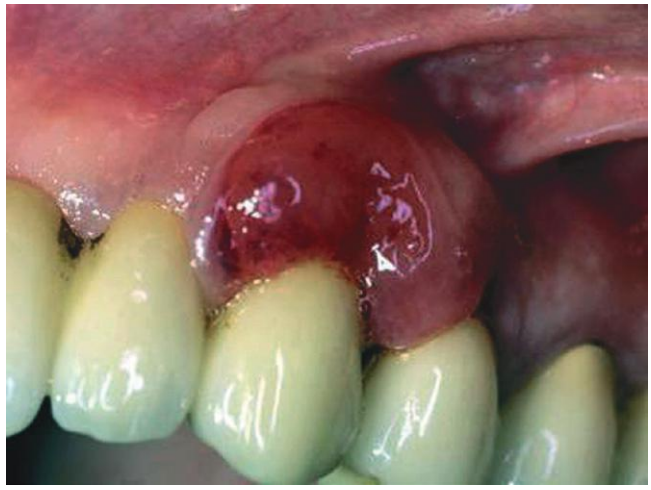


Figure 3.80 Semifirm and hemorrhagic pyogenic granuloma of the left anterior maxillary gingiva.

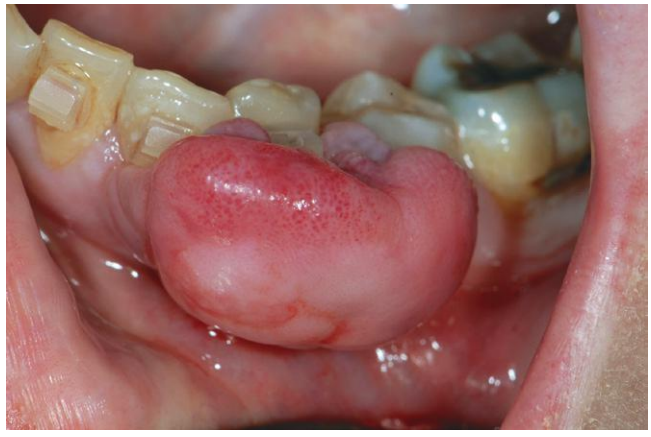


Figure 3.81 Large peripheral ossifying fibroma of the anterior mandibular gingiva.

9. **Peripheral giant cell granuloma** (Fig. 3.82)
   - *Site*—exclusively on attached gingiva/edentulous alveolar mucosa especially anterior to first molars.
   - *Morphology*—papule, nodule; frequently secondarily ulcerated.
   - *Color*—red-blue to purple.
   - *Signs and symptoms*—firm, painless reactive (non-neoplastic) lesion.
   - *Treatment*—complete removal (to periosteum) and elimination of trigger factor from adjacent tooth.

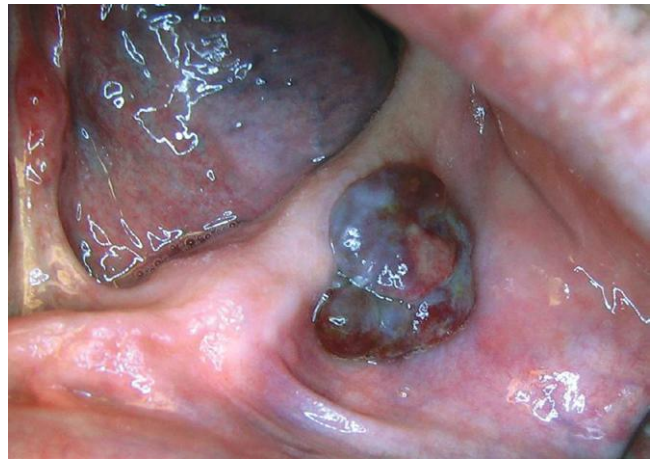


Figure 3.82 Peripheral giant cell granuloma of the left mandibular alveolar mucosa.

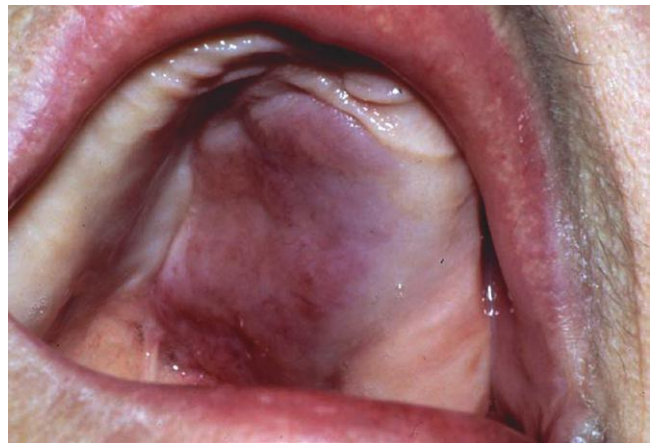


Figure 3.83 Non-Hodgkin's lymphoma of the hard palate.

10. **Non-Hodgkin's lymphoma** (Fig. 3.83)
    - *Site*—lymph nodes of head and neck; hard palate most often when extranodal.
    - *Morphology*—nodule, tumor, ulcer.
    - *Color*—pink or blue.
    - *Signs and symptoms*—painless usually, or painful especially if continued growth puts pressure on adjacent structures; often boggy and edematous; unilateral lesion that may cross midline, rarely arises bilaterally; becomes fixed, immovable with enlargement. A rare hard palate midline, highly destructive T-cell type variant is known as midline lethal granuloma.

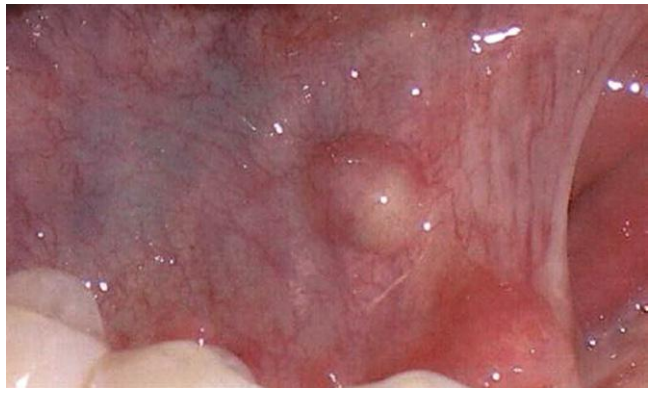


Figure 3.84 Reactive lymphoid aggregate (hyperplasia) of the right ventral tongue.

- *Treatment*—typically radiation and chemotherapy; sometimes total surgical removal. Complete medical workup is needed to rule out metastasis and confirm primary.

11. **Reactive lymphoid hyperplasia** (Fig. 3.84)
    - *Site*—lymph nodes or any oral site but particularly Waldeyer's ring–soft palate complex, tonsils, floor of mouth/ventral tongue, and oropharynx.
    - *Morphology*—papule, nodule; soft or firm.
    - *Color*—pink to yellow.
    - *Signs and symptoms*—asymptomatic, movable; nontender, but often tender to palpation when inflamed; secondary enlargement due to infection (stimulation from antigens).
    - *Treatment*—excisional biopsy to confirm diagnosis, if necessary.
12. **Generalized gingival enlargement** (non–plaque-related) (Fig. 3.85a,b)
    - *Site*—marginal/papillary gingiva; when drug-induced, begins in papilla and spreads across teeth.
    - *Morphology*—firm nodular, tumorous.
    - *Color*—pink; secondarily red if inflammation present.
    - *Signs and symptoms*—facial more often than lingual or palatal surfaces; multiple etiologies including red, edematous, and fibrotic hyperplastic due to puberty, pregnancy, diabetes mellitus; drug-induced (esp. phenytoin, cyclosporine, nifedipine); hereditary fibromatosis; granulomatous inflammation.
    - *Treatment*—change drug; gingivectomy sometimes needed, especially with fibromatosis.
13. **Benign mesenchymal neoplasms** (e.g., lipoma, neurofibroma, schwannoma, hemangioma) (Fig. 3.86a,b)
    - *Site*—any oral mucosal site.
    - *Morphology*—papule, nodule, tumor.
    - *Color*—pink, yellow, blue, red depending on type of proliferating mesenchymal tissue.

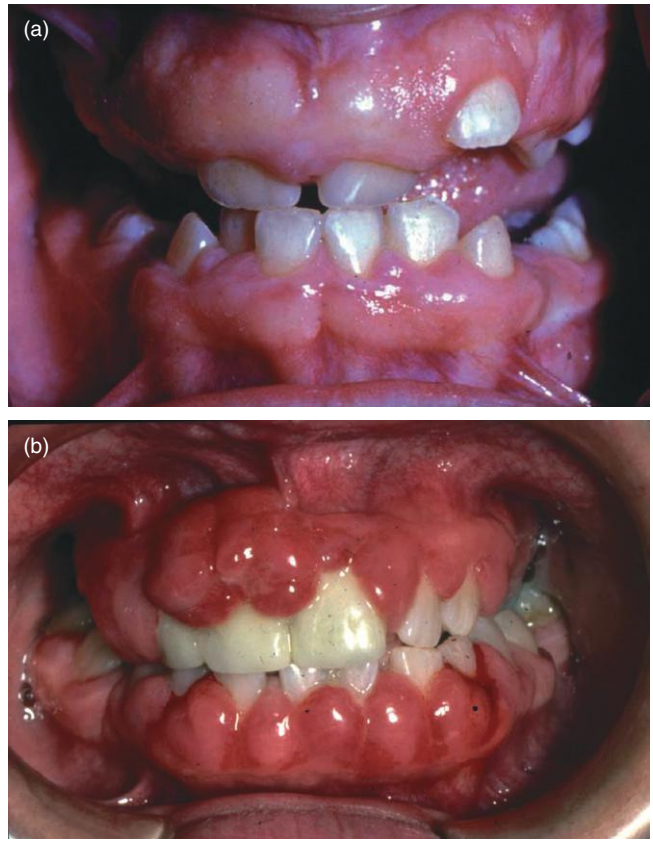


Figure 3.85 (a) Generalized hereditary gingival fibromatosis partially obscuring the clinical crowns. (b) Generalized gingival hyperplasia induced by patient's use of the anticonvulsant phenytoin.

- *Signs and symptoms*—painless; slow growth and then static.
- *Treatment*—complete excision.

14. **Hematoma** (Fig. 3.87)
    - See "Red Lesions," number 5 (extravasated blood), for description and treatment.
15. **Papilloma** (Fig. 3.88)
    - *Site*—soft palate, tongue, buccal mucosa most often.
    - *Morphology*—papule, nodule; rough "cauliflower" surface usually pedunculated.
    - *Color*—pink to white.
    - *Signs and symptoms*—painless; presumed to be caused by nononcogenic HPV types 6 and 11 in approximately 50% of cases; no malignant transformation potential.
    - *Treatment*—complete excision.

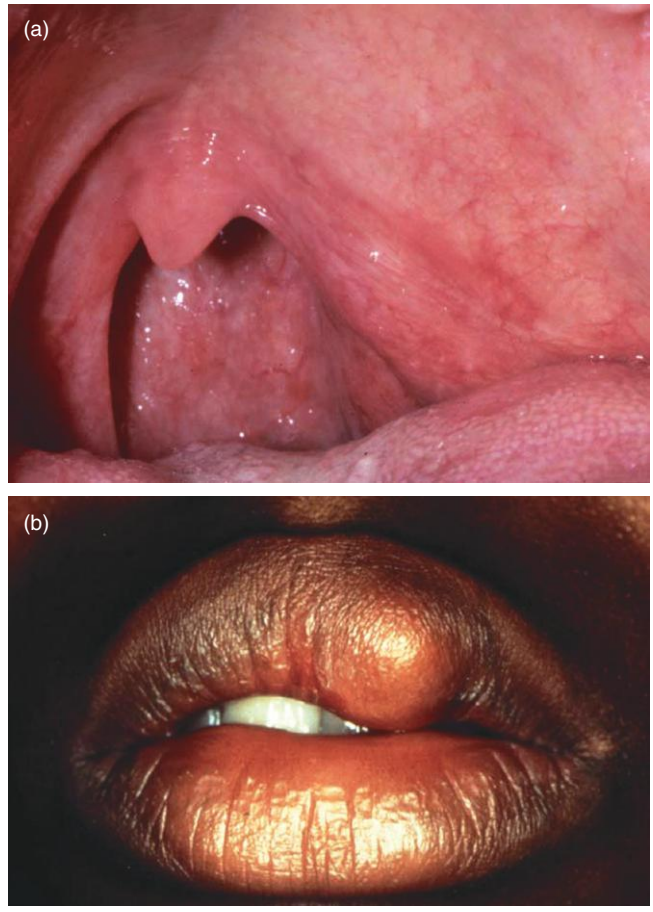


Figure 3.86 (a) Peritonsillar swelling that when biopsied proved to be a benign nerve sheath tumor, schwannoma (neurilemoma). (b) Schwannoma of the upper lip.

16. **Inflammatory papillary hyperplasia** (Fig. 3.89)
    - *Site*—hard palate, alveolar mucosa beneath denture base
    - *Morphology*—coalescing papules.
    - *Color*—red.
    - *Signs and symptoms*—asymptomatic; arises secondary to ill-fitting denture with poor denture hygiene
    - *Treatment*—remove denture at night for limited lesions. For advanced and irreversible lesions surgically excise and then reline/remake denture to improve adaptation.

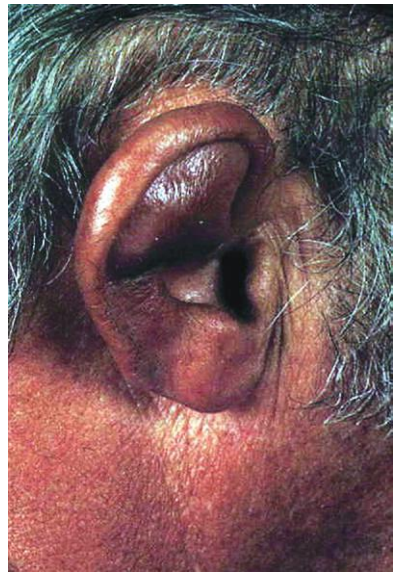


Figure 3.87 Large hematoma of the ear's pinna.

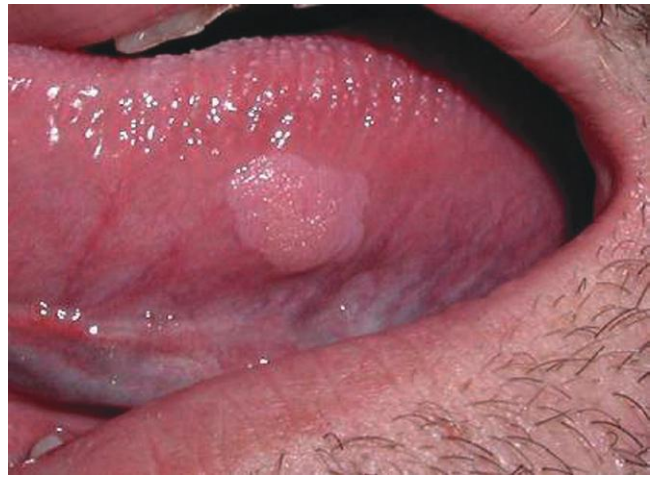


Figure 3.88 Squamous papilloma of the lateroventral tongue.

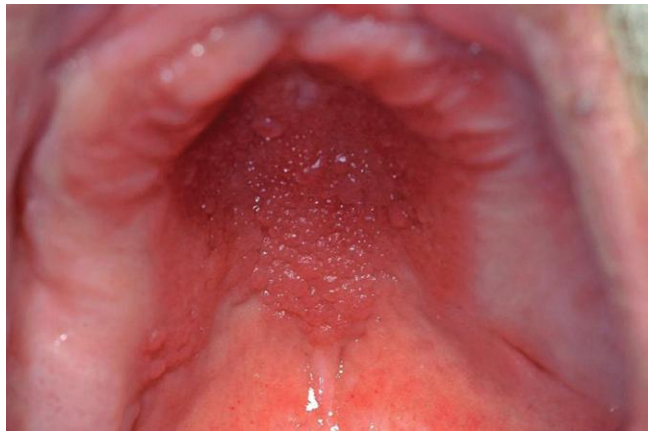


Figure 3.89 Inflammatory papillary hyperplasia of the hard palate associated with a removable full denture's base.

Cited References

1. Holmstrup P, Vedtofte P, Reibel J, Stoltze K. Oral premalignant lesions: is a biopsy reliable? *J Oral Pathol Med* 2007;36:262–266.
2. Speight PM. Update on oral epithelial dysplasia and progression to cancer. *Head and Neck Pathol* 2007;1:61–66.
3. van der Waal I, Axell T. Oral leukoplakia: a proposal for uniform reporting. *Oral Oncology* 2002;38:521–526.
4. Cleveland JL, Junger ML, Saraiya M, Markowitz LE, Dunne EF, Epstein JB. The connection between human papillomavirus and oropharyngeal squamous cell carcinoma in the United States: implication for dentistry. *JADA* 2011;142(8):915–924.
5. D'Souza G, Kreimer AR, Viscidi R. Case–control study of human papillomavirus and oropharyngeal cancer. *NEJM* 2007;356:1944–1956.
6. El-Mofty SK. Human papillomavirus (HPV) related carcinoma of the upper aerodigestive tract. *Head and Neck Pathol* 2007;1:181–185.
7. Gillison ML, Koch WM, Capone RB, et al. Evidence for a causal association between human papillomavirus and a subset of head and neck cancers. *J National Cancer Institute* 2000;92(9): 709–720.
8. Kahn MA. The emerging role of human papillomavirus in oropharyngeal squamous cell carcinoma. *Inside Dentistry*, special issue #2, 2010;32:1–7.
9. Solomon LW. Chronic ulcerative stomatitis. *Oral Diseases* 2008;14:383–389.

Recommended Reading

Cawson RA, Binnie WH, Barret AW, Wright JM. *Oral Disease*, 3rd edition. St. Louis, MO: Mosby; 2001.

Eversole LR. *Clinical Outline of Oral Pathology*, 4th edition. Shelton, CT: People's Medical Publishing House—USA; 2011.

Eversole LR. *Oral Medicine: A Pocket Guide*. Philadelphia: W.B. Saunders; 1996.

Hupp JR, Williams TP, Firriolo JF. *Dental Clinical Advisor*. St. Louis, MO: Mosby Elsevier; 2006.

Neville BW, Damm DD, Allen CM, Bouquot JE. *Oral and Maxillofacial Pathology*, 3rd edition, St. Louis, MO: Saunders Elsevier; 2009.
Newland JR, Meiller TF, Wynn RL, Crossley HL. *Oral Soft Tissue Diseases*, 5th edition. Hudson, OH: Lexi-Comp, Inc.; 2011.
Regezi JA, Sciubba JJ, Jordan RCK. *Oral Pathology: Clinical Pathologic Correlations*, 5th edition. St. Louis, MO: Saunders Elsevier; 2008.
Sapp JP, Eversole LR, Wysocki GP. *Contemporary Oral and Maxillofacial Pathology*, 2nd edition. St. Louis, MO: Mosby; 2004.
Scully C, Bagan JV, Carrozzo M, Flaitz CM, Gandolfo S. *Pocketbook of Oral Disease*. Edinburgh, UK: Churchill Livingstone Elsevier; 2013.
Silverman S, Eversole LR, Truelove EL. *Essentials of Oral Medicine*. Hamilton, Ontario: BC Decker, Inc.; 2002.
Woo S. *Oral Pathology: A Comprehensive Atlas and Text*. Philadelphia: Elsevier Saunders; 2012.
Wood NK, Goaz PW. *Differential Diagnosis of Oral and Maxillofacial Lesions*, 5th edition. St. Louis, MO: Mosby; 1997.

4 Differential Diagnosis of Common Oral Soft Tissue Lesions

Following the initial comprehensive head and neck soft tissue examination (Chapter 1), the clinician can identify the lesion as arising in the soft tissue and provide its detailed description (Chapter 2), determine its appropriate category (e.g., white lesion that rubs off, red lesion, ulceration) as listed in Chapter 3, and then create a nonprioritized list of all possible soft tissue lesions that may produce a similar clinical picture. The next step is to create a prioritized differential diagnosis list; the list should be rearranged with the most probable lesion ranked at the top and the least likely at the bottom. The process of priority ranking can be complicated at times so it behooves the clinician to be familiar with the signs and symptoms produced by a great many diseases and to possess statistical knowledge relative to the incidence of each disease entity. The priority ranking is directly related to the relative incidence of the lesions if all other factors about the lesions are similar. Thus, in developing a clinical differential diagnosis the clinician first ranks the lesions in order of their relative frequency of occurrence and then modifies this order based on age, gender, race, and anatomic location.

A special case can exist in which two or more lesions are synchronously present. If so, then seven possibilities must be considered:

- **Lesions A and B are completely unrelated:**
  1. Lesions A and B are both present as a matter of chance.
- **Lesions A and B are related and**
  2. Lesion A and Lesion B are identical.
  3. Lesion B is secondary to Lesion A.

The ADA Practical Guide to Soft Tissue Oral Disease, First Edition. Michael A. Kahn and J. Michael Hall.

4. Lesion A is secondary to Lesion B.
5. Lesion A and Lesion B are both secondary to a third lesion, which may be occult.
6. Lesion A and Lesion B are manifestations of systemic disease.
7. Lesion A and Lesion B form part of a syndrome.

Once a prioritized ranking differential diagnosis list has been created the clinician should recheck its credibility, particularly the top choices. This entails further examination of the lesion, asking the patient additional questions, possibly ordering additional tests, and a final reevaluation of all gathered pertinent data. The top choice or choices are referred to as the *working* or *provisional diagnosis*; in some instances, the first choice is overwhelmingly favored and becomes the singular working diagnosis. The working diagnosis dictates the proper management of the lesion, including possible surgery. The *final diagnosis* is usually provided by the pathologist who evaluates the biopsied tissue microscopically. In some instances the microscopic appearance of the lesion is not diagnostic in its own right and must be correlated closely with the previously submitted or gathered information. At times, an equivocal diagnosis remains and the clinical findings during surgery must also be considered.

Diagnostic Tips and Pitfalls

Acute Ulcers, Erosions, and Vesicles (Fig. 4.1)

1. **Traumatic ulcer**
   Tip—should heal in 7–10 days if the patient is immunocompetent; extremely common occurrence.
   Pitfall—traumatic ulcerative granuloma with stromal eosinophilia (TUGSE) is a very deep, slow-healing traumatic ulcer that can take weeks to months to heal. Also, factitial ulcers (self-inflicted) may be repeatedly traumatized despite the patient's denial.
2. **Recurrent aphthous ulcer, minor type**
   Tip—occurs only on movable mucosa.
   Pitfall—may appear identical to herpes simplex infection once the latter's vesicle is ruptured. Many systemic conditions also have oral aphthouslike ulcerations.
3. **Recurrent aphthous ulcer, major type**
   Tip—occurs only on movable mucosa.
   Pitfall—is not preceded by vesicle such as herpes simplex infection.
4. **Primary herpes simplex infection**
   Tip—occurs anywhere in the mouth, on both movable and nonmovable mucosa (bound to bone, i.e., hard palate and attached gingiva). In addition to painful ulcers the patient will also have fever, malaise, lymphadenopathy, and stomatitis, which always includes the gingiva.
   Pitfall—often misdiagnosed as acute necrotizing ulcerative gingivitis (ANUG) prior to the onset and recognition of vesicles.

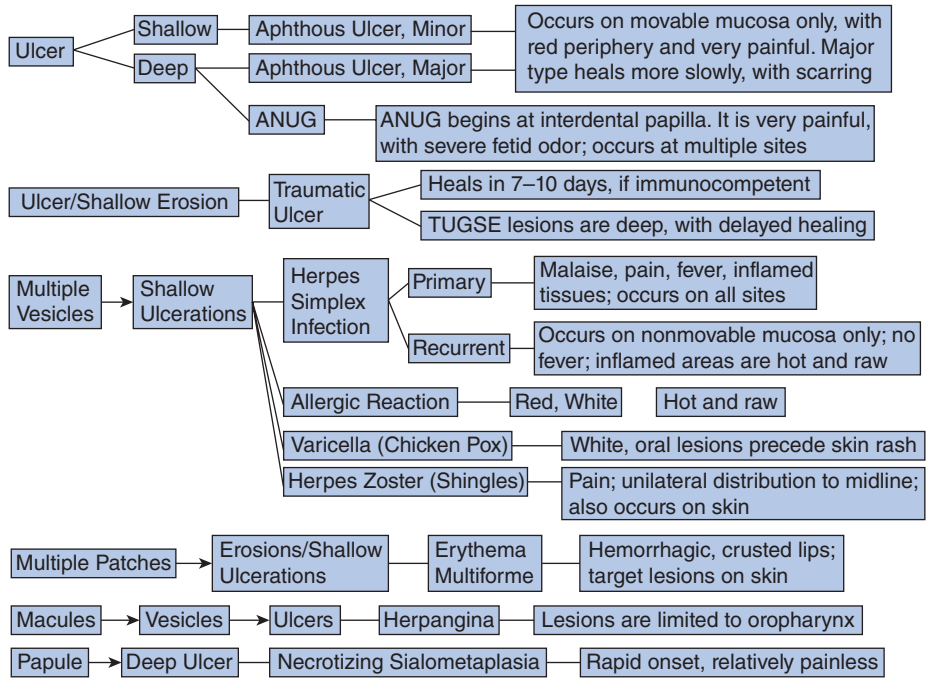


Figure 4.1 Acute ulcerations, erosions, and vesicles (bullae). ANUG, acute necrotizing ulcerative gingivitis; TUGSE, traumatic ulcerative granuloma with stromal eosinophilia.

5. **Recurrent herpes simplex infection**
   Tip—a crop of ulcers that occurs only on nonmovable mucosa (bound to bone; i.e., hard palate and attached gingiva); no other symptoms besides painful ulcers preceded by vesicles.
   Pitfall—mistaken for aphthous ulcer but preceded by a vesicle. Unlike aphthous ulcers, herpes simplex ulcers do not occur on movable mucosa.
6. **Acute necrotizing ulcerative gingivitis** (ANUG)
   Tip—not a communicable disease. Debridement results in rapid resolution.
   Pitfall—can become extensive and spread to oral mucosa not associated with the teeth (i.e., acute necrotizing ulcerative mucositis, or ANUM).
7. **Allergic reaction**
   Tip—cannot be wiped off.
   Pitfall—mistaken for leukoplakia, erythroplakia, and lichen planus.
8. **Erythema multiforme**
   Tip—acute, rapid, or explosive onset; lips with hemorrhagic crusts; can have "target" (bull's-eye appearing) skin lesions.
   Pitfall—not contagious; can become extensive; can be triggered by a drug reaction.
9. **Herpangina**
   Tip—vesicles and subsequent not very painful ulcers are limited to the oropharynx including soft palate; often seen as an epidemic event in children.

Pitfall—morphology mimics recurrent herpes but there is limited involvement: only occurs on posterior movable mucosa.

10. **Varicella** (chicken pox)
    Tip—white enanthem precedes cutaneous exanthem (rash); painful and unilateral.
    Pitfall—prevalence increases with age; single occurrence (unlike herpes simplex).
11. **Herpes zoster** (shingles)
    Tip—striking unilateral distribution up to midline of both face and oral mucosa (when involved).
    Pitfall—at times can appear identical to recurrent herpes simplex infection of the oral mucosa.
12. **Necrotizing sialometaplasia**
    Tip—acute onset unlike malignancy, despite nonpainful deep ulceration (pain subsides when necrotic tissue sloughs out, leaving deep ulcer) with no overt history of trauma; usually occurs on the hard palate.
    Pitfall—mistaken for squamous cell carcinoma (clinically and histologically), which has chronic onset. Squamous cell carcinoma is rare on hard palatal mucosa.

Chronic Vesicles, Bullae, Erosions, and Ulcers (Fig. 4.2)

1. **Erosive lichen planus**
   Tip—adjacent areas may exhibit white papules and striae; rare in children.
   Pitfall—desquamative gingivitis, allergic reaction.
2. **Squamous cell carcinoma**
   Tip—no history of trauma; nonhealing lesion with indurated margins particularly in high-risk anatomical sites; often preceded by erythroplakia, to a lesser

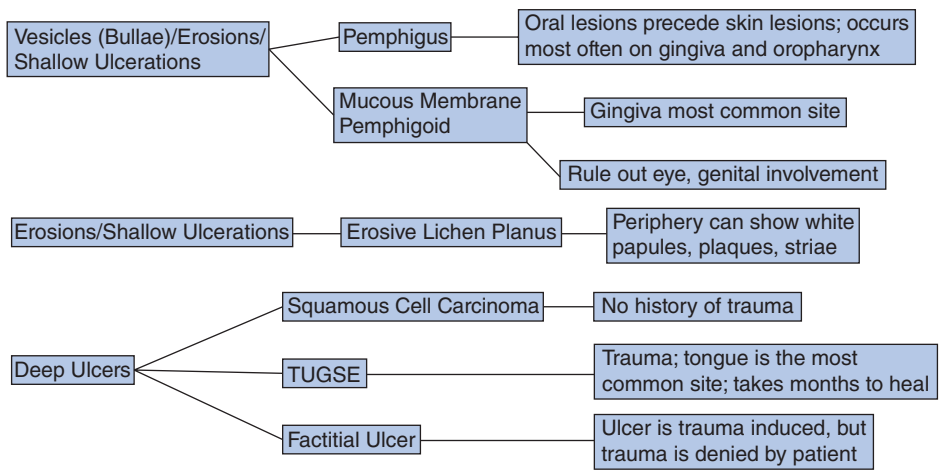


Figure 4.2 Chronic ulcers. TUGSE, traumatic ulcerative granuloma with stromal eosinophilia.

degree leukoplakia, and/or combination thereof; most often occurs on lateral tongue and floor of mouth.

Pitfall—biopsy required for diagnosis if no improvement without assumption that it is a chronic infection; early metastasis.

3. **Mucous membrane pemphigoid**

   Tip—rule out ocular or genital involvement; gingiva is most common site; antibody deposition at basement membrane zone.

   Pitfall—ocular involvement can lead to scarring and eventual blindness.

4. **Pemphigus vulgaris**

   Tip—oral lesions (particularly in the posterior area) usually precede skin involvement; blood crusted lips; antibody to desmosomes.

   Pitfall—clinical similarity to erythema multiforme (EM) but does not have acute onset like EM.

5. **Traumatic ulcerative granuloma with stroma eosinophilia** (TUGSE; traumatic granuloma; eosinophilic ulcer)

   Tip—lateral tongue most common site. Biopsy/surgery may trigger resolution.

   Pitfall—may mimic deep fungal infections and squamous cell carcinoma, so biopsy should be performed for diagnosis. TUGSE can occur on other oral mucosal sites besides the tongue.

6. **Factitial ulcer** (self-induced)

   Tip—lacks induration and ragged outline. Trauma is denied by patient but presence of ulcer is unexplained.

   Pitfall—biopsy without further delay if ulcer persists after 2 weeks, to rule out malignancy.

Lumps, Bumps, and Swellings (Papules, Nodules, Tumors, Vesicles, Bullae) (Fig. 4.3)

1. **Mucocele**

   Tip—if it develops fibrosis, it can feel firm (papule, nodule). Mucocele is usually blue with cyclical growth and regression.

   Pitfall—it will recur if mucin and associated damaged minor salivary gland lobule are not removed.

2. **Fibroma**

   Tip—history of trauma; smooth surface, normal color, asymptomatic; can begin as a pyogenic granuloma. Hard palate growth beneath ill-fitting maxillary denture base ("leaf fibroma") is a special type.

   Pitfall—benign mesenchymal tumors can look identical to fibroma, so a biopsy is necessary for a diagnosis. Also, fibroma can be mistaken for a fibrosed parulis or mucocele.

3. **Salivary gland tumors**

   Tip—firm; cannot tell clinically if lesion is benign or malignant, but recent growth spurt or pain and loss of mobility or sensation are worrisome signs. Unlike a mucocele, a salivary gland tumor does not exhibit cyclical growth and regression.

   Pitfall—lack of pain does not always indicate that tumor is benign.

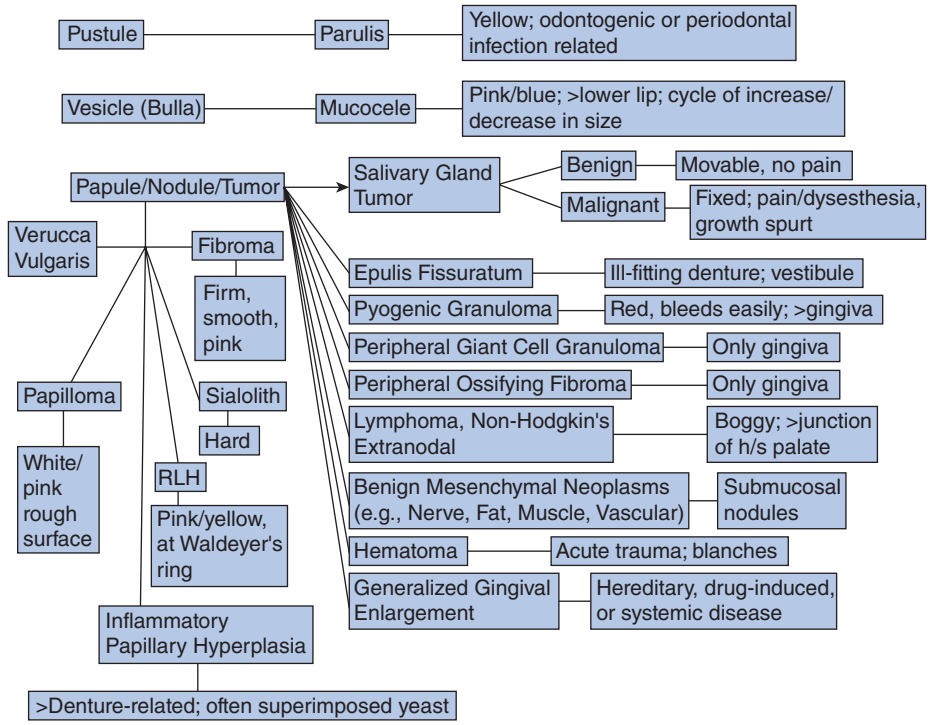


Figure 4.3 Lumps, bumps, and swellings. RLH, reactive lymphoid hyperplasia; h/s, hard and soft.

