Chapter

Dental Anatomy and Morphology of Permanent Teeth

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Abstract

The present chapter is proposing a detailed and illustrated description of dental morphology of permanent dentition. The main topics are related to nomenclature, age of emergence, a description of teeth's tissues (pulp, dentin, enamel, and cement), and morphology of all permanent teeth. The main focus of this chapter is the description of individualized morphology and specific variations of each permanent tooth. The goal of all treatment phases in dental medicine is to restore the function, integrity, and morphology of the oral cavity, and all these achievements are reached through deep knowledge of dental morphology. Cavities are restored with direct dental materials, which need to be carved according to the natural shape, outlines, occlusal and proximal contacts of teeth's morphology, reproducing also the shade and translucencies of natural teeth. The same goal dominates the prosthodontic field. It is well known in dental medicine that shape, size, and position assure the optimal function and preserve the self-maintenance of dental arches and dento-maxillary system. For esthetic, function, and self-preservation, all dental treatment fields have to first consider the dental morphology.

Keywords: teeth, crown, root, morphology, contact areas, occlusion, esthetics, oral cavity

1. Introduction

In the past decades, dental medicine has evolved according to the technological progress, development of high quality and esthetic dental materials, and new and conservative attitudes in clinical practice. Dental anatomy and morphology are the basic components of the skills and knowledge needed in all dental treatment phases. The knowledge related to function, shape, color, phonetics, position on the dental arch, and the relations with the opposing arch is as important as dental anatomy and morphology. The study of dental anatomy, morphology, physiology, and occlusion is mandatory in all the curriculum of dental schools and provides the basic and the most important component in developing a successful treatment plan for all phases of

dental treatments, which include odontotherapy, endodontics, prosthodontics, implantology, orthodontics, periodontology, and pediatric dentistry.

Dental practitioners, during the inspection of the oral cavity, will see the clinical crowns, the attachment of gingival tissue, the shape, size, position and angulations of the teeth, the relation of proximal contact areas, the occlusal contacts, and the evidence of parafunctions and esthetics. Having this picture, the basic knowledge, and considering all the factors and all related anatomical structures, a correct treatment plan will be made.

2. Introduction to dental anatomy and morphology

2.1 Nomenclature, numbering system, and dental tissues

For studying dental anatomy, a common language is required. Humans have two dentitions in their lifetime that support the anatomical structures and orofacial functions such as mastication, speech, and give shape and beauty to the face. Teeth are highly calcified structures with individualized tissues, supported in the upper and lower jaw by *bony sockets* also called *alveolus*. Teeth are comprised of four types: incisors, canines (cuspids), premolars (bi-cuspids), and molars. The first set of teeth is the *primary or deciduous dentition*, which begins to form prenatally at about 14 weeks and is completed postnatal at about 3 years of age. In total, 20 teeth, 10 maxillary and 10 mandibular teeth, and 5 teeth on each side of the jaw are consisting the deciduous dentition. The teeth in deciduous dentition are grouped on maxillary and mandibular jaw as follows: four incisors, two canines, and four molars (**Table 1**). World Dental Federation proposed a numbering system for deciduous and permanent dentitions, and the system was adopted by the World Health Organization and accepted by other organizations such as the International Association for Dental Research [1].

Morphological characteristics of deciduous teeth are different from permanent ones. Deciduous teeth have smaller crowns and roots, more prominent cervical ridges, and narrower "neck" or cervical diameter. The roots are narrower and flare, and the buccolingual diameters are smaller than the permanent's diameters. Crowns of deciduous anterior teeth have a mesiodistal diameter higher in comparison with the cervical-incisal diameter. The roots of deciduous anterior are long and narrower, and the roots of deciduous molars are longer, slender, and flare to allow more room for the development of permanent crowns. The cervical ridges of the deciduous anterior teeth are more prominent, the crowns and roots of deciduous molar are more slander mesiodistally, the buccal and lingual surfaces of deciduous molars are flatter, and the shade of deciduous is whiter [2].

The teeth supported by the upper jaw are called *maxillary* teeth and the ones supported by the lower jaw are called *mandibular* teeth. The deciduous dentition lasts until about 6 years of age when the first succedaneous or permanent teeth are emerging into the oral cavity. In this stage, the transitional dentition or mixed dentition is formed, which is present in the oral cavity until 12 or 13 years of age and ends when all the deciduous teeth are lost and all the permanent ones have emerged in the oral cavity. Mixed dentition, present between 6 and 12 years of age, can be a difficult period of time because of missing teeth, different shades and hues of the recently emerged teeth, malposition, and crowning, which may need orthodontic treatment.

In total, 32 teeth, 16 maxillary and 16 mandibular teeth, and 8 teeth on each side of the jaw are consisting the permanent dentition. Teeth in permanent dentition are grouped on each jaw as follows: four incisors, two canines, four premolars, and six

Dental Anatomy and Morphology of Permanent Teeth
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	Upper right							Upper left		
Tooth	**Second molar**	**First molar**	**Canine**	**Lateral incisor**	**Central incisor**	**Central incisor**	**Lateral incisor**	**Canine**	**First molar**	**Second molar**
Nomenclature	5.5	5.4	5.3	5.2	5.1	6.1	6.2	6.3	6.4	6.5
Age of emerge	25–33 months	13–19 months	16–22 months	9–13 months	8–12 months	8–12 months	9–13 months	16–22 months	13–19 months	25–33 months
Age of emerge	23–31 months	14–18 months	17–23 months	10–16 months	6–10 month	6–10 month	10–16 months	17–23 months	14–18 months	23–31 months
Nomenclature	8.5	8.4	8.3	8.2	8.1	7.1	7.2	7.3	7.4	7.5
Tooth	Second molar	First molar	Canine	Lateral incisor	Central incisor	Central incisor	Lateral incisor	Canine	First molar	Second molar
	Lower right							Lower left		

Table 1.
Nomenclature and age of emergence of deciduous dentition.

molars. The evolution of permanent dentition ends at about 14–15 years of age when the roots have completed their development. The age of emergence of permanent teeth is described in **Table 2**. The exception is related to third molars, which are emerging at 18–25 years of age [1, 3].

Teeth have two primary components, one *crown*—exposed in the oral cavity—and one or more *roots* supported by the alveolar socket. The tooth has four primary tissues —*enamel, dentine, cement, and pulp*. The main component of a tooth is a bone-like tissue called *dentine*.

Enamel covers the visible part of the crown in the oral cavity and is a highly calcified tissue (95.5% inorganic, 0.5% organic, and 4% water). The upper incisors reach the highest density of enamel, which is increasing progressively during development. The thickness of the enamel layer varies from about 2.5 mm in the cusps area, 2.0 mm in the incisal edge, and 0.5 mm at the cervical enamel. The color is semitranslucent and depends on the enamel thickness. In the thick opaque area, the color appears bluish-white and yellow-white in the area where the enamel layer is thinner. Enamel is the hardest structure of the body, having a value of 5–8 on the Moch scale (diamond-10 Moch). The high hardness influences the tensile strength and compressibility, which indicate that enamel is extremely brittle [4, 5].

