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Oral Anatomy of the Dog and Cat in Veterinary Dentistry Practice

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Bones of the cranium

The head is the most important and specialized part of the body because it contains the brain and important sensory organs for hearing, seeing, eating, and smelling [1–4]. It is divided into the neurocranium (cranium) and viscerocranium (face) [2,5,6]. The cranium is a group of plain and irregular bones that are perfectly connected by sutures [7] to form a hollow box [5]. The sutures are open in a newborn, but they become ossified after growth [8]. The margins of each bone of the cranium can be identified in adult animals [7].

The bones of the cranium are the occipital, parietal, frontal, temporal (paired), interparietal, basisphenoid, presphenoid, ethmoid, pterygoid, and vomer (unpaired) bones (Figs. 1 and 2) [9].

The cranium cavity is separated from the nasal cavity of the face by a perforated plate called the cribriform plate [1]. The face is the most important part of the head for veterinary dentistry and needs to be fully understood by the practitioner [10]. It can be divided into orbital, nasal, and oral regions [1,3,11].

The orbital region is formed by portions of the frontal bone and lacrimal and zygomatic bones. The nasal airway is limited dorsally by the nasal bones, laterally by the maxillary and incisive bones, and ventrally by the palatine process of the maxillary bone as well as by the incisive and palatine bones. Fixed on the nasal cavity are the nasal turbinates (delicate curved

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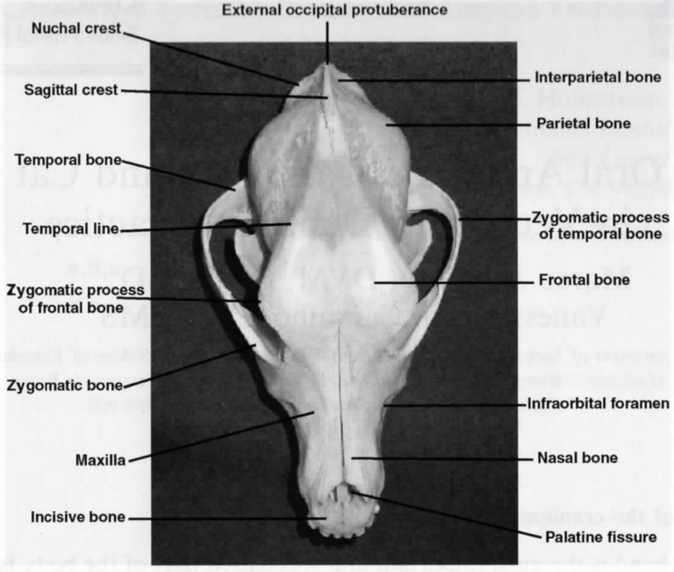

Fig. 1. Dorsal view of the bones of the cranium.

osseous laminas), which support the organs of smell, and the blood vessels [1,3,11]. The oral region has a long surface to support all the teeth [1].

The viscerocranium is composed of the following: incisive, nasal, maxilla, dorsal nasal concha, ventral nasal concha, zygomatic, palatine, and lacrimal bones and the mandible (see Figs. 1 and 2) [9].

The incisive bone divides the nasal cavity entrance and the palatine roof at the rostral end of the skull [6]. Some authors refer to the incisive bone as the premaxilla, but this is not a term used in veterinary anatomy [9]. This bone contains six incisive teeth that increase in size from the medial aspect to the lateral aspect. Laterally, the body of the incisive bone completes the medial wall of the canine alveolus [1]. The palatine process of the incisive bone forms a large groove to support the septal cartilage [11]. At this process, there are two large openings called palatine fissures that can be palpated in vivo and have a surface with a soft consistency. The palatine process contains the nasopalatine duct, which communicates between the nasal and oral cavity [12].

The nasal bone is long and thin, located at the dorsal surface of the face, and can be long or short depending on the breed of dog or cat. The ventral surface is covered by a mucous membrane, forming the dorsal nasal meatus [1]. The dorsal nasal concha (nasal turbinate), a simple and curved bone lamina inserted at the ethmoidal crest of the nasal bone [11], and the ventral nasal concha (maxillary turbinate), which is attached to the maxilla by a conchal crest [13], are located in the nasal cavity. The vomer bone forms

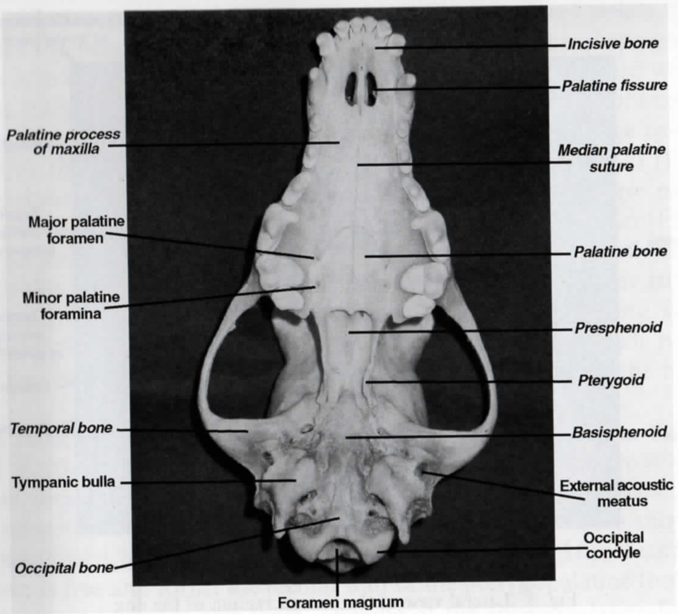

Fig. 2. Ventral view of the bones of the cranium.

the caudoventral portion of the nasal septum. The sagittal portion is formed by two thin lateral osseous laminas that are ventrally adhered to receive the cartilaginous nasal septum rostrally and the perpendicular plate of the ethmoid bone (osseous nasal septum) caudally [1].

