CHAPTER 10

CASE 10.2

Septic Sialoadenitis

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Clinical case

History

A 21-year-old American Quarter Horse gelding presented with a 4-day history of increasing swelling caudal to the left ramus of the mandible, inappetence, halitosis (malodorous breath), and ptyalism (hypersalivation).

Physical examination findings

The gelding was quiet, alert, and responsive with a normal temperature (100.2°F [37.9°C]), slight tachypnea (24 brpm), and mild tachycardia (44 bpm). His oral mucous membranes appeared slightly hyperemic with a mildly prolonged CRT of 3 s. A firm, painful swelling was present caudal to the left ramus of the mandible extending ventrally, involving the parotideal, pharyngeal, laryngeal, and intermandibular regions. The swelling tapered rostrally, allowing palpation of moderately enlarged mandibular lymph nodes. Ptyalism and halitosis were noted during the examination.

Differentials

Lymphadenopathy/lymphadenitis of the retropharyngeal lymph nodes (e.g., *Streptococcus equi* subsp. *equi* (strangles) infection), septic sialoadenitis, trauma, foreign body

Diagnostics

The horse was mildly painful upon palpation of the swelling in the retromandibular fossa. The skin overlying the swollen areas was clipped and thoroughly inspected. No signs of trauma were present and no draining tract was found. The gelding was sedated, and following positioning of a McPherson full-mouth speculum, an oral examination revealed a 2 × 2 cm (0.8 × 0.8 in.) ulcerated area underneath the apex of the tongue in the left lateral sublingual recess (Fig. 10.2-1). An 8-French Foley catheter was inserted into the defect and advanced caudally for 4–5 cm (1.6–2.0 in.). Lavage of the tract produced small amounts of food material, purulent material, and necrotic tissue. Additional superficial ulcerations were found along the lateral surfaces of the tongue (Fig. 10.2-2).

Ultrasonography of the swelling in the retromandibular fossa showed a complex structure in the left mandibular salivary gland, deep to the parotid salivary gland. The contents of the structure were of mixed echogenicity and included numerous hyperechoic foci, likely representing small gas bubbles within an abscess. A smaller, similar structure was identified in the rostral part of the intermandibular swelling. This rostral mass appeared to be associated with the polystomatic sublingual salivary gland. Ultrasound-guided fine-needle aspiration of the mass in the mandibular salivary gland produced foul-smelling, purulent fluid that was submitted for anaerobic and aerobic culture. A CBC showed a mild neutrophilic leukocytosis. Endoscopic evaluation of the nasal passages, pharynx, guttural pouches, larynx, and cranial trachea was unremarkable.

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FIGURE 10.2-1 Photograph of rostral oral cavity showing the ulcerated defect ventral to the apex of the tongue *(white arrow)* in the left lateral sublingual recess.

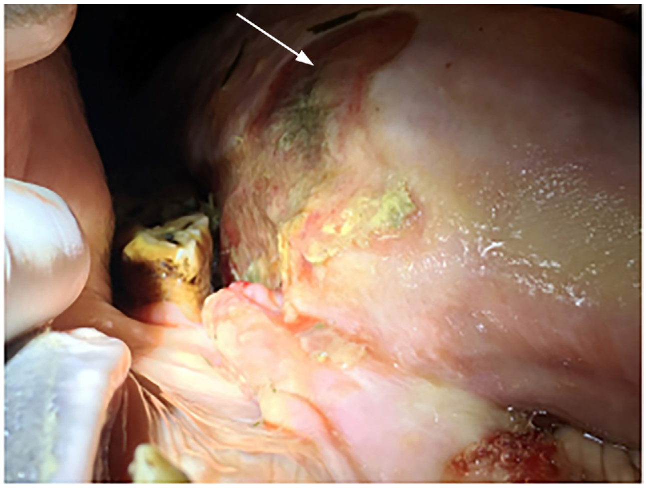

FIGURE 10.2-2 Large superficial ulceration of the right lateral surface of the tongue, adjacent to the first cheek tooth *(white arrow)*.