The enamel is structured in *enamel rods (prisms), rod sheaths, and cementing interred substance*. Generally, enamel rods are aligned perpendicular to dentine-enamel junction and usually in cervical area the rods become twisted. The rods are aligned in planes best suited to withstand the occlusal forces as long as the forces are perpendicular to the tooth surface. Rod sheath is an area identified in histologic sections of a tooth, found where enamel rods, the functional unit of enamel, meet interrod enamel. Both types of enamel meet at sharp angles and form the appearance of a space called the rod sheath. The rod sheath consists of more protein and the rod sheath is characterized as being hypomineralized in comparison to the rest of the highly mineralized enamel. The rod sheath is Inorganic matrix tying the enamel rods together. The interred substance cement the rods together. Enamel forms junctions with dentine and cement. The *dentine-enamel junction* (DEJ) has a pitted aspect and in the rounded pits fit the enamel rod, which generates a strong bond between the two tissues [3, 4].

Underlying the enamel tissue is the dentine root, a bone-like tissue that consists of a spongy bone-like tissue, which consists of the root, and is covered by *cementum* which is present only on the tooth surface. The crown delimited by the enamel and the root delimited by the cement join in a junction called cementoenamel junction (CEJ), which is also called the cervical line. The cementum is specially adapted to anchor and support the tooth in the bony socket and covers the dentine root. Both enamel and cement are covering the dentine, and three variations in their link may exist: the cervical enamel is covered by cementum (65%), contact line between enamel and cementum (25%), or enamel and cement do not touch, and in this situation, dentin is exposed (10%) [3, 6].

Dentin is the largest tissue of a tooth, gives the basic shape of the crown and root, and forms the walls of the pulp cavity in the crown and root area. The color is light yellow in deciduous teeth and yellow in permanent teeth, less hard than enamel, and harder than the cementum. In contrast to the enamel, dentine is highly elastic, can support the non-resilient enamel, and is highly permeable. In its chemical composition, dentine has 70% inorganic matter, 17% organic matter (collagen, proteins, and citric acid), and 13% water. Dentine is structured into dentinal tubules that are ending beneath the enamel and contain the Tome's fibers also called processes of odontoblasts cells present in the dental pulp. For this reason, dentine is a living and sensitive hard tissue of the tooth. Dentine tubes have an "S" curved shape and start perpendicular to

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M3	**M2**	**M1**	**P2**	**P1**	**C**	**LI**	**CI**	**CI**	**LI**	**C**	**P1**	**P2**	**M1**	**M2**	**M3**
1.8	1.7	1.6	15	1.4	1.3	1.2	1.1	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8
17–21 years	12–13 years	6–7 years	10–12 years	10–11 years	11–12 years	8–9 years	7–8 years	7–8 years	8–9 years	11–12 years	10–11 years	10–12 years	6–7 years	12–13 years	17–21 years
17–21 Years	11–13 years	6–7 years	11–12 years	10–12 years	9–10 years	7–8 years	6–7 years	6–7 years	7–8 years	9–10 years	10–12 years	11–12 years	6–7 years	11–13 years	17–21 years
4.8	4.7	4.6	4.5	4.4	4.3	4.2	4.1	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8
M3	M2	M1	P2	P1	C	LI	CI	CI	LI	C	P1	P2	M1	M2	M3

CI—central incisor, LI—lateral incisor, C—canine, P1—first premolar, P2—second premolar, M1—first molar, M2—second molar, and M3—third molar.

Table 2.
Nomenclature and age of emerge for permanent dentition.

the pulp chamber surface but are straight under the cusps and in the root area. The dentine encloses the *dental pulp*, the soft tissue formed by blood vessels, nerves, and specialized tissue, all responsible for the tooth's vitality [3, 6].

Dental pulp is contained within the pulp chamber of the crown, close to the cervical line and in the cervical third part of the crown, and is followed by the pulp canal along the root. The pulp chamber and root canal form together the pulp cavity. Pulp has the main role in forming the dentine, has a sensory function through which the tooth is felt, and also has a nutrient function by supplying nutrition to the dentine through the blood vessels and odontoblastic processes with an important role in maintaining the tooth's vitality. The last function is the defensive one, through which the pulp is producing secondary dentine to maintain the vitality of the tooth in case of damaging factors such as cavities, occlusal overloading, and aging. In young teeth, the pulp chamber is bigger and follows the shape of the crown through the extension of pulp chamber into the cusps. These extensions are called pulp horns. By aging, the pulp chamber is reducing its size because of secondary dentine deposition. The root canal and apical foramen are wide in case of young teeth and become narrow by aging. Root canals can be straight or curved, single or not, with accessory lateral canals usually in the apical foramen or at the floor of the pulp chamber. *Apical foramen* or *root apex* is a small foramen through which the blood vessels and nerves enter the pulp chamber and may be located on the lateral side of the apex. A tooth can have more than one foramina. Through apical foramen, there is a communication with periodontal space. Endodontic and periodontal pathology are interconnected and influenced one by another through apical foramen or accessory foramens and root canals [7].

The three hard tissues of the tooth, enamel, dentine, and cementum, and the soft tissue represented by dental pulp have to be considered in relation with the oral-facial structures, oral cavity, and all surrounded soft tissues and anatomical structures.

2.2 Surfaces, ridges, and landmarks in dental morphology

The crowns of anterior teeth have four axial surfaces and one incisal ridge. The premolars and molars have five surfaces, four axial, and one occlusal. The name of the surface is given after the anatomical position and relation to the adjacent anatomical structures. For upper and lower incisors and canines, the surfaces toward the lips are called *labial* surface. The surfaces that face the median line of the face or toward adjoining teeth are called *mesial* and opposite or the ones distant from the median line are called *distal* surfaces. Mesial and distal surfaces are also called *proximal* surfaces [1, 3].

The surfaces facing the tongue are called *lingual*. In case of premolars and molars, the name of the surfaces is maintained with one exception, the surfaces facing the cheeks are called *buccal* surfaces. Buccal and labial surfaces, when spoken collectively, are called *facial* surfaces. The surfaces of premolars and molars, which establish contact or occlusion with the ones positioned on the opposite jaw, are called *occlusal* surfaces and *incisal ridge* with respect to incisors and canines (**Figure 1**) [1, 3].

Beyond surfaces, teeth have other landmarks divided into positive and negative landmarks. The positive landmarks are cusps, tubercle, cingulum, marginal ridge, triangular ridges, transversal ridges, oblique ridges, and lobes. The negative landmarks are fossa, sulculus, pits, and developmental grooves [1, 3].

Cusps are elevations specific to premolar's and molar's crowns and divide the occlusal surfaces. Every cusps has a pyramidal shape with a quadrangular base with the exception of the mesial-lingual cusp of the upper first molar. Tubercles are small

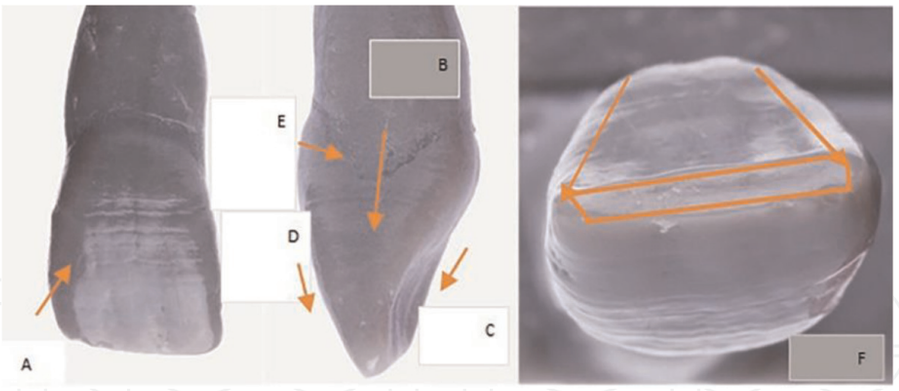

Figure 1.
Upper central incisor. A—Buccal or facial surface, B—mesial surface-proximal view, C—lingual surface from proximal view, D—facial surface from mesial view, E-cervical line—mesial view, and F—Incisal view—incisal ridge.