4. **Sialolith**
   Tip—floor of mouth usually; if palpable, feels very hard. Sialolith often can be seen on a radiograph.
   Pitfall—patient may report tenderness, pain, or fullness at mealtime.
5. **Parulis**
   Tip—associated with a nonvital tooth or significant periodontal bone loss. If an adjacent infection becomes chronic, it can develop fibrosis and feel firm (papule, nodule).
   Pitfall—during quiescent phase parulis can become fibrosed and appear to be a fibroma.
6. **Epulis fissuratum**
   Tip—associated with ill-fitting denture flange on vestibule, except for the variant that occurs on the hard palate (leaf fibroma).
   Pitfall—following removal, remake denture to avoid recurrence of lesion.
7. **Pyogenic granuloma**
   Tip—painless; bleeds easily.
   Pitfall—remove both the lesion and the irritant that triggers its reactive growth. Rule out malignancy such as extranodal lymphoma or Kaposi's sarcoma.

8. **Peripheral ossifying fibroma**
   Tip—confined to attached gingiva; may be red but is not as easily hemorrhagic as pyogenic granuloma.
   Pitfall—recurs if not excised down to periosteum and if the reactive trigger factor is not found and eliminated. Recurrence is common.
9. **Peripheral giant cell granuloma**
   Tip—confined to attached gingiva; often has a purple hue due to amount of hemosiderin deposited.
   Pitfall—recurs if not excised to periosteum and if the reactive trigger factor is not found and eliminated. Cupping of underlying bone can suggest an intrabony defect. Also, a type that arises in the jaw, central giant cell granuloma, can perforate the cortical plate and involve the overlying soft tissues.
10. **Lymphoma (non-Hodgkin's)**
    Tip—boggy, edematous consistency; bluish. Occurs most often at junction of hard and soft palate.
    Pitfall—can resemble salivary gland tumor but more diffuse. On the gingiva it can mimic pyogenic granuloma.
11. **Reactive lymphoid hyperplasia** (accessory lymphoid aggregates)
    Tip—usually in the area of Waldeyer's ring (oropharynx).
    Pitfall—progressive enlargement is not typical of this entity.
12. **Generalized gingival enlargement**
    Tip—morphology and treatment depend on cause.
    Pitfall—rule out systemic or drug-related association (clinical correlation). Biopsy is needed.
13. **Benign mesenchymal neoplasms**
    Tip—arise from endogenous structures in the lamina propria. All benign mesenchymal neoplasms are firm (nerve, fat, muscle, connective tissue) except vascular (hemangioma) or lymphatic (lymphangioma).
14. **Hematoma**
    Tip—usually history of trauma. Initially lesion is flat and then becomes elevated; does not blanch.
    Pitfall—large areas of extravasated blood can be due to atraumatic systemic conditions such as leukemia.
15. **Squamous papilloma**
    Tip—cauliflower-like surface.
    Pitfall—if proliferative, rule out condyloma (venereal wart) or verrucous carcinoma.
16. **Verruca vulgaris**
    Tip—white, very rough, spiky surface.
    Pitfall—if proliferative, rule out condyloma (venereal wart) or verrucous carcinoma.
17. **Inflammatory papillary hyperplasia**
    Tip—often seen in conjunction with chronic erythematous candidiasis (denture sore mouth) due to poor oral hygiene and ill-fitting denture.
    Pitfall—does not have to be associated with removable denture prosthesis.

White Lesions (Fig. 4.4)

1. **Dorsal white coating of tongue**
   Tip—brush tongue daily.
2. **Acute pseudomembranous candidiasis**
   Tip—peels off easily, leaving a red raw base.
3. **Hypertrophic candidiasis**
   Tip—can do noninvasive cytology scraping and stain for fungal organisms.
4. **Morsicatio** (nibbling habit)
   Tip—tissue tags are visible and can be removed with difficulty.
5. **Thermal burn**
   Pitfall—can mistake a malignancy for a thermal burn.
6. **Chemical burn**
   Tip—peels off with difficulty, leaving a red raw base.
7. **Linea alba**
   Tip—occurs at occlusal plane.
8. **Leukoedema**
   Tip—if the mucosa is stretched, the lesion tends to dissipate or disappear.
9. **Leukoplakia**
   Tip—fails to resolve after 2 weeks despite attempts to eliminate it.
   Pitfall—no correlation between size of the lesion and the presence or absence of dysplasia.
10. **Actinic cheilitis**
    Tip—splotchy color and blurring of vermilion border with skin.
11. **Reticular lichen planus**
    Tip—bilateral and symmetrical in clinical presentation; asymptomatic; rare in children.

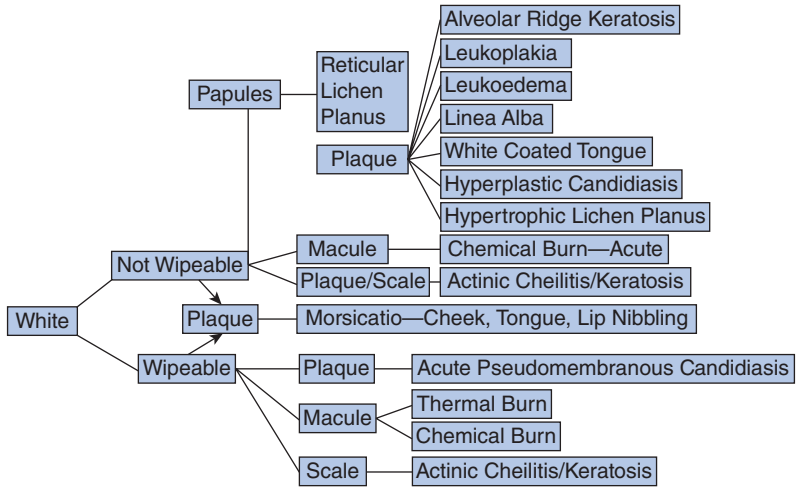


Figure 4.4 White lesions.

Pitfall—lichenoid allergic reactions look identical to reticular lichen planus; clinical correlation is necessary.

12. **Hyperplastic lichen planus**
    Tip—individual white papules and striae at borders of the plaque.
13. **Alveolar ridge keratosis**
    Pitfall—can be mistaken for leukoplakia.

Red Lesions (Fig. 4.5)

1. **Median rhomboid glossitis**
   Tip—midline dorsum just anterior to circumvallate papilla; flat or raised.
2. **Angular cheilitis**
   Tip—nonresolving.
3. **Chronic erythematous candidiasis**
   Tip—outline matches denture base.
4. **Geographic tongue**
   Tip—can lack a white border.
   Pitfall—may not move around and change shape.
5. **Erythroplakia**
   Tip—nonwipeable.
6. **Hemangioma**
   Tip—blanches; can be reddish-blue.
7. **Extravasated blood, hematoma**
   Tip—does not blanch when compressed; trauma history.
   Pitfall—not developmental like hemangioma.
8. **Telangiectasia**
   Tip—blanches when compressed.
9. **Plasma cell gingivitis**
   Tip—bright red, diffuse distribution on attached and alveolar mucosa.

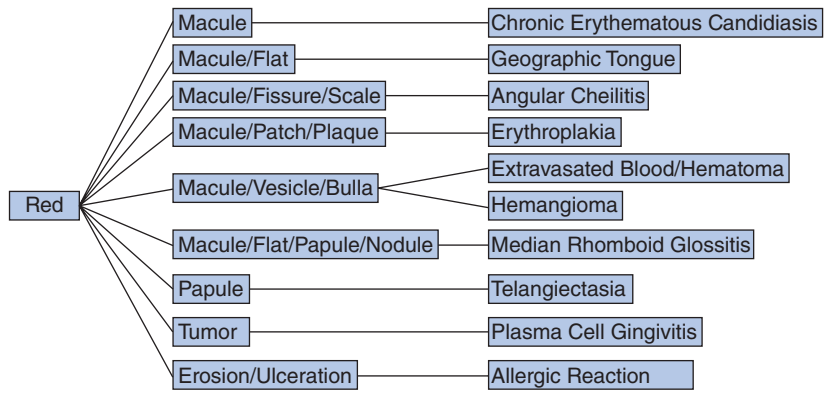


Figure 4.5 Red lesions.

10. **Allergic reactions**
    Tip—cinnamon flavoring is most common oral allergen.

Red-and-White Lesions (Fig. 4.6)

1. **Geographic tongue**
   Tip—can occur at other sites, including alveolar mucosa, palate, floor of mouth, vestibule.
   Pitfall—can be confused with ulcer.
2. **Chronic multifocal candidiasis**
   Tip—usually on the anterior buccal mucosa.
3. **Nicotine stomatitis**
   Tip—smoking-tobacco, other heat-induced lesion. Red dots are inflamed minor salivary glands.
4. **Erosive lichen planus**
   Tip—painful; bilateral and symmetrical distribution.
5. **Atrophic lichen planus**
   Tip—bilateral and symmetrical distribution.
6. **Erythroleukoplakia**
   Tip—more likely to exhibit dysplasia in the red component.
   Pitfall—can be confused with thermal burn but does not heal.
7. **Allergic reactions**
   Tip—often bilateral and symmetrical distribution.
   Pitfall—can appear similar to pemphigoid, pemphigus, erosive lichen planus, lupus erythematosus, and aphthous ulcers.

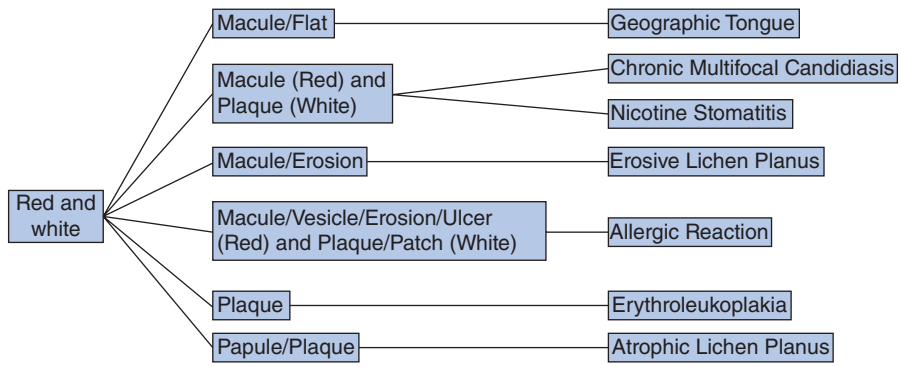


Figure 4.6 Red-and-white lesions.

Yellow Lesions (Fig. 4.7)

1. **Fordyce granules**
   Tip—bilateral and symmetrical distribution. Fordyce granules are more common in adults than in children (androgenic hormones stimulate sebaceous gland growth).

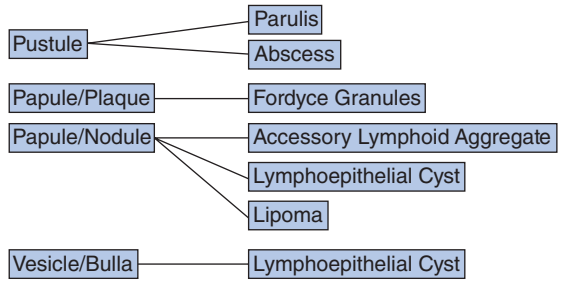


Figure 4.7 Yellow lesions.

Pitfall—not to be mistaken for an infection. If Fordyce granules become hyperplastic, they can form keratin-filled pseudocyst.

2. **Parulis and abscess**
   Tip—sign of nearby infection, particularly tooth-related. Radiographic placement of gutta percha point into opening of fistula can help localize necrotic pulp of tooth. Incision and drainage by procedure or by gutta percha can relieve pain of offending tooth.
   Pitfall—infection can disseminate through bloodstream, resulting in fever, lymphadenopathy, and malaise.
3. **Accessory lymphoid aggregates**
   Tip—small and nontender.
   Pitfall—extranodal lymphomas may mimic the accessory lymphoid aggregates; can be pink if lymphoid tissue is deeper.
4. **Lymphoepithelial cyst**
   Tip—tissue location is usually Waldeyer's ring.
   Pitfall—can be white or whitish-yellow.
5. **Lipoma**
   Tip—smooth surface.
   Pitfall—herniated buccal fat pad (induced by factitial or iatrogenic trauma) of buccinator muscle can mimic lipoma; can be pink if adipose tissue is deeper.

Blue Lesions (Fig. 4.8)

1. **Varix**
   Tip—if a thrombus forms, varix becomes firmer (papule, nodule); if a phlebolith forms, then varix becomes hard.
2. **Amalgam tattoo**
   Tip—sometimes amalgam particles are visible on a radiograph. Lesion can also be bluish-gray to black.
   Pitfall—some benign or malignant melanin-containing lesions can appear blue, so always biopsy an undocumented oral pigmentation that lacks radiographic evidence of amalgam particles.

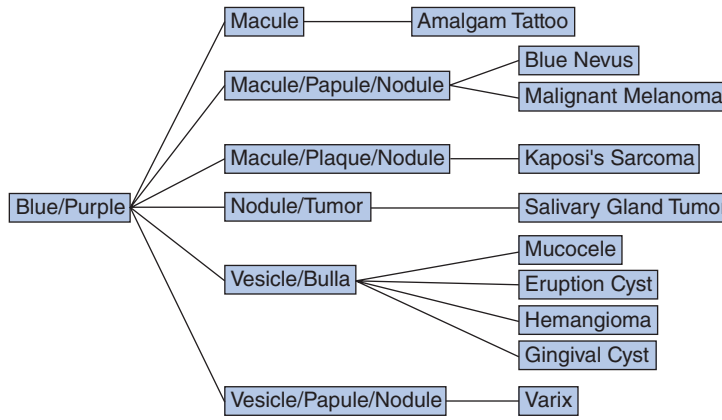


Figure 4.8 Blue and/or purple lesions.

3. **Mucocele**
   Tip—lesion is compressible but does not blanch and often has a continuous growth–regression cycle.
   Pitfall—if the spilled mucin is deeper, then it can appear pink; if it develops fibrosis, it can feel firm (papule, nodule); it can also appear purplish-brown.
   Pitfall—recurs if mucin and associated damaged minor salivary gland lobule are not removed.
4. **Eruption cyst**
   Tip—does not involve bone, so cyst is not visible on a radiograph. Eruption cyst can involve primary or permanent teeth; cyst can rupture and appear as an eruption hematoma.
   Pitfall—not a hemangioma.
5. **Hemangioma**
   Tip—compressible and blanchable.
   Pitfall—can also appear blue or reddish-blue.
6. **Kaposi's sarcoma**
   Tip—compressible but not blanchable; multifocal; occurs on face, often on nose; flat or evolves into raised lesion.
   Pitfall—can look very similar to pyogenic granuloma; can also be brown to reddish-purple.
7. **Salivary gland tumor**
   Tip—a mucinous component can sometimes impart a bluish hue (e.g., muco-epidermoid carcinoma).
   Pitfall—cannot tell clinical difference between benign and malignant salivary gland tumor even if ulcerated.
8. **Gingival cyst**
   Tip—can be pink; if blue, can look and feel like mucocele. Gingival cyst only occurs in soft tissue, so it is not seen on a radiograph.

9. **Blue nevus**
   Tip—although contains melanin does not appear brown to black; most common on hard palatal mucosa.
   Pitfall—vascular lesion but does not blanch.
10. **Malignant melanoma**
   Tip—evolving from benign nevus by one or more of the following: recent enlargement, recent elevation, irregular borders, asymmetry, ulceration, bleeding, mixture of colors. Malignant melanoma is most common on maxillary gingiva and hard palatal mucosa.
   Pitfall—can also appear brown to brownish-black to black to gray.

Brown, Gray, and Black Lesions (Fig. 4.9)

1. **Acquired melanocytic nevus**
   Tip—most common on hard palate and attached gingiva.
   Pitfall—always perform biopsy to rule out malignancy.
2. **Malignant melanoma**
   Tip—evolving from benign nevus by one or more of the following: recent enlargement, recent elevation, irregular borders, asymmetry, ulceration, bleeding, mixture of colors. Malignant melanoma is most common on maxillary gingiva and hard palatal mucosa.
   Pitfall—can be blue to purple also.
3. **Physiological pigmentation**
   Tip—symmetrical and bilateral distribution.
4. **Amalgam tattoo**
   Pitfall—can appear blue also.
5. **Hairy tongue**
   Tip—can be stimulated and extrinsically stained by bismuth-containing medicaments (e.g., Pepto-Bismol) and certain antibiotics.
6. **Melanotic macule**
   Tip—the lower lip is the most common site.
   Pitfall—can appear to be a freckle (ephelid), but freckles darken with sun exposure and melanotic macules do not.

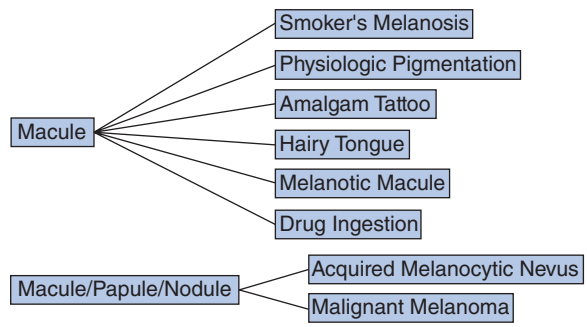


Figure 4.9 Brown, gray, and black lesions.

7. **Drug ingestion**
   Tip—color fades when the drug is stopped.
8. **Smoker's melanosis**
   Tip—more common in women and on the facial anterior attached gingiva.

Recommended Reading

Epstein JB, Guneri P, Boyacioglu H, Abt E. The limitations of the clinical oral examination in detecting dysplastic oral lesions and oral squamous cell carcinoma. *JADA* 2012;143(12): 1332–1342.

Eversole LR. *Oral Medicine: A Pocket Guide*. Philadelphia: W.B. Saunders; 1996.

Eversole LR. *Clinical Outline of Oral Pathology*, 4th edition. Shelton, CT: People's Medical Publishing House—USA; 2011.

Hupp JR, Williams TP, Firriolo JF. *Dental Clinical Advisor*. St. Louis, MO: Mosby Elsevier; 2006.

Magro CM, Robets-Barnes J, Crowson AN. Direct immunofluorescence testing the diagnosis of immunobullous disease, collagen vascular disease, and vascular injury syndromes. *Dermatol Clin* 2012;30:763–798.

Newland JR, Meiller TF, Wynn RL, Crossley HL. *Oral Soft Tissue Diseases*, 5th edition. Hudson, OH: Lexi-Comp, Inc.; 2011.

Regezi JA, Sciubba JJ, Jordan RCK. *Oral Pathology: Clinical Pathologic Correlations*, 5th edition. St. Louis, MO: Saunders Elsevier; 2008.

Sapp JP, Eversole LR, Wysocki GP. *Contemporary Oral and Maxillofacial Pathology*, 2nd edition. St. Louis, MO: Mosby; 2004.

Woo S. *Oral Pathology: A Comprehensive Atlas and Text*. Philadelphia: Elsevier Saunders; 2012.

Wood NK, Goaz PW. *Differential Diagnosis of Oral and Maxillofacial Lesions*, 5th edition. St. Louis, MO: Mosby; 1997.

5 Guidelines for Observation and/or Referral of Patients' Lesions

It is highly desirable and professionally responsible for the clinician to have a structured administrative plan for monitoring suspicious lesions of their patients. If accomplished, it simultaneously allows a favorable outcome and affords the clinician reasonable medicolegal protection. The following are guidelines for monitoring an area of suspicious clinical appearance or a lesion that yields an equivocal pathological diagnosis upon biopsy.

A look at the current dental literature mentions the standard diagnostic observation time span of 10–14 days for an undiagnosed lesion lacking a high degree of malignant suspicion; however, there is a paucity of recommendations for a lesion that continues to have a nonthreatening clinical appearance following a nonmalignant biopsy finding.[1,2]

We agree with others that although a dental hygienist is adequately trained to perform initial dental examinations the ultimate responsibility for diagnosis and follow-up rests with the dentist. If a general dentist confirms discovery of a lesion by a dental hygienist or personally discovers it and decides the lesion warrants referral to a specialist for a surgical biopsy, then, if at all possible, the referral appointment should be made while the patient is still at the dental office. In addition, a confirmation communication should be sent to the specialist describing the lesion and a requesting a written result; copies of both should be part of the patient's permanent dental record.[3] Whenever possible, surgical biopsy specimens should be submitted to oral and maxillofacial pathologists for interpretation since they are usually more familiar with the histopathological subtleties of the jaws and soft tissue of the oral tissues. It is important that any dental office that submits biopsies

The ADA Practical Guide to Soft Tissue Oral Disease, First Edition. Michael A. Kahn and J. Michael Hall.

have an established protocol regarding biopsy documentation to ensure timely receipt and review of the written report and the follow-up action, if any is needed.[3]

If a biopsy is indicated, the patient should be counseled so that he or she understands its purpose is to achieve a precise, definitive diagnosis that will result in proper treatment and management.[1–3]

Previous authors have compiled a comprehensive list of indications for a soft tissue biopsy:

- Any persistent or pathological condition that cannot be diagnosed clinically, including a lesion with no identifiable etiology that persists for more than 10–14 days despite local therapy
- Any lesion that is felt to have malignant or premalignant characteristics, including growth or rapid growth for no apparent reason; any lesion that produces symptoms; any lesion that is red, white, or pigmented for which a cause or diagnosis is not evident
- Any lesion that feels firmly attached or fixed to adjacent structures
- Any unknown lesion in high-risk areas for development of oral cancer (e.g., floor of mouth, lateral tongue)
- Confirmation of clinical diagnostic suspicions
- Any lesion that does not respond to routine clinical management, such as antibiotic therapy or endodontic treatment, over a reasonable period of time
- Any lesion that is a source of extreme concern to the patient (i.e., cancerphobia) such that the patient's fear about the persistent lesion is greater than the concern about undergoing the minor surgical procedure

It would be an error in logic to continue to observe a patient's soft tissue lesion as it continues to grow larger but not recommend a definitive diagnostic and therapeutic step to the patient. Even if the lesion proved to be benign upon biopsy, continued growth of a benign lesion can encroach upon normal anatomical structures and cause significant morbidity. Courts have ruled that a diagnostic biopsy needs to be performed as soon as possible by a prudent and reasonable dentist if the lesion's clinical features do not improve or the clinical diagnosis becomes uncertain.

There are no consistent guidelines in the dental literature regarding the timing of appointments for reevaluation of suspicious lesions with or without histopathologic evaluation. Since the frequency and length of follow-up and management of oral pathology soft tissues is influenced by many factors, the guidelines can only be generalized. The clinician's reasonable judgment and experience may, at times, cause modifications of the guidelines.[1]

Following discovery of an undiagnosed lesion the standard agreement of time for observation is 7–14 days, with or without local treatment. At the conclusion of this time period if the lesion has not responded to therapy or the lesion grows or alters its characteristics, then a biopsy is indicated.

If the lesion has not changed its appearance or surface characteristics after this observation time period, then a decision must be made whether to biopsy or continue to observe on a periodic basis. The patient, of course, has the ultimate decision

by granting consent; the clinician should inform the patient of the risks and benefits so the patient understands that he or she shares the responsibility of the decision if a biopsy is not performed. Generally, a decision to biopsy usually is superior to a decision not to biopsy since it provides a definitive diagnosis and removes potentially dangerous tissue. Many life-endangering conditions can masquerade, at least initially, as an innocuous lesion, and noninvasive screening techniques (e.g., brush biopsy, liquid-based cytology, and narrow-spectrum fluorescence) should not be considered a substitute for a biopsy when there is concern that the lesion may be malignant. A biopsy may need to be avoided if the surgical procedure would endanger the safety or health of the patient. On the other hand, when a biopsy is indicated but the healthy patient refuses the procedure, the refusal should be documented in the patient's chart; if the refusal continues, this could result in termination of the patient–doctor relationship, albeit in a professional and amicable manner.

Nonbiopsied Lesion with Low Index of Suspicion

A clinical provisional diagnosis or brief, appropriate differential diagnosis should be formulated and entered in the patient's record. Then the clinician should determine the periodicity to reevaluate the lesion for any changes and obtain the patient's consent; if unsure, the clinician should get a second opinion from a specialist such as an oral surgeon or oral pathologist. A suggested timetable would be to see the patient again in 1 month, then at 3, 6, and 12 months after the initial examination. Thereafter, with no changes, the lesion can be rechecked after 6 months and, after 2 years of no change, monitored semiannually or annually. If at any time there is a change in the lesion or immediate adjacent tissue, then a biopsy should be done immediately. Also, upon the initial dismissal, the patient should receive a printed timetable guideline as well as instructions to contact the clinician as soon as possible if any change of the lesion is noted by the patient before the next scheduled appointment.

The decision to observe rather than biopsy should be made with the utmost caution. The clinician must be sure that the lesion does not exhibit any malignant or premalignant changes. The dentist should obtain detailed written information from the patient with respect to habits, risk factors, and medical status. The patient should be fully informed and understand the rationale for foregoing the biopsy and be offered the opportunity to seek a second opinion.[1,4,5]

Biopsied Lesion Monitoring

If the biopsy of the lesion did not reveal any malignancy or premalignancy histopathology features but clinical concern remains, then it should be determined by the clinician, or in consultation with the oral pathologist, whether to perform another biopsy (i.e., same area, different area, or larger area) or to continue to observe the lesion. The clinician should understand that biopsy bias with respect to specific site collection exists and so her or his clinical impressions and judgment should be factored into the final decision of whether to re-biopsy or observe. If the clinician is still uncertain, then a documented second opinion from an oral

pathologist is warranted. The results of the biopsy and the decision to observe or re-biopsy should be documented in the patient's record and, if the decision is to observe, then you should formulate and document planned periodic reevaluations, as mentioned previously. It must be reinforced to the patient that they are to contact the dental office if there is any change in the biopsied area prior to the next scheduled observation appointment. Lastly, documentation of the lesion and its subsequent postbiopsy observation appointments should include clinical photographs.

Of particular concern are leukoplakias whose initial incisional biopsy did not exhibit any dysplasia—only hyperkeratosis and/or epithelial acanthosis. This type of lesion has been reported to have an overall 15–20% transformation rate. During the periodic observations of this type of biopsied lesion any change in thickness, an increased intensity of whiteness, or a papillomatous or verrucous surface change is indication for a second biopsy.[6] It should be noted that 90% of erythroplakias exhibit at least severe dysplasia and nearly all undergo malignant transformation if not completely removed. Thus, erythroplakias should always undergo excisional biopsy.

Pigmented lesions (i.e., blue, gray, black, or brown) of the oral cavity and oropharynx are a special case. They should always be biopsied, with the exception of a documented amalgam tattoo (by radiograph or patient chart entry), and should be thoroughly documented including photographs. If the results of the incisional biopsy of the pigmentation are benign, then the lesion can undergo routine monitoring for any change in color, size, surface texture, acquirement of additional colors of pigment, asymmetry, or irregular border development. These clinical warning signs should be shared with the patient so that he or she understands if they appear, he or she should immediately schedule a dental appointment.

Continued Monitoring of Biopsied Leukoplakias and Erythroplakias

Leukoplakias and, to a much greater extent, erythroplakias can possess significant dysplasia initially or undergo transformation to a greater grade of dysplasia or become invasive squamous cell carcinoma over a variable amount of time. Also, investigators have not yet been able to develop a valid and reliable monitoring test (i.e., molecular biology) to determine which lesions will remain static or invade the basement membrane complex without full-thickness dysplasia involvement (i.e., carcinoma-in-situ).[7] Therefore, we recommend that any grade of dysplasia discovered during an incisional biopsy of erythroplakia or leukoplakia at a high-risk oral cavity site (lateral and ventral tongue, floor of mouth) or oropharyngeal site (i.e., soft palate–tonsillar pillar–base of tongue complex) undergo immediate complete removal (i.e., excisional biopsy) with subsequent close follow-up of the postsurgical site and enhanced monitoring of the entire oral and oropharyngeal mucosa. Numerous studies have found that the likelihood of a recurrent lesion or a new primary, at the same or different site, is significantly increased.

The clinician should also understand that the absence of dysplasia in the initial biopsy does not preclude the presence of dysplasia in other areas of the tissue and

they should still be considered potentially malignant. Patients should be reminded of the continued use of risk factors, such as tobacco and alcohol, and they should be counseled to seek a physician-based tobacco cessation program. Many leukoplakic lesions are clinically reversible following successful completion of a tobacco cessation program.[8–10]

Cited References

1. Alexander RE, Wright JM, Thiebaud S. Evaluating, documenting and following up oral pathological conditions: a suggested protocol. *JADA* 2001;132:329–335.
2. Epstein JB, Sciubba JJ, Banasek JD, Hay LJ. Failure to diagnose and delayed diagnosis of cancer: medicolegal issues. *JADA* 2009;140:1494–1503.
3. Melrose RJ, Handlers JP, Kerpel S, Summerlin DJ, Tomich C. The use of biopsy in dental practice: the position of the American Academy of Oral and Maxillofacial Pathology. *Gen Dentistry* 2007;55:457–461.
4. Epstein JB, Guneri P, Boyacioglu H, Abt E. The limitations of the clinical oral examination in detecting dysplastic oral lesions and oral squamous cell carcinoma. *JADA* 2012;143(12):1332–1342.
5. Allison P, Locker D, Feine JS. The role of diagnostic delays in the prognosis of oral cancer: a review of the literature. *Oral Oncology* 1998;34:161–170.
6. Speight PM. Update on oral epithelial dysplasia and progression to cancer. *Head and Neck Pathol* 2007;1:61–66.
7. van der Waal I, Axell T. Oral leukoplakia: a proposal for uniform reporting. *Oral Oncology* 2002;38:521–526.
8. Rethman, MP, Carpenter W, Coehn EEW, et al. Evidence-based clinical recommendations regarding screening for oral squamous cell carcinomas. *JADA* 2010;141(5):509–520.
9. Poh CF, Ng S, Berean KW, Williams PM, Rosin MP, Zhang L. Biopsy and histopathologic diagnosis of oral and premalignant and malignant lesions. *JCDA* 2008;74:283–288.
10. Holmstrup P, Vedtofte P, Reibel J, Stoltze K. Oral premalignant lesions: is a biopsy reliable? *J Oral Pathol Med* 2007;36:262–266.

Recommended Reading

Alexander RE, Wright JM, Thiebaud S. Evaluating, documenting and following up oral pathological conditions: a suggested protocol. *JADA* 2001;132:329–335.

Melrose RJ, Handlers JP, Kerpel S, Summerlin DJ, Tomich C. The use of biopsy in dental practice: the position of the American Academy of Oral and Maxillofacial Pathology. *Gen Dentistry* 2007;55:457–461.

6 The Art and Science of Biopsy and Cytology

In Chapter 1, in addition to head and neck soft tissue examination techniques, there is information about overall screening and diagnosis adjunct options as well detailed information about some diagnostic adjunctive procedures such as chemiluminescent reflectance and narrowband autofluorescence. This chapter provides detailed information about oral mucosal cytology and biopsy indications. The surgical biopsy remains the current gold standard of tissue diagnosis.

Oral Mucosal Cytology Indications and Contraindications

Oral mucosal cytology is a screening procedure unique and different from uterine cervical cytology screening (i.e., traditional Pap smear or liquid cytology Pap smear with or without HPV testing). The uterine cervix and oral/oropharyngeal mucosa are composed of similar stratified squamous epithelial cells; however, the biologic nature and behavior of the cells differ because of a substantially different physiological milieu. This is an important point to keep in mind, particularly with indication criteria, microscopic interpretation, and future management considerations.

Studies in the 1960s and 1970s confirmed routine Pap smears of the oral cavity had too many false positives and negatives. We acknowledge the improved sampling of oral cavity epithelial cells with the late 1990s Oral CDx brush biopsy cytobrush (described in Chapter 1) and some investigators reported improved specificity, sensitivity, and positive predictive value compared with conventional cytology. In addition, after reading encouraging results of liquid-based cytology results from uterine cervix studies, one of us (MAK) concluded that methodology could be

The ADA Practical Guide to Soft Tissue Oral Disease, First Edition. Michael A. Kahn and J. Michael Hall.

useful for oral cytology specimens. Currently, the cytology method we support combines the advantages of a nylon-bristle cell collection device with liquid fixative for chairside cell transfer and immersion, transport, and slide preparation.

The following oral cytology indications and contraindications are based on our use of a liquid-based cytology process. It is important to remember the indications for cytology screening of the oral and oropharyngeal mucosa are very limited. Unlike the original Oral CDx brush biopsy's indication of "nonsuspicious" oral "red or white spots" we recommend the indication should be for lesions suspicious for squamous cell carcinoma (e.g., unexplained nonhealing ulcer, erythroplakia, or speckled leukoplakia), especially when occurring in high-risk oral mucosal sites and the patient refuses or is unable to undergo a surgical biopsy. It should be emphasized that we consider the brush biopsy a form of cytology since architectural intact tissue from the surface and underlying connective tissue is not obtained. Additionally, leukoplakias should be investigated in a similar manner; however, it is more difficult to harvest deeper level keratinocytes due to the variable thickened keratin layer. In addition, indications include two infectious diseases: herpes simplex and candidiasis. Candidiasis can be diagnosed by cytology because the surface epithelial cells are associated with superficially embedded spores and/or hyphae of *Candida albicans.* Herpes simplex infection (primary or recurrent) can be diagnosed with cytology by sampling an intact vesicle or the peripheral area of a ruptured one (i.e., erosion or ulceration), which possesses infected keratinocytes. Epithelial cells infected with Herpesviridae exhibit microscopic pathognomonic morphological changes that, when combined with the viral infection's clinical signs and symptoms, can result in an accurate diagnosis.

