Clinical Oral Medicine and Pathology
What is oral medicine? Broadly speaking, it is the field of medicine that encompasses the diagnosis and management of diseases affecting the oral cavity. Many conditions produce oral signs and symptoms, and yet the oral cavity is an unfamiliar zone for many clinicians. Physicians generally receive little formal training in dental and oral medicine, and tend to view the oral cavity as a place reserved for their “dental” colleagues. Likewise, dentists are experts in the diagnosis and management of diseases related to the teeth and periodontium; however, the proportion of dental education dedicated to the “non-dental” part of the oral cavity often falls short. For these reasons, it is not at all uncommon for a patient to visit five to ten doctors before receiving a correct diagnosis and appropriate treatment plan, often months to years following onset of symptoms. It was from this landscape that this book was designed and written.

Given the wide range of clinical presentations, patients with oral complaints may seek out or be referred to a variety of health care providers, including primary care physicians, dentists, otolaryngologists, oral surgeons, dermatologists, neurologists, psychiatrists, and rheumatologists. Many of these oral conditions can be recognized and managed without the need for additional specialty referral. In this book, we have attempted to provide a rational, concise, and yet comprehensive approach to the practice of oral medicine for all those who are likely to encounter diseases of the oral cavity in their daily practice. We have included specific guidelines on diagnosis, management, and follow-up. Our intent was to create a clinically relevant and accessible resource for health care professionals, truly bridging the worlds of dentistry and medicine.
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Chapter 1
Normal Anatomy

Summary Knowledge of normal anatomy and physiology of the oral cavity provides a basis for understanding and recognizing pathology. This chapter provides a review and overview of surface landmarks and underlying anatomy of the oral cavity in the context of diagnosing conditions that are detailed throughout the remainder of the book. The oral mucosa, palate, tongue, floor of mouth, dentition, salivary glands, and cervical lymphatic drainage are specifically highlighted.

Keywords Vermillion • Vestibule • Oral cavity proper • Oropharynx • Fauces • Palatoglossal arch • Palatopharyngeal arch • Retromolar trigone • Pterygomandibular raphe • Buccinator muscle • Muscles of mastication • Stenson duct • Wharton duct • Waldeyer ring • Lingual papillae • Tonsils • Tongue • Palate • Mucosa • Floor of mouth • Mucogingival junction • Parotid papilla • Palatal rugae • Periosteum • Gingival margin • Interdental papilla • Cementoenamel junction • Cementum • Enamel • Pulp • Foramen cecum • Incisive papilla • Apical foramen • Periodontal ligament • Trigeminal nerve • Temporomandibular joint • Parotid gland • Submandibular gland • Sublingual gland • Minor salivary glands • Lingual nerve • Inferior alveolar nerve • Cervical lymph nodes

1.1 Introduction

The oral cavity sits at the opening of the digestive tract and is bounded by the lips anteriorly (Fig. 1.1). The vermillion zone serves as the transition area between the moist oral mucosa and the skin of the face. The oral structures are adapted to serve a variety of functions, including maintenance of a protective barrier, initiation of digestion, special taste sensation, speech and swallowing, immunologic defense, and provision of salivary lubricants and buffers.

1.2 Surface Landmarks

The oral cavity can be subdivided broadly into three areas consisting of the vestibule, oral cavity proper, and oropharynx (Fig. 1.2). The vestibule is the space that is present between the lips or cheeks laterally and the dentition medially. The oral cavity proper lies inside the dental arches and is bounded posteriorly by the anterior pillar of the fauces, or palatoglossal arch. The oropharynx lies posterior to the palatoglossal arch, and includes the posterior one-third of the tongue, palatine tonsils, soft palate, and visible posterior wall (Fig. 1.3). The palatine tonsils sit in an alcove between the anterior (palatoglossal) and posterior (palatopharyngeal) arches, or pillars, and frequently exhibit surface pits or depressions called crypts (Fig. 1.4).

The retromolar trigone is a roughly triangular area behind the last molars representing the posterior aspect of the vestibule (Fig. 1.5). Adjacent to this is the pterygomandibular raphe, which indicates the junction between the buccinator and superior constrictor muscles, and is used as a landmark for administration of intraoral local anesthesia. The parotid papilla, which houses the opening of
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Fig. 1.1 Anatomy of the lips. Note small melanotic macule on the vermillion of the left upper lip near the border as well as physiologic pigmentation of upper lip.