elevations, similar in shape to the cusps but are actually an extra formation of enamel. *Cingulum* is the lingual lobe of anterior teeth and gives a bulk aspect in the cervical third of the lingual surface. *Ridges* are any linear elevation on the surface of the tooth and receive the name after the position on the surface. *Marginal ridges* are the rounded borders of the enamel that form and limit the margins of the occlusal surface. Each premolar and molar has a mesial and distal ridge on the occlusal surface. The *transversal ridges* start from the tips of the cusps of laterals toward the center of the occlusal surfaces and are named after the cusps to which they belong, like triangular ridge of the mesial-buccal cusp of the first mandibular molar. The union of two triangular ridges crossing on transversal direction forms the *transversal ridges*. The *oblique ridge* is specific to maxillary molars and is formed by the union of the triangular ridges of the distal-buccal and mesial-buccal cusps. *Lobes* are the primary structures in the development of the crown and cusps and mamelons are representations of lobes. *Mamelons* are any rounded protuberances present on the incisal ridges of recently emerged teeth, and by aging, their contour will become less evident [1, 3].

Fossae are irregular depressions or concavities present on the occlusal surfaces of the premolars and molars and on the lingual surfaces of the incisors. The *central fossae*, present on the occlusal surfaces, are formed by the convergences of ridges with the grooves. The *triangular fossae* are present on the occlusal surface of lateral teeth, mesial or distal to the marginal ridge, and also on the lingual surface of the maxillary incisors where the lingual fossae and marginal ridge meet the cingulum. *Pits* are point depressions found at the junction of developmental grooves [1, 3].

For an accurate description and positioning of the landmarks, the crown and roots are divided after the third rule, which means that each surface of the crown is divided into three equal parts in mesiodistal direction and in the cervical-incisal/occlusal direction. Following this rule, the buccal surface of the central upper incisor has three-thirds on cervical-incisal distal direction, which are third incisal, third middle, and third cervical. The buccal surface of the central upper incisor has three-thirds in mesiodistal direction, which are third mesial, third middle, and third distal. By following this rule, a landmark can be placed more precisely, for example, the mesio-incisal angle of the maxillary central incisor is placed in the third incisal (in cervical-incisal direction) and in the third mesial part in mesiodistal direction. The same rule is valid for the root [8].

3. Dental anatomy of the anterior teeth

3.1 Common features of permanent incisors and canines teeth

The incisors are the cutting blades of human dentition and together with the canines form the group of anterior teeth with great impact on esthetic, eating, speech and facial expression, and harmony. Both deciduous and permanent dentitions have four incisors on each jaw, two central incisors, and two lateral incisors, all single root teeth. The central incisors are the closest to the midline, whereas the lateral is more distal to the midline of the jaw. The mandibular central incisors emerge around 7 years of age, followed by the maxillary central incisors, maxillary lateral and the last ones, mandibular lateral incisors around 8 years of age. Mandibular incisors have the smallest and shortest root and the weakest resistance due to their reduced size. The relation between upper and lower incisor is forming the overjet and overbite with great impact on esthetic and normal relation between the upper and lower jaw. The evaluation of overbite and overjet is done early and gives important information about the growth pattern of the jaws, the length of the dental arches, and optimal space for permanent teeth. The *overbite* is the overlap of the maxillary central incisors over the mandibular central incisors measured relative to the incisal ridges. Normal overbite is approximately 1/3–1/2 (30 and 50%) of the height of the mandibular incisors. *Overjet* is defined as the extent of horizontal overlap, anterior-posterior direction, of the maxillary central incisors over the mandibular central incisors. The normal value of the overjet should be maximum 2 mm. The relations between the upper and lower incisors indicated a physiologic occlusion and development of the jaws or a malocclusion [9, 10].

Canines are the third teeth in line, from the median line of the dental arch and are refer as cornerstones of the dental arch. Canine's roots are the longest among all the teeth and the crowns are usually as long as the crowns of central incisors. Canines are single root teeth and their "V" crown shape and position are important for the guidance of the lower jaw into the intercuspal position. These teeth have a great value for an efficient function, stability, and natural facial expression. Lower permanent canines emerge around 9–10 years of age and the upper permanent canines emerge at 11–12 years of age, being through the last permanent teeth that emerge between incisors and premolars. Because of their timing emerge, placement between incisors and premolars and molars, which already emerged, canine's space can be restricted and for this reason are predisposed for malposition, crowding and malocclusion. Being located between incisors and premolars, canines support these teeth due to their shape, size, and position on the dental arch. A quality that has to be overlooked is the canine eminence that along with the bone ridge over the labial roots has an esthetic value by contouring the normal facial expression at the corner of the lips. Canines value is manifested through stability, efficiency, and natural facial expression [4].

3.2 Maxillary and mandibular incisors

3.2.1 Maxillary incisors

Maxillary central incisors (1.1, 2.1) are single cone shape root teeth, next to the median line. In smile and speech, the central incisors are the most exposed teeth with a great impact on esthetics. Maxillary central incisors (1.1, 2.1) have four axial surfaces: labial, lingual, mesial and distal, and one incisal ridge.

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The labial face is the widest, mesial-distally, and convex in the cervical incisal direction. It is less convex than the lateral incisal and canine and has a rectangular shape. The labial surface looks symmetrical and regularly formed for both centrals and is having a straight incisal edge. The height of the crown is 10–11 mm and mesial-distal measurement is 8–9 mm at the contact area. The mesial-distal diameter in the cervical area is 6.5–8 mm. The maximum convexities from the mesial and distal surfaces are consisting the contact area with its neighbors. The mesial outline is less convex than the distal one, and these two surfaces by continuing with the incisal ridge are forming two angles: mesial-incisal, more sharp than the distal-incisal. The incisal outline is usually regular and straight in a mesial-distal direction, but after a long function, it tends to become ascendant distally. The labial face has three lobes named mamelons, divided by two cervical-incisal groves. Due to function, the mamelons tend to become less evident. The cervical outline of the crown has a semicircular direction and is concave toward the incisal ridge (**Figure 2**). From proximal view, the facial surface is convex and the lingual surface is convex in the third cervical and concave in the third incisal area [11].

The lingual outline of the cervical line is placed below a smooth convexity called cingulum and has a similar shape with the labial cervical line. Cingulum is placed in the third cervical part of the lingual surface. Mesial and distal from the cingulum are the mesial and distal marginal ridges, which continue the incisal ridge. Below the cingulum is present a shallow concavity called lingual fossa, which is bordered mesially by the mesial marginal ridge, incisally by the lingual area of the incisal ridge, distally by the distal marginal ridge, and cervically by the cingulum. From the cingulum starts developmental grooves into the lingual fossa.

The mesial and distal surfaces have a triangular shape with the base in the cervical and the apex oriented toward the incisal ridge. The maximum convexities of both mesial and distal surfaces are joining with neighbor teeth into the contact area that is positioned into the third incisal and third labial of the proximal surface.

Viewed from incisal, the incisal ridge is positioned in the middle of the maximum labial-lingual diameter of the central incisor and in the same time, centered over the root (**Figure 3**).