Leukoplakias and erythroplakias can have variable amounts of epithelial dysplasia involving the thickness of the surface epithelium or just benign cellular atypia secondary to mucosal inflammation within the epithelium (i.e., inflammatory exocytosis). It is imperative for the clinician to understand that the histological interpretation of an oral cytology sample of a leukoplakia or erythroplakia is limited to stating whether abnormal cellular changes are present or not. Thus, the cytology procedure does not confirm the presence or absence of epithelial dysplasia; dysplasia is a subjective microscopic diagnosis that requires architecturally intact stratified squamous epithelium (i.e., surgical biopsy) so that the width of dysplasia within the epithelium can be determined. In a cytology procedure, conventional or liquid technique, the epithelial cells are disaggregated as individual cells and/or small clumps of cells; therefore, a pattern of disruption of the normal epithelial maturation process (i.e., dysplasia) cannot be appreciated. Any positive atypical cellular finding that is not due to herpes infection or candidiasis must undergo a diagnostic biopsy procedure.

It is also critical for the clinician to understand that cytology procedures are only able to examine epithelial cells and thus any pathology that exists within the lamina propria (i.e., the connective tissue and its elements below the epithelium's basement membrane) cannot be evaluated. The brush simply does not sample deeply enough to gather the pathological cells and/or substances. Examples of cytology sampling contraindications include amalgam tattoo, fibroma, mucocele, neuroma, and minor salivary gland tumors. Also, other specific epithelial proliferations such as squamous

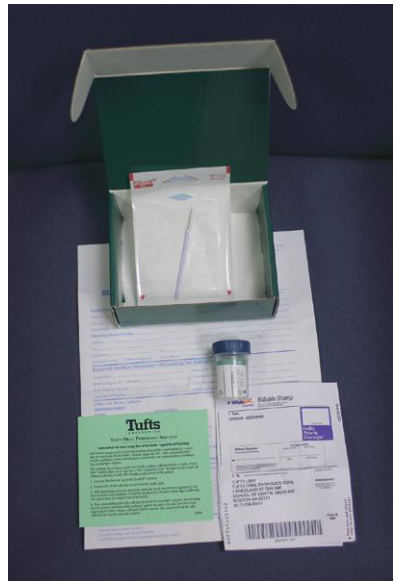


Figure 6.1 A typical available liquid cytology kit composed of instructions, requisition form, prepaid overnight mailer and shipping container, alcohol-based transport/fixative media container, and sterile nylon or plastic bristle collection device.

papilloma and verruca vulgaris cannot be diagnosed via cytology because they require the overall intact histological pattern and features only provided by surgical biopsy.

Cytology Technique Tips and Pitfalls

A suitable liquid cytology kit can be obtained from several oral pathology laboratories in the United States (Fig. 6.1). The free kit will typically be enclosed in a corrugated box or shipping tube that includes a specimen bottle filled with 10 mL of alcohol-based fixative (e.g., ThinPrep® or SurePath® brands), cytobrush (e.g., Medscand's Cytobrush Plus®), requisition form, small plastic bag, and a prepaid overnight mailer and outer shipping bag. The requisition form is filled out completely with patient, doctor, and lesion information (details of the latter are discussed in the biopsy section, "Scalpel Biopsy Dos and Don'ts").

It is very important to obtain an adequate harvest of keratinocytes from all levels of the oral mucosa's stratified squamous epithelium. Whether the cytobrush selected has soft or firm bristles, the clinician must apply enough downward and back-and-forth force to obtain a transepithelial specimen. Once the harvested area demonstrates pinpoint bleeding, then the clinician has clinical verification of adequate depth since the vasculature resides only within the lamina propria below the basement membrane zone. As soon as the cells have been harvested it is crucial that they are immediately immersed in the liquid fixative container so that the cell

sample does not air dry and destroy cellular detail. With the bristles of the brush immersed, the handle/shaft of the brush should be vigorously twirled with the fingers to agitate harvested cells off the bristles and into the liquid fixative. To retain as many harvested cells as possible for processing and analysis, the handle/shaft is cut off and the brush's bristles are left within the specimen container for use during specimen processing. The cap of the fixative container is secured and the container is placed in the provided small plastic bag. The plastic bag is placed in the corrugated box or tube, and lastly the box or tube is placed in the overnight delivery service shipping bag with the prepaid mailing label affixed on its surface.

Biopsy Indication and Contraindications

Biopsy of oral and oropharyngeal tissues is the gold standard for diagnosis and is defined as the removal for diagnostic study of a piece of tissue from a living body. It has been used for more than 150 years to establish the diagnosis of an unknown medical condition and is the oldest and most reliable method currently available that can establish the definitive diagnosis of a clinical abnormality in dentistry. The practice of modern dentistry requires evidence-based treatment decisions and therapeutic outcomes, and an accurate diagnosis is the most basic step to initial treatment. Recently, the American Academy of Oral and Maxillofacial Pathology (AAOMP), the American Association of Endodontists, and the American Association of Oral and Maxillofacial Surgeons endorsed tissue biopsy as the paramount procedure in order to obtain a definitive diagnosis of a discovered soft tissue lesion. This maxim is equally applicable to general dentists and dental specialists who elect to remove abnormal tissue in the course of patient care.

The biopsy procedure is well within the scope of training and ability for a general dentist; however, each must determine their comfort level and refer patients to those with more biopsy experience when appropriate. No matter who performs the biopsy procedure, the determination of when it is performed is most important. It is the professional obligation of the dentist to inform the patient in need of a biopsy and attempt to gain patient acceptance. A patient may be reluctant to undergo a biopsy for fear that it is only used to test for cancer and/or that common oral conditions do not require biopsy verification because the clinical judgment and experience of the clinician is sufficient. Although it is correct that a cancer diagnosis typically is based on a biopsy finding, the reason for the procedure is to obtain a definitive diagnosis since clinical findings are usually insufficient and cancer is just one of hundreds of possible diagnoses that can be made from biopsy tissue examination. For both the clinician and the patient, it can be a catastrophic result for the clinician to base the final diagnosis on a single clinical working diagnosis rather than formulate a differential diagnosis and then perform the biopsy to determine the definitive diagnosis.

The biopsy is not a substitute for thoughtful evaluation of the patient's condition—the clinician should initially develop a differential diagnosis and then perform the biopsy. When the biopsy tissue specimen is submitted, the clinician should include a differential diagnosis to aid the pathologist in his or her thought processes. In approximately 80–90% of cases, the pathologic diagnosis of the biopsy

specimen will be consistent with the clinical diagnosis but, if not, the dentist should contact the oral pathologist to ensure that a laboratory error has not occurred. A timely and accurate final diagnosis is beneficial for both the clinician and the patient whether in agreement or not with the clinical diagnosis. Benefits include increased clinical confidence in diagnostic skills, increased patient respect, and satisfaction that treatment performed was appropriate. The final written diagnosis usually brings closure to the clinical situation.

The two types of biopsy most commonly performed in order to obtain a definitive diagnosis are *incisional* and *excisional*. An excisional biopsy is a surgical procedure that removes the entire lesion for microscopic examination; conversely, an incisional biopsy is a surgical procedure that removes a portion of the lesion for microscopic examination. An excisional biopsy is performed when the lesion is relatively small and its clinical working diagnosis is thought to be benign; it can also be used to ensure that a previously diagnosed lesion has been removed completely. Other factors that are considered when deciding which type of surgical biopsy to perform include the lesion's site and the clinician's experience and comfort level. These are the same factors that determine whether the dentist performs the biopsy or refers to a specialist. Certainly, it is perfectly acceptable for a clinician to elect not to perform the biopsy in his or her practice but it is, likewise, totally unacceptable to ignore that a biopsy needs to be performed.

Scalpel Biopsy Dos and Don'ts

The specific site for an excisional biopsy is not a concern, but when an incisional biopsy is to be performed it is usually important that a portion of normal adjacent tissue is also included (i.e., perilesional). By including at least a small portion of normal mucosa the oral pathologist is aided in interpreting the microscopic features of the disease. If the lesion is very large, then multiple incisional biopsies should be performed; each biopsy should be placed in a separate 10% formalin container or, alternatively, each specimen can be differentiated within a single container by placing sutures of different length or composition. Sutures can also be used to denote a particular margin of a specimen so the oral pathologist can accurately orient the specimen during accessioning and gross preparation prior to tissue processing. When microscopic information about the lesional margins is requested by the submitting clinician, it is also helpful to include a diagram of the biopsy specimen that denotes the sutures and margins (e.g., anterior, posterior, distal).

Unless medically contraindicated, when applying local anesthetic to the area of the planned biopsy, it is advantageous to use a type with epinephrine to aid in capillary constriction prior to incising the tissue. The local anesthetic of choice is deposited adjacent to the lesion but never directly into the affected tissues. If the latter is done, then it creates significant artifactual change of the tissue, and the biopsy specimen is often not diagnosable under light microscopy.

The basic shape of the biopsy specimen, from above, should appear elliptical and, in cross-section, should appear V-shaped. By obtaining this three-dimensional conformation the biopsy tissue flaps area can be easily sutured without creating tension. This will promote the most ideal healing by primary intention and will

avoid or minimize secondary healing by the slower process of extensive granulation tissue fill-in.

It is critical, particularly for an incisional biopsy, that enough tissue in length, width, and depth is obtained so that selection bias does not compromise the biopsy's microscopic interpretation due to insufficient yield. A very small tissue sample also can be lost during tissue processing or can make tissue embedding and sectioning very difficult.

If the provisional clinical diagnosis includes a condition for which the patient is taking systemic or topical medication, the treatment should cease several days before the biopsy procedure in order to avoid a "masking" therapeutic effect, unless the risk of medication cessation outweighs the benefit of avoiding sampling bias. The area to be biopsied should not be cleaned with colored antiseptics or similar materials prior to biopsy, although toluidine blue does not interfere with the tissue staining process.

The most frequent pathology morphology seen within the oral cavity is an ulcer. It is important that, when an ulcer is biopsied, both its margins and adjacent normal tissue are included so that the submitted specimen does not consist solely of the ulcer's bed of granulation tissue and overlying inflammation, necrotic debris, and fibrinopurulent membrane. If the tissue biopsied is part of a sloughing-type disease (e.g., mucous membrane pemphigoid), then a suture can be passed through the sloughed area into the underlying connective tissue and out through a nonsloughed area. The specimen obtained may be placed in the formalin container with the suture still attached. In fact, depending on the biopsy site, it is often advisable to place a traction suture in the lesion prior to removal so that, when the suture is gently pulled by the assistant, the incising of the tissue is facilitated. Furthermore, the traction suture can prevent an accidental loss of the tissue by the suction device.

Most clinicians continue to biopsy with a sharp, sterile, stainless steel surgical blade, typically a #15; however, a laser is an acceptable device if the clinician determines its proper settings. If the settings are too high, then it can cause significant thermal artifactual change that renders some or all of the biopsied tissue undiagnosable. Therefore, if a laser is used, the margins of the specimen should be larger than the biopsy site of interest; this is particularly true if the purpose of the biopsy is to confirm the lack of dysplasia at the epithelium's lateral or inferior margins.

During the biopsy procedure, and particularly once the tissue has been freed from the surgical bed, it should be handled very gently so that, for example, tissue forceps do not leave a damaging crush artifact within the tissue. It is helpful to place the removed tissue on a sheet of paper, connective-tissue side down, prior to immersion in the formalin container. This step helps prevent the biopsied tissue from curling into the shape of a ball during transport, which could hinder the oral pathologist performing the subsequent orientation of the specimen during its accession and grossing.

It is critical that the clinician and pathologist work as a team to minimize potential errors during the multistep biopsy diagnostic process. The biopsy tissue is immediately immersed in a container of 10% formalin to avoid tissue autolysis. The container's label must have the patient's and doctor's names as well as the site and date of the biopsy. State law requires the patient's name on the specimen container

Figure 6.2 A typical available biopsy kit composed of instructions, requisition form, prepaid overnight mailer and shipping container, and 10% neutral buffered formalin container.

and a pathology lab is legally obligated to return an unlabeled specimen. A dentist should always have enough formalin containers on hand since oral pathology laboratories supply them free of charge (Fig. 6.2). If the formalin in the container has evaporated so that only powder remains, the dentist should dispose of the bottle rather than attempt rehydration. Alcohol is a poor second choice as an intact tissue fixative but it can be used in an emergency. Tap or distilled water should never be used as a fixative since it will destroy the tissue by hydrolysis and, thus, render it useless for microscopic evaluation. Following the biopsy, pressure with gauze should be applied to promote clotting. The surgical bed should be carefully inspected to ensure that no foreign body material has been left that will delay or compromise healing.

As the health-care professional, it is the dentist's responsibility to ensure that the fixative container's label and requisition forms are filled out in their entirety. The patient demographic information and billing information must be included as well as dental office contact information. The clinician must use his or her oral pathology knowledge to accurately describe the lesion as well as to provide a suitable differential diagnosis. Pertinent medical, dental, and social histories should also be included. After the biopsy specimen has been securely packaged appropriately within the oral pathology laboratory's kit, the clinician should verify the office's return address is on the shipping label whether or not a shipping company's bar code and tracking number are present.

Oral pathology laboratories attempt to provide accurate diagnoses in the minimum amount of time. If the diagnosis of the pathology report does not correlate substantially

with the clinical situation, it is the clinician's responsibility to investigate. Call and speak to the oral pathologist and express your concerns. The oral pathologist will verify the accuracy of the diagnosis or make the necessary changes.

Punch Biopsy Dos and Don'ts

The punch biopsy is a popular and convenient method used by dermatologists for skin biopsies and it is also suitable for performing small surgical biopsies of the oral mucosa. Typically, the punch instrument is a disposable, single-use device that makes a circular cut. The handle/shaft is plastic with a widened hub that extends into a very sharp, circular, surgical steel blade. The punch can be purchased from several medical and dental supply vendors and typically comes in color-coded diameters ranging from 2 to 8 mm. A popular punch size for an incisional biopsy is 4 mm, but a smaller lesion can be totally excised by using a larger diameter punch.

The punch procedure begins with a small amount of local anesthetic deposited adjacent to the lesion. Then the biopsy punch is held vertically above the lesion and is precisely and firmly pushed down into the tissue and simultaneously rotated clockwise or counterclockwise. The tissue to be biopsied is finger supported if it is not supported by bone; in the case of the tongue, firmly grasp it with gauze to immobilize the punch biopsy site. Usually the plastic hub is approximately 6 mm from the edge of the circular blade and thus the incising depth can be controlled. Once the tissue has been incised, the punch is removed, leaving a visible rim of blood that is confirmation of adequate depth into the lamina propria's superficial capillaries. The clinician should then gently hold the still attached specimen with tissue forceps and carefully free its base by gently pulling up along its long axis and simultaneously cutting the base with a pair of small, curved iris scissors or a surgical blade. Once the specimen has been freed it should be placed, connective-tissue side down, on a small piece of paper and immersed in a 10% formalin container with its cap subsequently replaced and retightened. As with a scalpel biopsy, direct pressure should be applied with surgical gauze until clotting occurs; a topical coagulant can be used for any persistent hemorrhage. Unlike a scalpel biopsy, no sutures can be placed in the circular (nonelliptical) surgical wound and it will heal entirely by granulation tissue formation; alternatively, some clinicians opt to place sutures to encourage faster healing. A small drop of clear cyanoacrylate resin (Dermabond®) can be placed on top of the wound to keep it clean while healing occurs.

The rest of the punch procedure is identical to a scalpel biopsy with regard to container labeling and requisition form completion. Also, the same standard patient instructions are given—to avoid injury to the biopsy site from food or toothbrush, gently rinse with warm salt water several times a day, and use nonsteroidal anti-inflammatory medications (NSAIDs) to relieve postoperative pain.

The AAOMP has stated that the routine submission of abnormal tissue to an oral pathologist for diagnosis is a vital link in the development of truly evidence-based clinical practice. It is not a panacea for protection against claims of malpractice, but its timely and routine use will likely substantially reduce the success rate of claims.

Recommended Reading

Afrogheh A, Wright CA, Sellars SL. An evaluation of the Shandon Papspin liquid-based oral test using a novel cytologic scoring system. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2012;113:799–807.

Ephros H, Rosetti JO. Oral punch biopsy and scalpel biopsy: emedicine clinical procedures. Available at: http://emedicine.medscape.com/article/1079770-overview (accessed November 11, 2011).

Khoo SP. Oral biopsy in dental practice—the pathologist's perspective. *Annals Dent Univ Malay* 1995;2:29–32.

Lorenzato M, Bory JP, Cucherousset J, et al. Usefulness of DNA ploidy measurement on liquid-based smears showing conflicting results between cytology and high-risk human papillomavirus typing. Available at: http://www.ajcp.com/volume_118/issue_5/202176.html (accessed April 17, 2008).

Magro CM, Robets-Barnes J, Crowson AN. Direct immunofluorescence testing the diagnosis of immunobullous disease, collagen vascular disease, and vascular injury syndromes. *Dermatol Clin* 2012;30:763–798.

Newland JR, Meiller TF, Wynn RL, Crossley HL. *Oral Soft Tissue Diseases*, 5th edition. Hudson, OH: Lexi-Comp, Inc.; 2011.

Poh CF, Ng S, Berean KW, Williams PM, Rosin MP, Zhang L. Biopsy and histopathologic diagnosis of oral and premalignant and malignant lesions. *JCDA* 2008;74:283–288.

Wood NK, Goaz PW. *Differential Diagnosis of Oral and Maxillofacial Lesions*, 5th edition. St. Louis, MO: Mosby; 1997.

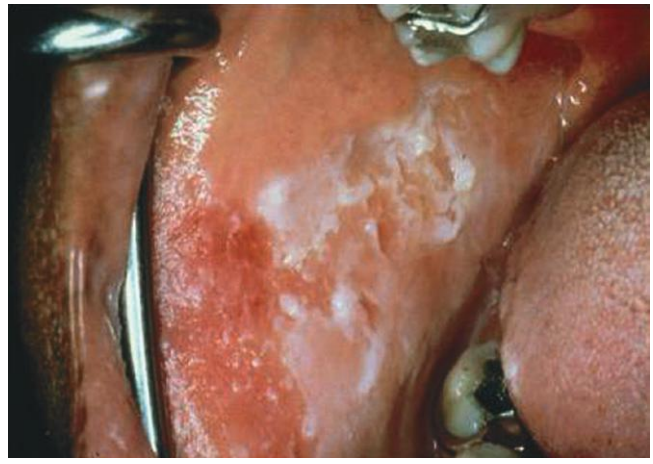
Section III

Clinicopathologic Exercises

7 Sample Patient Histories and Discussion

White Lesions

Case 1



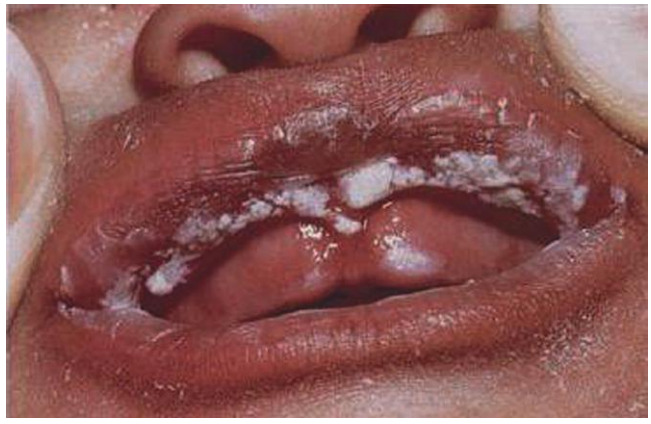
A 38-year-old woman has three children and is in the process of divorce from an abusive husband. She takes Ambien to help her sleep at night and is very concerned about the bilateral, superficial "peeling" of this roughened, ragged, and thickened plaque area of her right cheek. When the patient responded negatively to a series

The ADA Practical Guide to Soft Tissue Oral Disease, First Edition. Michael A. Kahn and J. Michael Hall.

of questions regarding habits and application of materials to the area, a biopsy was done. What is the diagnosis?

a. Candidiasis
b. Leukoedema
c. White sponge nevus
d. Morsicatio buccarum

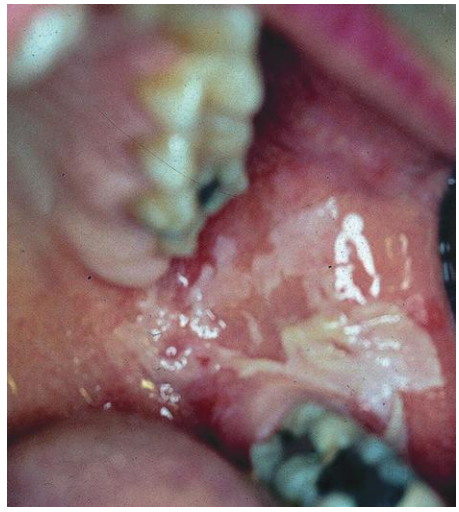
Case 2



A 2-month-old bottle-fed baby has had this oral condition since shortly after birth, although she feeds well and is gaining weight normally. She lives in a rural community without access to a pediatrician. These lesions wipe away, leaving an erythematous base. What is the diagnosis?

a. Candidiasis
b. Diphtheria
c. White sponge nevus
d. Hairy leukoplakia

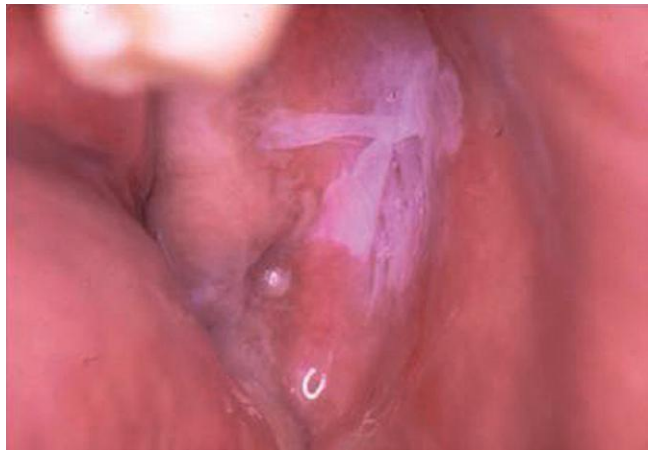
Case 3



A 29-year-old schizophrenic man is living in a homeless shelter. He presents with severe pain in the lower left mandible and deep recurrent caries in tooth #18. What would not be an appropriate process to list in the differential diagnosis of this lesion?

a. Chemical trauma
b. Leukoedema
c. Morsicatio buccarum
d. Tobacco pouch keratosis

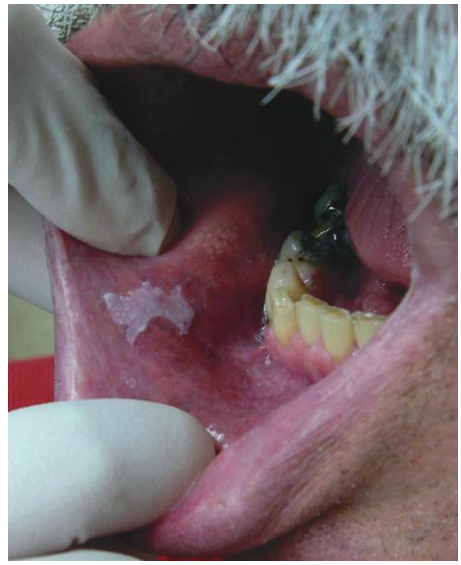
Case 4



A 57-year-old widower confides to you that he believes he has halitosis. He has recently noticed that the "lining of his cheeks seems to be peeling." The appearance combined with the history fits what most likely diagnosis?

a. Leukoedema
b. Lichen planus
c. Chemical reaction to mouthwash
d. Uremic stomatitis

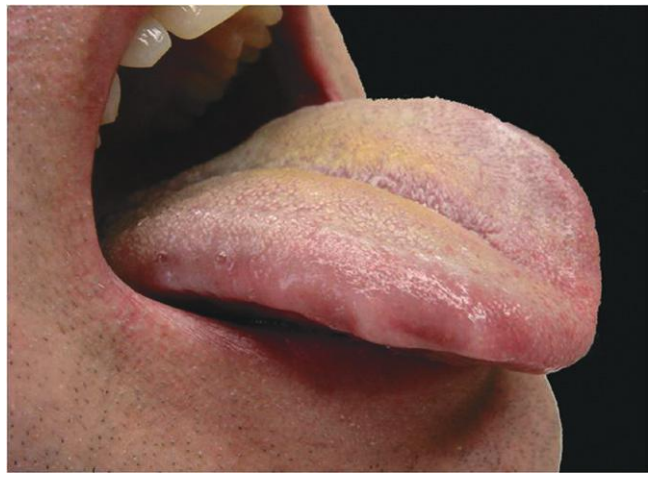
Case 5



This 62-year-old man smokes one pack of cigarettes a day. This lesion was discovered on a routine new patient examination; he had not been aware of it and did not know how long it was present. Based on the information given and the clinical photograph, what is the best diagnosis for this lesion?

a. Morsicatio
b. Leukoplakia
c. Squamous cell carcinoma
d. Hairy leukoplakia

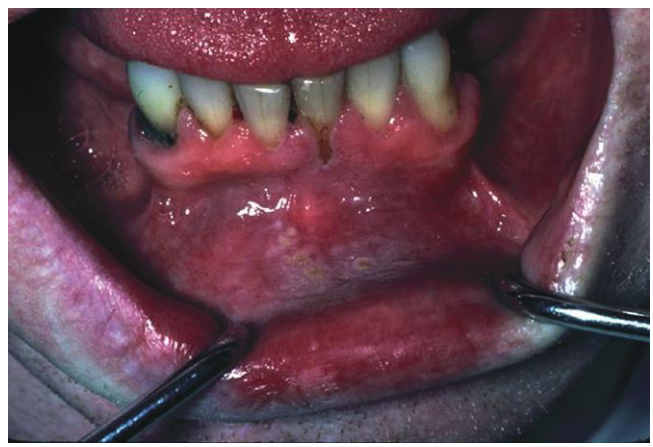
Case 6



A 55-year-old woman is troubled by a burning sensation on the tip of her tongue. She is convinced that the appearance of her tongue has changed from the previous pink color. What is the white layer seen on the dorsum of this coated tongue?

a. Desquamated epithelial cells and bacteria
b. Cells from white sponge nevus
c. Necrosis from a chemical burn
d. Hyperkeratosis

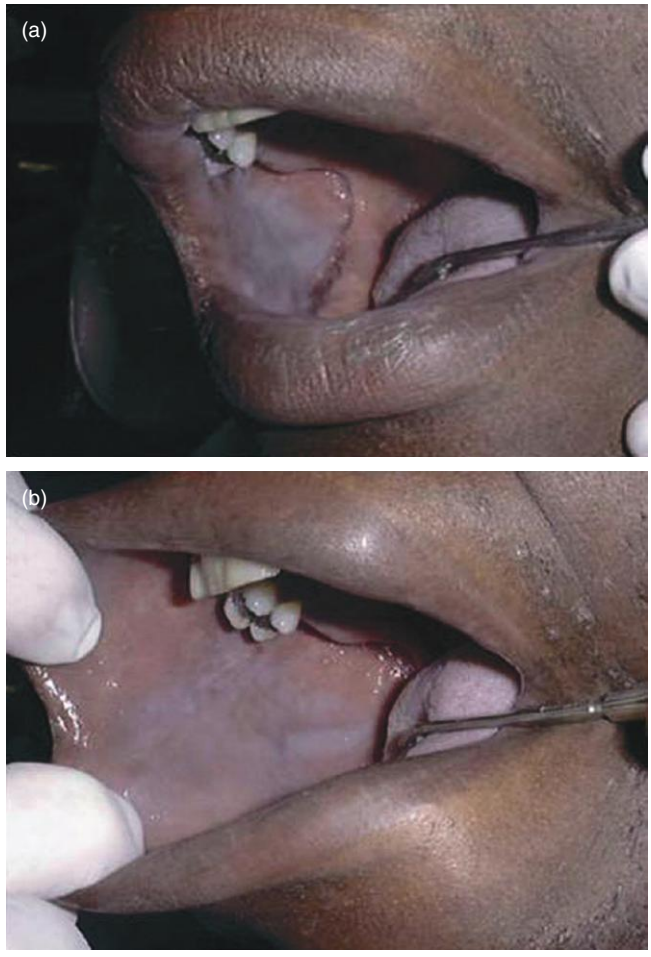
Case 7



A 46-year-old man was a professional baseball player in his youth. He admits to drinking a 6-pack of beer and use of tobacco products every day. If the histology from a biopsy of this area showed only excess keratin, what would the clinical diagnosis be?

a. Leukoedema
b. Hyperplastic candidiasis
c. Tobacco pouch keratosis
d. Lichen planus

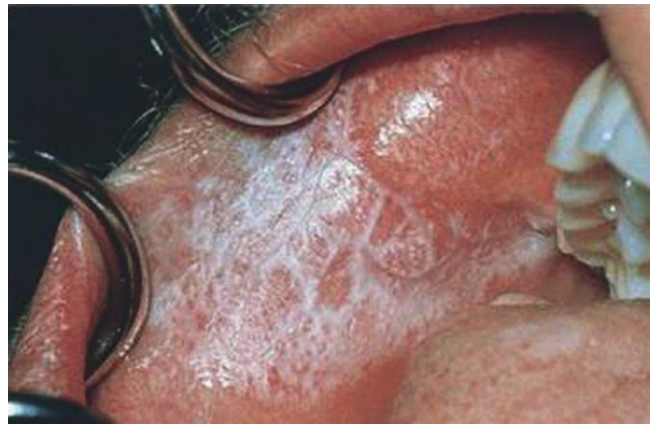
Case 8



A 35-year-old man is obese and takes lisinopril for hypertension. The observed changes are bilateral and asymptomatic. What is the likely clinical diagnosis of the lesions seen in this case?

a. Tobacco pouch keratosis
b. Pseudomembranous candidiasis
c. Nicotine stomatitis
d. Leukoedema

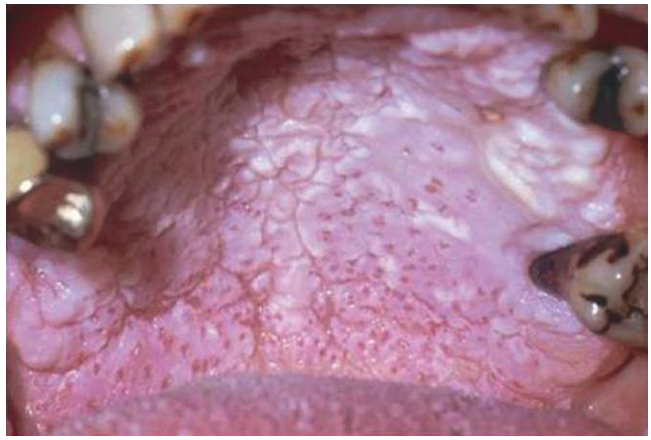
Case 9



This 48-year-old man complains of roughness on the inside of both of his cheeks. He claims that this has been present for about 6 months although it is asymptomatic. The clinical photograph and history strongly suggest lichen planus; what are the lines on the buccal mucosa called?

a. Wickham's striae
b. Lines of Zahn
c. Lines of Retzius
d. Koebner's striae

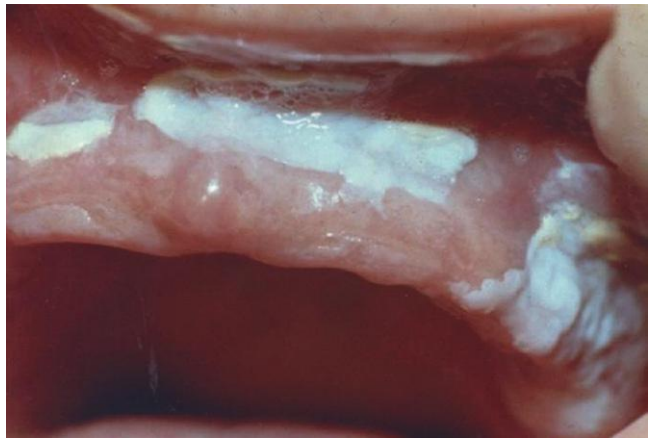
Case 10



A retired 72-year-old man has smoked three packs of cigarettes a day for 30 years. He has severe periodontal disease but, on questioning, did not know about any changes in his oral tissues. What is the clinical diagnosis given to this condition?

a. Leukoplakia
b. Hyperkeratosis with dysplasia
c. Nicotine stomatitis
d. Lichen planus

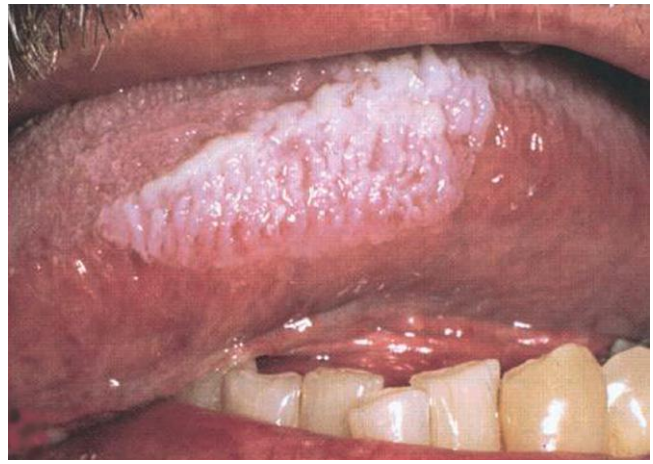
Case 11



A 60-year-old woman has worn complete upper and lower dentures for 20 years. She has chronic obstructive pulmonary disease (COPD) and recently completed a course of antibiotics to treat bacterial pneumonia. This is an example of pseudomembranous candidiasis. What in the history is not a typical factor for the development of the disease?

a. Age of 60
b. History of COPD
c. Denture wear
d. Antibiotic use

Case 12

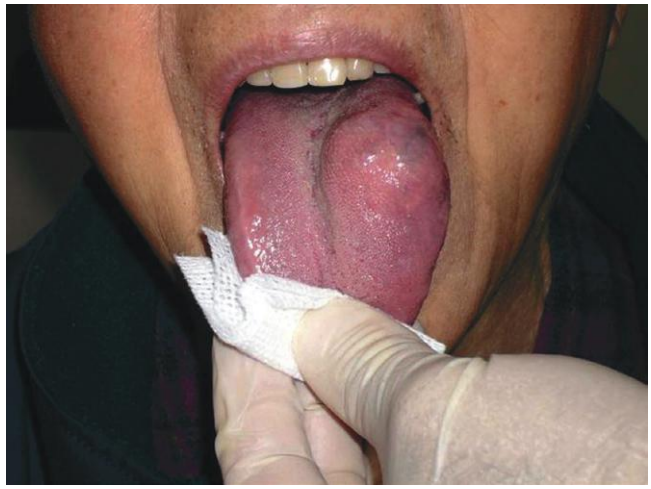


This 39-year-old man exhibits these changes bilaterally. On questioning about his social history he admits to being bisexual although he has never been tested for HIV. If you wanted to evaluate this person for hairy leukoplakia, what would be diagnostic?

a. HIV testing
b. Biopsy with stains for Epstein–Barr virus
c. The lesions should wipe away with gauze
d. Historical information about other family members with a similar condition

Red, Red-and-White, and Purpuric Lesions

Case 13-1



A young adult has been aware of this lesion for years and it has remained the same size. The blanchable and compressible lesion is not painful. What is the most likely provisional diagnosis of this lesion?