Diagnosis

Septic sialoadenitis of the left mandibular and polystomatic sublingual salivary glands

Treatment

Under ultrasonographic guidance, the ventral-most aspect of each abscess was identified, and after the site was anesthetized with 2% mepivacaine, the abscesses were open and drained with a #10 scalpel blade. During subsequent lavage with 0.2% povidone iodine solution, communication between the abscess in the mandibular salivary gland and the ulcerated area in the oral cavity via the mandibular duct was confirmed. There was no communication between the sublingual abscess and the oral cavity. Following this initial treatment, the horse was administered procaine penicillin, twice daily, IM, and gentamicin once daily, IV, to provide a broad-spectrum antimicrobial coverage. Flunixin meglumine was administered twice daily, IV, for pain management and anti-inflammatory effects. The microbiological culture grew a gram-negative anaerobic microorganism, identified as a *Fusobacterium* spp. Consequently, antimicrobial management was changed to oral metronidazole, 3 times a day, an antimicrobial effective against anaerobic bacteria. Daily lavages of the abscesses with 0.2% povidone iodine solution and of the oral cavity with a dilute chlorhexidine gluconate solution (5 mL of 2% chlorhexidine gluconate added to 1 L of water) were completed to address the lesions topically. The horse responded well to the treatment, and the daily lavages of the abscesses were discontinued after 10 days. After 14 days, systemic antimicrobials were discontinued and the ulcerations in the oral cavity had healed by day 21. By then, the clinical signs observed upon presentation had resolved, and the horse was discharged from the hospital.

Anatomical features in equids

Introduction

The relatively long and narrow oral cavity (mouth) of the horse is the first part of the alimentary tract and the site of prehension, mastication, and insalivation of food. The oral cavity is bordered by cheeks (lateral), palate (dorsal), sublingual mucosa (ventral), lips (rostral), and palatoglossal arches (caudal). The teeth divide the oral cavity into the centrally located oral cavity proper and the peripherally located vestibule of the oral cavity—i.e., the space between the outer surfaces of the teeth and the inner surface of the cheeks and lips (Fig. 10.2-3).

Function

The most elementary responsibility of the oral cavity is the preparation of food for swallowing. This includes not only the already-mentioned prehension, mastication, and insalivation, but also the intraoral "assessment" of ingested plant material. This is accomplished with the help of the gustatory organ (Organ of taste), i.e., all the taste buds, which are primarily located in the papillae of the tongue.

> The relatively small rima oris in horses can make examination of the caudal aspect of the narrow and long oral cavity difficult. Consequently, evaluation and treatment of disorders pertaining to the last cheek teeth (modified Triadan system 10s and 11s) and the body and root of the tongue are challenging.

Muscles and soft tissues of the lips and cheeks

The mouth opening (**rima oris**) is formed by the upper and lower **lips** that meet at the **commissure** of the lips. In the horse, the rounded commissure is located approximately at the level of the second premolar (modified Triadan system 06s), creating a relatively small mouth opening. For comparison, the commissure of the lips in the dog reaches as far caudal as the last premolar (modified Triadan system 08s), allowing the mouth to be opened wide.

The lips of the horse are very mobile and sensitive in order to allow the selection and prehension of food. Their skin is directly connected to the underlying **orbicularis oris muscle**. This circular muscle is the sphincter of the rima oris, and its fibers are not attached to the skeleton. The **levator nasolabialis muscle** arises rostral to the orbita and inserts at the lateral aspect of the upper lip and the lateral nostril. Contraction opens the nostril and raises the upper lip. Partially covered by the preceding muscle, the **levator labii superioris muscle** originates from the lacrimal bone and passes across the infraorbital foramen before forming an aponeurosis with its counterpart and inserting on the upper lip. It is also responsible for raising the upper lip. Originating from the ramus of the mandible, the **depressor labii inferioris muscle** is largely fused with the **buccinator muscle** (Fig. 10.2-3). It inserts into the orbicularis oris muscle, and depresses and retracts the lower lip.