The maxilla contains the canine, premolar, and molar teeth, and their roots are inserted into the bone, forming prominences that are called juga alveolaris or juga (Fig. 3). The most prominent jugals alveolaris are formed by the canine and fourth premolar teeth [1,12], because the maxilla has a thin lateral wall. This characteristic serves as a reference, helping the veterinarian to localize the roots during endodontic and exodontic procedures [10,14,15].

The infraorbital canal in dogs is present on the lateral face of the maxilla between the first molar roots and the fourth premolar roots (see Fig. 3). This canal begins in the pterygopalatine fossa (Fig. 4), and its opening is located in the infraorbital foramen distal to the upper third premolar. This canal contains the infraorbital vessels and nerves, which are important vascular structures in this region [1,11,12] and need to be carefully dissected and ligated during maxillectomy [10]. In cats, the infraorbital canal is short, and some animals have a double canal divided by a thin osseous lamina [13]. This infraorbital nerve can be easily reached by a needle through its rostral opening to accomplish regional anesthesia [14].

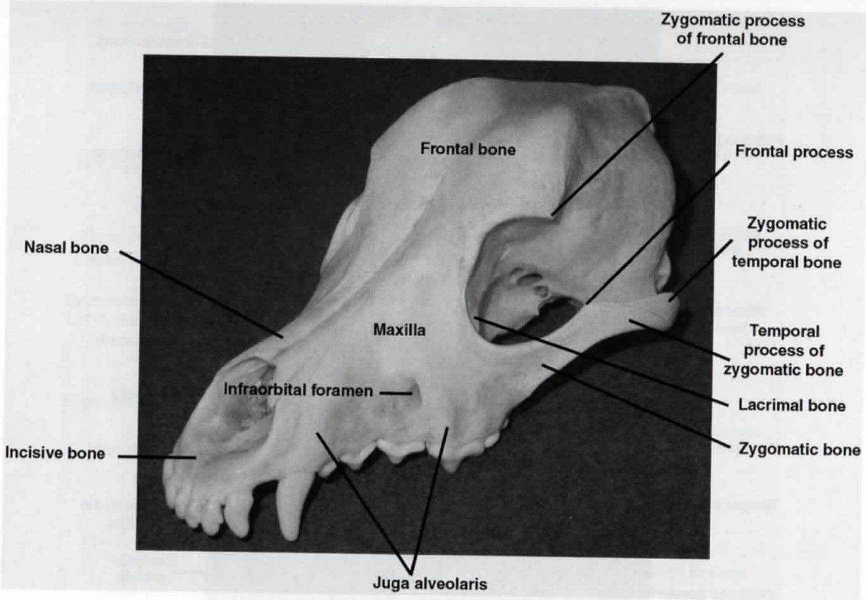

Fig. 3. Lateral view of the viscerocranium of the dog.

The lacrimal canal is also located in the maxilla. It is a tunnel that runs into the maxillary bone, beginning in the lacrimal fossa (at the lacrimal bone) and ending at the nasal cavity. The lacrimal canal drains lacrimal fluid from the conjunctival sac [2].

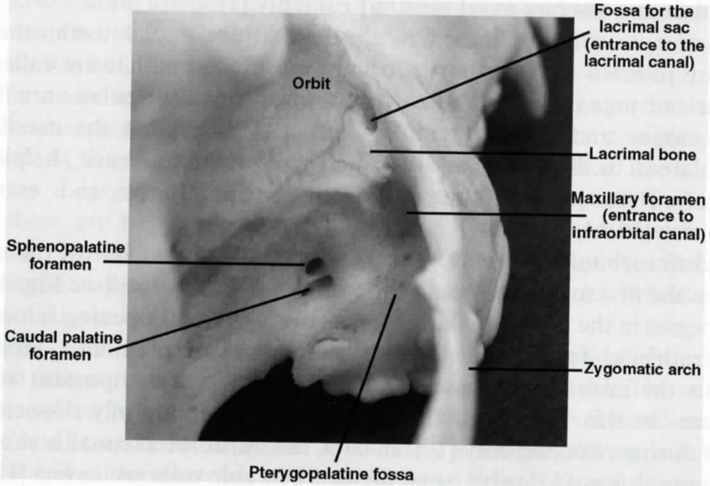

Fig. 4. Caudal view of the pterygopalatine fossa, lacrimal bone, and other important structures in the dog.

The palatine process of the maxilla comprises the hard palate, which separates the nasal and oral pathways. The ventral surface of the palatine process is in contact with the oral cavity. Its surface is demarcated with the palatine sulcus on both sides, beginning in the major palatine foramen and running rostrally to the palatine fissures. These fissures are large openings located at the rostral border of the palatine process (see Fig. 2) [1]. The major palatine foramen is located near or exactly at the transverse palatine suture between the median palatine suture and the alveolar border [11]. The major palatine artery that runs rostrally through the palatine sulcus emerges through this foramen. This artery is the most important vascular structure of the ventral palate mucosa and needs to be preserved during surgical procedures, such as cleft palate operations. Injuries to the major palatine artery can cause profuse hemorrhage and later dehiscence of the mucosa [10].