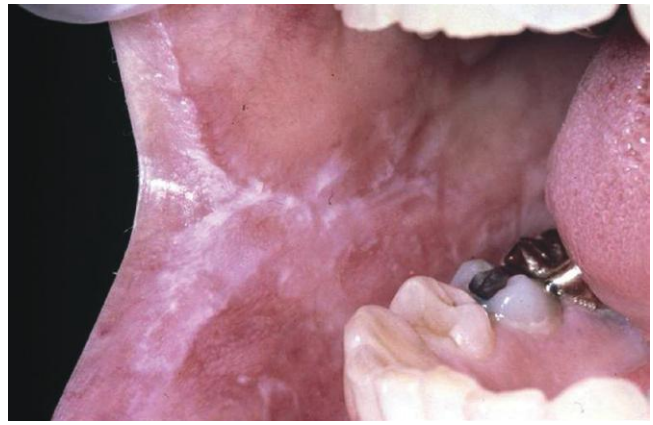
a. Erythema migrans
b. Erythematous candidiasis
c. Erythroplakia
d. Hemangioma

Case 13-2

A hemangioma is considered:

a. Neoplastic
b. Developmental
c. Inflammatory
d. Reactive

Case 14-1



A 25-year-old woman has noticed this unilateral change for the past few months. The area is asymptomatic and cannot be wiped off. Each of the following would be a reasonable differential diagnosis for this lesion *except* one. Which one is the exception?

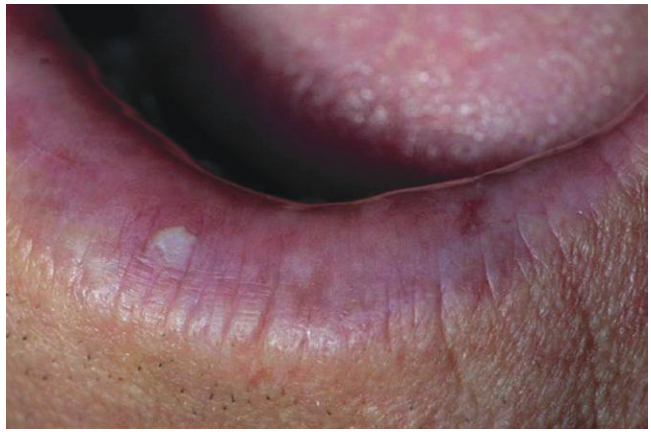
a. Cinnamon allergic reaction
b. Acute candidiasis
c. Lupus erythematosus
d. Cheek nibbling

Case 14-2

Which of the following is the most likely provisional diagnosis?

a. Lichen planus
b. Cinnamon allergic reaction
c. Thermal burn
d. White sponge nevus

Case 15-1



A 59-year-old man is noted to have this lower lip appearance during his routine dental cleaning appointment. None of the roughened area is removable. Based on the history and site, morphology, and color of the lesion, its provisional diagnosis is which of the following?

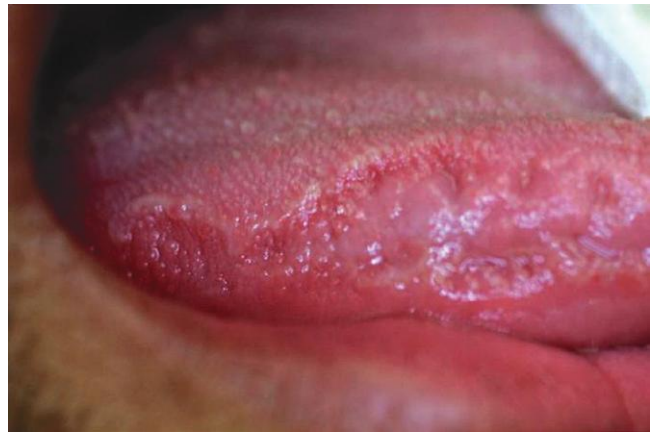
a. Lichen planus
b. Verruciform xanthoma
c. Actinic cheilitis
d. Candidiasis

Case 15-2

Which is true about actinic cheilitis?

a. Lesion often oozes a mucous secretion.
b. Actinic cheilitis is more common on the upper lip.
c. Precancerous changes are reversible.
d. A significant percentage of lesions are premalignant.

Case 16-1



A dental student is aware of this lesion that "comes and goes." When present, the area tends to change shape from day to day. Which of the following is the most likely diagnosis?

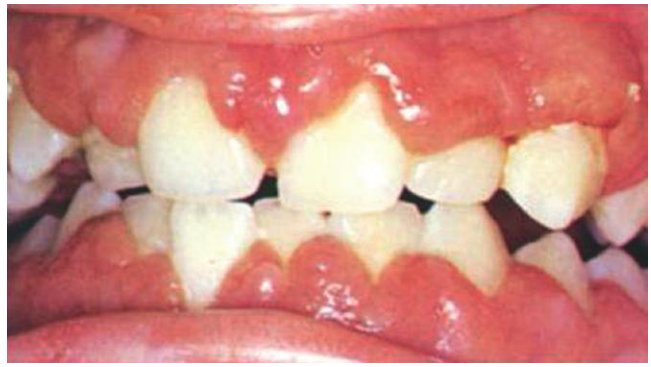
a. Traumatic erythema
b. Erythema migrans
c. Erythroleukoplakia
d. Nicotine stomatitis

Case 16-2

Which condition is statistically associated with geographic tongue?

a. Candidiasis
b. Erosive lichen planus
c. Psoriasis
d. Fissured tongue

Case 17-1



A 16-year-old girl taking phenytoin complains of fatigue, weight loss, low-grade fever, spontaneous gingival hemorrhage, and this gingival change. What part of the history is not consistent with drug-induced gingival hyperplasia?

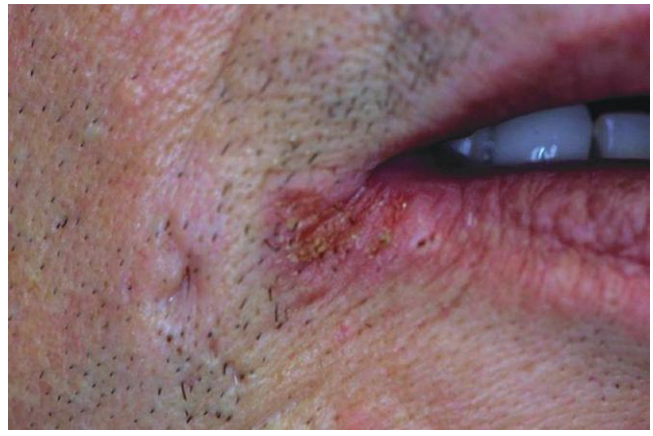
a. Anterior facial involvement
b. Erythema
c. Excess attached gingiva
d. Spontaneous gingival hemorrhage

Case 17-2

Which is the most likely provisional diagnosis?

a. Leukemia
b. Infectious mononucleosis
c. Scarlet fever
d. Hereditary hemorrhagic telangiectasia

Case 18-1



A 50-year-old man has had this chronic sore for the past year. It occasionally bleeds and is intermittently sore. What is the most likely provisional diagnosis?

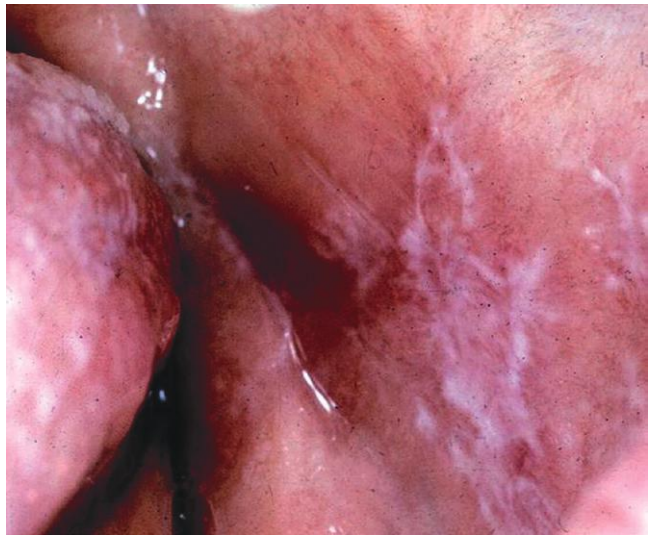
a. Hemangioma
b. Lichen planus
c. Actinic cheilitis (cheilosis)
d. Angular cheilitis

Case 18-2

In addition to candidiasis, what is another cause of angular cheilitis?

a. Vitamin deficiency
b. Developmental defect
c. Viral infection
d. Protozoan infection

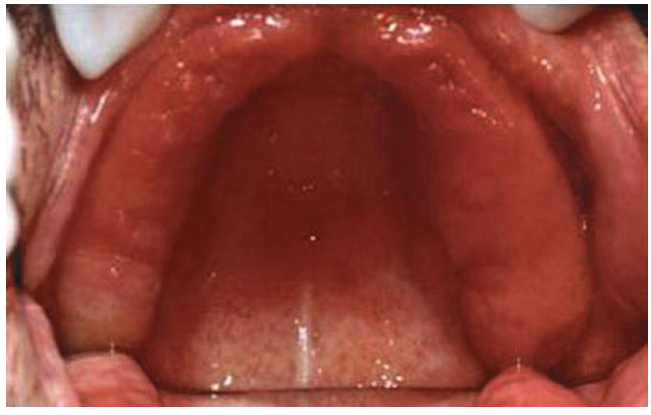
Case 19



A 55-year-old woman has had asymptomatic bilateral and symmetrical lesions for the past several years. Recently, some focal pain has occurred. The areas "feel rough" to the patient when rubbed with the tip of her tongue. Once a provisional diagnosis is made based on this lesion's site, morphology, color, and history what is the next step in management of this condition?

a. Topical steroid application
b. Biopsy of left and right lesions
c. Cytology to rule out malignancy
d. Antifungal medication

Case 20

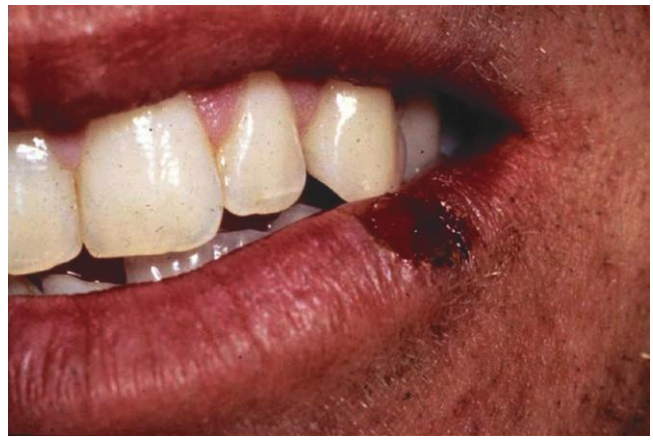


A denture patient is unaware of this lesion. What is the proper management of this condition?

a. Treat both the denture and oral mucosa with antifungal agents.
b. Leave the denture out at night, clean it, and rinse it in an antifungal solution.
c. Use laser ablation followed by new denture construction.
d. Apply antifungal cream to the affected oral soft tissues.

Acute Oral Ulcerations

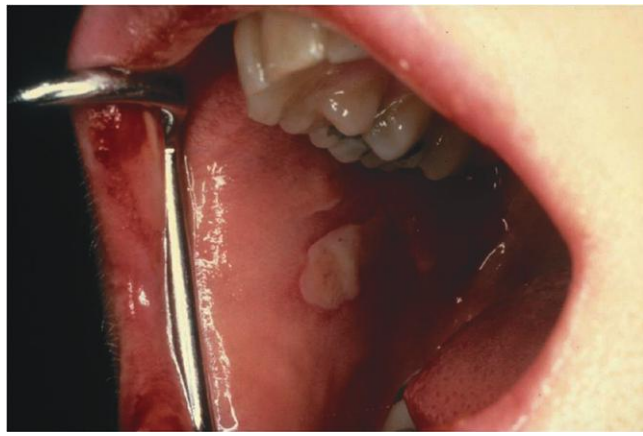
Case 21



A 36-year-old woman has an asymptomatic lesion of 1 week's duration; no other signs or symptoms were seen. Spontaneous healing occurred after 2 weeks. The patient has a history of recurrent aphthous ulcers but does not recall having lip lesions. What finding in the history suggests that this lesion is not an aphthous ulcer?

a. Patient's age
b. Asymptomatic lesion
c. Healed spontaneously in 2 weeks
d. Site

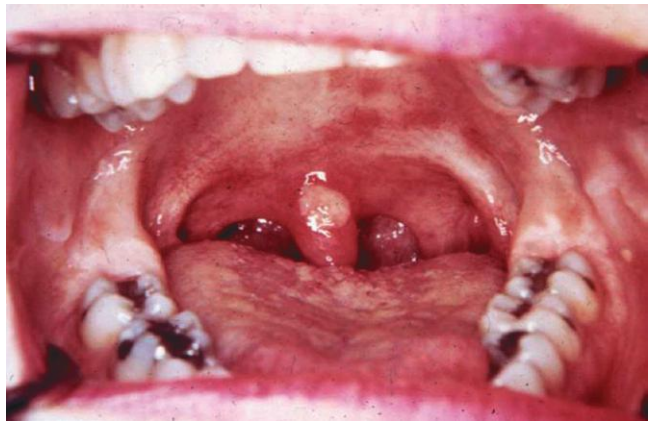
Case 22



A 20-year-old woman has an acute onset of painful ragged ulcerations of the movable mucosa accompanied by fever and malaise. The patient also gives a history of "cold sores" that occur several times per year on her lip. The history of painful acute-onset ulcers of the movable mucosa favors what diagnosis?

a. Erythema multiforme
b. Aphthous ulcers
c. Herpes simplex
d. Varicella

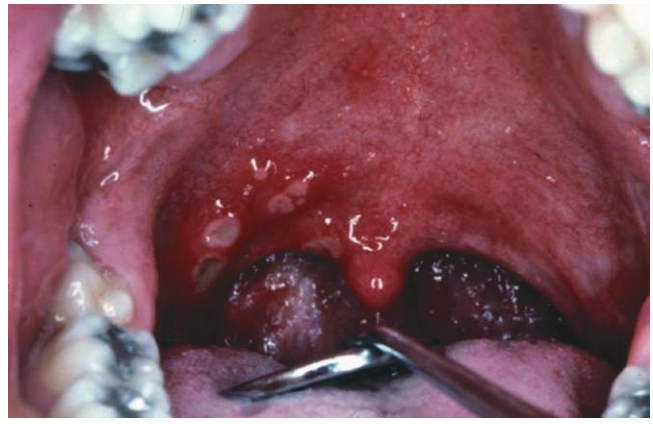
Case 23



A patient has had recurrent painful bouts of oral mucosal ulcerations of greater than 1 year's duration. Each episode of lesions resolves in approximately 10 days. Similar cutaneous lesions were seen at one time and were treated with steroids and antibiotics, resulting in resolution. What is the triad of signs and symptoms seen in Behcet's syndrome?

a. Arthritis, dermatitis, facial paralysis
b. Skin lesions, fissured tongue, oral ulcers
c. Oral ulceration, genital ulceration, ocular inflammation
d. Blistering skin, nonpainful oral ulceration, hairy tongue

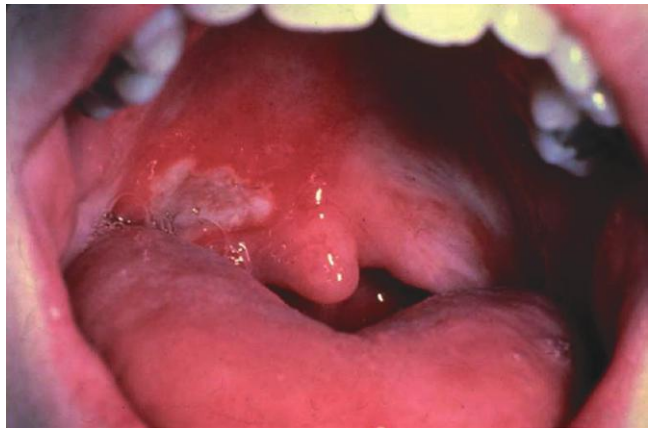
Case 24



A 16-year-old boy had soft palate ulcerations derived from ruptured vesicles. The ulcers were mildly tender and accompanied by a sore throat. The lesions resolved in 1 week. No prior history of a blistering or ulcerative disease was given. What is the most likely diagnosis for these lesions?

a. Herpangina
b. Herpes simplex
c. Recurrent aphthae
d. Syphilis

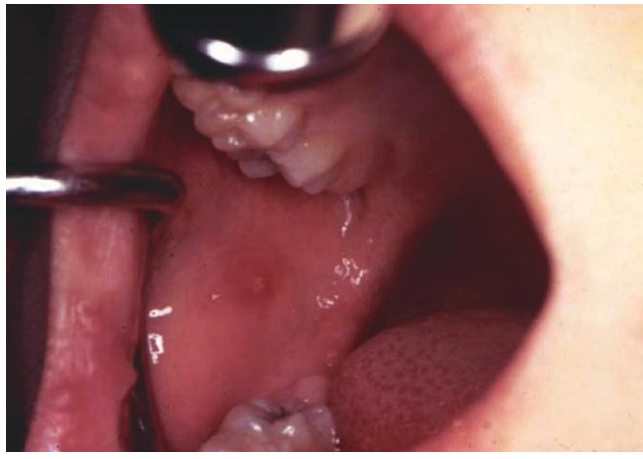
Case 25



Painful, often multiple, deep ulcerations of a cyclical nature, corresponding to her menstrual cycle, began in this 16-year-old girl. No treatment has been effective. Behcet's disease, cyclic neutropenia, Crohn's disease, and Sweet's syndrome all have oral lesions that can be identical to what?

a. Herpangina
b. Recurrent aphthous ulcers
c. Erythema multiforme
d. Pemphigus vulgaris

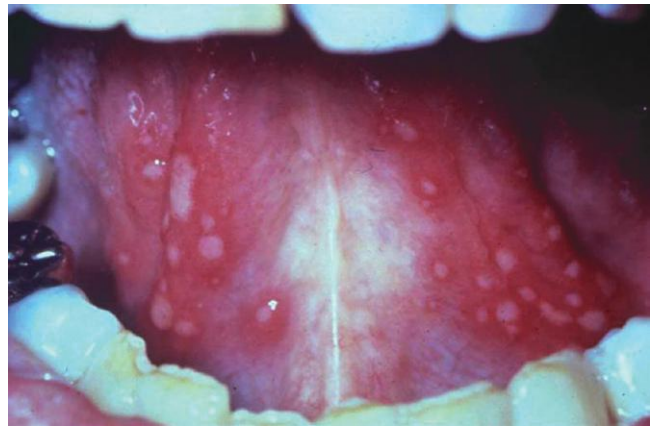
Case 26



An 8-year-old girl was seen by her physician for a complaint of fever, malaise, and sore throat. During the exam this ulceration was found. The lesion was asymptomatic and thus the patient was unaware of its presence. If this lesion were an initial finding for primary varicella zoster (i.e., chicken pox) what is likely to follow?

a. Painful ocular inflammation
b. Gingivostomatitis
c. Necrosis of the interdental papillae
d. Vesicular skin lesions

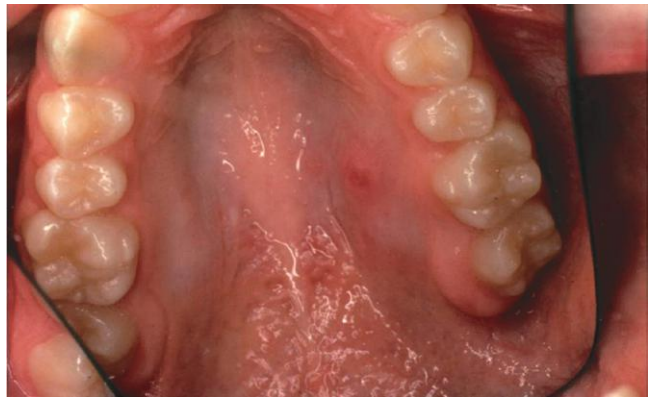
Case 27



A 38-year-old woman complains of almost constant painful crops of small ulcerations of the oral mucosa not preceded by vesicles. Individual ulcers heal within 2 weeks but are almost immediately replaced by new similar-appearing lesions. She reports that she is in otherwise good health with no concurrent skin lesions. What is the likely diagnosis for these lesions?

a. Herpetiform aphthae
b. Herpes simplex
c. Herpes zoster
d. Chicken pox

Case 28

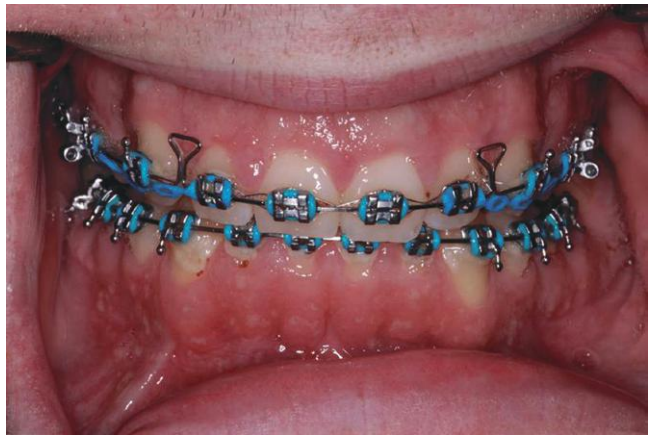


A 25-year-old man is seen because of a painful swelling on his hard palate. It has been present for about a week and the pain worsens when eating rough foods such as potato chips. Upon intraoral examination, ulceration is seen in the area of the swelling. Which would not be part of a reasonable differential diagnosis?

a. Recurrent aphthous ulcer
b. Necrotizing sialometaplasia
c. Superficial mucocele
d. Wegener's granulomatosis

Chronic Vesiculoerosive and Ulcerative Lesions

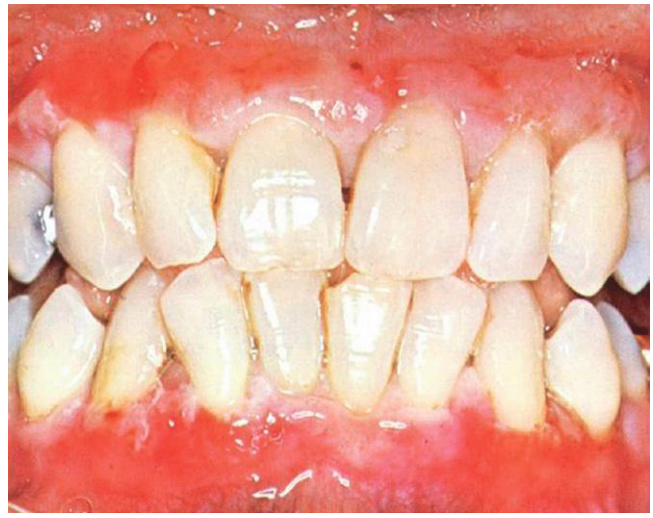
Case 29



An 18-year-old boy with mandibular alveolar mucosa papules has similar lesions on the buccal mucosa and palate. His medical and social histories are noncontributory; however, on the review of systems he mentions some recent episodes of intestinal cramping and diarrhea. Although these lesions do not look ulcerative, the history should make you suspect what condition?

a. Wegener's granulomatosis
b. Noma
c. Erosive lichen planus
d. Pyostomatitis vegetans

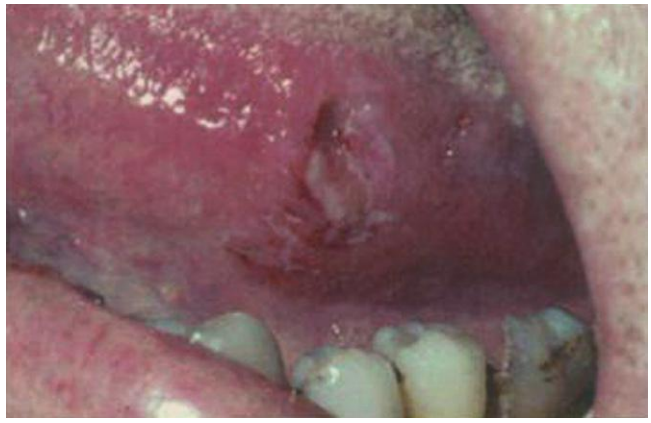
Case 30



A 62-year-old woman complains that for the last 2 years she has been unable to eat spicy foods and finds it painful to perform good oral hygiene. Upon head and neck examination, it is noticed that she has conjunctival inflammation. The clinical appearance is that of desquamative gingivitis. The presence of eye involvement should make you suspect what disease?

a. Mucous membrane pemphigoid
b. Erosive lichen planus
c. Erythema multiforme (Stevens–Johnson syndrome)
d. Herpes zoster

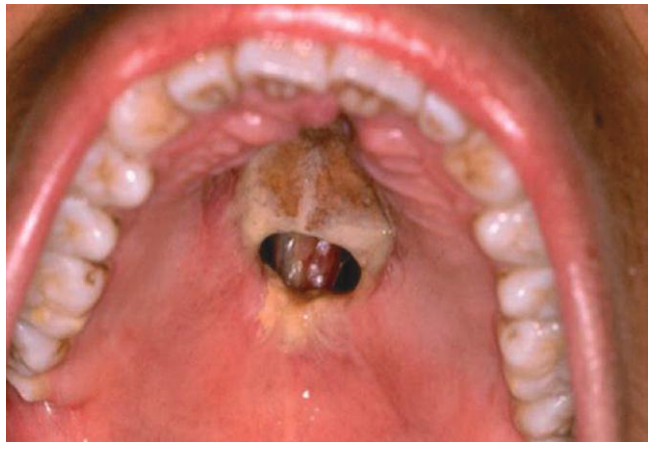
Case 31



A 54-year-old man presents with an area that has been tender for 3 months. He is in good health, drinks red wine with dinner about 3 times per week, and has never used tobacco. A nonhealing ulcer on the lateral tongue should make you think of all of these choices except which one?

a. Squamous cell carcinoma
b. Deep fungal infection
c. Mucous membrane pemphigoid
d. Traumatic granuloma

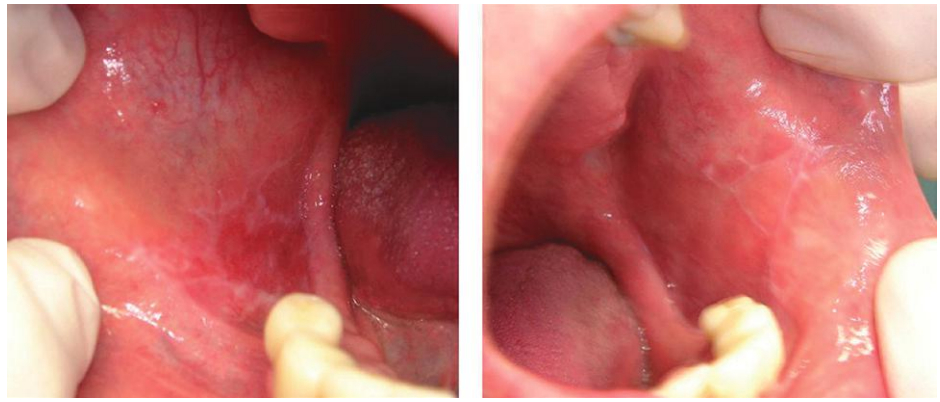
Case 32



This 62-year-old man emigrated from Guatemala 10 years ago. He has no health insurance and resisted going to the hospital until he began feeling deep fatigue and episodes of epistaxis. The patient in this case eventually died of his disease despite aggressive chemotherapy. He had no other known risk factors such as diabetes mellitus, and his immune status was intact. What is the likely diagnosis?

a. Behcet's syndrome
b. Midline lethal granuloma
c. Tertiary syphilis
d. Wegener's granulomatosis

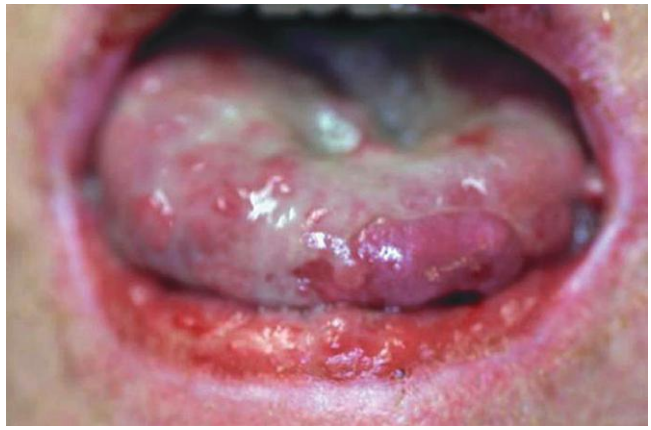
Case 33



A 61-year-old man experiences tenderness of the buccal mucosa that comes and goes. He changed to a mild children's dentifrice and stopped using mouthwash, but the lesions persisted. These lesions of lichen planus can easily be confused with a lichenoid hypersensitivity response. What clinical sign does not help to distinguish that this is lichen planus?

a. Lesions are bilateral
b. Lesions come and go
c. White striae
d. Ulceration

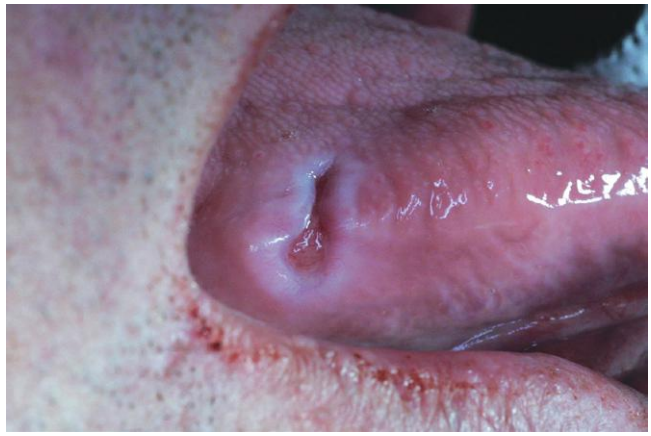
Case 34



A 54-year old man has had continuous, very painful mouth sores for approximately 7 months. The only time the sores remitted was when he was given high dose methylprednisolone for a bowel condition 2 months ago. The patient has pemphigus vulgaris. What will help to confirm the disease besides histopathology?

a. Presence of rheumatoid factor
b. Presence of antinuclear antibodies
c. Positive Nikolsky sign
d. Direct and indirect immunofluorescence studies

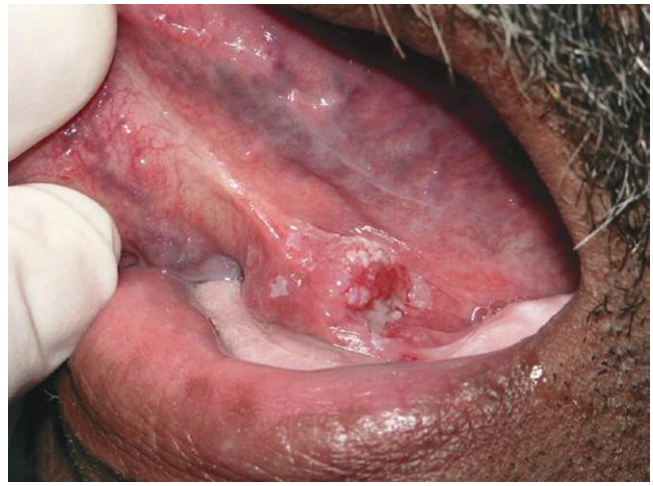
Case 35



A 38-year-old man bit his tongue 4 weeks ago and is concerned because it has not healed. Since most oral ulcerations resolve in 2 weeks a biopsy was taken from this patient. When the patient returned for a follow-up visit the next week the lesion was almost completely resolved. What is the likely diagnosis?

a. Traumatic ulcerative granuloma
b. Deep fungal infection
c. Squamous cell carcinoma
d. Erythema multiforme

Case 36

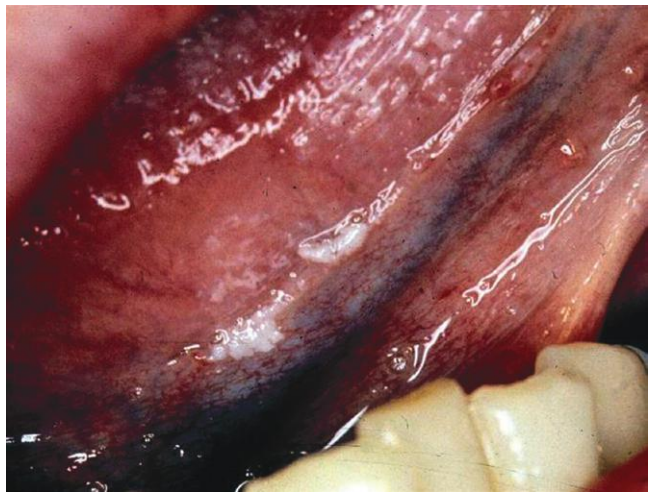


This 72-year-old edentulous man does not wear dentures. He has smoked cigarettes and used alcohol his entire adult life. He complained of a "raised" lesion on the left lateral tongue. This asymptomatic lesion was found on oral examination. The site and lack of symptoms should make what diagnosis the primary consideration in your differential diagnosis?

a. Recurrent herpes
b. Traumatic ulcer
c. Noma
d. Squamous cell carcinoma

Papillary Lesions

Case 37-1



An HIV-positive male is unaware of this tongue lesion and, thus, duration is unknown. What is the most likely provisional diagnosis of this lesion?