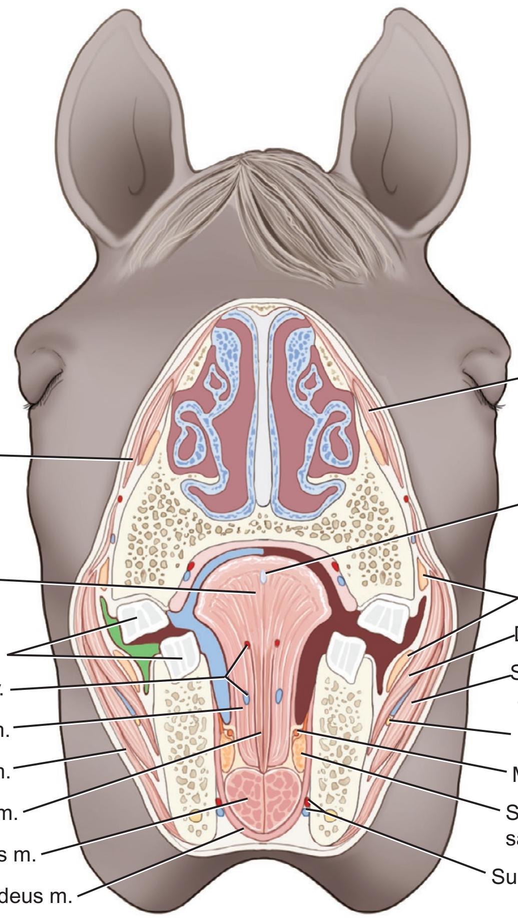

FIGURE 10.2-3 Cross-sectional view at level of 4th premolar tooth (3rd cheek tooth) identifying oral cavity, cheek anatomy, and structure relationships. For one-half of the image, the vestibule of the oral cavity is *shaded green*, and the oral cavity proper is *shaded blue*. View is from the cranial to caudal perspective.

The basic structure of the cheeks (**buccae**) consists, similar to the lips, of a hair-covered skin (without a subcutis), a muscular layer, and the oral mucosa. The **buccinator muscle** is the principle muscle of the cheeks, which form the lateral walls of the oral cavity. Its superficial part attaches along the molar areas of the maxilla and mandible, while the deep part consists of longitudinal fibers that extend caudally to the ramus of the mandible, where it is covered by the **masseter muscle**. Function of the buccinator ensures that food does not accumulate in the vestibule of the oral cavity, but is returned into the oral cavity proper.

The high mobility of the lips and the absence of a subcutis need to be considered when repairing a lip laceration. The intimate connection between the muscle and skin, as well as the mucosa, can lead to excessive motion and tension on the suture lines, often resulting in suture dehiscence. To minimize the risk of this complication, skin and mucosa are sharply separated from the underlying muscle along the edges of the wound. Tension relieving sutures are placed through the muscle before skin and mucosa are closed in separate layers (Fig. 10.2-4).

Muscles and soft tissues of the tongue

The **tongue** (L. *lingua*; Gr. *glossa*) occupies the greater part of the oral cavity proper and extends caudally into the oropharynx. Primarily composed of the intrinsic striated **lingual muscle proper**, the tongue is divided into 3 anatomical regions: root, body, and apex. The tip of the tongue, the **apex**, is freely moveable and only caudally attached to the floor of the oral cavity by the **lingual frenulum** (Figs. 10.2-3 and 10.2-5).

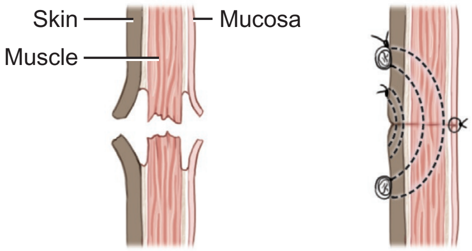

FIGURE 10.2-4 Cross-section of lip structure showing a lip wound *(left)* and the intimate connection between the muscle and skin, as well as the mucosa. To avoid excessive motion and tension on the suture lines, skin and mucosa are sharply separated from the underlying muscle along the edges of the wound. Tension-relieving sutures are placed through the muscle before skin and mucosa are closed in separate layers *(right)*.