The palatine bone has no teeth. The horizontal plate forms the third caudal portion of the hard palate and has a variable number of minor palatine foramina with minor palatine arteries (see Fig. 2). These minor blood vessels form a secondary blood supply to the palate mucosa and do not cause significant hemorrhage if they are incised [10]. The lateral surface of this bone is free and forms the medial wall of the pterygopalatine fossa. The palatine canal begins in this fossa, opening at the sphenopalatine foramen (see Fig. 4), running into the palatine bone, and ending at the major palatine foramen. This canal contains the major palatine blood vessels and nerves [1]. The infraorbital canal also begins at the pterygopalatine fossa in the maxillary foramen (see Fig. 4), running into the maxillary bone and opening at the infraorbital foramen. This canal contains the infraorbital blood vessels and nerves [1,11] and is important during maxillectomies in this region [10,14].

The zygomatic arch is formed rostrally by the zygomatic bone and caudally by the zygomatic process of the temporal bone. The orbital ligament closes the orbit between the frontal process of the zygomatic bone and the zygomatic process of the frontal bone [1]. This ligament can be ossified in cats [6]. In cats, it is present in the postorbital process, making the orbit nearly closed [16] as well as causing some difficulty during positioning, with overlapping radiographs of the zygomatic arch into the teeth. The same problem occurs in brachycephalic dogs [14].

Two bilateral bones barely attached to each other by strong fibers at the intermandibular joint (Fig. 5) comprise the mandible [7] and are called the symphysis. The symphysis is easily disrupted during mandibulectomy because there are no bones on this region [10]. In old cats, this intermandibular joint can frequently be ossified [17], causing difficulties in separating the mandible during surgery [10].

The horizontal ramus (body of the mandible) has teeth (pars incisive and pars molaris) [7,15,18], and the vertical ramus (ramus of the mandible) contains the coronoid, condyloid, and angular processes (see Fig. 5) [7,15,19].

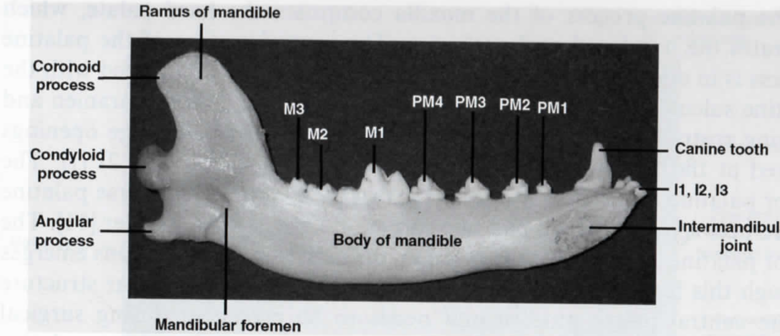

Fig. 5. Ventral view of the hemimandible of the dog.

The coronoid process is located between the zygomatic arch and the temporal bone. Most of the time, the zygomatic arch needs to be removed to obtain access to the coronoid process during surgery [10].

The body of mandible has an evident medullar cavity called the mandibular canal that begins at the mandibular foramen (see Fig. 5) in the ventral face near the angle of the mandible and opens at two or three mental foramina rostrally in the lateral face of the mandible [12]. The inferior alveolar nerve runs into the mandibular canal and is a part of the mandibular nerve, which separates into the mental nerves rostrally. The arteries and veins run together with the nerves [20] and need to be carefully located and ligated during mandibulectomies [10].

All the mental foramina are referred to by the same name, mental foramina [9], but they are different in size. There is a small one between the first and second lower incisive teeth, the largest one is ventral to the first lower premolar, and the third one is caudal to the largest foramen but can be absent [12]. These mental foramina need to be identified during rostral mandibulectomy as well, because there are blood vessels coming from these openings that can cause moderate hemorrhage when they are incised [10]. Regional block anesthesia can be performed at these large foramina if necessary [14].

Between the two horizontal rami, there is a space called the intermandibular space, where the tongue, pharynx, cranial portion of larynx, and hyoid apparatus are located [18].

The hyoid apparatus is dorsally attached to the skull and ventrally attached to the larynx and base of the tongue, suspending these structures in the caudal part of the mandibular space. It acts as a suspensory mechanism for the tongue and larynx [1,6,11]. The component parts, united by synchondroses, consist of the single basihyoid and the paired thyrohyoid, ceratohyoid, epihyoid, and stylohyoid bones as well as the tymphanohyoid cartilages [9]. The hyoid apparatus is an important reference point during pharyngostomy, because the incision is made between the hyoid apparatus and the angle of the mandible [10].

Temporomandibular joint

The articular (condylar) process of the mandible and the mandibular fossa of the temporal bone form the temporomandibular joint (Fig. 6). A cartilaginous disk divides the joint into two cavities: dorsal (or temporal) and ventral (or mandible) [12,15]. The joint is covered by a capsule that is attached around the joint surfaces, with synovial fluid inside [21]. Fibrous tissue is present around the capsule, forming a ligament laterally [12,15,22].