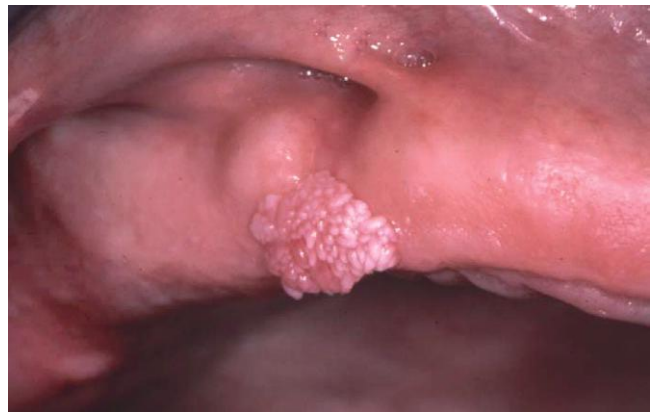
a. Verruca vulgaris
b. Hairy tongue
c. Squamous papilloma
d. Hairy leukoplakia

Case 37-2

If a biopsy of suspected hairy leukoplakia is taken, the confirmatory microscopic features should demonstrate evidence of the following:

a. Human papillomavirus
b. Epstein–Barr virus (EBV)
c. Human immunodeficiency virus
d. Herpes simplex virus

Case 38-1



A 41-year-old man has this firm, nonpainful, pedunculated palatal lesion of 1 year's duration. What is the least likely clinical diagnosis?

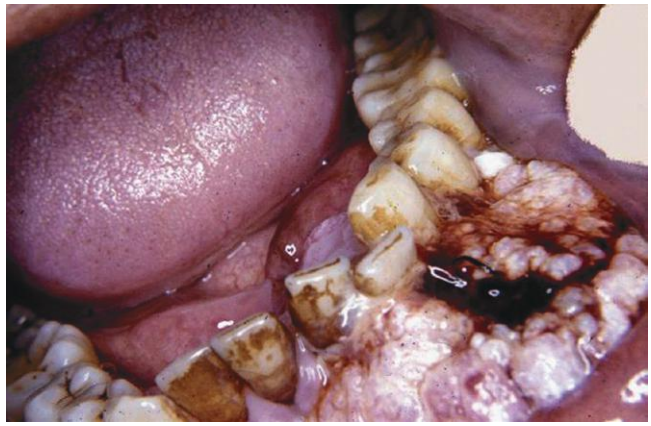
a. Verruca vulgaris
b. Squamous papilloma
c. Verrucous carcinoma
d. Verruciform xanthoma

Case 38-2

What clinical clue is not present in the current history that could aid in a provisional diagnosis of verrucous carcinoma?

a. Rapid onset
b. Pain
c. Smokeless tobacco habit
d. Compressible

Case 39-1



A 51-year-old man is seen in the emergency clinic with this large gingival mass of 8 months' duration. According to the patient the nonpainful lesion has slowly increased in size. Based on the history, site, morphology, and color of the lesion its provisional diagnosis is which of the following?

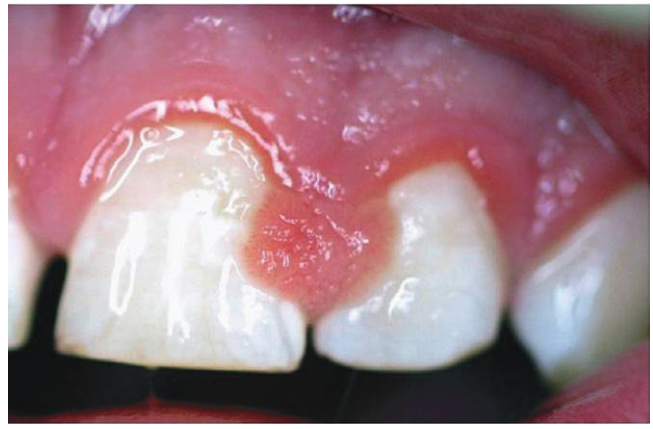
a. Verrucous carcinoma
b. Condyloma acuminatum
c. Inflammatory papillary hyperplasia
d. Giant cell fibroma

Case 39-2

What is the proper treatment for verrucous carcinoma?

a. Cessation of tobacco habit followed by chemical cauterization
b. Complete surgical removal
c. Biopsy; antiviral treatment; then surgical removal
d. Surgical removal followed by radiation therapy

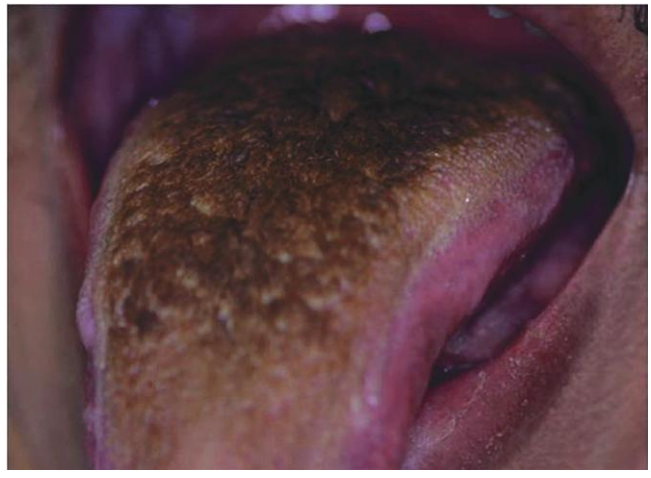
Case 40



A 14-year-old boy is seen at the pediatric dentist for a fluoride treatment. The patient and his mother report that this firm lesion has been present less than a month. What is this lesion's morphology?

a. Sessile macule
b. Pedunculated vesicle
c. Sessile plaque
d. Pedunculated papule

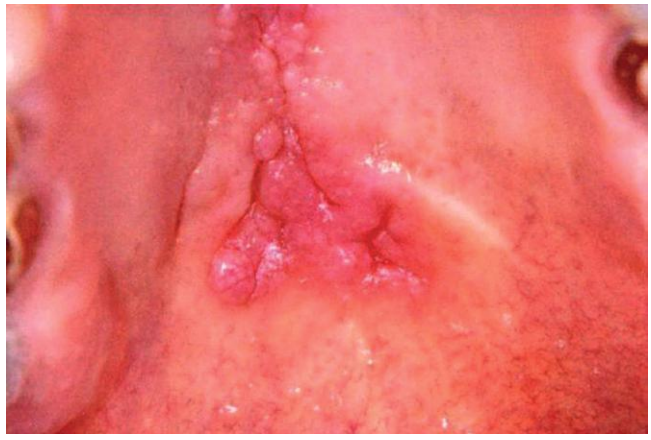
Case 41



An adult patient is embarrassed by this extensive tongue lesion. Although the lesion will not wipe off, the tongue does not have a burning sensation. What abnormality causes this appearance?

a. Increased spongiosis of the stratum spinosum layer
b. Elongated hyperkeratotic filiform papillae
c. Excess melanin deposition in the basal cell layer
d. Interruption in the normal maturation sequence of the epithelium

Case 42-1



A partial denture wearer has this asymptomatic palatal lesion. What is the provisional diagnosis?

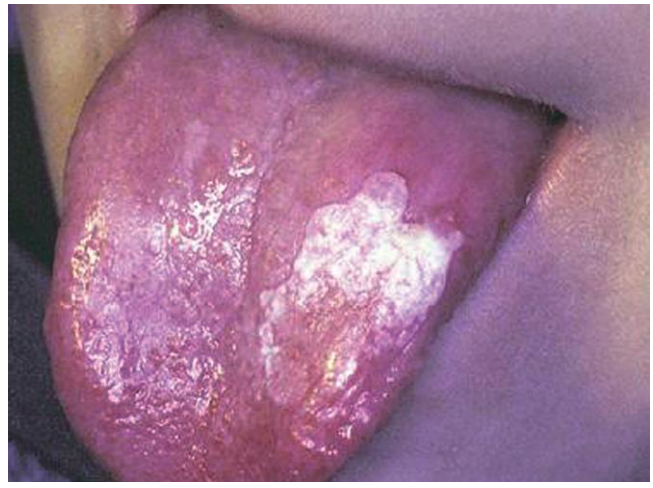
a. Denture stomatitis
b. Inflammatory papillary hyperplasia
c. Squamous cell carcinoma
d. Papilloma

Case 42-2

What disease is often associated with inflammatory papillary hyperplasia (IPH)?

a. Giant cell fibroma
b. Verruca vulgaris
c. Condyloma acuminatum
d. Candidiasis

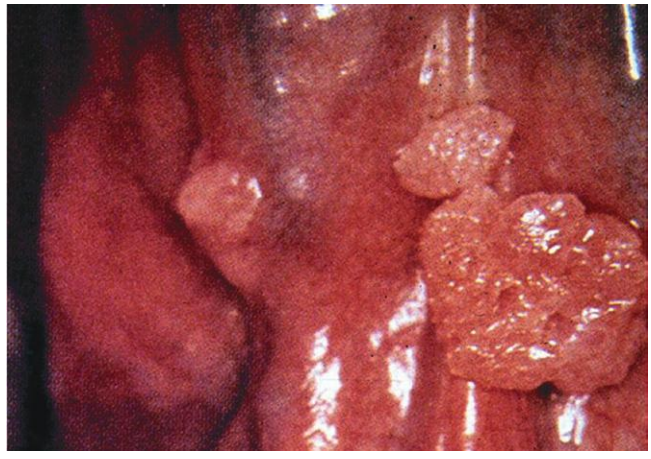
Case 43



A 52-year-old cigarette smoker is aware of this nonwipeable tongue lesion. The lesion has been present for several years and is believed to have slowly enlarged. What is the diagnosis?

a. Acute pseudomembranous candidiasis
b. Geographic tongue
c. Leukoplakia
d. White sponge nevus

Case 44

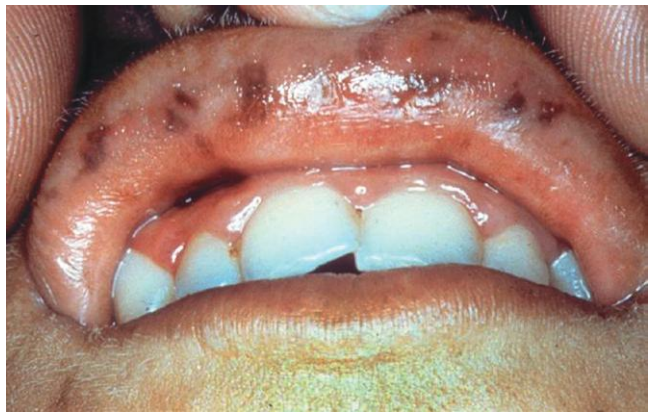


These asymptomatic ventral tongue lesions are also noted on the patient's anterior facial gingiva. What is the likely provisional diagnosis?

a. Condyloma acuminatum
b. Squamous papilloma
c. Verruciform xanthoma
d. Verrucous carcinoma

Pigmented Lesions

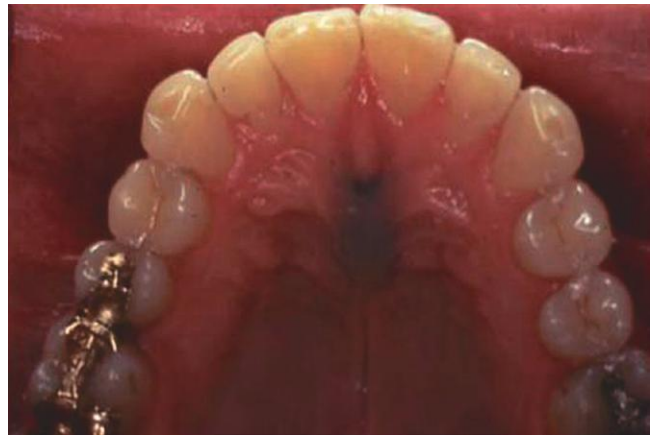
Case 45



A 29-year-old man with AIDS complains of fatigue, weakness, and depression. There has been a recent onset of oral pigmentation. The patient takes a regimen of antiviral medications. Why would a person with AIDS have the described symptoms and pigmentation as in this case?

a. AZT treatment
b. Opportunistic infection that has destroyed the adrenal cortex
c. Low lymphocyte counts
d. Increased melanocytic nevi in HIV-positive populations

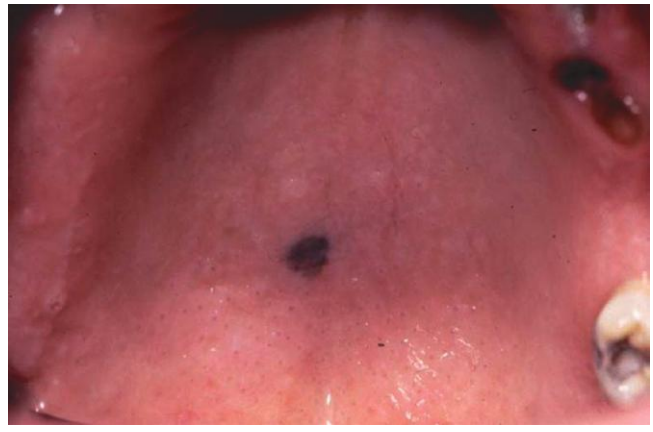
Case 46



What structure in the area could form a fluid-filled cystic lesion that might appear blue?

a. Incisive canal
b. Mucocele
c. Dentigerous cyst
d. Cyst from a nonvital tooth

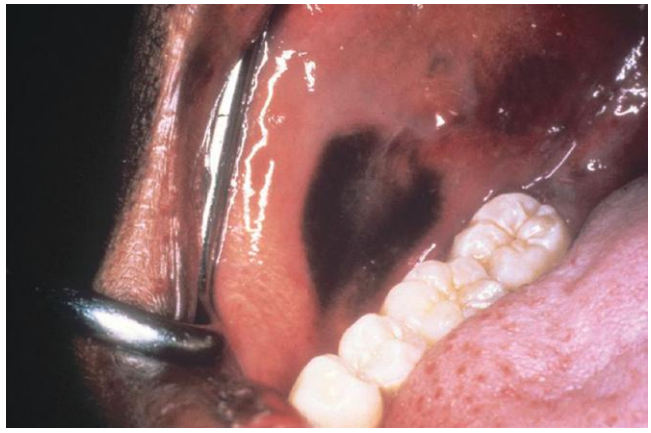
Case 47



What is the best treatment for this lesion?

a. Observation
b. Wide excision
c. Brush cytology for diagnosis
d. Biopsy

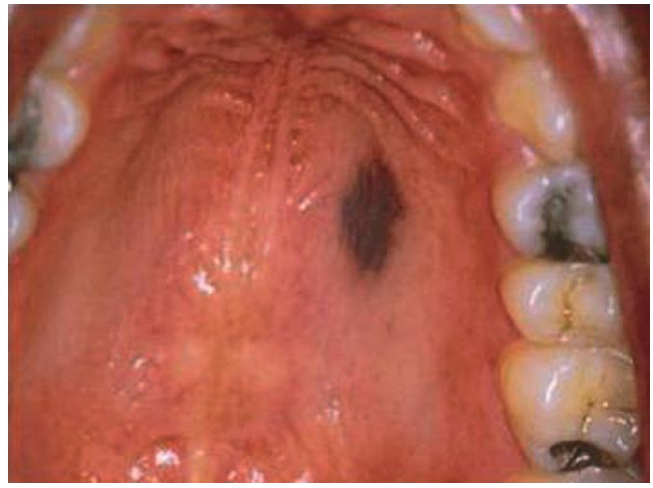
Case 48



What is the likely diagnosis of this lesion given its rapid appearance following trauma?

a. Melanoma
b. Melanoacanthoma
c. Peutz–Jeghers syndrome
d. Blue nevus

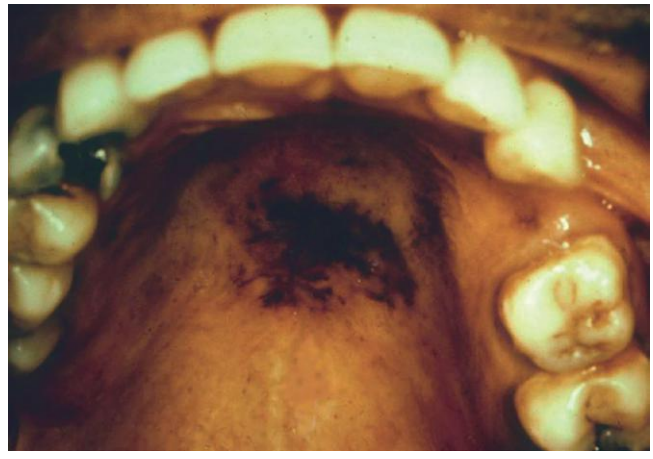
Case 49



When biopsied this lesion showed increased melanin pigment in the basal layer. What is the diagnosis?

a. Pigmented nevus
b. Melanoma
c. Amalgam tattoo
d. Melanotic macule

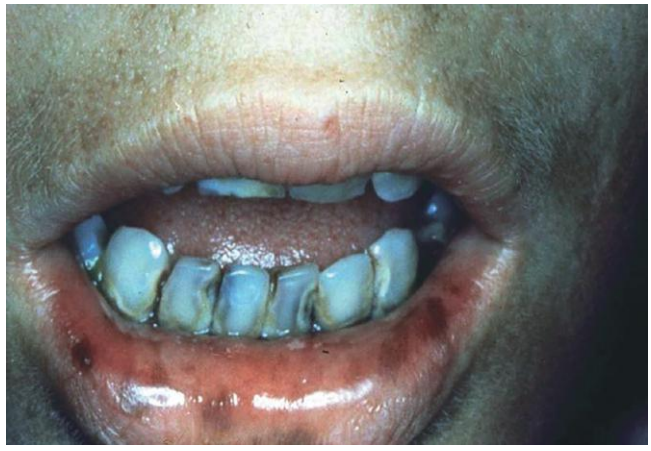
Case 50



This person is being treated with an antimalarial drug that is known to cause oral pigmentation. What disease listed would be commonly treated so?

a. Mucous membrane pemphigoid
b. Lupus erythematosus
c. Cat scratch disease
d. Diabetes mellitus

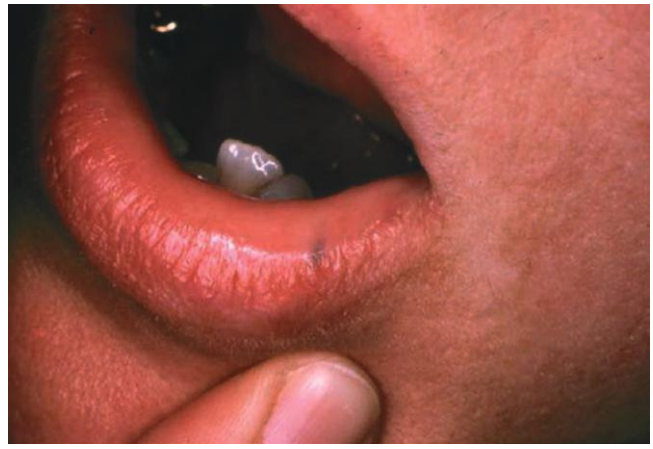
Case 51



A 12-year-old boy with congenital pigmentation of the orofacial area has multiple medical problems, including hyperthyroidism and multiple bone lesions resulting in several fractures. What is the most likely diagnosis?

a. Peutz–Jeghers syndrome
b. Addison's disease
c. Melanotic neuroectodermal tumor of infancy
d. McCune–Albright syndrome

Case 52

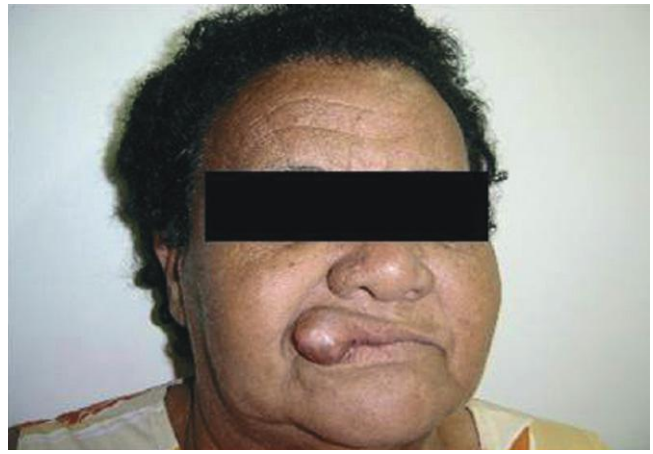


An 8-year-old boy has had this asymptomatic lesion for "a long time." Considering the history what is the most likely diagnosis?

a. Mucocele
b. Foreign body
c. Peutz–Jeghers syndrome
d. Albright's disease

Soft Tissue Masses

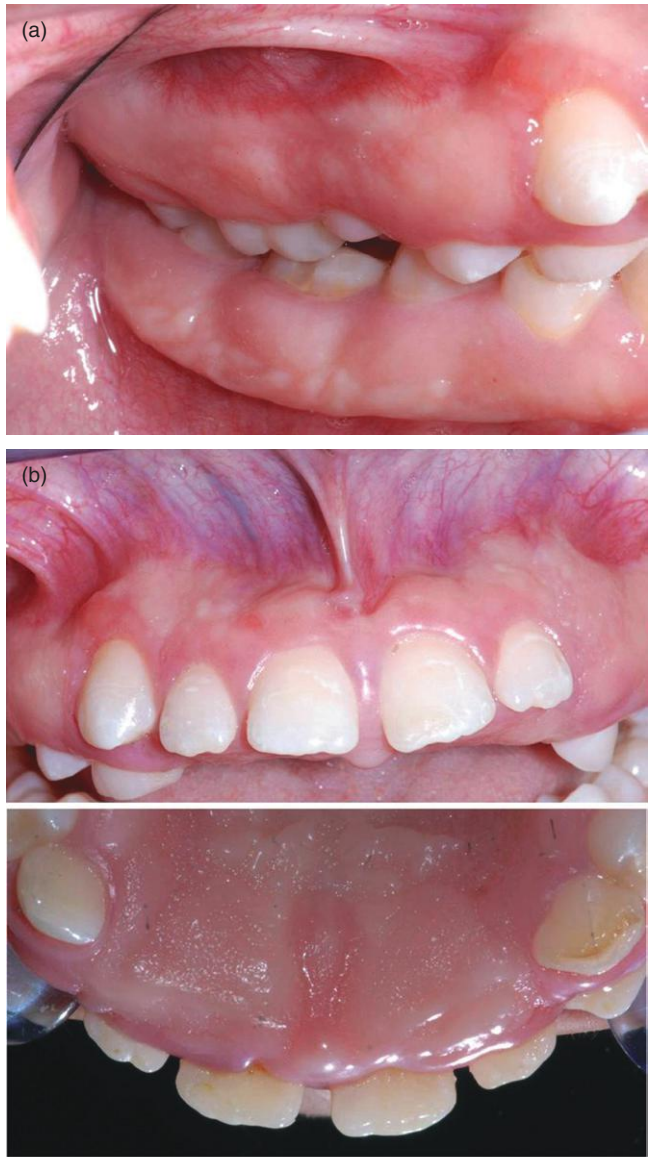
Case 53



Through an interpreter, this 59-year-old woman gives a 13-year history of a slowly expanding swelling. The lesion is nontender and firm upon palpation. Based on the site, morphology, color, and history of this lesion, what would be the best provisional diagnosis?

a. Mucocele
b. Fibroma
c. Nasolabial cyst
d. Monomorphic adenoma

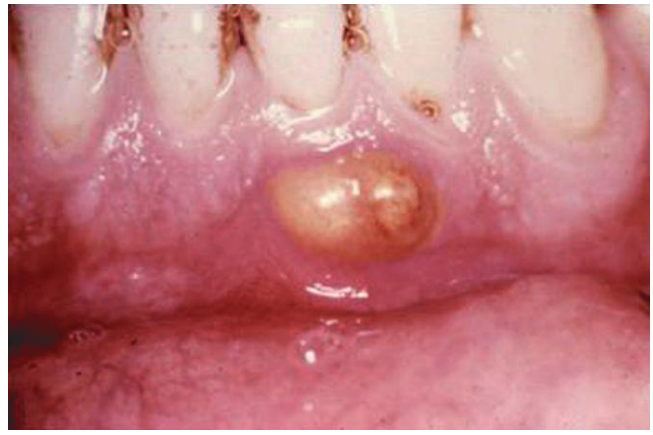
Case 54



A 16-year-old girl had a history of delayed eruption of her permanent teeth. Photo a uses a mirror to show the changes on the left side; photo b shows labial and lingual views of the anterior maxilla. Based on the information and pictures provided, the provisional diagnosis should be which of the following?

a. Gingival fibromatosis
b. Amyloidosis
c. Gingival cyst of the adult
d. Neurofibromatosis type 1

Case 55-1



A 33-year-old amateur hockey player has a history of facial trauma a few years ago. This fluctuant, asymptomatic swelling has been present for about 3 weeks. The soft tissue lesion illustrated is yellow because of which of the following?

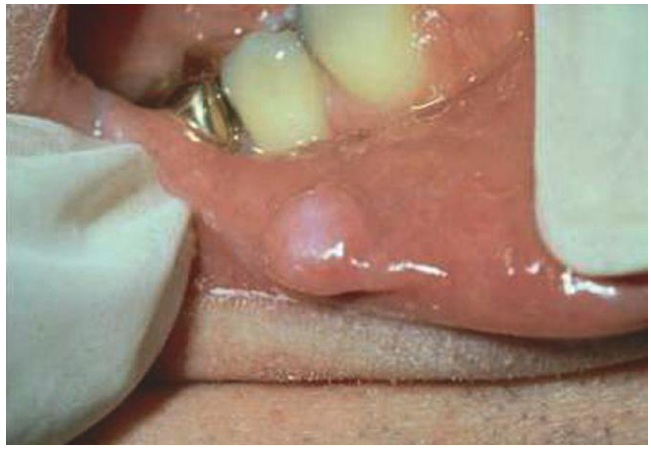
a. Fat
b. Lymphoid tissue
c. Pus
d. Sebum

Case 55-2

If the morphology of this lesion is a vesicle, then the correct provisional diagnosis would be which of the following?

a. Mucocele
b. Parulis
c. Fistula
d. Pyogenic granuloma

Case 56-1



A 45-year-old man with a past medical history of colon carcinoma developed this nontender, compressible swelling approximately 2 weeks ago. He is concerned and scheduled an emergency appointment with his dentist. If the patient is not seen by the dentist for several more weeks, what is likely to become of the lesion?

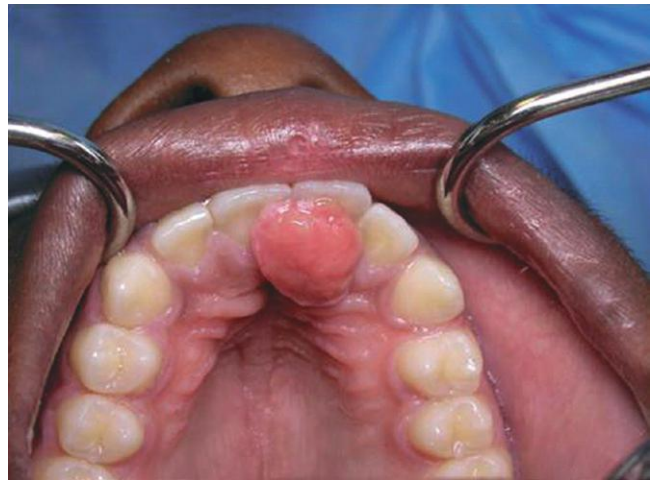
a. Regress and regrow
b. Spontaneously involute
c. Continue to enlarge indefinitely
d. Remain the same size

Case 56-2

What is the best treatment of this lesion?

a. Inject sclerosing agent and then completely remove
b. Incisional biopsy
c. Excisional biopsy
d. Excisional biopsy of the mucin and involved minor salivary gland

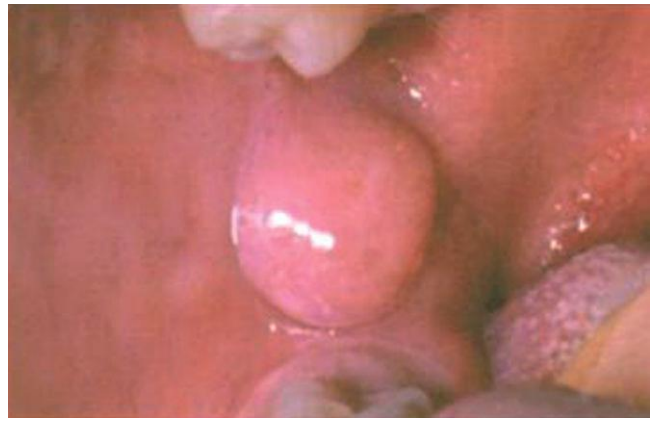
Case 57



A healthy 18-year-old boy has not traumatized this nonpainful lesion. Which of the following would not be a reasonable differential diagnosis?

a. Peripheral ossifying fibroma
b. Peripheral giant cell granuloma
c. Granular cell tumor
d. Pyogenic granuloma

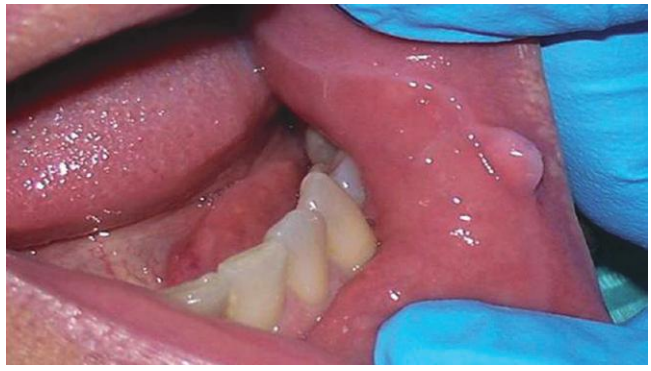
Case 58



An obese 40-year-old woman presented with this lesion at a new patient examination. She was not aware of this swelling, although her last appointment with her previous dentist was 2 years ago and he had not mentioned it then. What is a possible etiology of this lesion if when biopsied a central large mass of adipose tissue is discovered?

a. Infection
b. Physical trauma
c. Herniation of the buccal fat pad
d. Excessive fat metabolism

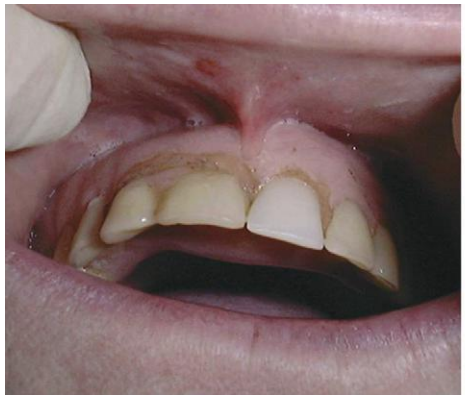
Case 59

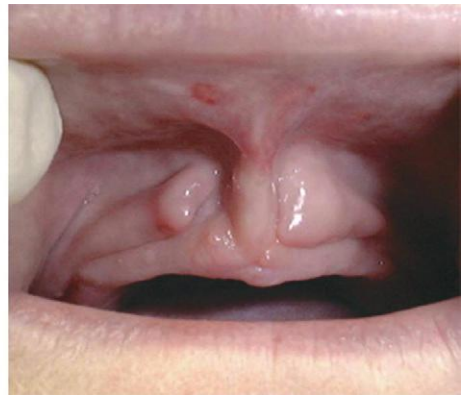


This healthy 25-year-old woman admitted to a habit of sometimes sucking on this soft nonpainful lesion. What is a very likely provisional diagnosis?

a. Mucocele
b. Fibroma
c. Congenital epulis
d. Pleomorphic adenoma

Case 60

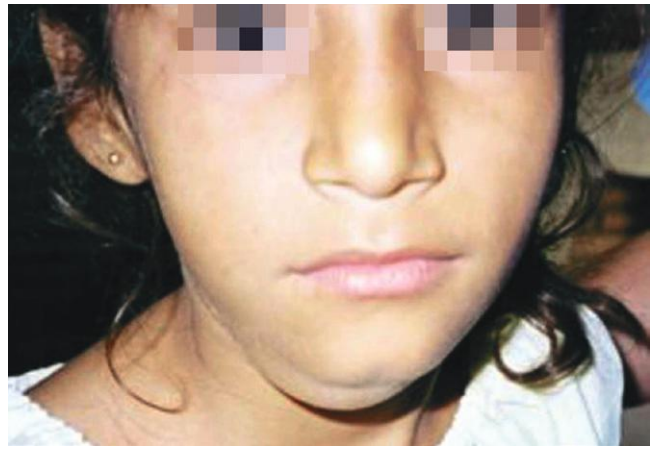




A 64-year-old woman has worn the maxillary denture in the photograph (left) for 30 years. These bilateral soft swellings (right) are visible when the denture is removed. What is the clinical diagnosis term?

a. Traumatic neuroma
b. Fibromas
c. Epulis fissuratum
d. Peripheral odontogenic tumor

Case 61-1



This soft and compressible lesion is associated with a subtle fluctuant swelling of the ipsilateral floor of mouth. Based on this lesion's site, morphology, and history provided, what would be the best provisional diagnosis?