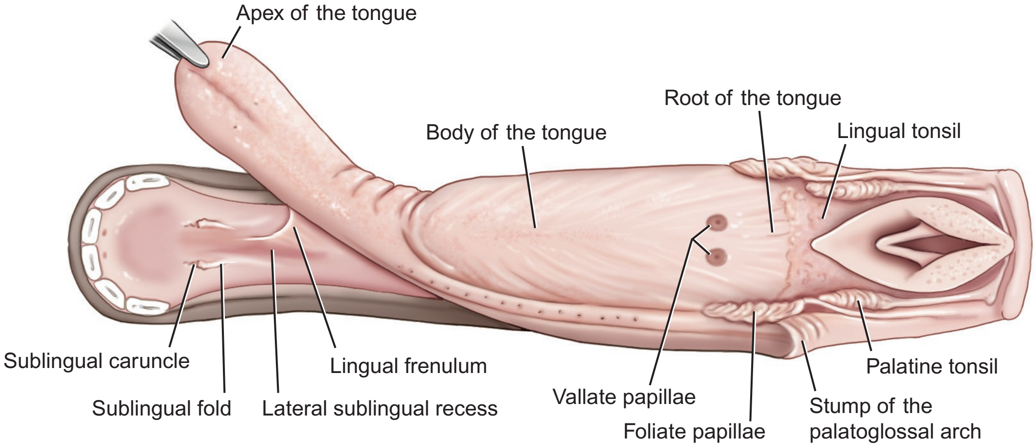

FIGURE 10.2-5 Dorsal view of the tongue and additional structures in the oral cavity proper. The caudal extent of the oral cavity proper is defined by the palatoglossal arches. The oropharynx continues the oral cavity proper, and therefore, the root of the tongue is primarily located in the oropharynx.

The apex has 4 mucosa-covered surfaces: the dorsal surface, 2 lateral borders, and the ventral surface. The middle part of the tongue, the **body**, is ventrally anchored to the mandible by the extrinsic lingual muscles (see later) and has 3 free surfaces. The **root** is defined as the part of the tongue caudal to the **vallate papillae** (Fig. 10.2-5). It is attached to—and supported by—the **lingual process** of the **basihyoid**, and only its dorsal surface is free and covered by mucosa.

The lingual mucosa is thick on the dorsum of the tongue and, via a dense submucosa, closely attached to the underlying musculature. The mucosa is thinner and more easily separated from the lingual muscle proper on the lateral borders and ventral aspect of the apex. The dorsal mucosa of the apex and body presents an abundance of the delicate mechanical **filiform papillae**, interspersed with gustatory (sensory) **fungiform papillae** on the dorsum of the apex and along the lateral edges of the tongue. The 2 remaining types of gustatory papillae in the equine tongue, the vallate papillae (see earlier) and the **foliate papillae**, are found on the border between the body and the root of the tongue, and directly rostral to the palatoglossal arches, respectively. In the submucosa of the root, numerous lymph follicles form a diffuse **lingual tonsil** (Fig. 10.2-5). Adjacent the lingual tonsil, in the ventrolateral walls of the oropharynx, lie the prominent palatine tonsils. Located in the body just below the mucosa and palpable as a median dorsal thickening, the thin **dorsal lingual cartilage** provides an additional support for the tongue (Fig. 10.2-3).

The lingual muscle proper (see earlier) consists of transverse, perpendicular, and longitudinal fibers that do not have a bony attachment. However, they are indirectly connected to the skeleton by extrinsic muscles that enter the tongue and interweave with the intrinsic musculature. The 2 most important extrinsic muscles are the hyoglossus and genioglossus muscles. The **genioglossus** originates from the incisive part of the mandible and enters the tongue ventrally, with its most rostral fibers passing through the lingual frenulum. This muscle is responsible for protrusion of the tongue. The **hyoglossus** counteracts the genioglossus muscle by retracting and depressing the tongue. It arises from the lingual process of the basihyoid bone, along with the thyrohyoid and stylohyoid bones in the horse, and courses toward the dorsal aspect of the median plane of the tongue.

Ventral to these 2 extrinsic muscles of the tongue, the **geniohyoid muscle** connects the rostromedial body of the mandible to the lingual process of the basihyoid bone and functions to move the tongue rostrally. Lying superficial to the geniohyoid, the **mylohyoid muscle** spans the intermandibular space with transverse fibers that are attached to the medial cortex of the mandible on each side. The mylohyoid muscle suspends the tongue and raises the floor of the oral cavity (Fig. 10.2-3). A third extrinsic tongue muscle, the **styloglossus muscle**, attaches between the stylohyoid bone and the apex of the tongue, functioning to retract the tongue caudodorsally and draw the apex to either side when acting singularly.