The maxillary central incisor may show a wide range of particularities with regard to labial outline, labial profile curvature, labial lobe grooves, mamelons, and cingulum and are classified into three basic shapes: tapering when mesial and distal borders converge toward cervical line, square when mesial and distal borders are almost

Figure 2.
A. Facial surface—the three mamelons divided by developmental grooves; B. Outline of distal ridge; C. Cervical line on labial surface; D. Outline of mesial ridge; E. Mesial surface with the view of labial surface; F. Distal surface —aspect of cervical line and outline of labial surface; G. Distal surface—aspect of cervical line and outline of lingual surface; and H. Lingual surface—view of cingulum, marginal ridges, and developmental grooves.

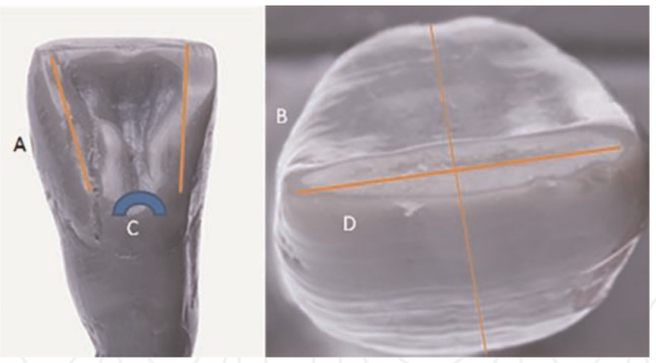

Figure 3.
A—Distal marginal ridge, B—Mesial marginal ridge, C—Cingulum, D—Incisal ridge from incisal view.

Figure 4.
Upper lateral incisor. A—Labial surface, B—lingual surface, C—mesial surface, and D—Lingual-distal surface.

parallel, and an ovoid shape when mesial and distal borders converge incisal and cervical [1, 3, 11].

Maxillary lateral incisor (1.2, 2.2) varies more than any tooth and is smaller in all dimensions except the root length that has a significant distal curvature of the apex (**Figure 4**). The root has one root canal, with the pulp chamber centered within the root. On cross-section, the root shows a large variation in shape and may be triangular, oval, or round. The crown measures from 2 to 3 mm shorter than the central incisor. The labial aspect is similar with the central incisor but has more accentuated curvature, rounded incisal ridge, and rounded incisal angles. The mesial outline of the labial face resembles with the central incisor but with a rounded mesial-incisal angle. The distal outline is always more rounded and shorter than the mesial one. On labial surface, the cingulum is prominent with deep developmental grooves within a more concave lingual fossa. The mesial surface is similar with the central incisors one, the distal surface appears thicker than the mesial one, and the cervical line is usually more cervically than it is on the mesial surface. The incisal aspect can be similar with the central incisor, but it also may resemble with a small canine [1].

3.2.2 Mandibular incisors

Mandibular central incisors (3.1, 4.1) are single-root anterior teeth, the smallest ones with regular and symmetric surfaces and outlines. The crown is about half of the mesial-distal diameter of the maxillary central incisor and the labial-lingual diameter is only 1 mm less. Because of its size, the mandibular central incisor is the only tooth that has occlusal contact with only one tooth, the upper central incisor. Except

mandibular central incisor, if present, the maxillary third molars have occlusal contact only with the third mandibular molars. The permanent central incisors emerge at 6–7 years of age, after the permanent molars.

The labial surface is straight and its long axis is continued by the root, is wider in mesial-distally then the lingual surface, and is wider in the cervical third because of the presence of a smooth cingulum. From incisal view, more labial surface can be seen. The mesial and distal outline are parallel and slightly tapered toward cervical line. The labial surface is regular, convex, and flattened with a convexity in the middle third. The mesial-incisal angle formed by the incisal margin and mesial outline is straight with right angles and is characteristic of lateral lower incisor.

The lingual aspect is smooth with a concavity in the incisal third placed between the marginal ridges. In some cases, the marginal ridges are more prominent near the incisal edge and the concavity becomes more contoured. The lingual surface is flat in the incisal third and convex in cervical third. The cingulum is not marked by any developmental grooves.

The mesial surface is smooth in the incisal third, flatter in the middle third, and flat in the cervical third receiving a slightly convex line. Immediately below the middle third a concavity is present.

The distal surface is similar with the mesial one and has a developmental depression on the distal surface of the root with a deeper and defined groove. The cervical line is placed incisal with about 1 mm on the mesial surface.

Usually, the lower lateral incisor does not exhibit too many variations, however, labial surface may have a degree of labial inclination and over contoured mamelons separated by well-defined grooves (**Figure 5**). The pulp cavity and root canal are narrow but can also be very large in size. Usually, the tooth has one root canal narrow in mesial-distal section but wider on labial-lingual cross-section. This tooth may have the second root canal [1, 3, 11].

3.3 Maxillary and mandibular canines

The crown of upper canines is usually as long as the crowns of central incisors, but the single strong developed root is the longest than those of any teeth. Canine crowns have a single pointed cusp narrower more lingual than labial. The labial surface has a smaller mesial-distal diameter in comparison with central incisors with about 1 mm.

Figure 5.
Labial view of upper and lower central incisors in mixed dentition—the mamelons and developmental grooves are well defined.

The cervical line is concave toward incisal on facial and lingual surface and convex toward incisal on mesial and distal surface as it is for any tooth. The mesial outline is convex from the cervical line and forms the mesial contact area, which is approximately at the middle third to the incisal third junction. The distal outline is usually concave between the cervical line and distal contact area that is found in the center of the middle third of the distal surface.

The cusp tip is on the same line with the center of the root. The cusp has two slopes, the mesial one being shorter than the distal one. The labial surface of the cusp is smooth with ought any developmental lines, except the shallow depressions that divide the three lobes. The middle labial lobe is the most developed one and forms a ridge on the labial surface. The connection of the outline of the mesial slope of incisal ridge with the outline of the mesial surface forms a rounded angle positioned more incisal than the distal angle. The same link is present for the distal slope outline with the outline of the distal surface but in this case, the angle is more rounded and placed more cervically.

The lingual surface of the crown is narrower than the labial one and has a large cingulum which can look like a small cusp. In this morphology type, the ridges and developmental grooves of the lingual surface are well-defined. The marginal ridges are converging, and link with the cingulum and occasionally a well-defined lingual ridge is confluent with the cusp tip and extends near the cingulum. Between this lingual ridge and the marginal ones are evident shallow concavities called mesial and distal lingual fossae. In other cases, the lingual surface is smooth and the fossae and ridges are difficult to distinguish (**Figure 6**).

The lingual surface of the root is narrower than the labial one and the mesial and distal developmental depressions are evident on the root surface (**Figure 6**) [1, 3, 11].

The corwns of mandibular lower canines (3.3, 4.3) are narrower mesial-distal, less than 1 mm when compared with the maxillary ones but are longer with about 0.5–1 mm. The root is usually of same size or shorter and about 1 mm wider than lateral lower incisors. The labial surface has a pentagon shape, and the lingual surface is smoother with a less defined cingulum and marginal ridges being similar with the lingual surface of the lower lateral incisor. The cusp is less structured, and the cusp ridge is thinner labio-lingually in comparison with the upper canine. The cusp tip is usually on a line with the center of the root from mesial to distal, but it can also lie lingualy toward this line, same as mandibular incisors. Lower canines can have bifurcated roots, and this situation is not rare.