Fig. 1.2 Major areas of oral cavity: oral cavity proper, oropharynx, and vestibule. The vestibule is referred to as “buccal” posteriorly and “labial” anteriorly where it contacts the cheek and lip, respectively.

Fig. 1.3 Posterior oral cavity/oropharynx. The anterior pillar (palatoglossal arch) marks the posterior boundary of the oral cavity proper. The palatine tonsils, which are located in the tonsillar fossae, are not visible in this photo. Asterisk marks posterior oropharyngeal wall.

Fig. 1.4 Oropharynx showing large palatine tonsils with prominent crypts. Note debris visible within crypts on the left (short arrows) as well as a papilloma at the left base of uvula (long arrow).

Stenson duct of the parotid gland, is located in the buccal vestibule opposite the maxillary second molar (Fig. 1.6).

Folds of mucosa in the midline maxillary and mandibular labial vestibules can be seen anchoring the lips to the alveolar mucosa or gingiva, and are known as the labial frenula (Figs. 1.7 and 1.8). These can be quite prominent in some cases and even affect tooth eruption.
1.3 Oral Mucosa

The lining of the oral cavity serves a variety of functions, including protection, sensation, and secretion, and is histologically adapted to the unique environment inside the mouth. Oral mucosa lacks the appendages seen in skin, although sebaceous glands can be found in the upper lip and buccal mucosa in approximately 75% of adults (see Chap. 2). Submucosal minor salivary glands are found throughout the oral cavity, with highest concentrations in the palate and lower lip. Aggregates of lymphoid tissue can also be found in the oral cavity, however, the largest collection of lymphoid tissue is seen posteriorly and known as Waldeyer ring. This consists of the palatine, lingual, and adenoid (pharyngeal) tonsils, and virtually encircles the entrance to the oropharynx. Small nodules of accessory tonsil tissue are often seen on the posterior wall of the oropharynx and may become enlarged with inflammation or infection and mistaken for a suspicious mass. Normal pits and depressions in tonsil tissue (tonsillar crypts) may become plugged with keratin or other debris and form cysts which appear yellow to white in color (Figs. 1.4 and 1.9).

The majority of the oral cavity is lined by soft, moist, pliable, nonkeratinized mucosa which is loosely attached to underlying tissues and exhibits some mobility. This
consists of a stratified squamous epithelium which continually renews itself by division of progenitor cells in the deeper basal layer (Fig. 1.10). New cells show progressive maturation as they migrate to the surface layers, which are subsequently shed. Areas of the mouth that receive a greater degree of masticatory stress, namely the hard palate, tongue dorsum, and gingiva, are lined with keratinized mucosa, giving more protection against friction and abrasion. This tissue is more firmly attached to the underlying periosteum, which prevents damage from shearing forces.

The mucogingival junction, where the mobile mucosa lining the vestibule and floor of mouth joins the tightly adherent gingiva of the dental alveolus, should be easily visible in the healthy state. The gingiva appears paler pink secondary to decreased visibility of underlying blood vessels through the relatively opaque keratin
layer. The gingival margin should be well defined with slightly rolled margin and pointed interdental papillae. Healthy tissue will exhibit stippling, representing collagen fibers attaching the gingiva to the underlying periodontium (Figs. 1.7, 1.8, and 1.11).

1.4 Tongue

The tongue is divided into the oral tongue (anterior two-thirds) and tongue base (posterior third) by the circumvallate papillae, which form a V-shaped line anterior to the foramen cecum (Fig. 1.12). The foramen cecum is a shallow depression which exists as a developmental remnant of the thyroglossal duct. The oral tongue is typically subdivided into four areas: tip, lateral surfaces (sides), dorsum (top), and ventral (undersurface).

Embryologically, the mucosa lining the anterior portion of the tongue arises from the first branchial arch, and carries with it the trigeminal nerve. The mucosa of the tongue base arises from the third arch and is innervated by the glossopharyngeal nerve. The intrinsic muscles of the tongue are derived from the occipital somites, and are supplied by the hypoglossal nerve. Lingual tonsil tissue is frequently seen on the surface of the tongue posterior to the circumvallate papillae and lining the vallecula, which is a valley-like depression separating the tongue base from the epiglottis. Mucus glands are present posteriorly, and open into the crypts of the lingual tonsil.