The **lingual frenulum** is a mucosal fold that arises from the ventral surface of the caudal apex of the tongue and attaches to the floor of the oral cavity. On either side of its attachment is the **lateral sublingual recess**. The lateral border of this recess is formed by the **sublingual fold (plica sublingualis)**, where the openings of the **sublingual polystomatic salivary gland** (see later) are located (Fig. 10.2-5).

Innervation of the mouth, lips, and tongue

The **trigeminal nerve** (CN V) provides sensory innervation to the lips and cheeks via its major **maxillary** ($CN\text{-}V_2$) and **mandibular** ($CN\text{-}V_3$) branches. The **maxillary nerve** supplies the **infraorbital nerve** to the upper lip. The lower lip receives sensory innervation via the **mental nerve** which continues as the **inferior alveolar nerve**. supplied by the mandibular branch. The **buccal nerve**, also a branch of the mandibular nerve, supplies sensory fibers to the cheek mucosa. Motor innervation of the lips and cheeks is derived from the **buccal branches** of the **facial nerve** (CN VII).

> Traumatic injury to the buccal branches of the facial nerve can be the result of compression during anesthesia and recovery or by a tight-fitting halter. Iatrogenic damage is a possible complication of oral and maxillofacial surgeries, especially buccotomies. Knowledge of the course of these nerves is therefore critical, especially when planning a surgical approach to the oral cavity (Case 10.4). Clinical signs of injury pertaining to the lips and cheeks include food packing in the ipsilateral vestibule of the oral cavity and asymmetry of the upper and/or lower lips.

Motor innervation of the intrinsic and extrinsic muscles of the tongue is provided by the **hypoglossal nerve** (CN XII). Regular sensory innervation of the lingual mucosa is divided between the **lingual nerve** of the **mandibular nerve** (rostral two-thirds) and the **lingual branch** of the **glossopharyngeal nerve** (CN IX; caudal third). Special sensory innervation for taste is supplied through nerve fibers that join the regular sensory nerves for distribution.

> Because the hypoglossal nerve (CN XII) is the only source of motor innervation for the in- and extrinsic tongue muscles, injury to the nerve typically results in abnormal function and tone, asymmetry, and deviation of the tongue. Dysfunction of CN XII can occur following head trauma or be a complication of guttural pouch disease (e.g., guttural pouch mycosis) because the nerve travels along the caudal wall of the guttural pouch. It is therefore recommended to endoscopically examine the guttural pouches in cases of suspected hypoglossal nerve injury (see Case 10.5).

Blood supply to the mouth, lips, and tongue

Branches of the **facial artery** and the **masseter branch of the external carotid a.** provide the blood supply to the cheeks. The **inferior** and **superior labial arteries** from the **facial artery** supply the lips. The **linguofacial trunk** gives rise to the **facial** and **lingual arteries**. The latter enters the tongue medial to the hyoglossus muscle and becomes the

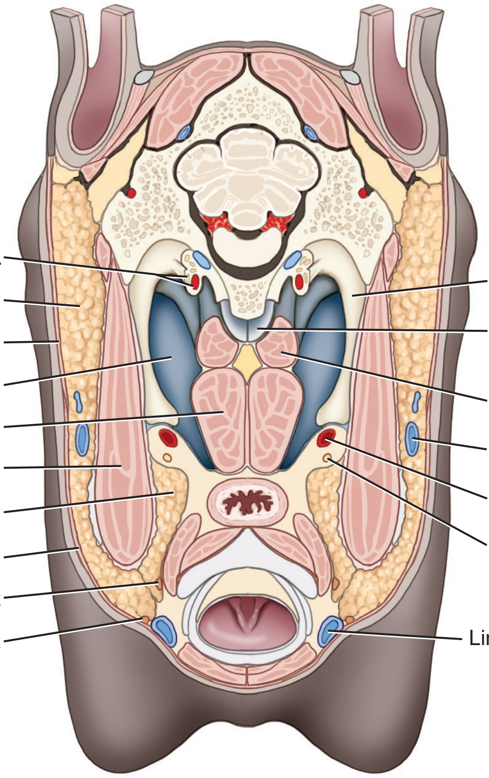

FIGURE 10.2-6 Cross-sectional image of the head at the level of the retromandibular fossa, showing the relationships of the major salivary glands and their ducts to surrounding structures. View is from the caudal to cranial perspective.