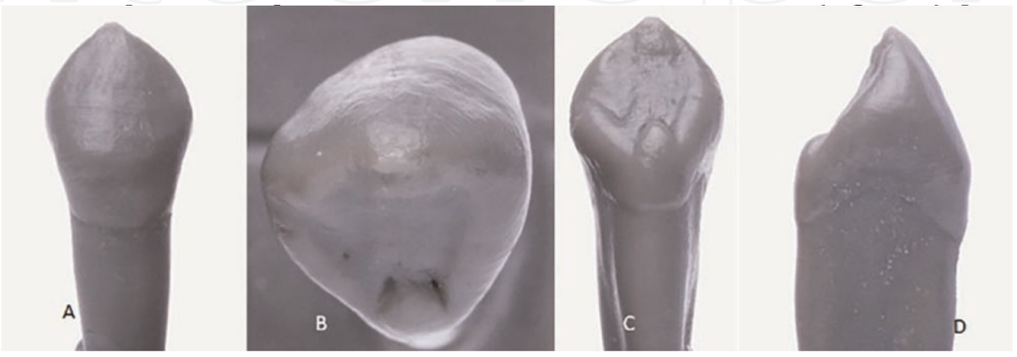

Figure 6.
A—"V" shape labial surface, labial ridge, mesio-incisal, and distal-incisal angles, B—incisal view of the cusp, labial, and lingual surface, C—lingual surface, cingulum, marginal ridges, developmental grooves, and fossae, and D—mesial surface with the high position of the cervical line.

The differences between the labial surfaces of maxillary and mandibular canines refer to a longer appearance of the lower one because of the narrower mesial-distal diameter. The height of the contact areas is placed above the cervix. The mesial outline is almost straight if the mandibular canine and contact area are positioned near the mesio-incisal angle, and the distal contact area is also placed toward incisal. The distal surface is very similar with the distal surface of the upper canine [1, 11].

4. Dental anatomy of lateral teeth

4.1 Common features of permanent premolars and molars

Premolars, referred as posterior or lateral teeth, are succedaneous teeth present only in permanent dentition and replace the deciduous molars. There are four premolars on each jaw and two on each quadrant. Premolars emerge between 10 and 12 years of age, before the permanent canines and second molars. First maxillary and mandibular premolars emerge earlier than second maxillary and mandibular premolars. These teeth are referred as bicuspids and are taking their place on the dental arch between canines and molars having a transitional morphology between the canines and molars.

Both maxillary premolars (1.4, 1.5, 2.4, 2.5) are developed from four lobes same as anterior teeth, but, comparing with the anterior, the lingual cusp is well-defined. The buccal cusps of first maxillary premolars are long and sharp similar with the canine's cusp. The second premolar has a shorter crown and root, the root being equal in height with the molar's roots though the crowns are slightly longer. Usually, the first maxillary premolar has two roots—one buccal and one lingual, and the second maxillary premolar has one root.

Permanent mandibular premolars (3.4, 3.5, 4.4., 4.5) have the same position on the dental arch as the maxillary ones, replace the mandibular deciduous molars, and are developed from four lobes, same as maxillary ones.

The first mandibular premolar has two cusps, the buccal one is larger and longer and the lingual one is much smaller, similar with the cingulum, and is nonfunctional, the morphology of this tooth being very similar with the mandibular canine's. Second premolars have three cusps, one buccal, and two small lingual cusps being more similar with a molar. The first mandibular premolar is smaller than the second one, but the first maxillary one is bigger than the second one.

Molar's most important function is mastication, though the crowns and roots are considerable in size, except the crown's height which is shorter than premolars. The two roots of mandibular molars and the three roots of maxillary molars are longer and curved.

Maxillary molars (1.6, 1.7, 1.8, 2.6, 2.7, 2.8) have three roots, two buccal and one lingual, one massive crown with well-developed two buccal cusps, and two lingual cusps. The first permanent maxillary molar emerges at 6 years old and soon after emerges the mandibular first molars. Both emerge distally by the second deciduous molars and do not replace any deciduous tooth. The first molar's occlusal relation is important for anticipating malocclusions.

Mandibular molars (3.6, 3.7, 3.8, 4.6, 4.7, 4.8) are the largest teeth, showing variations related to cusps number, from 3 to 5, size, occlusal surface, length of the crowns, and root. The outlines of the crowns are similar, quadrilateral, for all three molars, and each has two roots, a mesial, and a distal one. Third molars show a fusion of the two roots. The crowns are shorter cervical-occlusal, but the mesiodistal and buccal-oral diameters are much larger than those of the mandibular anterior teeth.

The roots are bifurcated, not so long but more bulky and thick, and assure a great anchorage and stability of the tooth in alveolar socket [1, 3, 11].

4.2 Maxillary and mandibular premolars

The first maxillary premolar (1.4, 2.4) emerges first after the canine at age of 10. Premolar's crowns have four axial surfaces (mesial, distal, buccal and lingual) and one occlusal surface. The two cusps, buccal and lingual, form the occlusal surface. Both are well shaped and defined. The buccal cusp is usually longer than the lingual one. The long axis of the crown is continuing the long axis of the root.

The buccal and the mesial aspect of this tooth is trapezoidal, and the crown shows a little curvature at the cervical line from a buccal point of view. Lingually, its gross outline is the reverse of the buccal gross outline.

When it comes to the distal aspect, the crown of the first maxillary premolar differs from the mesial aspect. The crown surface is convex at all points except for a small flat area, the curvature of the cervical line which is less on the distal than on the mesial surface, usually there is no groove crossing the distal marginal ridge of the crown, and the root is flattened on the distal surface above the cervical line.

The occlusal aspect of this tooth resembles a six-sided or hexagonal figure, which are called mesiobuccal, mesial, mesiolingual, distal, distolingual, and distobuccal. The two buccal sides are approximately equal, but the mesial side is shorter and the mesiolingual side is also shorter than the distolingual one. The occlusal surface is limited by the cusp and marginal ridges, which are in the same line with each other. The two ridges of the buccal cusp, the mesiobuccal, and distobuccal are in line, but their alignment is on distobuccal direction and for this reason the distobuccal cusp ridge is buccaly placed toward mesiobuccal cusp ridge. The two cusps are dived by the central groove placed in the center of the occlusal surface (**Figure 7**). Usually, the surface of the tooth has no supplemental grooves, which makes the surface relatively smooth but has two pits, a mesial and a distal.

In most cases, it has two roots and two pulp canals or even two buccal roots, similar with molars. In the less cases in which it only has one root, there are still two canals found. However, the first maxillary premolar root(s) may be irregularly curved or distally inclined in the apical third [1, 3, 11].

The maxillary second premolar (1.5, 2.5) is supplementing the first one in function. It is less angular, which gives a more rounded effect to the crown. Just like the first

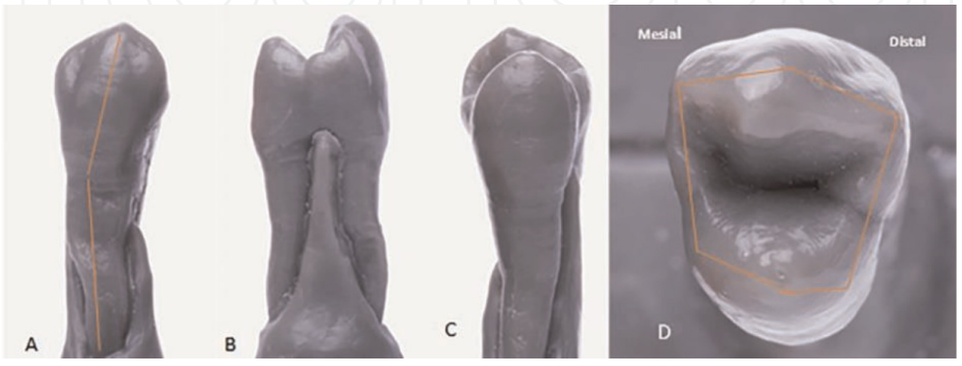

Figure 7.
Maxilary first premolar; A—Buccal surface—"V" shape buccal cusp, buccal ridge, and inclination toward the root, B—Medial surface—buccal cusp is higher than the lingual one, C—Lingual surface—lingual cusp is smaller than the buccal one, D—Occlusal surface—hexagonal shape, slopes of the cusps, marginal ridges, central groove, and mesial and distal pits.

one, it has two cusps, of the same height, but are less sharp. The buccal cusp is not as long as one of the first maxillary premolars.