The movements of this joint are limited by all these structures [22]. The temporomandibular joint of dogs and cats can only move vertically. Characteristically, the cartilaginous disk is fibrous and thin but with evident rostral thickness to avoid anterior luxation during substantial vertical movements [23].

The perpendicular anatomic shape of the condylar process in dogs and cats is the most important characteristic permitting only vertical movement of this joint [24]. Especially in cats, the condylar process is transversally conic, and the mandibular fossa has a deep canal that intercepts any kind of lateral movement [25]. This conical shape in a lateromedial direction presents great difficulties when a condylectomy has to be performed [10].

Cranial types

As opposed to the case in human beings, the animal face is normally larger than the cranium [8], whereas the oral and nasal portions can be too

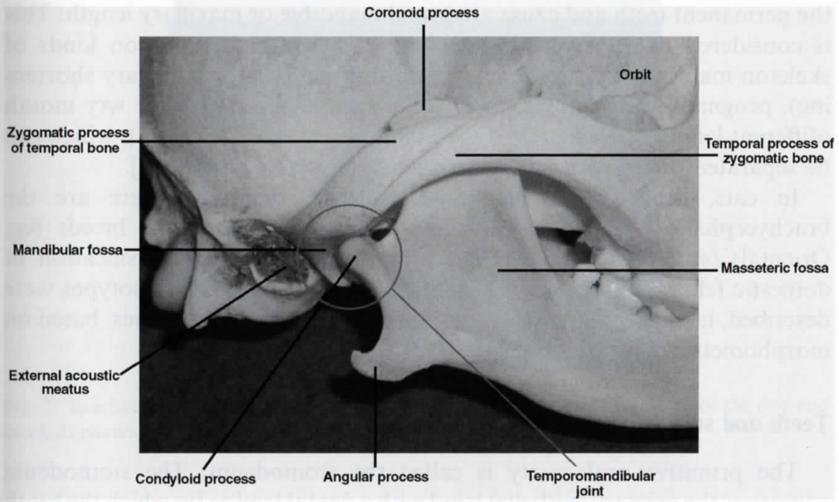

Fig. 6. Lateral view of bones of the temporomandibular joint of the dog.

long or too short, especially in dogs, because there is greater variation in breeds [3,18].

There are three kinds of cranium: brachycephalic, mesocephalic, and dolichocephalic. Brachycephalic means "short head," as in the Pekingese, Pug, Boxer, Bulldog, Shiatzu, and Lhasa Apso breeds. Mesocephalic means "medium head," as in the Labrador Retriever, Spaniel, Terrier, Beagle, Poodle, and Schnauzer breeds. Dolichocephalic means "long and straight head," as in the Collie, Dachshund, Doberman Pinscher, Greyhound, Saluki, Siberian Husky, and German Shepherd breeds (Fig. 7) [15,18,26–28].

Some characteristics are peculiar in dolichocephalic heads. This type of head has an extreme thin and long mandible, with distinct maxillary prognathism [27]. Normally, ample space is observed between the teeth [24]. Normal occlusion can occur if these animals have inherited abnormal maxilla and mandible length [27]. The dolichocephalic characteristics of the cranium are not yet observed in puppies; however, the long face appears when the puppies begin to grow [29].

A brachycephalic head always has maxillary brachygnathism and sometimes has mandibular brachygnathism also, and it is common to observe an anterior cross-bite in various degrees [27]. In fact, however, the real problem is the short maxilla; the impression of mandible prognathism is false [14] and can be referred to as relative prognathism [12].

Brachycephalic animals frequently have an airway obstructive syndrome because of the anatomic characteristics of the brachycephalic cranium, which results in a short and twisted pharynx, long soft palate, and straight nostril (in 50% of cases) [30].

Head shape and teeth positioning can each affect the other [26]. The wrong position of deciduous teeth can result in inappropriate occlusion of the permanent teeth and cause abnormal mandible or maxillary length. This is considered to be a genetic problem [24]. The most common kinds of skeleton malocclusion are brachygnathism (mandible or maxillary shortening), prognathism (mandible or maxillary lengthening) [14], or wry mouth (different length of each side of the mandible or maxilla) [14,31], which can be separated or organized by means of Angle classification [14].

In cats, head shapes are more uniform. Basically, there are the brachycephalic breeds (eg, Persian) and the dolichocephalic breeds (eg, Oriental) (see Fig. 7) [26,28]. Recently, another kind of classification of domestic feline head shapes was reported. Three different phenotypes were described, including triangular, cuneiform, and round head shapes, based on morphometric evaluation [32].

Teeth and support tissue development

The primitive oral cavity is called the stomodeum. The stomodeum comprises the primary epithelial band with a dental lamina (in which the tooth germs develop) and a vestibular lamina (in which the soft tissues develop) [33].