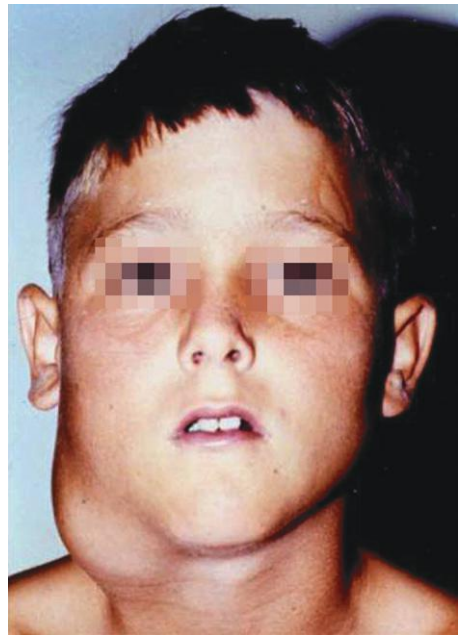
a. Plunging ranula
b. Dermoid cyst
c. Cat scratch disease
d. Infectious mononucleosis

Case 61-2

What floor-of-mouth pierced muscle results in this neck swelling?

a. Genioglossus
b. Geniohyoid
c. Omohyoid
d. Mylohyoid

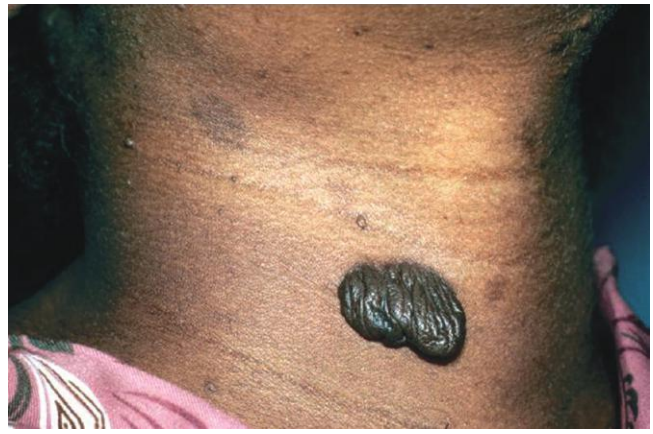
Case 62



A 10-year-old boy has this firm, unilateral neck swelling as well as a low-grade fever and night sweats. Based on the patient's age, signs and symptoms, and site of involvement the most likely provisional diagnosis is which of the following?

a. Cervical lymphoepithelial cyst
b. Abscess
c. Lipoma
d. Hodgkin's disease

Case 63-1



A 31-year-old woman has several facial and thoracic lesions similar to this neck lesion. In addition to the pigmentation noted on the neck, there is also axillary pigmentation. What is the likely diagnosis?

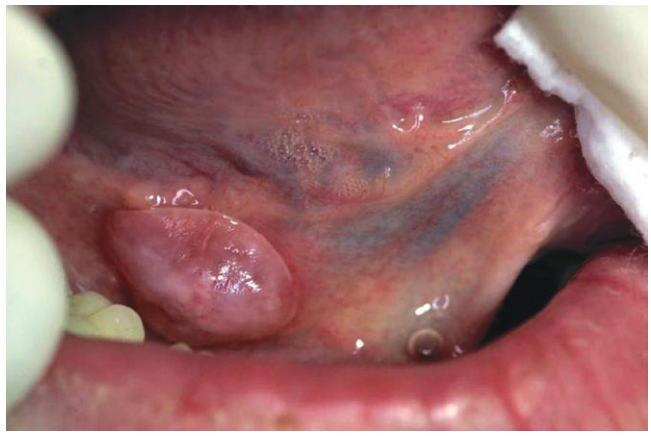
a. Sarcoidosis
b. Neurofibromatosis type 1
c. Multiple endocrine neoplasia syndrome type 2b
d. Amyloidosis

Case 63-2

What is the name of the smaller, flat brown pigmentations higher up on the neck?

a. Café au lait spots
b. Snail track lesions
c. Ash leaf spots
d. Purpura

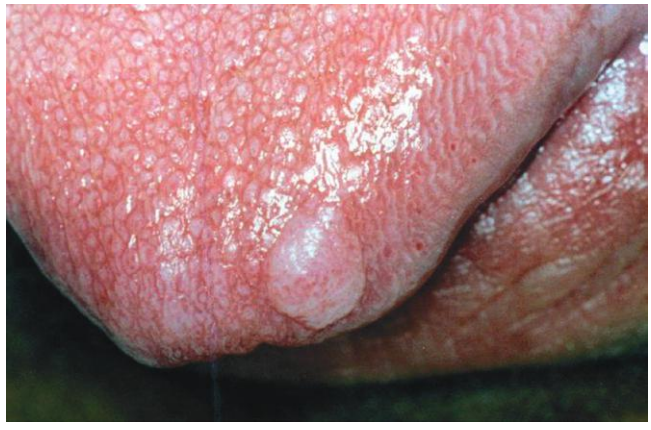
Case 64



This floor-of-mouth, nonpainful, compressible bulla has been present for several weeks in a 12-year-old girl. What is the clinical name for this lesion?

a. Dermoid cyst
b. Ranula
c. Mucoepidermoid carcinoma
d. Nevus

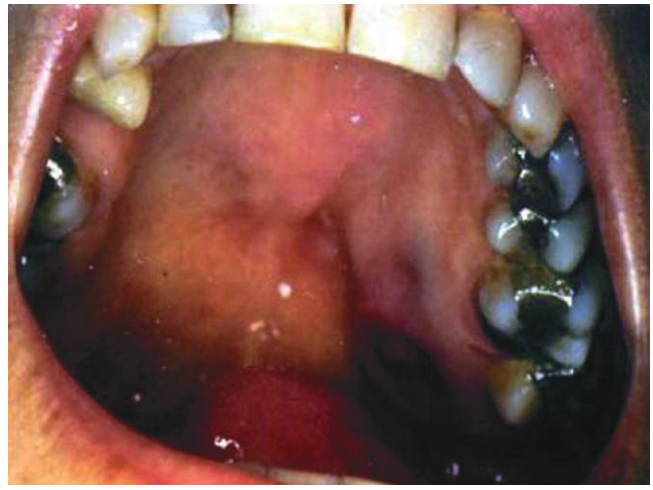
Case 65



A patient accidentally bit his tongue a few weeks ago. Lately, he has noticed this firm "bump." What is the most likely tissue that has proliferated to result in this clinically apparent lesion?

a. Connective tissue
b. Neurofibroma
c. Granular cell tumor
d. Hemangioma

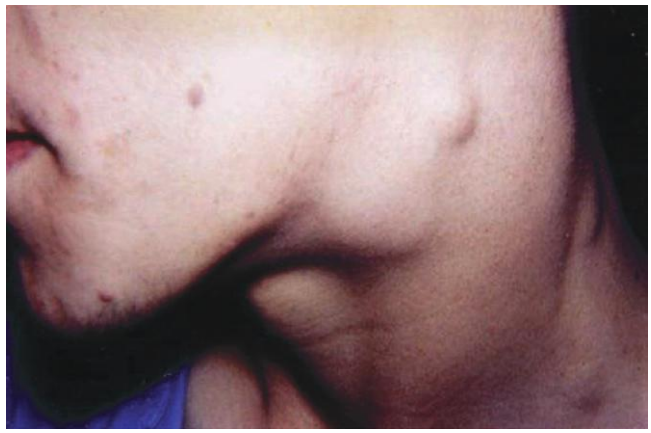
Case 66



A 57-year-old man is aware of this boggy, edematous swelling of the palate. Each of the following is a reasonable clinical differential diagnosis for this lesion *except* one. Which one is the exception?

a. Kaposi's sarcoma
b. Mucoepidermoid carcinoma
c. Non-Hodgkin's lymphoma
d. Mucocele

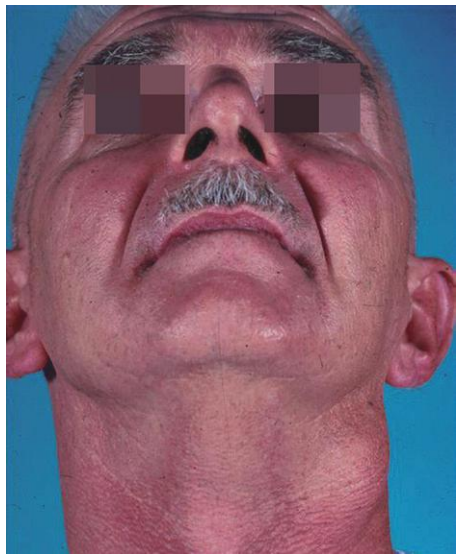
Case 67



This tender neck mass arose following a severe sore throat and flulike symptoms. Which of the following neck swellings best fits the clinical history and appearance provided?

a. Cervical lymphoepithelial cyst
b. Thyroglossal duct cyst
c. Reactive lymphadenopathy
d. Pleomorphic adenoma

Case 68



A patient requests a head and neck examination to evaluate a very firm, nonpainful swelling of his left neck. The patient recently quit smoking cigarettes after a 30-year, pack-a-day habit.

If, upon biopsy of this lymph node swelling, squamous cell carcinoma were found, where would the occult primary most likely be?

a. Prostate
b. Hard palate
c. Floor of mouth
d. Posterior lateral tongue

ANSWERS TO CASE STUDY QUESTIONS

Discussion

White Lesions

Case 1

a. *Candidiasis*—wrong. The lesion does not have a roughened, ragged appearance and the entire white component is removable (i.e., the *Candida albicans* hyphae/spores).
b. *Leukoedema*—wrong. The lesion disappears when stretched; it is not partially removable; it is bilateral.
c. *White sponge nevus*—wrong. The lesion has been present from an early age and is bilateral; it is not partially removable.
d. *Morsicatio buccarum*—correct. The ragged white clinical appearance is typical; tissue tags are "peelable" but frictional-induced white keratin component is not; patients are often not aware of their nibbling habit and/or deny it.

Case 2

a. *Candidiasis*—correct. The age, history, and clinical information are diagnostic for a typical case of pseudomembranous candidiasis.
b. *Diphtheria*—wrong. Similar-appearing lesions of necrotic debris may be seen but are in the oropharynx with diphtheria.
c. *White sponge nevus*—wrong. The patient's age is correct but white sponge nevus lesions do not wipe away.
d. *Hairy leukoplakia*—wrong. The patient's age and immune status and the lesion's wipeability and site are not correct.

Case 3

a. *Chemical trauma*—wrong. This is an aspirin burn and the white areas represent necrotic tissue. This should be part of your differential diagnosis.
b. *Leukoedema*—correct. Leukoedema lesions should be bilateral and disappear with stretching.

c. *Morsicatio buccarum*—wrong. Morsicatio may appear this way and be unilateral. This should be part of your differential diagnosis.
d. *Tobacco pouch keratosis*—wrong. The history would provide more details. Tobacco pouch keratosis is a type of keratotic reaction to the irritant chemicals in tobacco. This should be part of your differential diagnosis.

Case 4

a. *Leukoedema*—wrong. The lesion should be bilateral and disappear when stretched; leukoedema does not peel.
b. *Lichen planus*—wrong. The lesion should be bilateral and more linear; lichen planus does not peel.
c. *Chemical reaction to mouthwash*—correct. This is especially seen with mouthwash having a high alcohol content; coagulative necrosis portion peels off.
d. *Uremic stomatitis*—wrong. It has similar lesions but more widespread and there is a history of kidney failure; uremic stomatitis does not peel.

Case 5

a. *Morsicatio*—wrong. This diagnosis needs clinical corroboration or biopsy results.
b. *Leukoplakia*—correct. This is purely a clinical diagnosis; there is not enough information to diagnose it further.
c. *Squamous cell carcinoma*—wrong. Biopsy is necessary for diagnosis.
d. *Hairy leukoplakia*—wrong. The lesion is at an atypical site and there is no history of HIV. Biopsy is necessary for diagnosis.

Case 6

a. *Desquamated epithelial cells and bacteria*—correct. The bacteria likely cause the burning sensation.
b. *Cells from white sponge nevus*—wrong. The patient's age is too great, and there is no family history.
c. *Necrosis from a chemical burn*—wrong. The pattern is too generalized, and there is no history of caustic chemical use.
d. *Hyperkeratosis*—wrong. The pattern is distinct enough to allow a clinical diagnosis of coated tongue, and hyperkeratosis is not the cause of the coloring.

Case 7

a. *Leukoedema*—wrong. Leukoedema would have a different histology and is usually seen on the buccal mucosa.
b. *Hyperplastic candidiasis*—wrong. Histopathology would show fungal hyphae.
c. *Tobacco pouch keratosis*—correct. This is a hyperkeratosis from the irritation of chemicals in snuff.
d. *Lichen planus*—wrong. This is an unusual site and the histopathology is not consistent with lichen planus.

Case 8

a. *Tobacco pouch keratosis*—wrong. Lesion would not disappear upon stretching.
b. *Pseudomembranous candidiasis*—wrong. Lesion would wipe off, leaving a red base, and would not disappear if stretched.
c. *Nicotine stomatitis*—wrong. The location is incorrect, and the lesion would not disappear with stretching.
d. *Leukoedema*—correct. Leukoedema is clinically diagnosable from history, appearance, and behavior.

Case 9

a. *Wickham's striae*—correct. These are typical for lichen planus but similar lesions are seen with hypersensitivity reactions and lupus erythematosus.
b. *Lines of Zahn*—wrong. They are fibrin and platelet lines separating coagulated blood in a thrombus.
c. *Lines of Retzius*—wrong. They are the incremental deposition of enamel.
d. *Koebner's striae*—wrong. Koebnerization leads to Wickham's striae.

Case 10

a. *Leukoplakia*—wrong. There is enough information given along with the clinical presentation to make a diagnosis.
b. *Hyperkeratosis with dysplasia*—wrong. Diagnosis requires microscopic analysis.
c. *Nicotine stomatitis*—correct. Heat-induced changes cause inflammation of the salivary ducts.
d. *Lichen planus*—wrong. The red papules seen are not typical for lichen planus.

Case 11

a. *Age of 60*—correct. People of all ages get candidiasis.
b. *History of chronic obstructive pulmonary disease (COPD)*—wrong. People with COPD often take steroids, which may predispose to candidiasis.
c. *Denture wear*—wrong. Wearing dentures day and night, improper cleaning, and so on enhance the development of candidiasis.
d. *Antibiotic use*—wrong. Antibiotic may kill other organisms, resulting in an imbalance where yeast may overgrow.

Case 12

a. *HIV testing*—wrong. People without HIV can have hairy leukoplakia.
b. *Biopsy with stains for Epstein–Barr virus*—correct. The only way to confirm a diagnosis of hairy leukoplakia is to show the presence of Epstein–Barr virus.
c. *The lesions should wipe away with gauze*—wrong. That is true for some types of candidiasis.
d. *Historical information about other family members with a similar condition*—wrong. Hairy leukoplakia is not an inheritable disease such as white sponge nevus.

Red, Red-and-White, and Purpuric Lesions

Case 13-1

a. *Erythema migrans*—wrong. The lesion has the wrong morphology; there is usually a white raised rim and the lesion changes size.
b. *Erythematous candidiasis*—wrong. The lesion has the wrong color (blue) component; the history is not supportive.
c. *Erythroplakia*—wrong. The lesion has the wrong color (blue) component and wrong morphology.
d. *Hemangioma*—correct. The lesions may be blue besides red; they are compressible and blanchable.

Case 13-2

a. *Neoplastic*—wrong. Hemangiomas are not neoplastic but rather developmental hamartomas.
b. *Developmental*—correct. Hemangiomas are hamartomatous.
c. *Inflammatory*—wrong. Hemangiomas are not inflammatory but rather developmental hamartomas.
d. *Reactive*—wrong. Hemangiomas are not reactive lesions but rather developmental hamartomas.

Case 14-1

a. *Cinnamon allergic reaction*—wrong. Topical mucosal allergic reaction can be a mixture of red and white, and lesions do not wipe off.
b. *Acute candidiasis*—correct. The acute form is the pseudomembranous type and the white mixture of fungal hyphae, epithelial cells, keratin, and bacterial colonies can be wiped off.
c. *Lupus erythematosus*—wrong. The age, gender, and lack of wipeability fit, although the lesions are often painful since the red component is erosive in nature.
d. *Cheek nibbling*—wrong. The site is good for this and sometimes there is a lack of wipeable tissue shreds so that none of the white portion can be wiped off; the reddened area could be secondary inflammation and the habit can be unilateral.

Case 14-2

a. *Lichen planus*—wrong. Although the age and gender are good, the red component of the lesions would be painful erosions.
b. *Cinnamon allergic reaction*—correct. Although the history does not mention the use of cinnamon-flavored gum or candy, the color, site, morphology, and lack of wipeability all fit.
c. *Thermal burn*—wrong. The white component is wipeable.
d. *White sponge nevus*—wrong. The site is good but onset is in childhood for this autosomal dominant inherited condition, which is more extensive, bilaterally on the buccal mucosa.

Case 15-1

a. *Lichen planus*—wrong. There is no evidence of papules or striae; the red component is not erosive.
b. *Verruciform xanthoma*—wrong. This is not a typical site and verruciform xanthoma does not account for the diffuse, mottled reddened vermilion.
c. *Actinic cheilosis*—correct. The mottled red-and-white changes are typical of a sun-damaged lip; furthermore, the lesion has a rough, sandpaper surface texture.
d. *Candidiasis*—wrong. Candidiasis lesions are wipeable and more extensive.

Case 15-2

a. *Lesion often oozes a mucous secretion*—wrong. That condition is cheilitis glandularis.
b. *Actinic cheilitis is more common on the upper lip*—wrong. It is much more common on the lower lip.
c. *Precancerous changes are reversible*—wrong. The elastic and collagen fibers are permanently damaged as well as the surface epithelium.
d. *A significant percentage of lesions are premalignant*—correct. Approximately 20% will develop squamous cell carcinoma.

Case 16-1

a. *Traumatic erythema*—wrong. The lesion is not an ulcer and there is no mention of pain.
b. *Erythema migrans*—correct. The lesion is a flat reddened area encircled by a raised border; this condition comes and goes and the lesion frequently changes shape as different areas of the tongue undergo depapillation and then repappilation.
c. *Erythroleukoplakia*—wrong. This potentially malignant lesion is seen in middle-aged to elderly adults and does not have a cyclical appearance.
d. *Nicotine stomatitis*—wrong. This smoking-tobacco-related condition is not premalignant despite its leukoplakic component; the red component comprises inflamed minor salivary glands.

Case 16-2

a. *Candidiasis*—wrong. Neither the chronic erythematous nor the acute pseudomembranous form of this superficial fungal condition is associated with geographic tongue.
b. *Erosive lichen planus*—wrong. This condition is an immune-mediated condition in which there is a blistering process of the epithelium resulting in ulceration and erosion.
c. *Psoriasis*—wrong. Even though geographic tongue has histopathology similar to psoriasis, there is no evidence that it is related to psoriasis.
d. *Fissured tongue*—correct. This harmless developmental disorder is associated with geographic tongue in a relationship that is not understood.

Case 17-1

a. *Anterior facial involvement*—wrong. That is the most common site of involvement.
b. *Erythema*—wrong. Although the tissue may be firm and pink it is often secondarily inflamed.
c. *Excess attached gingiva*—wrong. In dentate areas the attached gingival hyperplasia creates areas of anatomical crown coverage.
d. *Spontaneous gingival hemorrhage*—correct. For this condition to be occurring, some inherited or disease-associated blood diathesis must be present.

Case 17-2

a. *Leukemia*—correct. The constitutional symptoms are seen along with an elevated white blood cell count; anemia and infections, in addition to decreased platelets with resultant spontaneous hemorrhage, are seen due to a bone marrow myelophthesic anemia (all three major blood cell lines are affected).
b. *Infectious mononucleosis*—wrong. Mononucleosis lesions are petechiae on the soft palate, 1–2 mm of extravasated blood due to capillary fragility; there usually is an associated pharyngitis/tonsillitis.
c. *Scarlet fever*—wrong. The oral site involved is the tongue (i.e., strawberry or raspberry tongue).
d. *Hereditary hemorrhagic telangiectasia*—wrong. The vascular lesions are pinpoint areas of extravasated blood due to a developmental defect in the blood vessel wall; no gingival hyperplasia is seen, nor are constitutional symptoms.

Case 18-1

a. *Hemangioma*—wrong. They are flat or raised, are compressible, and do not bleed or cause soreness.
b. *Lichen planus*—wrong. It is a chronic mucosal or cutaneous disorder that can be found in this age group and in men nearly as often as in women, but there should be a blister (vesicle); additionally, this would be a rare site of involvement.
c. *Actinic cheilitis (cheilosis)*—wrong. This lesion is related to sun damage and would not be sore, and it involves other areas of the lower lip more than the commissure.
d. *Angular cheilitis*—correct. The site, morphology, and color are correct as is the painful chronic nature.

Case 18-2

a. *Vitamin deficiency*—correct. Nutritional deficiencies such as vitamin B complex and iron can cause this condition, also known as perleche, besides certain infectious bacterial organisms.
b. *Developmental defect*—wrong. Developmental blind-ended epithelial lined pouches called commissural lip pits can be seen at this site but they are depressed areas that are asymptomatic and normal color.
c. *Viral infection*—wrong. Viral infections cause vesicle (blister) formation such as recurrent herpes labialis, which secondarily breaks down into clusters of small

ulcers that then scab. Unless the patient is severely immunocompromised the lesions should be acutely painful for 7–10 days and then resolve; furthermore, there should not be bleeding.

d. *Protozoan infection*—wrong. Angular cheilitis is typically caused by the fungal organism *Candida albicans* and rarely by the bacterium *Staphylococcus aureus*.

Case 19

a. *Topical steroid application*—wrong. Although the lesion is likely lichen planus, which often positively responds to topical or systemic steroid treatment, the provisional diagnosis should be confirmed by biopsy.

b. *Biopsy of left and right lesions*—correct. The only way to know the diagnosis with absolute certainty is to perform incisional, perilesional biopsies of both sites of involvement; never assume that the diagnosis is the same for each side.

c. *Cytology to rule out malignancy*—wrong. Cytology is a screening procedure not a diagnostic procedure.

d. *Antifungal medication*—wrong. The provisional diagnosis is lichen planus with areas of erosion beginning; steroid medication is usually most effective.

Case 20

a. *Treat both the denture and oral mucosa with antifungal agents*—correct. The denture should be soaked nightly for 2 weeks in a nystatin rinse mixed with water; the oral mucosa should be treated with either clotrimazole troches (10 mg, five times daily; dissolved) or clotrimazole cream applied to the inner aspect of the denture.

b. *Leave the denture out at night, clean it, and rinse it in an antifungal solution*—wrong.

c. *Use laser ablation followed by new denture construction*—wrong. The diagnosis is chronic erythematous candidiasis, and laser ablation will not address the organisms that are within the denture's acrylic resin.

d. *Apply antifungal cream to the affected oral soft tissues*—wrong. In addition to managing the oral mucosa, the denture should be soaked in an antifungal solution (e.g., nystatin 100,000 I.U.; use several drops in a small container of water).

Acute Oral Ulcerations

Case 21

a. *Patient's age*—wrong. People of all ages get aphthae.

b. *Asymptomatic lesion*—correct. Aphthae are painful.

c. *Healed spontaneously in 2 weeks*—wrong. Aphthae usually resolve in 2 weeks.

d. *Site*—wrong. Although aphthae usually do not begin on the dry lip (i.e., vermilion), they start on the labial mucosa and can expand to the dry lip.

Case 22

a. *Erythema multiforme*—correct. Erosions of explosive onset are the typical finding.

b. *Aphthous ulcers*—wrong. Aphthae are a chronic recurrent problem with a recognizable prodrome.

c. *Herpes simplex*—wrong. Primary herpes would have a gingivostomatitis. Secondary lesions would begin as ulcers on nonmovable mucosa bound to bone.
d. *Varicella*—wrong. Oral lesions of chicken pox are usually nonpainful.

Case 23

a. *Arthritis, dermatitis, facial paralysis*—wrong.
b. *Skin lesions, fissured tongue, oral ulcers*—wrong.
c. *Oral ulceration, genital ulceration, ocular inflammation*—correct.
d. *Blistering skin, nonpainful oral ulceration, hairy tongue*—wrong.

Case 24

a. *Herpangina*—correct. Site, age, morphology, and mild symptoms are all correct.
b. *Herpes simplex*—wrong. Site is wrong and symptoms are too mild.
c. *Recurrent aphthae*—wrong. Aphthae do not begin with blisters.
d. *Syphilis*—wrong. Recurrent oral lesions are mucous patches and not ulcerative.

Case 25

a. *Herpangina*—wrong. The lesions are not vesicular.
b. *Recurrent aphthous ulcers*—correct. The only way to tell the difference is to search for systemic signs and symptoms.
c. *Erythema multiforme*—wrong. Chronicity and recurrence are different than the signs of erythema multiforme.
d. *Pemphigus vulgaris*—wrong. Pemphigus lesions begin as blisters and spread until the disease is controlled.

Case 26

a. *Painful ocular inflammation*—wrong. This occurs in Behcet's disease.
b. *Gingivostomatitis*—wrong. This occurs in primary herpes simplex.
c. *Necrosis of the interdental papillae*—wrong. This occurs in ANUG.
d. *Vesicular skin lesions*—correct. These lesions are typical for chicken pox.

Case 27

a. *Herpetiform aphthae*—correct.
b. *Herpes simplex*—wrong. This is an incorrect site for recurrent lesions.
c. *Herpes zoster*—wrong. Zoster does not cross the midline.
d. *Chicken pox*—wrong. Age, recurrence, and pain are not typical for chicken pox.

Case 28

a. *Recurrent aphthous ulcer*—correct. Aphthae occur on movable mucosa.
b. *Necrotizing sialometaplasia*—wrong. This is a likely diagnosis. Extranodal non-Hodgkin's lymphoma and salivary gland tumors should also be considered.

c. *Superficial mucocele*—wrong. This is a good site and they often have periodic rupture with painful ulceration.
d. *Wegener's granulomatosis*—wrong. This is a good site and presentation for this disease; however, lung and kidney involvement should also be present.

Chronic Vesiculoerosive and Ulcerative Lesions

Case 29

a. *Wegener's granulomatosis*—wrong. Lesions usually occur on palate with lung and kidney involvement.
b. *Noma*—wrong. Necrotic ulcerations are seen in immunocompromised patients.
c. *Erosive lichen planus*—wrong. Usually Wickham's striae are seen along with erythema and ulceration.
d. *Pyostomatitis vegetans*—correct. The peculiar lesions in conjunction with the history are indicative of inflammatory bowel disease (Crohn's, ulcerative colitis, etc.).

Case 30

a. *Mucous membrane pemphigoid*—correct. About 30% of cases have ocular involvement that can lead to scarring and blindness.
b. *Erosive lichen planus*—wrong. The oral lesions are similar but eye lesions are not present.
c. *Erythema multiforme (Stevens–Johnson syndrome)*—wrong. This disease can have oral and eye lesions but it is an acute rather than a chronic process.
d. *Herpes zoster*—wrong. Zoster stops at the midline; this patient's distribution is wrong.

Case 31

a. *Squamous cell carcinoma*—wrong. This should be the first choice in the differential diagnosis.
b. *Deep fungal infection*—wrong. This is a lesion of histoplasmosis. Deep fungal infections closely resemble carcinoma.
c. *Mucous membrane pemphigoid*—correct. Lesions of pemphigoid are usually multiple and shallow, and they heal.
d. *Traumatic granuloma*—wrong. These nonhealing ulcers are very similar to carcinomas in appearance.

Case 32

a. *Behcet's syndrome*—wrong. The ulcers seen in Behcet's are mucosal and there should also be cutaneous and ocular signs.
b. *Midline lethal granuloma*—correct. This is a T-cell lymphoma that occurs on the palate.

c. *Tertiary syphilis*—wrong. A gumma presents with a similar lesion but does not cause death by malignant spread.
d. *Wegener's granulomatosis*—wrong. A very similar presentation may be seen and it may prove fatal, but death is usually from kidney failure. It is not a malignancy.

Case 33

a. *Lesions are bilateral*—wrong. This is a typical sign of lichen planus.
b. *Lesions come and go*—correct. Lichen planus is a chronic disease with exacerbation and remission. Hypersensitivity reactions will remain as long as the allergen is in contact with the area.
c. *White striae*—wrong. White striations (striae) can be seen in lichenoid hypersensitivity reactions as well as lupus erythematosus.
d. *Ulceration*—wrong. Ulceration can be seen in erosive lichen planus as well as in a hypersensitivity reaction.

Case 34

a. *Presence of rheumatoid factor*—wrong. Rheumatoid factor is common in the serum of people with many autoimmune diseases.
b. *Presence of antinuclear antibodies*—wrong. This is seen in lupus erythematosus.
c. *Positive Nikolsky sign*—wrong. A Nikolsky sign will be present but it is seen in many blistering diseases.
d. *Direct and indirect immunofluorescence studies*—correct. Direct (tissue) and indirect (serum) immunofluorescence should be positive in pemphigus.

Case 35

a. *Traumatic ulcerative granuloma*—correct. These lesions are typically long-standing and are suspicious for carcinoma or deep fungal infection. They often spontaneously resolve after biopsy.
b. *Deep fungal infection*—wrong. Healing does not occur without treatment.
c. *Squamous cell carcinoma*—wrong. Lesion would not resolve without treatment.
d. *Erythema multiforme*—wrong. This is an acute disease and would not present as a long-standing single ulcer.

Case 36

a. *Recurrent herpes*—wrong. Herpes lesions will be on intraoral mucosa bound to bone and will be painful.
b. *Traumatic ulcer*—wrong. The ulcer is usually painful and has a history of injury.
c. *Noma*—wrong. Necrotic ulcerations occur in severely immunocompromised children, especially those who are malnourished.
d. *Squamous cell carcinoma*—correct. The leading site for intraoral carcinoma is the lateral ventral tongue and floor of mouth. The lesions are often asymptomatic.

Papillary Lesions

Case 37-1

a. *Verruca vulgaris*—wrong. The site, morphology, and color of the lesion all fit and so a reasonable clinical provisional diagnosis would include this lesion; *however*, the history of HIV-positivity does not make this choice the most likely diagnosis.
b. *Hairy tongue*—wrong. The site, but not the morphology or color, of the lesion does not fit and so this is not a reasonable clinical provisional diagnosis. The "hairs" of the dorsal tongue are elongated filiform papillae with excess keratin that is extrinsically stained, usually brown or black.
c. *Squamous papilloma*—wrong. The site, morphology, and color of the lesion all fit and so a reasonable clinical provisional diagnosis would include this lesion; *however*, the history of HIV-positivity does not make this choice the most likely diagnosis.
d. *Hairy leukoplakia*—correct. The site, morphology, and color of the lesion all fit and so a reasonable clinical provisional diagnosis would include this lesion; furthermore, the history of HIV-positivity makes this choice the most likely provisional diagnosis.

Case 37-2

a. *Human papillomavirus*—wrong. This family of DNA viruses, of which there are more than 130 types, cause some oral squamous papillomas and warts (verruca vulgaris) besides genital ones; 15 or so types are oncogenic, including cervical carcinoma.
b. *Epstein–Barr virus*—correct. When the immune system in an HIV-positive patient becomes increasingly inefficient (i.e., full-blown AIDS onset is imminent), then the Epstein–Barr virus for unknown reasons congregates especially on the lateral border of the tongue, invades the epithelial cells, and creates this benign neoplastic growth.
c. *Human immunodeficiency virus*—wrong. Although hairy leukoplakia is associated with the transformation of HIV-positivity to AIDS by severe immunodeficiency onset, it is another virus that then is able to infect and cause hairy leukoplakia.
d. *Herpes simplex virus*—wrong. Herpes simplex type 1 causes recurrent herpes labialis and intraoral lesions involving nonmovable mucosa in immunocompetent persons; the epithelial cells are invaded by the virus, the destroyed cells resulting in clusters of vesicles that then de-roof into coalescing shallow, irregular ulcers.

Case 38-1

a. *Verruca vulgaris*—wrong. Site, color, and morphology are all as expected for this lesion.
b. *Squamous papilloma*—wrong. Site, color, and morphology are all as expected for this lesion.

c. *Verrucous carcinoma*—correct. Although the surface texture, lack of pain, and color (some are red or a mixture of white and red) are acceptable, the size is much too small and the location is not particularly common; also the age of occurrence is generally patients in their 50s and older.
d. *Verruciform xanthoma*—wrong. Site, color, and morphology are all as expected for this lesion.