From a buccal point of view, in many cases, the crown and the root of this tooth are thicker at their cervical area. Also, the buccal ridge of the crown may not be so prominent in comparison with the first maxillary premolar.

Lingual, the crown of this tooth has a trapezoidal form, and because the buccal and lingual cusps are almost the same length, the shape of it is generally symmetrical.

From mesial view, the buccal and lingual cusps are nearly equal as height, but the buccal one is slightly more prominent than the lingual one. The mesial marginal ridge is not crossed by a groove. Also, this surface of the crown is not marked by concavity, but it is evenly convex from the cervical line to the marginal ridge. Distally, the aspect of the second maxillary premolar is similar to the first one.

The occlusal aspect of this tooth is differentiated in many ways from the first maxillary premolar. The shape is ovoid instead of hexagonal, and the mesial and distal borders show little to any lingual convergence. This trait along with the equality of the cusps determines a rectangular shape of the tooth. The central groove is placed more lingual and as a result, the buccal cusp appears to be larger.

Most maxillary second premolars only have one canal and one root. In some exceptions, we can find two roots with two canals or one root with two canals [1, 3, 11].

4.2.1 The mandibular first premolar

The mandibular first premolar is the first tooth from the mandibular lateral group. It is situated between the canine and the second mandibular premolar, and it has characteristics from both.

The particularities that resemble those of the canine: the buccal cusp is long and sharp, and it is the only occluding cusp; the buccolingual distance is approximately equal with the canine one; the occlusal surface slopes sharply lingually, in cervical direction; the mesiobuccal cusp ridge is shorter than the distobuccal one; and the outline of the occlusal aspect resembles the outline of the incisal aspect of the canine.

The particularities that resemble those of the second mandibular premolar: except for the longer cusp, the outline of the crown and root resembles the second premolar; the contact areas, mesially and distally are similar; and the tooth has more than one cusp.

Buccal, the crown, is roughly trapezoidal. The cervical margin is represented by the shortest of the uneven sides. The middle buccal lobe is well-developed, creating a large, pointed buccal cusp. The distal cusp ridge is longer than the mesial one.

From a lingual point of view, the crown tapers toward the lingual, since the lingual measurement mesiodistally is less than that buccally. The lingual cusp is always small. A major part of the crown is made up of the middle buccal lobe. This makes it resemble the canine.

From the mesial aspect, the crown is roughly rhomboidal. This tooth shows an outline that is fundamental and characteristic to all posterior teeth when viewed from the mesial or distal aspect. The convexity of the outline of the lingual lobe is lingual to the outline of the root.

The distal aspect of the mandibular first premolar is different from the mesial one in some respects. The shape is spheroidal, and it has an unbroken curved surface.

Occlusal, we can observe considerable variation in the gross outline of the tooth. Both mandibular premolars exhibit more variations in form occlusally than the

maxillary premolars. The common characteristics of all mandibular first premolars, regardless of type, from occlusal point of view are: the buccal lobe in the middle makes up the major bulk of the tooth crown; the buccal ridge is prominent; and the mesiobuccal and distobuccal line angles are prominent even though they are rounded.

In most cases, it has one root and one canal, and in very rare cases, two roots and two canals. The mesial and distal surfaces of the roots are wider than the buccal an lingual, so the root canal will follow the same pattern [1, 3, 11].

4.2.2 The mandibular second premolar

The mandibular second premolar is resembling the first premolar from the buccal aspect only. Although the buccal cusp is not so pronounced, the mesiodistal proportion of the crown and its general outline are similar. There are two common forms of this tooth: the first form, which probably occurs more often, is the three-cusp type, and the second is two-cusp type. The two types differ mainly from the occlusal point of view.

From the buccal aspect, the mandibular second premolar (**Figure 8**) presents a shorter buccal cusp than the first one, with mesiobuccal and distobuccal cusp ridges describing angulation of less degree. The contact area seems higher because of the short buccal cusp.

Lingual, this tooth's crown shows considerable variations from the crown portion of the first premolar: lingual lobes are developed to a greater degree; less of this occlusal surface is visible. In the three-cusp type, the lingual development creates the greatest variation between the two teeth. In the two-cusp type, the lingual cusp development attains equal height as the three cusp. This surface of the crown is smooth and spheroidal, showing a bulbous from above the constricted cervical portion.

Mesial, the second premolar differs from the first one as follows: the crown and root are wider buccolingually; the buccal cusp is not centered over the root trunk; the lingual lobe development is greater; the marginal ridge is at right angles at the long axis of the tooth; less of the occlusal surface is visible; no mesiolingual developmental groove on the crown; the root is longer and generally slightly convex on the mesial surface; and the aspect of the root is usually blunter on the second premolar.

The distal aspect of this tooth is similar to the mesial aspect, except that more of the occlusal surface may be visible. This is possible because the distal marginal ridge is at a lower level than the mesial marginal ridge when we look at the tooth vertically.

From the occlusal point of view, the outline form of each type shows variations. The square or three-cusp type is square lingual to the buccal cusp ridges when

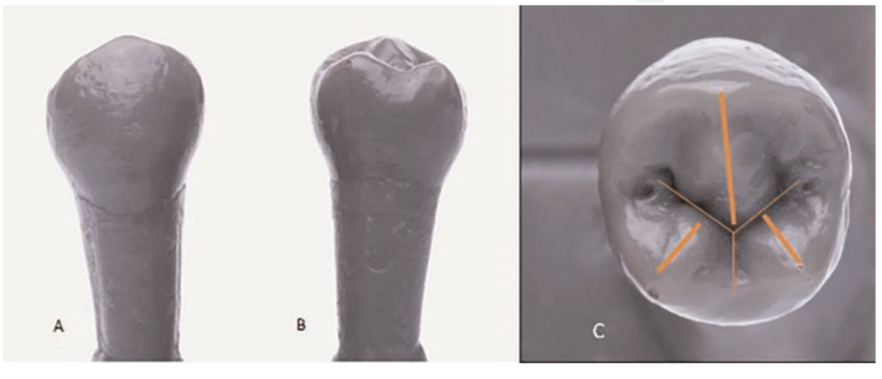

Figure 8.
Mandibular second premolar; A buccal surface and root, B lingual surface, and C occlusal surface.

developed. The three cusps are unequal: the buccal is the largest, the mesiolingual is next, and the distolingual is the smallest. The round or two-cusp type viewed from this point is much different than the three-cusp one: the outline of the crown is rounded lingual to buccal cusp ridges; there is some lingual convergence of mesial and distal sides, no more than in the square type; the mesiolingual and distolingual line angles are rounded; and there is one well-developed lingual cusp directly opposite the buccal one in a lingual direction.

For the majority of the population, the mandibular second premolar has a single root and a single root canal, but rarely it can also have two roots and two root canals [1, 3, 11].