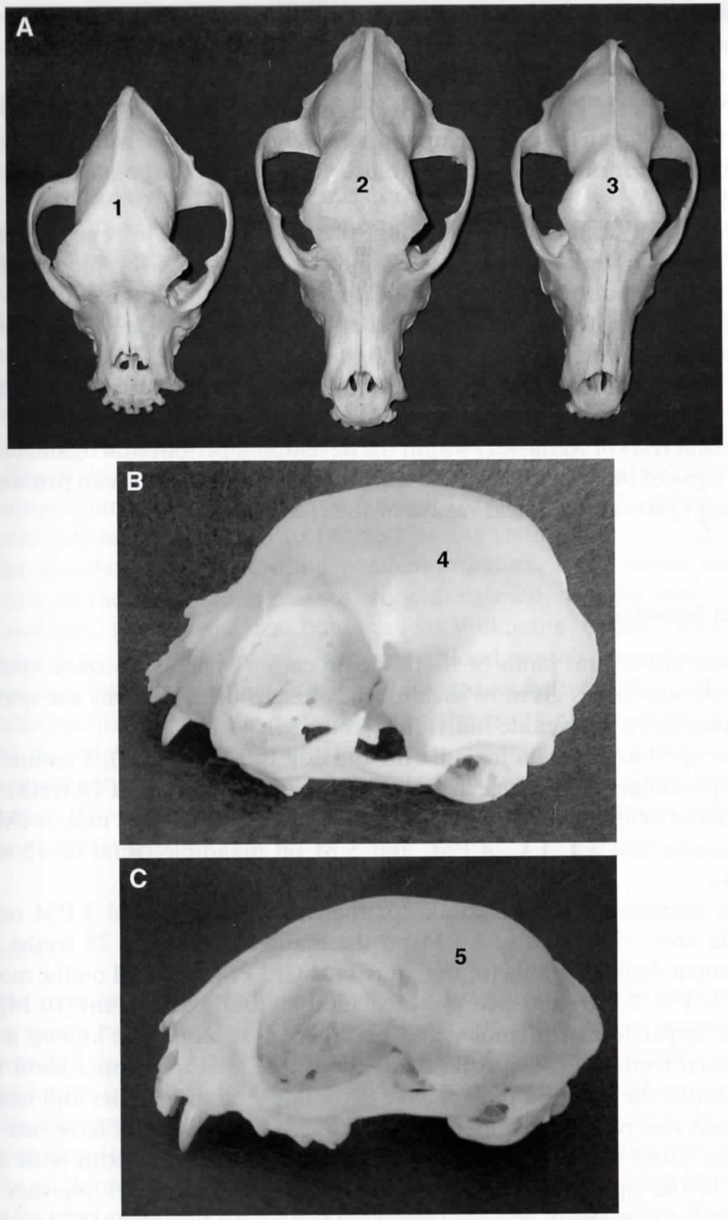

Fig. 7. Brachycephalic (1), mesocephalic (2), and dolichocephalic (3) craniums of the dog and brachycephalic (4) and mesocephalic (5) craniums of the cat.

Development of the tooth germ occurs in three stages: the bud, cap, and bell stages. It begins on approximately day 30 of gestation. The bud stage initiates tooth formation when the dental lamina forms a small bud. Afterward, in the cap stage, three different structures are observed: a dental organ (from which the enamel forms), a dental papilla (from which the dentin-pulp complex forms), and a dental follicle (from which the periodontal tissues form) [33].

Crown formation occurs during the bell stage. The end of crown calcification occurs approximately 20 days postpartum for the deciduous teeth and around the third month postpartum for the permanent teeth [27].

The formation of the roots is directed by Hertwig's epithelial root sheath, which is the epithelial extension comprising the junction at the cervical loop of the inner and outer enamel epithelium. As the roots end their development stage, the root sheath degenerates, leaving small clumps of epithelial cells (epithelial rests of Malassez) within the developing periodontal ligament [27]. With signs of inflammation, these epithelial rests of Malassez can proliferate, forming cysts on the apical region of the root [10].

Dental formulae

There are several kinds of tooth identification systems. In some systems, a specific number is given to each tooth, whereas other systems use symbols and numbers to designate individual teeth [34].

The deciduous dental formula for the dog is 3 incisors (I), 1 canine (C), and 3 premolars (PM) on each mandible and maxilla (total of 28 teeth). The permanent dental formula for the dog is 3 I, 1 C, 4 PM, and 2 molars (M) on the maxilla and 3 I, 1 C, 4 PM, and 3 M on mandible (total of 42 teeth) [10,14].

The deciduous dental formula for the cat is 3 I, 1 C, and 3 PM on the maxilla and 3 I, 1 C, and 2 PM on the mandible (total of 28 teeth). The permanent dental formula for the cat is 3 I, 1 C, 3 PM, and 1 M on the maxilla and 3 I, 1 C, 2 PM, and 1 M on the mandible (total of 32 teeth) [10,14].

The upper fourth premolar and the lower first molar are known as the carnassial teeth. In the maxilla of the dog, the last three upper teeth have three roots, the other premolars have two roots, and the canines and incisors have just one root. In the mandible, the incisors and canines have one root and the other teeth have two roots. In the cat, the only tooth with three roots is the upper fourth premolar. The upper and lower incisors and canines have one root, and the remaining teeth have two roots [12,14,24,28]. A study of 155 skulls of adult domestic cats showed anatomic variation in the teeth of cats, however. For example, the maxillary second premolar tooth can be absent, and this tooth can present a single root (27%), partly fused roots (55%), or two fully formed roots (9.2%). The maxillary first molar tooth can be absent (2.3%); when is present, it can have a single root (35%), a partly fused root (34.7%), or two roots (28%). Supernumerary roots were found on the maxillary third premolar teeth (10.3%) [35].