deep lingual artery (Fig. 10.2-3). This vessel continues rostrally, releasing numerous **dorsal lingual branches** that course toward the upper surface of the tongue. The facial artery supplies the **sublingual artery** which travels rostrally in the intermandibular space, ending in the sublingual floor of the oral cavity where it supplies the lingual frenulum and surrounding muscles (Fig. 10.2-3). Venous drainage converges into the large **linguofacial** and **maxillary veins** (Fig. 10.2-6), which unite to form the **external jugular vein**.

Salivary glands

The minor and major salivary glands in the horse produce approximately 40 L of saliva per day. Saliva keeps the oral cavity moist, facilitates mastication and deglutition, and contains the enzyme amylase that initiates carbohydrate digestion. The **minor salivary glands** are comprised of microscopic glandular tissue in the lips, tongue, palate, and cheeks. Only the glandular tissue in the cheeks forms the macroscopically noticeable **dorsal** and **ventral buccal salivary glands** (Figs. 10.2-3 and 10.2-7A and B) that are located above and below the buccinator muscle, respectively. Mucous secretions of the minor salivary glands are directly released into the oral cavity. Although these glands are of limited clinical importance, disease of the buccal salivary glands can lead to clinical signs.

The parotid, mandibular (Figs. 10.2-6 and 10.2-7A and B), and polystomatic sublingual (Figs. 10.2-3 and 10.2-7B) salivary glands constitute the **major salivary glands** in the horse. Compared with their minor counterparts, they produce more serous secretions that drain through ducts into the oral cavity.

Expanding cranio-caudally from the ramus of the mandible to the wing of the atlas and dorso-ventrally from the base of the ear to the **linguofacial vein**, the **parotid salivary gland** is the largest salivary gland in the horse. It is enclosed by the parotid fascia, which sends trabeculations into the glandular tissue, dividing the gland into distinct lobules. The major collecting ducts for the glandular secretions follow these trabeculations to merge in the cranio-ventral aspect of the parotid salivary gland to form a single **parotid duct**. This duct crosses the tendon of the