Case 38-2

a. *Rapid onset*—wrong. Verrucous carcinoma has a very slow, chronic onset.
b. *Pain*—wrong. Verrucous carcinoma is not a painful condition.
c. *Smokeless tobacco habit*—correct. Many elderly patients use this type of tobacco (snuff, chewing) and in 1–9% of users it forms where the tobacco is held against the mucosa.
d. *Compressible*—wrong. Verrucous carcinoma is not fluid-filled (vesicle–bulla).

Case 39-1

a. *Verrucous carcinoma*—correct. Typically seen in the vestibule, particularly with smokeless tobacco users; white intermixed with red and hemorrhage; slowly enlarges with a marked verrucous surface and advancing sessile borders.
b. *Condyloma acuminatum*—wrong. Usually multiple lesions with blunt projections; no bleeding.
c. *Inflammatory papillary hyperplasia*—wrong. Typically seen beneath a denture base, particularly in the palatal vault; multiple small pink papules often with erythema (red) but no hemorrhage.
d. *Giant cell fibroma*—wrong. Typically a smooth or papillated surface papule/nodule with no bleeding.

Case 39-2

a. *Cessation of tobacco habit followed by chemical cauterization*—wrong. Even those cases caused by smokeless tobacco use will not reverse the diagnosis once this well-differentiated form of squamous cell carcinoma has arisen; chemical cauterization can be helpful for painful conditions in which nerves are exposed to the oral cavity.
b. *Complete surgical removal*—correct. Once a diagnosis is established by a small biopsy of a representative area of the lesion, then its complete removal is necessary to ensure no recurrence.
c. *Biopsy; antiviral treatment; then surgical removal*—wrong. The intermediate step of antiviral treatment is not helpful and only delays completion of treatment.
d. *Surgical removal followed by radiation therapy*—wrong. Surgical removal is appropriate after an incisional biopsy diagnosis; however, controversy exists if radiation treatment can be used as primary or adjuvant treatment. Prior studies have shown radiation causes increased grade of tumor but more recent reports point to success with radiation as a primary therapy.

Case 40

a. *Sessile macule*—wrong. A macule is a flat lesion of abnormal color; sessile indicates a broad base with the base's size exceeding the length of any portion of the lesion superior to it.
b. *Pedunculated vesicle*—wrong. A vesicle is an elevated lesion filled with fluid so it is not firm but rather soft and compressible.
c. *Sessile plaque*—wrong. A plaque is a very slightly elevated lesion unlike the more marked elevated lesion seen.
d. *Pedunculated papule*—correct. The elevated lesion is firm and less than 5 mm in diameter and thus by definition is a papule and upon palpation will be firm; the base involves growth over unattached tooth surface and thus is pedunculated, with the base possessing less length in greatest dimension than the superior aspect of the lesion.

Case 41

a. *Increased spongiosis of the stratum spinosum layer*—wrong. Increased intracellular edema (i.e., spongiosis) results in leukoedema or white sponge nevus, which are whitish areas and in the case of white sponge nevus exhibit a thickened folded tissue.
b. *Elongated hyperkeratotic filiform papillae*—correct. The excess surface keratin in conjunction with the increased length of the dorsal papillae increase secondary extrinsic staining (often tea, coffee, cigarettes), resulting in a brown or black discoloration.
c. *Excess melanin deposition in the basal cell layer*—wrong. Focal melanosis results in a brown discoloration but the morphology is a macule; also, the pigmentation on the tongue generally only involves the tip of the papillae.
d. *Interruption in the normal maturation sequence of the epithelium*—wrong. By definition, this is dysplasia, which is a potentially malignant change; the morphology would be white or red plaques (i.e., leukoplakia, erythroplakia).

Case 42-1

a. *Denture stomatitis*—wrong. Erythematous form of candidiasis that can be asymptomatic or have a burning sensation, and it has a macular morphology.
b. *Inflammatory papillary hyperplasia*—correct. The reddish coloration is from chronic inflammation mixed with numerous individual papules that are coalescing; it is typically seen under a denture base.
c. *Squamous cell carcinoma*—wrong. Rare site for this type of cancer; the lesion is typically a white or red plaque that then breaks down into ulceration; verrucous carcinoma would be white and not necessarily associated with a denture.
d. *Papilloma*—wrong. Papilloma is usually more discreet and pink to white; it is not associated with a denture.

Case 42-2

a. *Giant cell fibroma*—wrong. Lesion is a solitary pink papule/nodule with smooth or rough surface; site is typically gingiva.
b. *Verruca vulgaris*—wrong. Lesion is a solitary white papule/nodule with a very rough, spiky surface.
c. *Condyloma acuminatum*—wrong. Lesions are usually multiple pink to white-pink papules/nodules lacking any erythematous (inflammatory) component.
d. *Candidiasis*—correct. Investigators are not sure if chronic erythematous candidiasis is always secondary to the onset of IPH.

Case 43

a. *Acute pseudomembranous candidiasis*—wrong. This type of fungal infection is wipeable; with the information provided, a provisional diagnosis can be made but a diagnosis would require microscopic information.
b. *Geographic tongue*—wrong. Although the site is appropriate, the color is incorrect (irregular, red flat area surrounded by a thin, elevated white rim); with the information provided a provisional diagnosis can be made but a diagnosis would require microscopic information.
c. *Leukoplakia*—correct. This is purely a clinical term for unwipeable white plaques that do not resolve in 2 weeks. When biopsied this lesion possessed premalignant changes; the tobacco habit is likely the chief etiologic factor.
d. *White sponge nevus*—wrong. Although this lesion is white and unwipeable, white sponge nevus is most often seen bilaterally on the buccal mucosa beginning early in life, unlike this patient's history; it is autosomal dominant inherited; it would not slowly enlarge as this lesion has.

Case 44

a. *Condyloma acuminatum*—correct. The lesion's site, color, morphology, and multifocal, multicentric distribution are all indicative of this venereal wart condition.
b. *Squamous papilloma*—wrong. Lesion is white to pink white and is not multifocal.
c. *Verruciform xanthoma*—wrong. Lesion is not multifocal and not common on ventral tongue.
d. *Verrucous carcinoma*—wrong. Lesion is red and/or white and is not multifocal.

Pigmented Lesions

Case 45

a. *AZT treatment*—wrong. AZT can cause pigmentation but it does not cause the other symptoms listed.
b. *Opportunistic infection that has destroyed the adrenal cortex*—correct. Adrenocortical insufficiency (Addison's disease) due to uncontrolled tuberculosis infection is a likely cause in AIDS patients.

c. *Low lymphocyte counts*—wrong. This may lead to infection but not pigmentation.
d. *Increased melanocytic nevi in HIV-positive populations*—wrong. No reported incidence.

Case 46

a. *Incisive canal*—correct. Incisive canal cysts may have a soft tissue component.
b. *Mucocele*—wrong. Salivary glands in the rugae area as well as mucoceles not seen.
c. *Dentigerous cyst*—wrong. All teeth are erupted; however, this may be an eruption cyst associated with a supernumerary tooth.
d. *Cyst from a nonvital tooth*—wrong. An intrabony lesion would not be seen clinically.

Case 47

a. *Observation*—wrong. Observation will not give a diagnosis.
b. *Wide excision*—wrong. Definitive treatment is not appropriate without a diagnosis.
c. *Brush cytology for diagnosis*—wrong. Cytology only looks at superficial cells confined to the epithelium; it is not appropriate for pigmented lesions.
d. *Biopsy*—correct. This is a melanoma; real pigmented lesions can rarely be diagnosed by clinical signs and need tissue for microscopic analysis.

Case 48

a. *Melanoma*—wrong. Wrong site, wrong age; rapid growth of a new lesion of melanoma is not typical.
b. *Melanoacanthoma*—correct. Trauma, buccal mucosa, and rapid growth are the usual findings.
c. *Peutz–Jeghers syndrome*—wrong. Pigmentation should be present from early childhood.
d. *Blue nevus*—wrong. Lesion usually occurs on palate and is not rapidly spreading.

Case 49

a. *Pigmented nevus*—wrong. Nevi are composed of a proliferation of benign melanocytes.
b. *Melanoma*—wrong. Melanomas are composed of a proliferation of malignant melanocytes.
c. *Amalgam tattoo*—wrong. Amalgam tattoo should have deposits of foreign material in the lamina propria.
d. *Melanotic macule*—correct. Lesion is most commonly seen on the lower lip.

Case 50

a. *Mucous membrane pemphigoid*—wrong. It is usually treated with topical steroids.
b. *Lupus erythematosus*—correct. Chloroquine acts as a steroid sparing anti-inflammatory.
c. *Cat scratch disease*—wrong. Disease is usually self-limited.
d. *Diabetes mellitus*—wrong. Antimalarials are not indicated for this use.

Case 51

a. *Peutz–Jeghers syndrome*—wrong. The pigmentation is similar but Peutz–Jeghers has colon polyposis, not bone lesions.
b. *Addison's disease*—wrong. Adrenal insufficiency will show bronzing of the skin but no bone lesions.
c. *Melanotic neuroectodermal tumor of infancy*—wrong. Pigmented intrabony lesions are in the anterior maxilla and are solitary; skin pigmentation is absent.
d. *McCune–Albright syndrome*—correct. Endocrine disorders, polyostotic fibrous dysplasia, and skin pigmentation are typical of Albright's syndrome.

Case 52

a. *Mucocele*—wrong. Good location and age but the lesion should have a history of size increase with fluctuance.
b. *Foreign body*—correct. This is a traumatic implantation of pencil "lead."
c. *Peutz–Jeghers syndrome*—wrong. Age is correct but there should be multiple lesions and the patient should have other signs of the disease (colon polyps).
d. *Albright's disease*—wrong. There should be multiple lesions.

Soft Tissue Masses

Case 53

a. *Mucocele*—wrong. These occur almost exclusively on the lower lip rather than the upper lip.
b. *Fibroma*—wrong. Almost always there is a history of trauma, and fibromas rapidly enlarge in a few weeks to months and then remain the same size thereafter.
c. *Nasolabial cyst*—wrong. The site is incorrect and this cyst would have fluid in it and be fluctuant, not firm.
d. *Monomorphic adenoma*—correct. Over the age of 40 this benign salivary gland is more likely than a pleomorphic adenoma; both are common on the upper lip.

Case 54

a. *Gingival fibromatosis*—correct. The age, site, and eruption-pattern disruption are classic for this inherited overgrowth of gingiva caused by excess fibroblastic collagen production; the entire clinical crown can be covered.

b. *Amyloidosis*—wrong. The tongue is the most common intraoral site for this peculiar type of protein product that is most often seen at multiple sites in the elderly, associated with multiple myeloma.
c. *Gingival cyst of the adult*—wrong. Although it occurs at this site, it is a solitary lesion, often with a translucent bluish appearance; it would not delay the eruption of any tooth.
d. *Neurofibromatosis type 1*—wrong. Although the neurofibromas can be on the skin and in the mouth at multiple sites, the patient should also have brown, flat skin pigmentation (café au lait spot) and several other stigmata of the autosomal dominant inherited disorder. The tongue is overwhelmingly the most common oral site.

Case 55-1

a. *Fat*—wrong. If this lesion were firm and thus the morphology were a papule/nodule, then it could be a lipoma due to the proliferation of adipose tissue.
b. *Lymphoid tissue*—wrong. Although lymphoid tissue can cause soft tissue lesions to appear yellow, the site (not in Waldeyer's ring of lymphoid tissue) is not logical.
c. *Pus*—correct. The lesion's morphology is a vesicle and the contents a sea of neutrophils resulting in a focal abscess (i.e., pus).
d. *Sebum*—wrong. Sebum can appear yellow as, for example, in the small papules and coalesced plaque areas of Fordyce granules seen most often on the labial and buccal mucosa; Fordyce granules are not typically seen on the gingiva and the morphology is an elevated blisterform (i.e., vesicle and bulla).

Case 55-2

a. *Mucocele*—wrong. Mucoceles can occur on the gingiva very rarely but they will appear pink to blue depending on the depth of the pool of inspissated mucin; the history does not agree with this as a provisional diagnosis.
b. *Parulis*—correct. The periapical abscess has spread via a fistula to the surface, where a "gum boil" appears (the collection of pus).
c. *Fistula*—wrong. A fistula is the epithelial-lined tract extending from an intrabony abscess to the mucosal site.
d. *Pyogenic granuloma*—wrong. These are bright red due to the collection of granulation tissue and are more typically found in the interdental papilla area where an inciting etiologic factor is present (e.g., restorative overhang, calculus, retained cement or impression material, hormonal changes as in pregnancy).

Case 56-1

a. *Regress and regrow*—correct. The lesion is a mucocele that typically changes sizes due to macrophage involvement with the spilled (extravasated) mucin due to the injured duct of the minor salivary gland lobule.
b. *Spontaneously involute*—wrong. The lesion is a mucocele.
c. *Continue to enlarge indefinitely*—wrong. The lesion is a mucocele.
d. *Remain the same size*—wrong. The lesion is a mucocele.

Case 56-2

a. *Inject sclerosing agent and then completely remove*—wrong. Sclerosing agents are only used at times for vascular lesions such as hemangiomas.
b. *Incisional biopsy*—wrong. The lesion does not have a worrisome (i.e., malignant) diagnosis and is small enough for complete removal.
c. *Excisional biopsy*—wrong. If the damaged gland is not also removed, then the lesion will recur.
d. *Excisional biopsy of the mucin and involved minor salivary gland*—correct. If the damaged gland is not also removed, then the lesion will recur.

Case 57

a. *Peripheral ossifying fibroma*—wrong. This is a classic site and morphology for this lesion.
b. *Peripheral giant cell granuloma*—wrong. This is a classic site and morphology for this lesion.
c. *Granular cell tumor*—correct. This lesion is very common on the dorsum of the tongue but very rare at this site.
d. *Pyogenic granuloma*—wrong. This is a classic site and morphology for this lesion.

Case 58

a. *Infection*—wrong. Fat is not a source of infection and no other signs or symptoms of infection are mentioned or observed.
b. *Physical trauma*—wrong. This is a lipoma, which is a true neoplasm (no initiating traumatic event as seen in reactive lesions such as pyogenic granuloma and fibroma or fibrous nodule).
c. *Herniation of the buccal fat pad*—correct. At times rather than a neoplastic event (e.g., lipoma) there is an outpouching of normal fat at this site.
d. *Excessive fat metabolism*—wrong. There is no relationship between a lipoma and fat metabolism or weight.

Case 59

a. *Mucocele*—wrong. Although the site and color fit, the morphology does not; the lesion is stated to be firm whereas a mucocele is a vesicle filled with mucin and thus is soft and compressible.
b. *Fibroma*—correct. This is a classic site for accidental biting (as are the tongue and buccal mucosa); firmness indicates an elevated, nonblisterform papule rather than a vesicle.
c. *Congenital epulis*—wrong. It occurs in infants (>females) on the alveolar ridge (>anterior maxilla).
d. *Pleomorphic adenoma*—wrong. It is much more common on the upper lip than lower lip.

Case 60

a. *Traumatic neuroma*—wrong. This is a histological diagnosis; lesion is most often seen as a solitary mass in the mental nerve foramen area of mandibular denture wearers following ridge resorption; it is often painful.
b. *Fibromas*—wrong. This is a histological diagnosis of a reactive lesion (typically solitary) subsequent to acute trauma. The history is wrong although site and color fit.
c. *Epulis fissuratum*—correct. Low-grade chronic trauma of ill-fitting dentures (due to gradual ridge resorption) often creates a reactive exuberant growth of excess tissue in the denture flange area that is clinically referred to as epulis fissuratum.
d. *Peripheral odontogenic tumor*—wrong. This is a histological diagnosis even though the gingiva is the correct site.

Case 61-1

a. *Plunging ranula*—correct. This lesion occurs in the lateral or midline of the neck as a soft compressible and fluctuant swelling in which floor-of-mouth extravasated mucin spreads inferiorly.
b. *Dermoid cyst*—wrong. It is a soft and fluctuant swelling of the midline (not lateral) neck.
c. *Cat scratch disease*—wrong. Although the lateral neck is a typical site, there must be a history of a cat scratch that then subsequently leads to significant infection in a draining lymph node.
d. *Infectious mononucleosis*—wrong. Although there is a lateral neck swelling, the patient should be experiencing a sore throat, swollen and tender lymph nodes, and fatigue.

Case 61-2

a. *Genioglossus*—wrong.
b. *Geniohyoid*—wrong.
c. *Omohyoid*—wrong.
d. *Mylohyoid*—correct.

Case 62

a. *Cervical lymphoepithelial cyst*—wrong. The cyst would be soft and fluctuant; it is typically seen in somewhat older patients (young adults).
b. *Abscess*—wrong. The swelling would be painful with or without drainage, and there would not be night sweats.
c. *Lipoma*—wrong. The mass would be soft and there would not be a fever or night sweats.
d. *Hodgkin's disease*—correct. Classic location, signs, and symptoms; malignant nodes are not painful. Also, age is good since there is a bimodal age distribution with two mean peaks: young people and the elderly.

Case 63-1

a. *Sarcoidosis*—wrong. Although multiple lesions of the head and neck occur with this condition, they are usually associated with the eyes, ears, and mouth; the lesions are flat and violaceous; they do not involve the axilla.
b. *Neurofibromatosis type 1*—correct. The sites of involvement as well as the color and morphology are classic for this condition, which is autosomally inherited; each lesion is a neurofibroma.
c. *Multiple endocrine neoplasia syndrome type 2b*—wrong.
d. *Amyloidosis*—wrong. Pale areas are seen and most commonly on the skin near the eyes.

Case 63-2

a. *Café au lait spots*—correct.
b. *Snail track lesions*—wrong. These are seen in Crohn's disease
c. *Ash leaf spots*—wrong. These areas of hypopigmentation are seen in tuberous sclerosis.
d. *Purpura*—wrong. These are areas of extravasated blood seen in bleeding disorders and sites of trauma.

Case 64

a. *Dermoid cyst*—wrong. This is a microscopic diagnosis of a developmental disorder.
b. *Ranula*—correct. This term is a clinical descriptor that means the area appears like a frog's swollen belly.
c. *Mucoepidermoid carcinoma*—wrong. This malignant salivary gland tumor can occur in the floor of mouth and have a bluish hue; however, the name is a microscopic diagnosis, not a clinical term.
d. *Nevus*—wrong. The term nevus means a "spot" and is typically reserved for cutaneous lesions such as congenital and acquired melanocytic nevi.

Case 65

a. *Connective tissue*—correct. This patient's lesion is likely a reactive fibroma due to the trauma, with fibroblasts stimulated to produce extra collagen.
b. *Neurofibroma*—wrong. This nerve sheath tumor consists of proliferating neuritis and axonal tissue and is a true, nonreactive neoplasm.
c. *Granular cell tumor*—wrong. Although this is the most likely morphology, color, and site for this lesion, a granular cell tumor is not caused by trauma but rather is a true proliferation of Schwann cell origin.
d. *Hemangioma*—wrong. Hemangiomas are compressible and blanchable and usually more red and/or blue; they are not caused by trauma but rather are developmental hamartomas.

Case 66

a. *Kaposi's sarcoma*—wrong. This vascular neoplasm is frequently found in the palate of HIV-positive males and, although this patient's HIV status is not reported, the site, morphology, and color fit well.
b. *Mucoepidermoid carcinoma*—wrong. The palate is the most common intraoral site for this malignant salivary gland tumor; often it has a bluish hue as seen here.
c. *Non-Hodgkin's lymphoma*—wrong. The palate is the most common extranodal oral site for this kind of lymphoma, especially B-cell type; it often has a boggy consistency.
d. *Mucocele*—correct. Although superficial mucoceles are often seen associated with palatal minor salivary glands, they are small vesicles filled with mucin that are compressible instead of boggy and would not attain the size or color of this lesion.

Case 67

a. *Cervical lymphoepithelial cyst*—wrong. Although lateral in position, the cyst would be soft, fluctuant, and nontender.
b. *Thyroglossal duct cyst*—wrong. The cyst would be in a midline position, not lateral, and would be fluctuant and nontender.
c. *Reactive lymphadenopathy*—correct. This cyst is in a lateral position with tender reactive nodes subsequent to an infection.
d. *Pleomorphic adenoma*—wrong. Although the tail of the parotid may involve this benign salivary gland tumor, it would be nonpainful and unrelated to the constitutional symptoms mentioned.

Case 68

a. *Prostate*—wrong. Although distant metastasis from the prostate can spread to bone, brain, and soft tissues, including the oral cavity, it does not spread to cervical lymph nodes.
b. *Hard palate*—wrong. The hard palate is an infrequent site of primary squamous cell carcinoma and does not typically drain to the anterior triangle lymph nodes.
c. *Floor of mouth*—wrong. Although the floor of mouth is second in frequency to the posterior lateral tongue as a primary site of squamous cell carcinoma, it typically drains to the submental nodes rather than to the cervical lymph node chain seen in this patient.
d. *Posterior lateral tongue*—correct. This is the most common site of typical squamous cell carcinoma that arises due to the etiologic factor of long-term cigarette use.

Appendix A

Glossary of Descriptive Terminology

abrasion the wearing away of a substance or structure through some unusual or abnormal mechanical process.

annular shaped like a ring.

atrophy loss of the normal thickness of the mucosa resulting in an increased translucency.

contusion (bruise) a superficial injury, usually painful or tender, produced by impact without laceration. There may or may not be a color due to hemorrhage.

crust dried residue of a combination of any or all of the following: serum, blood, cellular detritus, purulent discharge, or other exudates. Crust is seen on skin, including vermilion of lip.

ecchymosis a nonelevated area of hemorrhage, larger than a petechia.

erosion a depressed, superficial lesion that results from partial loss of the mucosa. The epithelium above the basal cell layer is denuded. An erosion often arises secondary to rupture of a vesicle or bulla; therefore, the base of a ruptured vesicle could represent an area of erosion. Erosions are moist and slightly depressed; healing rarely results in scarring.

eschar a slough produced by burning or a corrosive application.

excoriation a scratch that removes the cutaneous epidermis, producing a superficial lesion.

fissure a narrow, linear cleavage or groove of the mucosa that may or may not extend through the mucosa. A fissure may be normal or abnormal; it typically

The ADA Practical Guide to Soft Tissue Oral Disease, First Edition. Michael A. Kahn and J. Michael Hall.

affects the lips and paraoral tissues. When pathogenic organisms infect a fissure, pain, ulceration, and inflammation often result.

fistula an abnormal passageway that leads from a suppurative cavity, cyst, or abscess to the surface of the mucosa (epithelium). An abscessed tooth often produces a clinically evident pustule at the terminal end of the fistula known as a parulis (gum boil).

keratosis increased production and retention of keratin resulting in a raised lesion.

laceration a wound made by tearing. As a consequence, it has irregular edges.

linear arranged in a fashion to resemble a line.

papilla a small nipple-shaped projection or elevation.

papillary describing a tumor or growth exhibiting numerous surface projections.

papillomatous similar to or resembling a papilloma; another term for papillary.

patch a circumscribed area that is larger than a macule and differentiated from the surrounding epidermis by color or texture, or both. Like the macule the patch is neither elevated nor depressed.

pedunculated describing a tumor or growth whose base is narrower than the widest part of the lesion.

petechia a round, pinpoint area of hemorrhage.

plaque a lesion that is slightly elevated and is flat on its surface.

polypoid a lesion resembling a polyp.

pseudomembrane a membranous layer of exudate containing organisms, precipitated fibrin, necrotic cells, and inflammatory cells that is produced by an inflammatory reaction on the surface of a tissue.

punctate resembling or marked with points or dots.

scale an increased rate of Malpighian cell proliferation of the epidermis results in nonretention of superficial cells; the desquamating layers are scales.

scar the result of an injury that produces either an atrophy or a hypertrophy of the mucosa with an increase in the amount of underlying collagen tissue. The scar usually acquires a lighter color because of decreased vascularity. It is a permanent mark after a wound heals, a visible sign that indicates a disruption in the integrity of the epidermis and dermis. Scars are infrequently found in the oral cavity but may be of any shape or size.

sessile describing a tumor or growth whose base is the widest part of the lesion.

sinus tract an abnormal passageway that leads from a suppurative cavity, cyst, or abscess to the surface of the skin (epidermis).

slough a mass of dead tissue.

stellate pointed, shaped like a star.

telangiectasia a vascular lesion caused by permanent dilatation of a small, superficial blood vessel.

ulcer lesion characterized by the loss of the surface epithelium and frequently some of the underlying connective tissue. It often appears depressed or excavated.

verrucous describing a tumor or growth that exhibits a rough, warty surface.

wheal an edematous papule or plaque that results from acute extravasation of serum into the upper dermis. Usually pale red, pruritic, and of short duration; they are often seen in allergic individuals.

Recommended Reading

Cawson RA, Binnie WH, Barret AW, Wright JM. *Oral Disease*, 3rd edition. St. Louis, MO: Mosby; 2001.

Eversole LR. *Oral Medicine: A Pocket Guide*. Philadelphia: W.B. Saunders; 1996.

Neville BW, Damm DD, Allen CM, Bouquot JE. *Oral and Maxillofacial Pathology*, 3rd edition. St. Louis, MO: Saunders Elsevier; 2009.

Newland JR, Meiller TF, Wynn RL, Crossley HL. *Oral Soft Tissue Diseases*, 5th edition. Hudson, OH: LexiComp, Inc.; 2011.

Regezi JA, Sciubba JJ, Jordan RCK. *Oral Pathology: Clinical Pathologic Correlations*, 5th edition. St. Louis, MO: Saunders Elsevier; 2008.

Sapp JP, Eversole LR, Wysocki GP. *Contemporary Oral and Maxillofacial Pathology*, 2nd edition. St. Louis, MO: Mosby; 2004.

Scully C, Bagan JV, Carrozzo M, Flaitz CM, Gandolfo S. *Pocketbook of Oral Disease*. Edinburgh, UK: Churchill Livingstone Elsevier; 2013.

Appendix B

Formulary of Over-the-Counter and Prescription Medications Based on Disease Classification; Common Errors of Prescription Writing

Disclaimer

This brief compilation of prescribed drugs and therapeutic regimens useful in the treatment of common oral diseases and conditions is not intended to be all-inclusive, but is provided to give an overview of the pharmaceuticals available and the protocols that have been developed. The number of medications within each category has intentionally been limited; some regimens are off-label use. The authors acknowledge that the same treatment objectives may be accomplished by many pharmacological and therapeutic approaches. Brand names are included for the convenience of identification. No advertisement or promotional support is accepted from any company or interest.

The drugs are grouped according to their class of action or use for a specific condition. Every effort has been made to ensure that drug selection and dosage is in accordance with current recommendations and practice; however, in view of ongoing research, changes in governmental regulations, and new drug reactions, the clinician is urged to check the package insert or back label for each drug for any change in indication or dosage and for warnings and precautions. For any given patient, the drug, dosage, and administration may vary from the accepted norm, depending on the clinical situation.

As with any therapeutic procedure, the clinician has the responsibility to determine if there are any contraindications to the proposed therapy, to be aware of the potential complications and side effects, and to inform the patient of such possibilities. The following must always be considered for possible contraindications:

The ADA Practical Guide to Soft Tissue Oral Disease, First Edition. Michael A. Kahn and J. Michael Hall.

medical history; pregnancy; nursing mothers; children; known hypersensitivities; the elderly or medically compromised; impaired renal or hepatic function; concurrent medications; and full-disclosure labeling.

Antimicrobials

0.12% Chlorhexidine gluconate (Peridex; PerioGard; generics)
Dsp: 480 mL
Sig: Swish 1 teaspoonful for 1 minute then expectorate; perform twice daily—morning and evening after tooth brushing. Avoid eating or drinking for 30 minutes.
Use: Reduces the pathogenic microbial flora associated with inflammatory signs of oral disease.
Caution: It may stain teeth yellow to brown, may alter taste temporarily, and may increase the deposition of calculus. Contains 11.6% alcohol.

0.12% Chlorhexidine gluconate oral rinse without alcohol (CHX)
Dsp: 480 mL
Sig: Swish 15 mL for 1 minute then expectorate; perform twice daily—morning and evening after tooth brushing and meals. Avoid eating or drinking for 30 minutes.
Use: Reduces the pathogenic microbial flora associated with inflammatory signs of oral disease.
Caution: It may stain teeth yellow to brown, may alter taste temporarily, and may increase the deposition of calculus.

0.2% Aqueous chlorhexidine gluconate (compounded by pharmacist; only ask for peppermint, raspberry, or spearmint flavoring agents)
Dsp: 480 mL
Sig: Swish 1 teaspoonful for 1 minute then expectorate; perform twice daily—morning and evening after tooth brushing. Avoid eating or drinking for 30 minutes.
Use: Reduces the pathogenic microbial flora associated with inflammatory signs of oral disease.
Note: Use this for alcoholics and patients with xerostomia (e.g., postirradiation) because it is a nonalcohol formulation. It is available only through a specialty-compounding pharmacist. To find your nearest pharmacist who participates in the Compounding Centers of America call 1-800-331-2498. Shelf life is 6 months.
Caution: It may stain teeth yellow to brown, may alter taste temporarily, and may increase the deposition of calculus.

Antihistamine and Palliative Coating Agents

Diphenhydramine HCl 50 mg (Benadryl) or **promethazine 12.5 mg** (Phenergan; generic available) **[child]**
Dsp: #20
Sig: Take 1 tablet three times daily for 2–3 days.

Use: Mild to moderate allergic stomatitis of the immediate type, erythema multiforme.
Note: Diphenhydramine causes xerostomia.
Caution: Do not administer more than 50 mg of diphenhydramine per visit. Do not use during acute asthma attacks; avoid in patients with history of hyperthyroidism or angle-closure glaucoma; diphenhydramine should not be used along with alcohol, barbiturates, opioids, and monoamine oxidase inhibitors (MAOIs) or with any other centrally acting drug.

Diphenhydramine elixir 12.5 mg/5 mL (Benadryl) or **promethazine syrup 6.25 mg/5 mL** (Phenergan) with **Kaopectate** (attapulgite) or **Milk of Magnesia** 4 oz **[Child and Adult]**
Dsp: 8 oz; compound the ingredients.
Sig: Rinse with 1 teaspoonful every 2 hours and expectorate.
Use: Allergic stomatitis of the immediate type, erythema multiforme; palliation of painful vesiculoulcerative lesions such as primary herpetic gingivostomatitis; sedation and antiemetic effects.
Note: Dyclonine HCl 0.5%, 1 oz may be added for greater anesthetic efficacy. Sucralfate (Carafate) 1 g/10 mL or Maalox (aluminum hydroxide, magnesium hydroxide) may be substituted for Kaopectate or Milk of Magnesia. Palliative rinse; no therapeutic effect. Allergic reactions are extremely rare.
Caution: When topical anesthetics are used, patients should be cautioned concerning a reduced gag reflex and the need for caution while eating and drinking to avoid possible airway compromise. Also, the preparation can cause constipation and drowsiness; Maalox may be substituted for Kaopectate or Milk of Magnesia if constipation is a problem.

Topical Anesthetics, Chemical Cauterizers

Topical Anesthetics

20% Benzocaine gel or **liquid** or **spray** (Hurricaine)
Dsp: 1 oz
Sig: Apply small amount to ulcer as needed for pain.
Use: Palliation of painful vesiculoulcerative lesions.
Caution: The FDA announced in 2011 that over-the-counter benzocaine gels and liquids applied to the gingiva (or other areas of the mouth) have caused a rare but potentially fatal adverse effect, methemoglobinemia. Benzocaine products should not be used on children less than 2 years of age (e.g., for teething children), except under the advice and supervision of a health-care professional.

2% Lidocaine HCl viscous (Xylocaine)
Dsp: 100 mL
Sig: Apply 3 drops with clean fingertip or cotton-tip applicator to oral sores as needed for pain, then expectorate; alternatively, 2 teaspoons may be rinsed in

the mouth, then expectorated. For infant or toddler apply 3 drops to pacifier (see Caution).
Use: Palliation of painful vesiculoulcerative lesions.
Note: This preparation can be used for infants who are unable to rinse.
Caution: Do not swallow to avoid anesthetizing gag reflex; parents should be instructed to observe the child closely while he or she is taking food or liquids following administration of the anesthetic. There have been reports of cutaneous overuse (amount, prolonged time, wraps/dressings) leading to life-threatening events such as arrhythmias and seizures.

Orabase with benzocaine
Dsp: 5 g (or 15 g)
Sig: Apply to affected area before meals and as needed for pain.
Use: Palliation of painful vesiculoulcerative lesions (e.g., aphthous ulcer).
Caution: The FDA announced in 2011 that over-the-counter benzocaine gels and liquids applied to the gingiva (or other areas of the mouth) have caused a rare but potentially fatal adverse effect, methemoglobinemia. Benzocaine products should not be used on children less than 2 years of age (e.g., for teething children), except under the advice and supervision of a health-care professional.

Chemical Cauterizers

Debacterol® Single-Use Applicator Package (30% sulfuric acid and 22% sulfonated phenolics); 1 box (24 individually wrapped applicator sets consisting of a prefilled [0.2 mL] cotton swab applicator and drying cotton swab)
Dsp: 1 applicator package
Sig: Dry the affected area using the drying swab. Hold the applicator with the colored ring pointing up. To start the flow of Debacterol, gently bend the colored ring to one side until it snaps. Debacterol will flow to the opposite end (i.e., applicator swab). Apply directly to affected area for no more than 5 seconds. Rinse thoroughly with water and expectorate. Dispose of used applicator.
Use: Immediate palliation of painful minor aphthous ulcer.
Note: If excess irritation occurs during use, a rinse with sodium bicarbonate (baking soda) will neutralize the reaction (use 0.5 teaspoon in 120 mL of water).