The lumen (internal pulp space) of the pulp cavity of permanent teeth rapidly decreases in size until an animal is approximately 2 years of age. A thin or completely obliterated pulp can thus be expected in older pets. In younger animals, especially those less than 1 year of age, the pulp is much larger [24]. Radiographically, the apex of the mandibular first molar in dogs and cats is closed by 7 months of age, and the maxillary canine (the last to close) has a closed apex by 10 months of age in dogs and by 11 months of age in cats [36].

The alveolar process is the portion of bone that is located around the teeth and is composed of the cortical plate, trabecular bone, and cribriform plate. The cribriform plate is know as the lamina dura on radiographs, corresponding to a thin layer of bone in the interior of the alveolus [15], and has many perforations for the passage of vessels to the periodontal ligament [14]. The trabecular bone acts like a support between the cortical plate and the lamina dura. The alveolar crest (margin) is the occlusal portion of the alveolar process located next to the neck of the teeth [15].

The alveolar bone is a tooth-dependent structure. It is formed with the eruption of the teeth and is reabsorbed with extraction of the teeth. There are multiple tunnels in this bone called Volkmann canals, which are connected to the periodontal ligaments. Blood vessels, lymphatics, and nerves pass into these canals [20]. There are spaces between the teeth called interdental spaces, and the bone between the roots of the same tooth is called the interradicular septum [15]. When the interdental space is larger than usual, it is called a diastema, such as between the canine and first premolar. The space between the third incisor and the canine is called the occlusal space [24].

Muscles

The muscles of the head are composed of six groups: facial musculature (innervated by branches of the facial nerve), masticatory musculature (innervated by the mandibular branch of the trigeminal nerve), tongue musculature (supplied by the hypoglossal nerve), pharyngeal musculature (under the control of the glossopharyngeal and vagus nerves), laryngeal musculature (supplied by the vagus nerve), and eye musculature (innervated by the oculomotor, trochlear, and abducent nerves) [1]. The most important muscles manipulated by veterinarians during dental practice are discussed.

On the superficial muscles of the face, there are the muscles of the cheeks and lips and the muscles of the forehead and dorsum of the nose [1]. The muscles of the lips and cheeks are the orbicularis oris (closes the mouth and is a compressor of the labial glands), incisivus (raises the upper lip and pulls the lower lip), levator nasolabialis (increases the diameter of the external nose), levator labii superioris (lifts portions of the upper lip), caninus depressor labii superioris, depressor labii inferioris, mentalis, zygomaticus, and buccinator (returns food from the vestibule to the masticatory surface of the teeth) [1,6]. These muscles are situated on the superficial layer of the face and are known as the muscles of mimics. The platysma (draws the commissure of the lips caudally) is a cutaneous muscle located on the superficial muscle of the face (Fig. 8) [6].

The muscles of mastication are the masseter (see Fig. 8) (raises the mandible when closing the mouth), pterygoideus lateralis (raises the mandible), pterygoideus medialis (raises the mandible), and temporalis (same action as the masseter) [1,6]. These groups promote elevation of the mandible and permit the mouth to open, compression, and all mastication movements [6]. All are innervated by rami of the trigeminal nerve [28]. With this masticatory group can be included the superficial muscles of the mandibular space: the digastricus and mylohyoideus. They are referred to as superficial muscles of the larynx, with the function of supporting the masticatory muscles. The digastricus muscle is inserted in the lateral and medial portions of mandible at the ventral margins and promotes the opening of the mouth, moving the mandible in the back and down directions.

The mylohyoideus muscle is an auxiliary muscle of the tongue and mastication situated between the two medial faces of the mandible [6]. The muscles of the tongue are the styloglossus (draws the tongue backward), hyoglossus (retracts and depresses the tongue), genioglossus (depresses the tongue), and lingualis proprius (masticatory and deglutition functions).

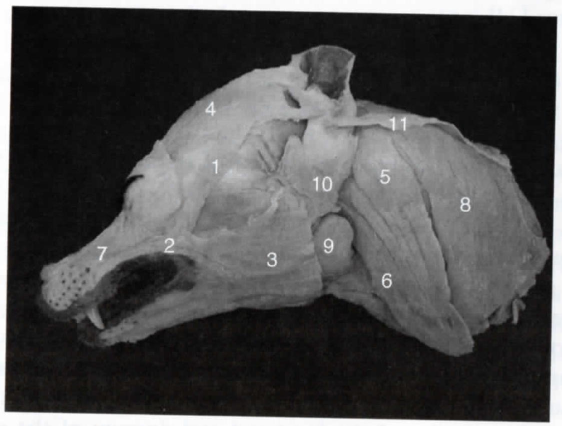

Fig. 8. Lateral view of the muscles of the dog: zygomatic (1), orbicularis oris (2), platysma (3), frontal (4), sternocephalicus pars occipital (5), sternocephalicus pars mastoidea (6), levator nasolabialis (7), cleidocephalicus (8), mandibular gland (9), parotid gland (10), rhomboideus (11), and masseter.

The muscles of the soft palate are the tensor veli palatini (stretches the palate between the pterygoid bones), levator veli palatini (raises the caudal part of the soft palate), and palatinus (shortens the palate and curls the posterior border downward).