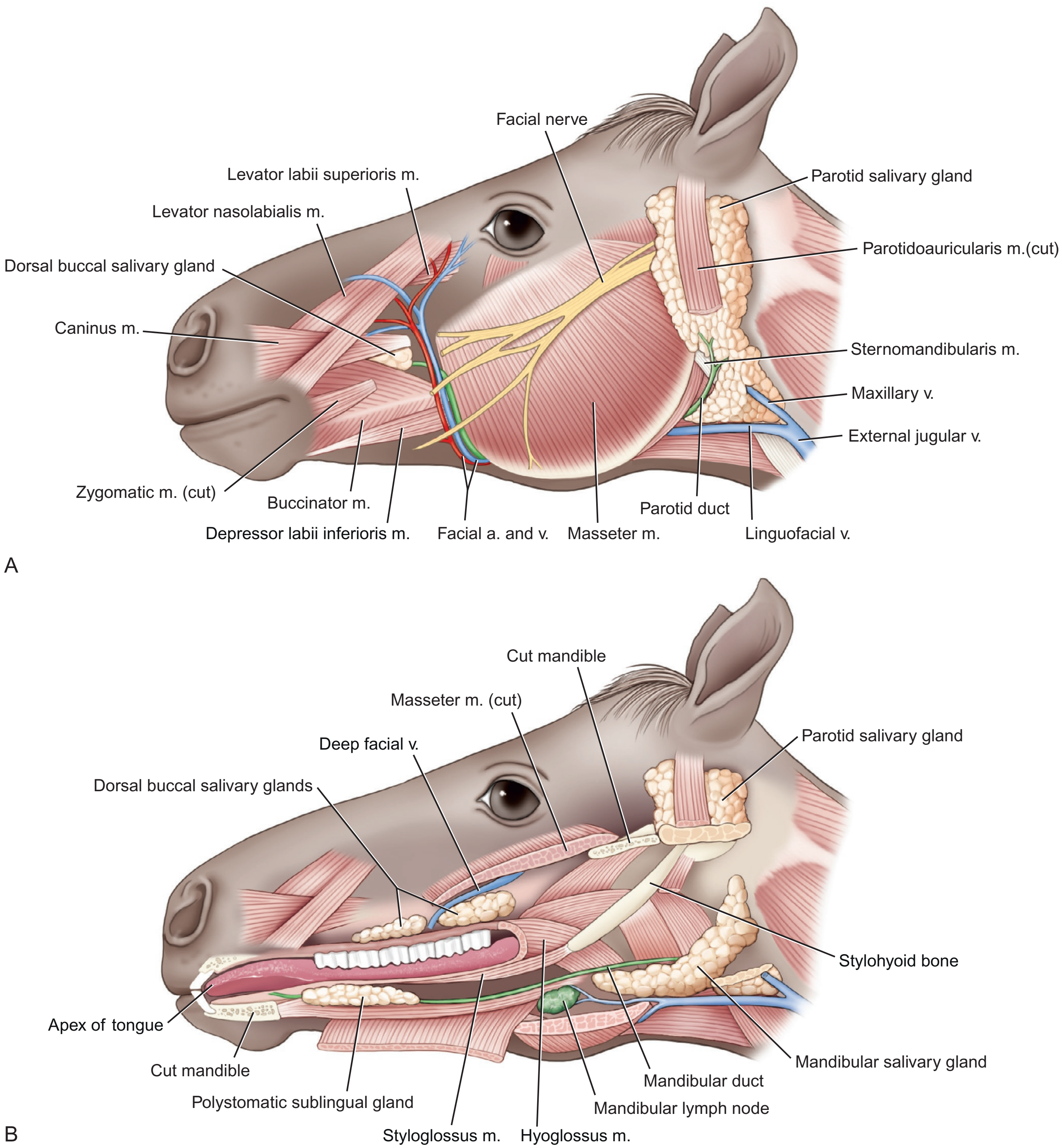

FIGURE 10.2-7 Superficial (A) and deep (B) views of the lateral head of the horse, focusing on the salivary glands and related structures.

sternomandibularis muscle (Fig. 10.2-7A) before continuing rostrally on the medial side of the mandible. Together with—and immediately caudal to—the facial artery and vein, the parotid duct passes medially to laterally over the **facial notch** in the free ventral border of the mandible and enters the face on the rostral edge of the masseter muscle. For approximately 5 cm (2.0 in.), the duct follows the border of the masseter muscle before turning rostrally, crossing under the facial vessels to enter the vestibule of the oral cavity via the **parotid papilla** at the level of the upper 3rd or 4th premolars (modified Triadan 07/08 teeth).

Sialoliths are concretions that may develop in any salivary gland and its duct; however, the parotid salivary duct is most commonly affected in the horse (see side box entitled "Sialoliths"). Melanomas are tumors that can be found in most aging gray horses, where they typically develop on the ventral tail, the perineum, and the external genitalia. However, another predilection site is the parotid salivary gland, where tumors can reach considerable size (Fig. 10.2-8). Surgical removal, especially of large masses, is complicated because of the critical anatomical structures associated with the parotid salivary gland.

Knowledge of the surrounding anatomical structures and their association with the parotid gland is important when contemplating a surgical procedure in the parotideal region. Branches of the 2nd cervical nerve (C2) cross the gland's lateral (superficial) surface, which is covered by the **parotidoauricularis muscle** (Figs. 10.2-6 and 10.2-7A) and the cutaneous muscle of the face. The **maxillary vein** passes through the central aspect of the gland, while the **linguofacial vein** courses along its ventral border (Fig. 10.2-6). The segment of the parotid salivary gland located between these 2 large vessels abuts the **mandibular salivary gland** medially. Other clinically important anatomical structures associated with the irregular medial (deep) surface of the parotid salivary gland include: (1) branches of the internal and external carotid arteries and of the maxillary vein; (2) the vagosympathetic trunk, facial (CN VII), glossopharyngeal (CN IX), and hypoglossal nerves (CN XII); (3) the parotid and retropharyngeal lymph nodes; and (4) the guttural pouch and stylohyoid bone.