4.3 Maxillary and mandibular molars

4.3.1 The maxillary first molar

The maxillary first molars (1.6, 2.6) are the largest and strongest teeth on the maxillary arch (**Figure 9**). It has four well-formed large cusps, and a small low functioning one called the Carabelli tubercle is placed on the mesio-lingual cusp. The main cusps are the mesiobuccal, distobuccal, mesiolingual, and distolingual, while the fifth, Carabelli tubercle, can take the form of a well-developed cusp, or it can downgrade to a series of depressions, grooves, and pits on the mesial portion of the lingual surface.

From a buccal aspect, the crown is roughly trapezoidal. It has cervical, and occlusal outlines representing the uneven sides, the cervical one being the shorter one. The buccal developmental groove dividing the buccal cusps is more or less equidistant between the mesiobuccal and distolingual line angles.

Lingually, the gross outline of the maxillary first premolar is the reverse of the buccal aspect. From this point, we can see the Carabelli tubercle situated on the mesiolingual cusp.

From a mesial point of view, we can observe the increased buccolingual dimensions and the cervical curvature of the crown outlines at the cervical third buccally and lingually. The cervical line is irregular, and it curves occlusaly. Distally, the gross outline of the first maxillary molar is the reverse of the mesial aspect.

The occlusal aspect of this tooth shows that its shape is roughly rhomboidal. An outline following the four major cusp ridges and the marginal ridges is especially so.

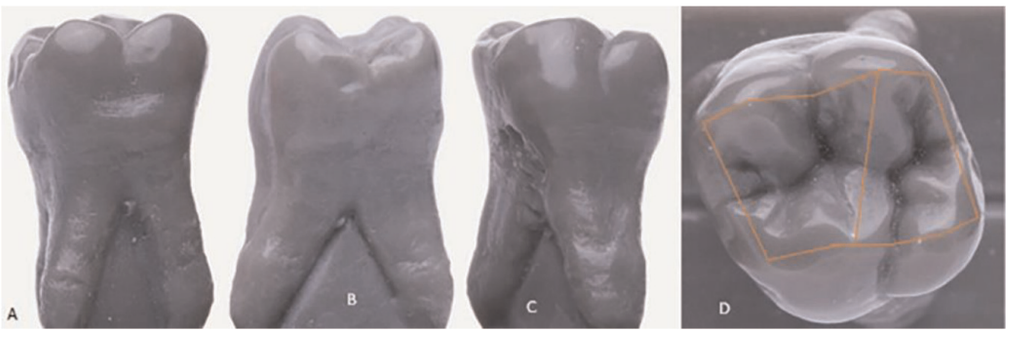

Figure 9.
A Buccal surface and buccal roots, B distal surface, distal-buccal and lingual root, C lingual surface and root, and D occlusal surface and oblique ridge.

Because of the mesiodistal and buccal-lingual diameter, the crown is wider mesially than distally and wider lingually than buccally. The largest cusp is the mesiolingual, followed by the mesiobuccal, distolingual, distobuccal, and Carabelli tubercle.

The occlusal surface has four fossae, two major fossae, the mesial one is triangular and the distal one is linear and two minors ones, a mesial and a distal one, both triangular in shape. The marginal ones are outlined by the marginal ridges, and the central ones are divided by the oblique ridge.

The oblique ridge is crossing the occlusal surface and makes the union of the triangular ridges of the distobuccal and mesiolingual cusps. The oblique ridge is reduced in size in the center of the occlusal surface and in some morphological variations is crossed by a developmental groove and the two major fossae are connected. The mesial and distal marginal ridges are irregular and confluent with the mesial and distal cusp ridges of the major cusps. The central fossa is concave and connected with developmental grooves and also short grooves, and central developmental pit.

There are three well-developed roots, two buccal and one lingual. They are well separated, which gives maximum anchorage against the forces that tend to unseat them. The lingual root is the largest, the mesiobuccal one is a little shorter but broader, and the distobuccal is the smallest. The percentage in which the first maxillary molars development deviates from the normal is small [1, 3, 11].

4.3.2 The maxillary second molar

The maxillary second molar supplements the first one in function. Its roots are as long or even longer than the first molar's. The distobuccal cusp is not as large and well-developed, and the distolingual cusp is smaller. The crown of this tooth is approximately 0.5 mm shorter cervico-occlusally than the one of the first molar, but buccolingually the dimensions are about the same.

Buccaly, the crown is slightly shorter cervico-occlusally and narrower mesiodistally than the maxillary first molar. The apex of the mesiobuccal root is on the same imaginary line as the buccal groove of the crown.

Lingual, there are a few important differences between the second and first molars. The distolingual cusp of the crown is smaller and there is no fifth cusp evident. Also, the distobuccal cusp may be seen through the sulcus between the mesiolingual and distolingual cusp.

From a mesial aspect, the buccolingual dimension is about the same as the one of the first molar, but the crown height is smaller. The roots do not spread as far buccolingually, staying within the confines of the buccolingual crown outline.

From a distal aspect, because the distobuccal cusp is smaller than the one of the first molar, more of the mesiobuccal cusp is visible from this angle. The mesiolingual cusp cannot be seen.

The occlusal aspect shows a rhomboidal shape in most cases, although in comparison with the first maxillary molar, the acute angles of the rhomboid are smaller, and the obtuse angles are greater. It is common to find supplemental or accidental grooves and pits on the occlusal surface of the second molar than are usually found on the first one and.

Most maxillary second molars have three roots and three canals. Although the presence of two canals in the mesiobuccal root of the maxillary second molar is not common, it may occur [1, 3, 11].

4.3.3 The maxillary third molar

All the third molars, mandibular and maxillary, show more development variations than any other teeth in the mouth. In describing the normal third maxillary molar, direct comparisons will be made with the second one, which he supplements in function. Their design is also similar. The maxillary third molar, known as "wisdom tooth," often appears as a developmental anomaly. It can vary considerably in size, contour, and relative position to the other teeth.

From a buccal aspect, the crown is shorter cervico-occlusally and narrower mesiodistally than the one of the second molar.

From the lingual point of view, there is only one large cusp and, therefore, no lingual groove. However, in some cases, the third molar with the same essential particularities has a poorly developed distolingual cusp with a developmental groove lingually.

Mesial, aside from the differences in size, the main features are the fused roots that have a bifurcation in the apical third. The root is considerably short in relation to the crown length. The crown and root portions are usually poorly developed, with irregular outlines.

From the distal point of view, most of the buccal surface of the crown is at sight. More of the occlusal surface may be seen than at the second molar, because of the more acute angulation of the occlusal surface in relation to the long axis of the root. The distance between the cervical line and the marginal ridge is short.

Occlusal, the third molar presents a heart-shaped outline. On this tooth, there are three functional cusps: two buccal and one lingual. It presents many accidental grooves unless the tooth is very much worn.

The number of roots can vary from one to five and the number of incased root canals from one to even six. However, in most cases, one- to three-rooted third molars are most frequent [1, 3, 11].

4.3.4 The mandibular first molar

The mandibular first molar (**Figure 10**) is the biggest tooth on the mandibular arch. They have five well-developed cusps: mesiobuccal, distobuccal, mesiolingual, distolingual, and distal. Although the crown is relatively short cervico-occlusally, the mesiodistal and buccolingual measurements provide a broad occlusal form.