Salivary glands

There are several salivary glands working in the oral cavity. The humidity of the mouth, its digestive proprieties, and its lubrication are dependent on the saliva secreted by these glands. There are minor salivary glands on the lips, cheek, tongue, soft palate, larynx, and esophagus. The largest volume of saliva production comes from the major and compact glands, which are not located in the mouth; however, the saliva is conducted to the oral cavity by long ducts [7].

The major salivary glands are the parotid, mandibular (see Fig. 8), sublingual, and zygomatic glands. The sublingual gland is divided into the polystomatic (diffuse) and monostomatic (compact) glands [7,28]. As opposed to the minor glands, the major glands produce a serous liquid with the enzyme ptyalin, which is important in the digestion of carbohydrates [7].

In cats, a membranous bulge is located lingual to the mandibular molar, extending from the middle aspect to the distal aspect of this tooth. The bulge is an irregular sphere approximately 7 mm in diameter containing a small mixed salivary gland. This gland is a tubuloacinar gland with multiple small openings through several short ducts to the surface of the lingual membrane, with a predominance of mucous acini. Studies have not demonstrated a specific function for this gland [37].

Nerves

The most important cranial nerve of the face is the trigeminal nerve (fifth cranial nerve). It is divided into the ophthalmic nerve, maxillary nerve, and mandibular nerve [28].

The maxillary nerve is the largest ramus of the trigeminal nerve. It is responsible for the sensory perception of the cheek, nose, soft and hard palate, upper teeth, and gingiva. In the pterygopalatine fossa, the maxillary nerve is divided into three pterygopalatine nerves: the minor palatine nerve that runs to the soft palate, together with the minor palatine artery; the major palatine nerve that runs to the palatine canal, together with the major palatine artery; and the accessory palatine nerve that runs to the caudal portion of the hard palate. Another maxillary nerve ramus is the nasal nerve, which passes to the nasal cavity by means of the sphenopalatine foramen in the pterygopalatine fossa [1].

The maxillary nerve then enters the infraorbital canal through the maxillary foramen, now called the infraorbital nerve, and has an alveolar connection to the upper teeth. After the infraorbital foramen, this nerve has multiple connections that run to the upper lips [1].

The mandibular nerve has a motor function in the mastication muscles, especially the masseter, temporal, and digastric muscles. It contains the pterygoid nerves (medial and lateral); the buccal nerve that runs to the masseter and temporal muscles; the temporal nerve that runs to the temporal muscle; the masseter nerve that runs to the masseter muscle; the auriculotemporal nerve that runs to the ear, parotid gland, and temporomandibular joint; the mylohyoid nerve that runs to the digastric muscle and mylohyoid muscle; and the lower alveolar nerve that passes into the mandibular canal in the mandibular foramen with a connection to the lower teeth. This nerve forms the mental nerves, the nerves to the lower lips, and the lingual nerve to the tongue [7,28].

The ophthalmic nerve is the most important sensitive nerve of the orbit, dorsal skin of the nose, and nasal mucous and paranasal sinus, and it has three connections: the frontal, lacrimal, and nasociliary nerves [28].

The facial nerve (seventh cranial nerve) acts on the facial muscles and cranial portion of the digastric muscle, salivary glands of the tongue, sublingual gland, and muscles of the oral cavity [1,7].

Vascular system

The vascular system of the head depends on the external carotid artery, a bifurcation of the common carotid artery [7,11]. The branches that leave the external carotid artery are the occipital, cranial laryngeal (supplies most of the mucosa and intrinsic muscles of the larynx), ascending pharyngeal, lingual (principal artery of the tongue), facial (gives rise to a glandular branch and to muscular branches), caudal auricular, parotid, superficial temporal (constituting blood supply to masseter), and maxillary arteries [1].

The maxillary artery gives off many branches that supply the deep structures of the head lying outside the brain case. It may be divided into three important rami: the mandibular portion, the pterygoid portion, and the pterygopalatine portion [1].

In the mandibular portion, the mandibular branch carries the blood supply to the temporomandibular joint with the mandibular artery [1]. Some care needs to be taken during surgical manipulation of this region to avoid disruption of this artery [10]. The mandibular alveolar artery runs into the mandibular canal, exiting the bone as the mental artery [1]. During a mandibulectomy, much care needs to be taken to preserve the artery during osteotomy of the mandible. The two parts of the incised mandible contain the artery inside, and it needs to be ligated to avoid hemorrhage. If hemorrhage occurs, it can be controlled using bone wax [10]. The caudal mental artery, with its respective nerve and vein, exits the caudal mental foramen and runs to the lower lip. The middle mental artery is the largest of the three mental vessels and provides the principal blood supply to the

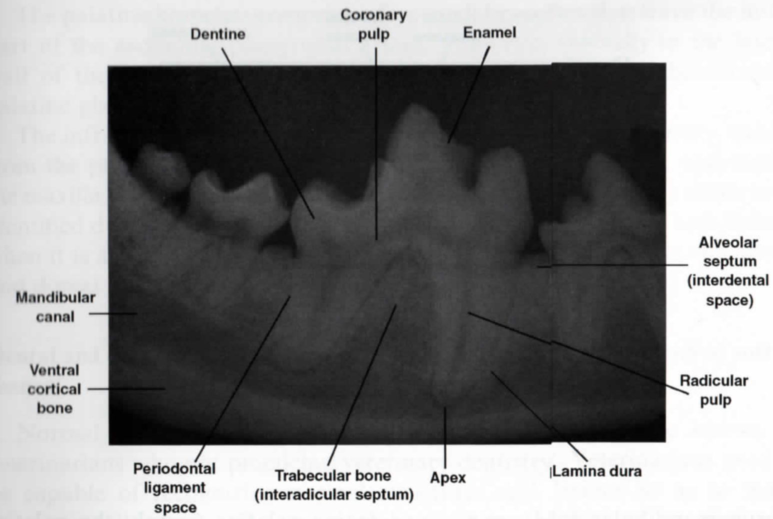

Fig. 9. Intraoral radiograph of the lower first molar region of the dog.

rostral part of the lower jaw. It is the main continuation of the alveolar artery of the mandible. The rostral mental artery is the smallest of the three mental arteries, running to the incisive-mandibular canal [1].