The substantially smaller, crescent-shaped **mandibular salivary gland** (Fig. 10.2-7B) is located between the wing of the atlas and the basihyoid bone. Its lateral (superficial) surface is in direct contact with the maxillary vein, the parotid salivary gland, and the tendon of the sternomandibularis muscle, which passes between the 2 salivary glands. The flexor muscles of the head, along with the guttural pouch, larynx, common carotid artery, and vagosympathetic trunk, are located deep (medial) to the mandibular salivary gland. The lingual vein separates the rostral end of the gland from the adjoining mandibular lymph nodes. A single **mandibular duct** emerges from the central part of the gland and travels rostrally along its dorsal edge. The duct continues submucosally in the floor of

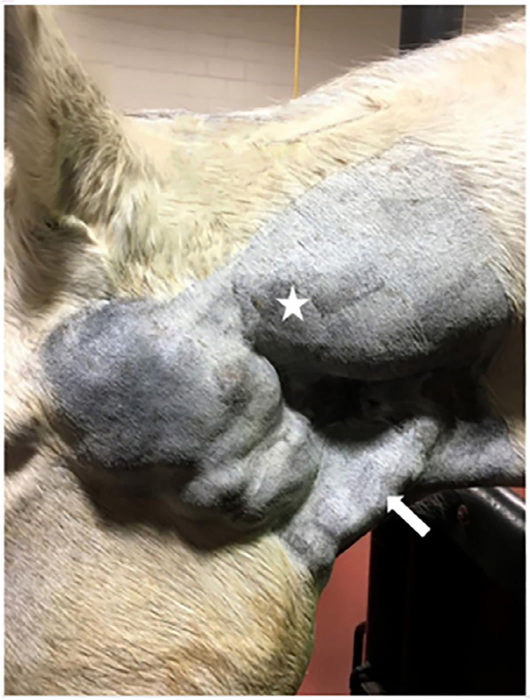

FIGURE 10.2-8 Melanomas in the left parotid salivary gland in a 25-year-old Warmblood gelding. The tumors are causing gross irregular external swelling of the parotid region. The hair has been clipped for ultrasonographic evaluation. The palpable wing of the atlas *(star)* and distended linguofacial vein *(arrow)* are identified. Rostral is to the left in this image.

FIGURE 10.2-9 The external swelling created by a parotid duct sialolith is visible at the rostral margin of the masseter muscle and ventral to the rostral extent of the facial crest. *White arrows* define the ventral margin of the swelling. (Photo courtesy of Dr. Cindi Prestage.)

the oral cavity, adjacent to the inner surface of the polystomatic sublingual salivary gland. The opening of the duct is located on a flattened papilla, the **sublingual caruncle**, that marks the end of the **sublingual fold** and can be identified easily rostrolateral to the **lingual frenulum** (Fig. 10.2-5).

The third major salivary gland, the **polystomatic sublingual gland** (Fig. 10.2-7B), is located submucosally in the lateral sublingual recess, stretching from the mandibular symphysis caudally to the last mandibular premolar or first molar (modified Triadan 08/09 teeth). Numerous small ducts release secretions of the sublingual glands through openings along the **sublingual fold**.

SIALOLITHS

Salivary stones (sialoliths) are concretions of calcium carbonate and organic matter that may appear smooth or spiculated, and be gray, light tan, or white. They are often ovoid-shaped, developing within the confines of a salivary duct, and usually occur singularly. Septic sialoadenitis may precede or be a consequence of sialolith formation. A large stone can be visualized and palpated externally as a firm, non-painful swelling, often at the rostral margin of the masseter muscle and facial crest (Fig. 10.2-9). A swelling may be seen orally, bulging through the cheek mucosa in the case of a parotid duct stone. A stone can cause acute or chronic duct obstruction and subsequent swelling and pain of the associated salivary gland and preceding portion of the duct. Removal of the stone is the definitive treatment. Surgical access to the salivary duct externally or via the oral cavity is often required.

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