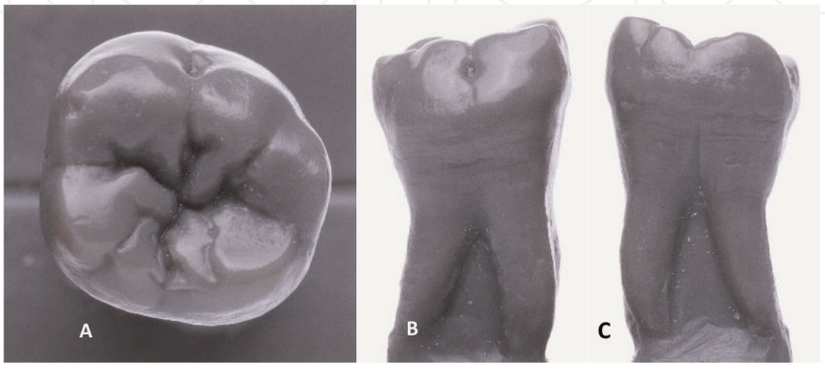

Figure 10.
Mandibular first molar; A—Occlusal surface with the three buccal cusps and two lingual, B—Buccal surface and three buccal cusps and the mesial and distal roots, and C—Lingual surface with two lingual cuspa and mesial and distal roots.

From a buccal point of view, the mandibular first molar's shape is roughly trapezoidal, and the cervical and occlusal outlines represent the uneven side of the trapezoid. If posed vertically, all fives cusps are visible. This side also shows two groves: the mesiobuccal developmental groove and the distobuccal developmental groove.

From the lingual aspect, there are three cusps visible: two lingual and the lingual portion of the distal one. The lingual ones are pointed, so the cusp ridges are high enough to hide the two buccal cusps' view. The lingual developmental grove serves as a line of demarcation between the lingual cusps. Some first molars show no groove on this side but show a depression lingual to the cusp ridges.

From the mesial point of view, if held with its mesial surfaces at right angles to the line of vision, two cusps and only one root are to be seen: the mesiobuccal and mesiolingual cusps, and the mesial root. The buccolingual height of the crown is greater at the mesial portion than it is at the distal portion. Also, the mesial root is longer than the distal one.

Distal, the gross outline of the tooth is similar to the mesial view. From this point of view, the distal cusp is in the foreground on the crown portion. The distal cusp is placed a little buccal to center buccolingually, and the distal contact area appears on its distal contour.

From the occlusal aspect, the mandibular first molar is somewhat hexagonal. The crown measurement is 1 mm greater mesiodistally than buccolingually. The crown converges lingually from the contact areas. The occlusal surface presents a major fossa and two minor fossae. The development grooves on the occlusal surface are the development groove, the mesiobuccal development groove, the distobuccal development groove, and the lingual development groove.

This tooth usually has two roots: mesial and distal. The mesial root usually has a more complicated root canal system because of the presence of two canals. The distal root usually has one canal, but often there can be two also [1, 3, 11].

4.3.5 The mandibular second molar

The mandibular second molar has four well-developed cusps: two buccal and two lingual, and it supplements the first molar in function. The anatomy differs in some details. Normally, the second molar is smaller than the first molar by a fraction of a millimeter, in all dimensions.

Buccal, comparing to the first molar, the crown is shorter cervico-occlusally and narrower mesiodistally. The crown and root have a tendency toward greater overall length, but they are not always longer. The only groove on this side is the buccal developmental groove, which acts like a line of demarcation between the mesiobuccal and distobuccal cusps.

From the lingual aspect, there are several differences between the second and first mandibular molars. The crown and root of the second one converge lingually but to a slight degree; the mesiodental calibration at the cervix lingually is always greater than the one of the first molar; the mesial and distal curvatures that describe the contact areas are more noticeable from the lingual aspect; they prove to be at a slightly lower level than those of the first molar.

From the mesial aspect, except for the dimension differences between the second and first mandibular molars, the differences are small: the cervical ridge buccally is less pronounced; the cervical line shows less curvature; and the mesial root is somewhat pointed apically.

From the distal aspect, the second molar is similar in shape to the first one, the only difference being the absence of a distal cusp and a distobuccal groove.

Occlusal, the mandibular second molar differs considerably from the first one. The small distal cusp of the first molar is not present at the second, and the distobuccal lobe development is sometimes more pronounced than the messiobucal one. Many of the second mandibular molars are rectangular from the occlusal point of view. Also, many of them show considerable prominence cervically on the mesiobuccal lobe only.

Most of the second mandibular molars have two roots with three root canals, two in the mesial root and one in the distal root. The proportions of the crown and roots are very similar to the first molar. The roots of the second molar may be straighter with less divergence from the furcation than in the first one and sometimes they are shorter [1, 3, 11].

4.3.6 The mandibular third molar

The mandibular third molar varies considerably in different individuals and presents many form and position anomalies. It supplements the second molar in function, but in general, it is showing irregular development of the crown portion, with undersized and malformed roots. However, its design conforms to the general plan of all mandibular molars. In many cases, third molars have five or more cusps, with the crown portions larger than the mandibular second molar. In these cases, the alignment and occlusion may not be normal because there is insufficient room available.

From a buccal aspect, mandibular third molars vary considerably in shape and outline. However, a well-developed third molar closely resembles the second molar. The crown is wider at contact areas mesiodistally than at the cervix, the buccal cusps are short and rounded, and the crest of contour, mesially and distally, is located a little more than at half of the distance from the cervical line to the tip of the cusps.

Lingual, the observations of the third molars coincide with the buccal aspect. When the tooth is well-developed, corresponds closely to the morphology of the second molar, except for size and root development. Same as for the mesial and distal points of view.

The occlusal aspect is in a big part similar to the second mandibular molar when the development facilitates good alignment and occlusion. They tend toward a more rounded outline and a smaller buccolingual measurement distally.

Most mandibular third molars have two roots and three canals. They are usually shorter, with a poor development. The roots may be separated with a definite point of bifurcation, or they may be fused in all parts of their way [1, 3, 11].

5. Conclusion

In conclusion, the present chapter summarizes the most essential terminology and dental anatomy of permanent dentition, though the domain is much more extended. Terminology is the basis for communication in the domain, and this aspect cannot be minimized. Dental practitioners need an accurate communication about the dental morphology with dental technicians and laboratories for performing highly esthetic and functional prosthodontic restauration. The highest esthetic in prosthodontics and odontotherapy is given by the finest details of dental morphology.

This chapter is presenting the nomenclature of permanent and deciduous teeth, age of emerge, and replacement of the deciduous teeth which are essential for clinical

evaluation and interception of any possible malposition or malocclusion. Each tooth has individualized morphology given by curves, lines, ridges, and angles all having a functional aim and basis. For this reason, it is important to be accurately reproduced in all dental practical domains. Dental morphology can vary for each individual because of the invariable norm in nature. The shape, size, and angles of the teeth are related to the sex and constitutional type and therefore it is necessary to have a starting point in the study of dental anatomy.

Dental anatomy is a teach in the first year of study of any dental school, being the basic for the study of dental medicine. Having strong knowledge about dental anatomy, future subjects such as endodontics, restorative dentistry, prosthodontics even extraction, surgery, implantology, and periodontics find their basics in dental morphology. Composite resins, high quality, and highly esthetic dental materials used in odontotherapy cannot reach highly esthetic fillings if are not modeled and laired according to the morphology of the teeth and the optical parameters of dentin and enamel. The biggest challenge is found for the restauration of the anterior teeth.

Restorative dentistry is approaching and considering all the dental concepts and details of dental morphology in elaborating the treatment plan. A successful clinician or a successful dental technician should be able to mentally create the picture of the teeth from any aspect. This mental picture should be correlated with the patience's appearance, to esthetics, and with natural appearance but in the same time to support the function of the dental-maxillary system.

Conflict of interest

The authors declare no conflict of interest.

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