The pterygoid portion has no branches. The pterygopalatine portion has important rami, including the pterygoid (supplies part of the medial pterygoid), buccal (large wings are distributed to masseter, temporal, and buccinator muscles terminating in the region of the soft palate and the

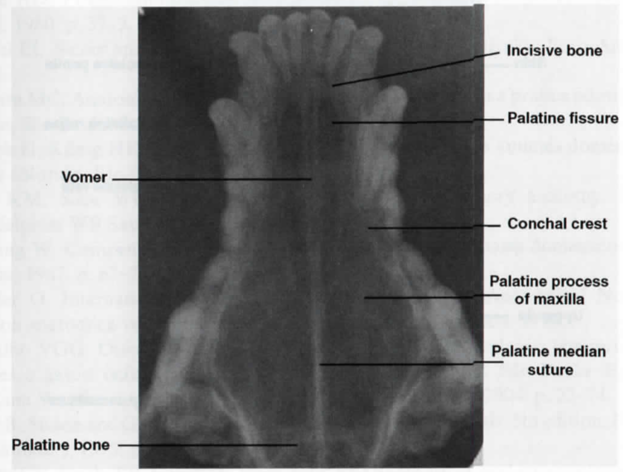

Fig. 10. Intraoral radiograph of the maxilla of the dog.

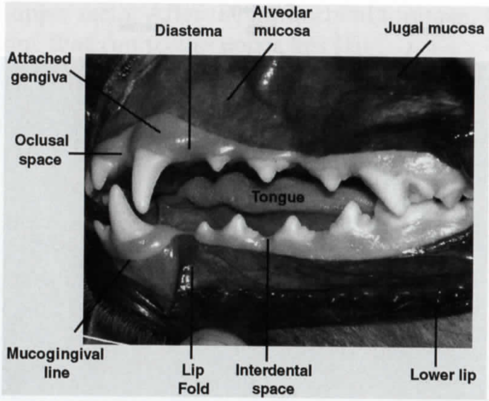

Fig. 11. Lateral view of the soft tissues of the dog.

pterygomandibular fold), minor and major palatine (supply the palatine glands, musculature, and mucosa of the hard palate), and infraorbital and sphenopalatine (supply the mucoperiosteum of the nose) arteries [1,7].

The branches of the sphenopalatine artery provide extensive vascularization of the dorsal and ventral nasal concha, which can cause extensive hemorrhage with trauma. When this happens, especially during nasal surgery, the region needs to be manipulated quickly and the hemorrhage controlled by compression [10].

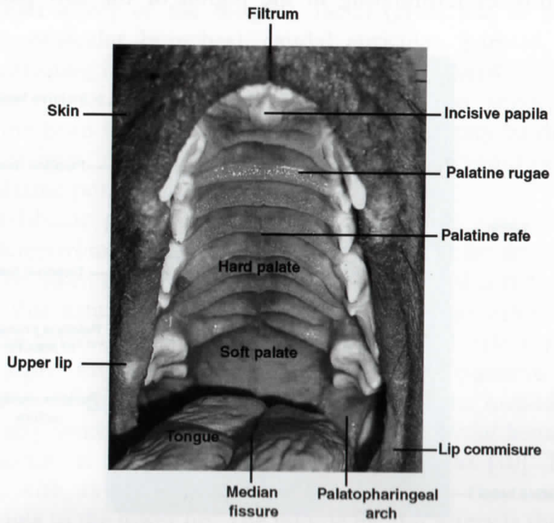

Fig. 12. Intraoral view of the mouth of the dog.

The palatine branches comprise a few small branches that leave the initial part of the ascending pharyngeal artery. They run ventrally in the lateral wall of the pharynx to the soft palate, where they supply the extensive palatine glands and the palatine mucosa and muscles [7].

The infraorbital artery is the continuation of the maxillary artery, exiting from the pterygopalatine fossa, entering the infraorbital canal, and exiting the maxilla by means of the infraorbital foramen [1,7]. This artery needs to be identified during maxillary surgery because it can cause extreme hemorrhage when it is accidentally incised [10]. It terminates by dividing into the lateral and dorsal nasal arteries [1].

Dental and oral anatomy on intraoral radiographs and oral anatomy of soft tissues

Normal radiographic aspects of the oral cavity need to be known by veterinarians who are practicing veterinary dentistry. Veterinarians need to be capable of recognizing normal structures and lesions so as to make a correct diagnosis [5]. Knowledge of the normal anatomy of soft tissues is also important in identifying oral lesions. Some examples of normal structures on radiographs and in soft tissues can be observed in Figs. 9 through 12.

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