The epithelium lining the tongue dorsum is specialized to withstand masticatory trauma as well as receive taste sensation. The dorsum has an irregular, bumpy, surface secondary to the presence of papillae. Although some taste receptors (taste buds) can be found in the soft palate and pharynx, the majority are located on the lingual papillae. Numerous small, hair-like, keratinized, filiform papillae cover the anterior surface of the tongue dorsum and do not contain taste receptors. These projections provide an abrasive surface that helps break down food against the hard palate during mastication. They are interspersed with fewer numbers of larger, smooth, and more rounded nonkeratinized fungiform papillae, with taste buds present on their superior surface. The fungiform papillae frequently appear deeper red in hue compared to the filiform papillae,
as the color of the underlying vascular core is transmitted prominently through the epithelium (Fig. 1.13). Foliate papillae are ridge-like structures on the posterolateral aspect of the tongue containing taste buds on their lateral surfaces, and are often mistaken for abnormal tissue on oral exam. They vary greatly in size, and are virtually absent in some patients (Fig. 1.14). The circumvallate papillae are large round structures on the posterior tongue dorsum which also house taste buds. These are usually not appreciated on exam unless the tongue is protruded, and are also sometimes mistaken for pathology (Fig. 1.13).

1.5 Floor of Mouth

The lateral and ventral surfaces of the tongue, as well as the floor of mouth, are lined by thin, smooth, nonkeratinized mucosa that is fairly translucent (Fig. 1.15). Veins along the ventral surface of the tongue are easily visualized through the mucosa and can be quite prominent. A fringed fold of mucosa, called the plica fimbriata, sits lateral to the midline on each side and frequently contains tissue tags that can be mistaken for pathology. The sublingual salivary glands can be palpated laterally and frequently will be seen to bulge into the floor of mouth. The main sublingual duct joins the submandibular (Wharton) duct to empty into the oral cavity at the sublingual papilla near the base of the lingual frenulum. Additional tiny ducts open from the sublingual gland directly into the overlying mucosa.

1.6 Palate

The palate forms the roof of the oral cavity and is divided into the hard palate anteriorly and the soft palate posteriorly (Figs. 1.16 and 1.17). The mucoperiosteum of the hard palate is tightly bound and immobile, which explains why dental injections into this area are especially painful. The midline incisive papilla anteriorly indicates the opening of the incisive canal, which transmits the sensory
naspalatine nerves to the anterior hard palate. A midline raphe can be visualized, representing embryologic fusion of the palatal shelves. Lateral folds of mucosa, known as palatal rugae, are present anteriorly and assist in mastication. At the posterior aspect of the hard palate in the midline the palatine fovea can be seen as small pits, formed by coalescence of mucous gland ducts. The greater palatine neurovascular bundle exits its bony foramen under the mucosa opposite the maxillary second molar, innervating the posterior hard palate. The maxillary tuberosity can be palpated posterior and lateral to this behind the last molar, as the broad posterior extent of the maxilla.

1.7 Dentition

The tooth containing portion of the oral cavity is divided into maxillary and mandibular dental arches (Fig. 1.18). These are each further divided in half by the midline into quadrants. The teeth sit within the raised, alveolar (tooth bearing) bone of the dental arches. The adult, or secondary, dentition consists of 32 teeth, with 3 molars, 2 premolars (“bicuspids”), 1 canine (“eye tooth” or “cuspoid”), and 2 incisors per quadrant. Molars and premolars are referred to as posterior teeth; canine and incisors are anterior. The pediatric, or primary, dentition contains a total of 20 teeth, with 2 molars, 1 canine, and 2 incisors per quadrant. The premolars erupt into the space occupied by the primary molars, and the permanent molars erupt posterior to this as the jaws and dental arches elongate with growth.

There are a variety of numbering systems used to identify each tooth. The most widely accepted method numbers the teeth from “1” to “32,” beginning with the upper right third molar (tooth #1) and proceeding clockwise across the upper then lower arches, ending with the lower right third molar (tooth #32).

Each tooth consists anatomically of a root and crown, with the crown being the portion visible above the gingival margin (Fig. 1.19). The bulk of the tooth is made up of a calcified substance known as dentin, with an outer surface layer of harder enamel covering the crown and a softer material called cementum lining the root surface. The hollow inner core of the tooth, or pulp chamber, contains a soft jellylike material referred to as pulp, with nerve endings and blood vessels entering through the tip (apex) of the root via the apical foramen.