Antifungals

Clotrimazole troches 10 mg (Mycelex)
Dsp: #70
Sig: Dissolve, in mouth, 1 troche as a lozenge five times daily for 14 consecutive days.
Use: Fungicidal; oral candidiasis.
Note: Remove denture(s) if applicable. Do not eat or drink for 30 minutes following use. Troche contains sucrose, so there is a risk of caries with prolonged use (> 3 months); care must be exercised in diabetic patients.

Clotrimazole 1% cream (Lotrimin-Rx; generic)
Dsp: 15 g
Sig: Apply thin film to inner surface of denture and/or angles of mouth four times a day (after each meal and at bedtime).
Use: Denture sore mouth; angular cheilitis.
Note: Do not eat or drink for 30 minutes following use. Continue for at least 3 days after apparent clinical resolution. An inexpensive over-the-counter athlete's foot cream (Lotrimin AF) is also available and may be substituted and used identically.

Clotrimazole 1% and betamethasone cream (Lotrisone)
Dsp: 15 g tube
Sig: Apply a thin amount to the affected area twice daily.
Use: Angular cheilitis.

Fluconazole 100 mg tablets (Diflucan); also available in 50 mg, 150 mg, and 200 mg tablets
Dsp: #15
Sig: Take 2 tablets on first day, then take 1 tablet daily thereafter for 14 days to treat oral candidiasis; for 21 days to treat esophageal candidiasis. Take 4 tablets on first day, then take 2 tablets daily for 28 days to treat systemic candidiasis.
Use: Systemic fungal infection—oropharyngeal, esophageal, mucocutaneous, and systemic candidiasis (HIV-seropositive patients).
Caution: Avoid in patients with severe liver and kidney disease.

Fluconazole 100 mg tablets (Diflucan)**/hydrocortisone 10 mg and iodoquinol 10 mg** (Alcortin A gel)
Dsp: 11 tablets/30 g tube
Sig: Apply a thin film of cream to the affected area three or four times daily for 10 days in conjunction with 200 mg of fluconazole immediately on day 1 and 100 mg each day on days 2–10.
Use: Severe exfoliative cheilitis (chapped lips) with cheilocandidiasis.
Note: Patient must stop lip-licking habit for complete resolution.

Hydrocortisone 10 mg and iodoquinol 10 mg (Alcortin A gel)
Dsp: 30 g tube
Sig: Apply small dab to corner of mouth, four times a day.
Use: Angular cheilitis; candidiasis.
Note: Advise patient to avoid contact with oral cavity since it has a very bitter taste.

Nystatin oral suspension 100,000 I.U./mL (Mycostatin, Nilstat)
Dsp: 240 mL
Sig: Take 1 teaspoonful (2–5 mL) every 6 hours (after each meal and before bedtime), rinse orally for 2 minutes, then swallow (if pharyngeal involvement) or expectorate, for 1 week. Do not eat or drink for 30 minutes following application.
Use: Oral candidiasis.

Note: Remove denture(s) if applicable; a few drops can be added to the water used for soaking acrylic prostheses. If dentate, good oral hygiene should be reinforced since nystatin suspension has high sugar content (50%). Advise the patient to regularly brush their palate if they have a removable maxillary prosthesis.

Nystatin pastilles or troches 200,000 I.U. (Mycostatin)
Dsp: #80
Sig: Dissolve 1 pastille in mouth four times daily as a lozenge for 14 consecutive days.
Use: Oral candidiasis.
Note: Remove denture(s) if applicable. If dentate, good oral hygiene should be reinforced since nystatin suspension has high sugar content. Advise the patient to regularly brush their palate if they have a removable maxillary prosthesis. Do not chew the pastille. The pastille is more effective than the oral suspension.

Nystatin 100,000 units/g—triamcinolone acetonide 0.1% ointment (Mycolog II, Mytrex)
Dsp: 15 g (30 g, 60 g) tube
Sig: Apply to the corner of the mouth after each meal and at bedtime until healing occurs.
Use: Angular cheilitis.
Note: Concomitant intraoral antifungal treatment may be indicated. As with nystatin ointment, in denture wearers this may be applied as a thin film to the inner surface of the denture.

Immunosuppressives: Steroids and Alternatives, Occlusive Dressings

Important note: Systemic steroids are contraindicated or must be used with caution in a number of systemic conditions (e.g., steroids raise blood glucose in diabetics). Consultation with a patient's physician is recommended before prescribing. Most oral pathologists feel that tapering of prednisone is not necessary with 5- to 7-day burst therapy, nor is tapering necessary with alternate-day therapy if the dosage does not exceed 20 mg. Steroids are contraindicated if an active infection exists (the microbial proliferation is usually enhanced and systemic dissemination is possible). Baseline hematology laboratory studies to include platelets are necessary to monitor possible bone marrow suppression. Hepatotoxicity has been reported. To reduce the possibility of adrenocortical suppression, it is important that prednisone be taken in harmony with diurnal adrenocortical steroid levels. To accomplish this, prednisone should be taken 90 minutes after normal arising time. Alternate-day morning dosage also reduces the possibility of adrenocortical suppression. When gingival lesions are prominent, a soft acrylic splint that extends over the attached gingiva can be useful to help occlude the topical steroid gel to the mucosal tissues.

Classes of Relative Potencies of Selected Topical Corticosteroids

Note: Class I is the most potent and Class VII is the least potent.

Class I:
- Betamethasone dipropionate 0.05% ointment
- Clobetasol propionate 0.05% cream or ointment
- Halobetasol propionate 0.05% cream or ointment

Class II:
- Betamethasone dipropionate 0.05% cream
- Fluocinonide 0.05% cream, gel, ointment, or solution

Class III:
- Betamethasone valerate 0.1% ointment
- Fluocinonide 0.05% cream
- Triamcinolone acetonide 0.1% ointment

Class IV:
- Fluocinonide acetonide 0.025% ointment
- Triamcinolone acetonide 0.1% cream

Class V:
- Betamethasone valerate 0.1% cream
- Fluocinonide acetonide 0.025% cream
- Hydrocortisone valerate 0.2% cream or ointment

Class VI:
- Triamcinolone acetonide 0.025% cream

Class VII:
- Hydrocortisone 1% cream or 2.5% ointment

0.5% Hydrocortisone acetate ointment (Orabase HCA)
Dsp: 5 g tube
Sig: Dry area and then apply thin film to oral sores after meals and at bedtime. Do not rub in.
Use: Oral erosive lichen planus, bullous pemphigoid, oral pemphigus, contact (delayed) allergic stomatitis, recurrent aphthous stomatitis, chapped (cracked) lips.

Miles' Mixture
84,000 international units nystatin
84 mg tetracycline
1.04 mg hydrocortisone/5 mL liquid
Sig: Alternately rinse with 2% viscous lidocaine for 2 minutes and expectorate, four times daily.
Use: Major aphthous ulcer in immunosuppressed patients.
[*Reference*—Glick M and Muzyka BC. *JADA* 1992;123:61–65.]

0.05% Betamethasone dipropionate ointment (Diprolene)
Dsp: 15 g (45 g) tube
Sig: Apply to oral sores four times daily (after meals and at bedtime).

Use: Oral erosive lichen planus, bullous pemphigoid, oral pemphigus, contact (delayed) allergic stomatitis, recurrent aphthous stomatitis.
Note: Taking with food may minimize gastrointestinal distress.
Caution: Warning label states it is only for external use; tell patient to ignore the label (i.e., this is an off-label use). If candidiasis occurs, then add 100,000 units of nystatin into each gram of the ointment.

0.1% Betamethasone valerate ointment (Valisone)
Dsp: 15 g (45 g, 110 g, 430 g) tube
Sig: Apply thin amount to oral sores four times daily (after meals and at bedtime).
Use: Oral erosive lichen planus, bullous pemphigoid, oral pemphigus, contact (delayed) allergic stomatitis, recurrent aphthous stomatitis, chapped (cracked) lips.
Note: Taking with food may minimize gastrointestinal distress.
Caution: Prolonged use can result in tissue thinning.

0.05% Clobetasol propionate gel or ointment (Temovate or generic)
Dsp: 30 g tube
Sig: Dry area and apply to oral lesions four to six times daily (after meals and at bedtime). Do not rub in.
Use: Oral erosive lichen planus, bullous pemphigoid, oral pemphigus, contact (delayed) allergic stomatitis, recurrent aphthous stomatitis, chapped (cracked) lips.
Note: The gel formulation has a slightly lower potency than the ointment. If patient is a denture wearer, apply a thin film to the inner surface of the denture base wherever it contacts the oral lesions.

0.05% Clobetasol propionate ointment (Temovate or generic) **with Orabase or Orabase with benzocaine**
Dsp: 30 g tube (15 g each, compounded 1:1)
Sig: Dry area and apply to oral lesions four to six times daily (after meals and at bedtime). Do not rub in. Do not eat or drink anything for ½ hour after use.
Use: Oral erosive lichen planus, bullous pemphigoid, oral pemphigus, contact (delayed) allergic stomatitis, recurrent aphthous stomatitis, chapped (cracked) lips.
Note: Mixing with equal part of Orabase promotes adhesion and may improve efficacy.
Caution: The FDA announced in 2011 that over-the-counter benzocaine gels and liquids applied to the gingiva (or other areas of the mouth) have caused a rare but potentially fatal adverse effect, methemoglobinemia. Benzocaine products should not be used on children less than 2 years of age (e.g., for teething children), except under the advice and supervision of a health-care professional.

Dexamethasone elixir 0.5 mg/5 mL (Decadron)
Dsp: 100 mL
Sig: Take 1–2 teaspoonful as an oral rinse for 2 minutes three times a day, then expectorate. Discontinue when lesions become asymptomatic.

Use: Minor aphthous ulcerations; other oral erosive stomatitides.

0.05% Fluocinonide gel or ointment (Lidex or generic) **[Child or Adult]**
Dsp: 15 g (30 g, 60 g) tube
Sig: Dry area and apply thin amount to oral lesions four to six times daily (after meals and at bedtime). Do not rub in.
Use: Oral erosive lichen planus, bullous pemphigoid, oral pemphigus, contact (delayed) allergic stomatitis, recurrent aphthous stomatitis, chapped (cracked) lips.
Note: The gel formulation has a slightly lower potency than the ointment but generally has better patient acceptance. If the patient is a denture wearer, apply a thin film to the inner surface of the denture base wherever it contacts the oral lesions.
Caution: Fluocinonide has a bitter taste; patient may prefer betamethasone valerate.

0.05% Fluocinonide (Lidex or generic) **ointment compounded 1:1 with Orabase or Orabase with benzocaine**
Dsp: 30 g total (15 g each)
Sig: Dry area and apply to oral lesions four to six times daily (after meals and at bedtime). Do not rub in.
Use: Oral erosive lichen planus, bullous pemphigoid, oral pemphigus, contact (delayed) allergic stomatitis, recurrent aphthous stomatitis, chapped (cracked) lips.
Note: Mixing with equal part of Orabase promotes adhesion and may improve efficacy.
Caution: The FDA announced in 2011 that over-the-counter benzocaine gels and liquids applied to the gingiva (or other areas of the mouth) have caused a rare but potentially fatal adverse effect, methemoglobinemia. Benzocaine products should not be used on children less than 2 years of age (e.g., for teething children), except under the advice and supervision of a health-care professional.

Methylprednisolone 4 mg (Medrol dosepak 21s)
Dsp: 1 dosepak [contains twenty-one 4 mg tablets]
Sig: Take graduated daily doses according to the manufacturer's directions listed on the dosepak (according to many oral pathologists the manufacturer's use of graduated daily doses [tapering] of this product is not necessary due to its low dosage).
Use: Very severe cases of oral erosive lichen planus, major aphthous stomatitis, benign mucous membrane pemphigoid, and erythema multiforme.
Caution: Do not prescribe if patient has existing infectious disease or diabetes mellitus (danger of hyperglycemia).

Prednisone 10 mg tablets (5 mg and 20 mg are also available) (Deltasone)
Dsp: #50
Sig: Take 5 tablets in the morning (90 minutes after normal arising time) until lesions recede, then decrease by 1 tablet on each successive day *or* switch to every-other-day therapy for four doses, then stop systemic therapy. The patient may then continue with topical steroid therapy.

Use: Very severe cases of oral erosive lichen planus, major aphthous stomatitis, benign mucous membrane pemphigoid, and erythema multiforme.
Note: When daily dose is 30 mg or greater patients may experience insomnia, headache, or irritability. Concomitantly administer azathioprine.
Caution: Do not prescribe if patient has existing infectious disease or diabetes mellitus (danger of hyperglycemia).

Prednisolone syrup 15 mg/5 mL (Prelone)
Dsp: 8 oz
Sig: Take 1 teaspoonful four times a day. Gargle or swish for as long as possible and expectorate.
Use: Very severe cases of oral erosive lichen planus, major aphthous stomatitis, benign mucous membrane pemphigoid, and erythema multiforme.

0.1% Triamcinolone acetonide ointment (Kenalog) **in Orabase or Orabase with benzocaine**
Dsp: 30 g total (15 g each)
Sig: Dry area and apply a thin film to oral sores four times daily (after meals and at bedtime). Do not rub in. Do not eat or drink for ½ hour after use.
Use: Oral erosive lichen planus, bullous pemphigoid, oral pemphigus, contact (delayed) allergic stomatitis, recurrent aphthous stomatitis, chapped (cracked) lips.
Caution: The FDA announced in 2011 that over-the-counter benzocaine gels and liquids applied to the gingiva (or other areas of the mouth) have caused a rare but potentially fatal adverse effect, methemoglobinemia. Benzocaine products should not be used on children less than 2 years of age (e.g., for teething children), except under the advice and supervision of a health-care professional.

0.1% Triamcinolone acetonide suspension in 2% viscous lidocaine
Dsp: 100 mL
Sig: Swish 1 teaspoonful for 1 minute four times a day (after meals and at bedtime) and expectorate.
Use: Immediate pain relief for patients with oral erosive lichen planus, bullous pemphigoid, oral pemphigus, contact (delayed) allergic stomatitis, or recurrent aphthous stomatitis.
Note: Do not drink or eat for ½ hour after using. Shake well before using. Shelf life is 6 months.

Used in Conjunction with a Lowered Dose of Steroids

Azathioprine 50 mg (Imuran)
Dsp: #30
Sig: Take 1 tablet daily in conjunction with prednisone.
Use: Prescribed concomitantly with prednisone for managing severe conditions of oral erosive lichen planus, major aphthous stomatitis, benign mucous membrane pemphigoid, and erythema multiforme in which the patient does not respond

well to steroid alone. This combination gives the clinical effects of a higher dosage of topical or systemic steroids without their side effects.

Caution: Chronic use increases the risk of nausea/vomiting and neoplasia as well as serious hematologic consequences. Monitor the patient weekly and taper medications as indicated by clinical response. Discontinue if severe nausea occurs. Treatment should be in collaboration with the patient's physician. Azathioprine should not be taken during pregnancy. A baseline complete blood count (CBC) and liver enzyme panel should be ordered prior to starting patients on azathioprine.

Alternative to Steroids

5% Amlexanox oral paste (Aphthasol)

Dsp: 5 g tube

Sig: Apply a small amount of paste (approx. ¼ inch) to the fingertip as soon as possible after noticing the symptoms of an aphthous ulcer and with gentle pressure dab onto each mouth ulcer four times a day (after breakfast, lunch, and dinner and at bedtime following oral hygiene). Use should continue until the ulcer heals.

Use: Recurrent aphthous stomatitis.

Note: Advise patient not to eat or drink for ½ hour after application and to wash hands following use.

Caution: Safety and effectiveness in pediatric patients has not been established.

Occlusive Dressings

Lidocaine; tetracycline; dexamethasone; nystatin

- 2% lidocaine (viscous), 100 mL
- Tetracycline oral suspension (125 mg/5 mL), 18 mL
- Dexamethasone (0.5 mg/5 mL), 9 mL
- Nystatin oral suspension (100,000 I.U.), 73 mL

Dsp: 200 mL

Sig: Rinse or gargle with 2 teaspoons for 2 minutes four or five times daily.

Use: Oral erosive lichen planus, bullous pemphigoid, oral pemphigus, contact (delayed) allergic stomatitis, recurrent aphthous stomatitis.

Sucralfate; tetracaine; distilled water

- Sucralfate (Carafate), 6 g
- Tetracaine 2% (Pontocain), 15 mL
- Distilled water, 15 mL

Dsp: 30 mL

Sig: Apply to affected area as needed.

Use: Oral erosive lichen planus, bullous pemphigoid, oral pemphigus, contact (delayed) allergic stomatitis, recurrent aphthous stomatitis, chapped (cracked) lips.

Tetracycline; dexamethasone; diphenhydramine

- Tetracycline oral suspension (125 mg /5 mL), 18 mL
- Dexamethasone elixir (0.5 mg /5 mL), 9 mL
- Diphenhydramine elixir (12.5 mg /5 mL), 173 mL

Dsp: 200 mL

Sig: Rinse mouth with 1–2 teaspoonful for 2 minutes four times daily, and then expectorate.

Use: Oral erosive lichen planus, bullous pemphigoid, oral pemphigus, contact (delayed) allergic stomatitis, recurrent aphthous stomatitis.

Antivirals

Acyclovir 5% ointment (Zovirax)

Dsp: 3 g or 15 g tube

Sig: Apply to skin of lip with a cotton-tip applicator or gloved finger every 2 hours during waking hours, beginning when symptoms first occur (i.e., prodromal stage).

Use: Recurrent herpes labialis (some decrease in viral shedding, not pain). In primary herpes labialis there are reports of decreased viral shedding and pain.

Note: Apply during early (prodromal) recurrence if possible; otherwise apply directly over vesicles. Do not apply with exposed finger to avoid autoinoculation to other body sites (e.g., eyes) or transmission to other persons. Has an irregular performance against oral lesions; better on genital lesions, in immunocompromised patients and herpes zoster patients (does not prevent postherpetic neuralgias). No generic is available at this time.

Acyclovir 200 mg (Zovirax, generic) **[Child or Adult]**

Dsp: #50 or #60

Sig: **Adults**: Take 1 capsule five times daily for 10 days (primary HSV) or 5 days (recurrent HSV) *or* 2 capsules three times a day for 10 days (primary HSV) or 5 days (recurrent HSV). **Children**: 20 mg/kg five times per day.

Use: Prevention of recurrent herpes simplex infection and herpes-related erythema multiforme; varicella zoster (shingles).

Note: Treatment should begin during the early stage of the recurrence in immunosuppressed patients. The current FDA recommendation is that systemic acyclovir is used to treat oral herpes only for immunocompromised patients (until lesions are crusted over). May be used in children aged 2 years and above as a liquid suspension. Frontal headaches are common if patient is not adequately hydrated.

Caution: Use with caution in patients with renal function impairment or dehydration.

Acyclovir 400 mg (Zovirax, generic)

Dsp: #60

Sig: Take 1 capsule every 12 hours.

Use: Prevention of recurrent herpes simplex infection flare-ups.

Note: May be indicated for patients experiencing six or more episodes per year. An alternate regimen is 200 mg acyclovir by mouth three to five times daily (as previously described).

Acyclovir 5% and hydrocortisone 1% cream (Xerese, Xerclear)
Dsp: 1 tube
Sig: Apply to sore five times daily for 5 days.
Use: Recurrent herpes labialis.
Note: Therapy is most effective if started within 48 hours after the onset of symptoms. It is probably not indicated if the patient has been symptomatic for 7 days or longer. Patient must maintain good hydration (64 fluid ounces per day

Famciclovir 500 mg (Famvir; generic available); also available in 125 mg and 250 mg
Dsp: #21
Sig: Take 1 tablet three times a day for 7 days.
Use: Acute herpes zoster (shingles) infection; recurrent herpes labialis (off-label use).
Note: This is the prodrug of penciclovir, with approximately the same efficacy and safety as acyclovir. Famciclovir is equivalent to acyclovir in the duration of acute pain, but more effective for duration of postherpetic neuralgia. Start soon after symptoms appear (within 48 hours); efficacy after 72 hours is questionable.
Caution: Reduce doses in patients with renal impairment. Drug interactions occur with cimetidine, digoxin, and theophylline products. This medication has not been studied in children less than 18 years old and there are no randomized controlled studies with proof of efficacy for chronic recurrent herpes labialis.

Famciclovir 500 mg (Famvir; generic available)
Dsp: #3
Sig: Take 3 tablets for 1 day *or* 1½ tablets twice for 1 day.
Use: Recurrent herpes labialis (off-label use).
Note: This is the prodrug of penciclovir, with approximately the same efficacy and safety as acyclovir. Famciclovir is equivalent to acyclovir in the duration of acute pain, but more effective for duration of postherpetic neuralgia. Start soon after symptoms appear (within 48 hours); efficacy after 72 hours is questionable.
Caution: Reduce doses in patients with renal impairment. Drug interactions occur with cimetidine, digoxin, and theophylline products. This medication has not been studied in children less than 18 years old.

Penciclovir 1% cream (Denavir)
Dsp: 2 g tube
Sig: Apply thin amount to herpetic lesion every 2 hours during waking hours for a period of 4 days. Treatment should be started as early as possible (i.e., during the prodrome or when lesions appear).
Use: Recurrent herpes simplex infection (studies indicate decreased pain and mean duration of lip lesions reduced by ½ day).
Note: Do not apply with fingertip. No studies of primary HSV labialis or immunocompromised patients.

Valacyclovir HCl 500 mg (Valtrex; generic available)
Dsp: #42 or #14
Sig: Take 2 caplets three times a day for 7 days without regard to meals *or* take 1 tablet twice a day for 7 days.

Use: Herpes zoster (shingles) in immunocompetent individuals.
Note: Not for use in immunocompromised patients. A prodrug of acyclovir that is three to five times more bioavailable than acyclovir. Valacyclovir is more effective than acyclovir for acute pain cessation and duration of postherpetic neuralgia. Start soon after symptoms appear (48 hours); efficacy after 72 hours is questionable. It has the lowest cost among prescription antivirals listed.
Caution: Reduce doses in patients with renal impairment. This medication has not been studied in children less than 18 years old. Avoid use in patients with HIV or bone marrow or renal transplants due to risk of hemolytic uremic syndrome.

Miscellaneous Over-the-Counter

10% Docosanol cream (Abreva)
Dsp: 2 g tube
Sig: Apply to herpetic lesion five times a day as soon as possible after detection.
Use: Recurrent orofacial herpes simplex infections (i.e., cold sores, fever blisters).
Caution: Local application must be done with a cotton-tipped applicator to prevent viral transmission and autoinoculation.

Antianxiety

Alprazolam 0.25 mg (Xanax)
Dsp: #20
Sig: Take 1 tablet three times daily or 1 tablet 1 hour prior to dental appointment.
Use: Tension reduction prior to appointments; myogenic facial pain.

Chlordiazepoxide 10 mg (Librium)
Dsp: #20
Sig: Take 1 tablet twice daily.
Use: Tension reduction prior to appointments; myogenic facial pain.

Diazepam 5 mg (Valium)
Dsp: #20
Sig: Take 1 tablet before bedtime 1 day prior to surgery, then 1 tablet 1 hour prior to surgery.
Use: Tension reduction prior to appointments; myogenic facial pain.
Caution: Contraindications are similar to codeine. Do not use in the presence of cimetidine or any other H_2-blocker.

Hydroxyzine 25 mg (Atarax)
Dsp: #10
Sig: Take 2 tablets 1 hour before dental procedure.
Use: Anxiety and anxiety-related skin eruptions; sedation and antiemetic action.

Hydroxyzine pamoate 25 mg (Vistaril)
Dsp: #20

Sig: Take 1 tablet 15–30 minutes before dental appointment.
Use: Short-term relief of anxiety; sedative when used as premedication.

Lorazepam 1 mg (Ativan)
Dsp: #20
Sig: Take 1 tablet daily or 1 tablet 1 hour prior to dental appointment.
Use: Tension reduction prior to appointments; myogenic facial pain.

Prochlorperazine maleate 5 mg (Compazine)
Dsp: #20
Sig: Take 1 tablet twice daily.
Use: Short-term relief of anxiety; severe nausea and vomiting.

Antixerostomics

Some of the Drugs Reported to Frequently Cause Xerostomia

Anticholinergics and antiparkinsonian agents—benztropine mesylate, dicyclomine, flavoxate, methantheline bromide, oxybutynin
Antidepressants—amitriptyline, desipramine, imipramine, MAOIs, all tricyclic antidepressants (TCAs), trazadone
Antipsychotics—chlorpromazine, haloperidol, prochlorperazine, thioridazine, thiothixene, trifluoperzine
Antihypertensives—beta blockers, captopril, clonidine, guanethidine, methyldopa, reserpine
Central nervous system (CNS) stimulants—amphetamines, dethylproprion, phentermine, phenylpropranolamine, pseudoephedrine
Diuretics—calcium sparing diuretics, carbonic anhydrase inhibitors, chlorthalidone, loop diuretics, thiazides
Miscellaneous—atropinics, hypotensive agents, narcotics, muscle relaxants, systemic bronchodilators

Prescription Saliva Substitutes

Aquoral artificial saliva [oxidized glycerol triesters, silicon dioxide, aspartame, and artificial flavoring]
Dsp: 1 bottle
Sig: 2 sprays (0.1 mL/spray), three or four times daily.
Use: Relieves symptoms of dry mouth that may be the result of Sjögren's syndrome, oral inflammation, medication, chemo- or radiotherapy, and stress or aging.

Maxisal liquid
Dsp: 1 bottle
Sig: Use as needed.
Use: Enhance salivary function; also can be used for patient with burning mouth syndrome.

Neutral calcium^{2+}/PO4^{3-} rinse (Caphosol®) Calcium^{2+} 4.74 mM, PO_4^{3-} 2.96 mM, Na^+ 97.67 mM, Cl^- 116.6 mM and pH 7.1
Dsp: 30 mL per dose
Sig: Four times a day rinse with 30 mL of solution.
Use: Reduce frequency, intensity, and duration of oral mucositis in patients undergoing hematopoietic stem cell transplantation.
Note: A neutral supersaturated solution used in combination with topical fluoride treatments.

Numoisen liquid and lozenge
Liquid—water, sorbitol, linseed extract, *Chondrus crispus*, methylparaben, sodium benzoate, potassium sorbate, dipotassium phosphate, propylparaben (300 mL)
Lozenge—sorbitol 0.3 g/lozenge, polyethylene glycol, malic acid, sodium citrate, calcium phosphate dibasic, hydrogenated cottonseed oil, citric acid, magnesium stearate, silicon dioxide (100s)

Oasis® mouthwash and mouth spray
Mouthwash—water, glycerin, sorbitol, poloxamer 338, PEG-60, hydrogenated castor oil, copovidone, sodium benzoate, carboymethylcellulose (473 mL) [alcohol free, sugar free; mild mint flavor]
Spray—glycerin, cetylpryridinium, copovidone (30 mL) [alcohol free, sugar free; contains sodium benzoate; delivers ~150 sprays, mild mint flavor]

Burning Mouth Syndrome and Other Neuralgias

Consider prescribing a tricyclic antidepressant or benzodiazepines in low dose when a psychogenic or idiopathic case is suspected. The dosage should be adjusted according to the individual response of the patient, and maintenance doses may have to be continued for many months.

Alprazolam 0.5 mg extended-release (Xanax XR; generic available)
Dsp: #20
Sig: Take ½ tablet three times daily or ½ tablet 1 hour prior to dental appointment.
Use: Burning mouth syndrome.
Caution: Side effects expected include dry mouth and morning drowsiness; adjust dosage according to patient reaction and clinical symptomatology.

Amitriptyline 25 mg (Elavil)
Dsp: #50
Sig: Take 1 tablet at bedtime for 1 week, then 2 tablets at bedtime; increase to 3 tablets after 2 weeks and maintain at that dosage.
Use: Burning mouth syndrome, neuralgia, myofascial pain, and headache.
Caution: Side effects expected include dry mouth and morning drowsiness; adjust dosage according to patient reaction and clinical symptomatology. Contraindicated in patients with a history of ischemic cardiovascular disease and myocardial infarction.

Carbamazepine ER 200 or 300 mg (Carbatrol)
Dsp: #30
Sig: Take 1 caplet at bedtime.
Use: Neuralgia and myofascial pain.
Note: This gives more even blood levels than an immediate-release product.

Clonazepam 0.25 mg (Klonopin)
Dsp: #21
Sig: Take 1 tablet at bedtime for 1 week. Increase the daily dose by as much as 0.25 mg each week, up to a total dosage of 3 mg.
Use: Burning mouth syndrome; bad taste in mouth.
Note: If the burning subsides at any point, that dose can be maintained. Reevaluate after 3 weeks of medication.
Caution: Physician consultation and oversight is strongly recommended. Clonazepam may cause significant sedation.

Doxepin HCl 25 mg (Sinequan)
Dsp: #45
Sig: Take 1 tablet each evening for 5 days, then 2 tablets each evening for 5 days, then 4 tablets each evening for 7 days.
Use: Atypical facial pain of psychogenic origin and burning mouth syndrome; most effective in depressed patients with anxiety.
Caution: A dexamethasone suppression test is advisable initially. Maintenance dose varies from 100 to 200 mg daily.

Fluoxetine HCl 20 mg (Prozac)
Dsp: #30
Sig: Take 1 tablet daily in the morning.
Use: Atypical facial pain of psychogenic origin and burning mouth syndrome; most effective in depressed patients.

Gabapentin 100 mg (300 mg, 400 mg) (Neurontin)
Dsp: #30
Sig: Take 1 capsule at bedtime.
Use: Neuralgia and myofascial pain.
Note: Gabapentin has fewer side effects and causes less drowsiness than carbamazepine. Safe for cardiac patients.

Nortriptyline 10 or 25 mg (Pamelor)
Dsp: #90
Sig: Take 1 tablet at bedtime for 1 week, then 2 tablets at bedtime. Increase to 3 tablets at bedtime after 3 weeks and maintain that dosage, if needed.
Use: Burning mouth syndrome, neuralgia, and myofascial pain.
Note: Nortriptyline has twice the potency of amitriptyline and causes less drowsiness and xerostomia so it may be better tolerated in the elderly.
Caution: There is an increased risk of suicidal thinking and behavior (suicidality) associated with use in children and adolescents.

Prescription Writing Requirements and Safe Writing Practices

Doctor's Name
Address
Phone Number
Patient's Name Date
Patient's Address Age
Rx: Drug Name Dosage/Size
Dsp: Number of tablets, capsules, ounces (oz) to be dispensed
Sig: Direction on how drug is to be taken
Doctor's Signature
State License Number
DEA Number (if required)
Fill Generic: This note, if added to the prescription, allows the pharmacist to fill with the least expensive generic drug available.

Prescription Writing

Always include the following:

1. Date
2. Full name and address of patient
3. Name and address of prescriber
4. Signature of prescriber

If prescribing a Class II drug, then the Drug Enforcement Agency (DEA) number is necessary. If prescribing a Class II or Class III narcotic, then a triplicate prescription form (in the state of California) is necessary and it must be handwritten by the prescriber.

Safe Writing Practices

- There should be a space between a number and its units as it is easier to read. There should be no period after the abbreviation mg or mL.
- Never place a decimal and a zero after a whole number. If the decimal point is not seen because it falls on a line or because individuals are working from copies where the decimal point is not seen, this causes a 10-fold overdose.
- Just the opposite is true for numbers less than one. Always place a zero before a naked decimal.
- Never abbreviate the word "unit." The handwritten U or u looks like a 0 (zero) and may cause a 10-fold overdose error to be made.
- Q.D. is not a safe abbreviation for "once daily" as, when the Q is followed a sloppy dot, it looks like QID, which means four times daily.
- O.D. is not a safe abbreviation for "once daily" as it is properly interpreted as meaning "right eye" and has caused liquid medications such as saturated solution of potassium iodide and Lugol's solution to be administered incorrectly. There is no safe abbreviation for "once daily." It must be written out in full.

- Do not use chemical names such as 6-mercaptopurine, as sixfold overdoses have been given when these were not recognized as chemical names. The proper name of this drug is mercaptopurine.
- Do not abbreviate drug names because they are misinterpreted and cause error.
- Do not use the apothecary system or symbols.
- When writing an outpatient prescription, write a complete prescription. A complete prescription can prevent the prescriber, the pharmacist, and/or the patient from making a mistake and can eliminate the need for further clarification.

The legible prescription should contain the following:

a. Patient's full name
b. For pediatric or geriatric patients: the patient's age (or weight where applicable)
c. Drug name, dosage form, and strength (If a drug is new or rarely prescribed, print this information.)
d. Number or amount to be dispensed
e. Complete instructions for the patient, including the purpose of the medication
f. Contraindications (When there are recognized contraindications for a prescribed drug, indicate to the pharmacist that you are aware of this fact.)

Recommended Reading

Ciancio SG, editor. *The ADA/PDR Guide to Dental Therapeutics*, 5th edition. Chicago, IL: American Dental Association; 2009.

Cohen MR, Davis NM. Avoid dangerous Rx prescriptions. *Am Pharm* 1992;NS32:112–113.

Eversole LR. *Oral Medicine: A Pocket Guide*. Philadelphia: W.B. Saunders; 1996.

Jeske AH, editor. *Mosby's Dental Drug Reference*, 8th edition. St. Louis, MO: Mosby Elsevier; 2008.

Kahn MA. *Your Pocket-Size Dental Drug Reference*. Shelton, CT: People's Medical Publishing House—USA; 2012.

Siegel MA, Silverman S, Sollecito TP, editors. *Clinician's Guide to Treatment of Common Oral Conditions*, 5th edition. Hamilton, Ontario, Canada: BC Decker; 2001.

Wynn RL, Meiller TF, Crossley HL, editors. *Drug Information Handbook for Dentistry*, 17th edition. Hudson, OH: LexiComp; 2011.

Index

Note: Page numbers in *italics* refer to figures and photos.

The ADA Practical Guide to Soft Tissue Oral Disease, First Edition. Michael A. Kahn and J. Michael Hall.