

Educational Material of Dental Anatomy Applied to Study the Morphology of Permanent Teeth

Selma SIÉSSERE^{1,2}
Mathias VITTI¹
Luiz Gustavo de SOUSA¹
Marisa SEMPRINI¹
Simone Cecílio Hallak REGALO¹

¹*Department of Morphology, Stomatology and Physiology, Faculty of Dentistry of Ribeirão Preto, University of São Paulo, Ribeirão Preto, SP, Brazil*

²*Department of Morphological Sciences, Faculty of Dentistry of Uberaba, University of Uberaba, Uberaba, MG, Brazil*

The purpose of this report is to present educational material that would allow the dental student to learn to easily identify the morphologic characteristics of permanent teeth, and how they fit together (occlusion). In order to do this, macro models of permanent teeth with no attrition were carved in wax and later molded with alginate. These molds were filled with plaster, dental stone and/or cold-cured acrylic resin. The large individual dental stone tooth models were mounted on a wax base, thus obtaining maxillary and mandibular arches which were occluded. These dental arches were molded with plaster or dental stone. The authors suggest that these types of macro models allow an excellent visualization of the morphologic characteristics of permanent teeth and occlusion. Dental students are able to carve the permanent dentition in wax with great facility when they can observe macro models.

Key Words: macro models, dental morphology, permanent teeth.

INTRODUCTION

Dental anatomy, as a branch of biology, comprises the study and organization of the tooth as an isolated entity and as an integrant of both the dental and the masticatory systems. Although anatomy, in general, seems to be a descriptive and static science, dental anatomy escapes from this rule, because it needs to explain the reason for the existence of dynamic functions of the teeth (1). Teeth, dental arches, and periodontal tissues constitute the major part of most dental practices (1).

Teeth are mainly mineralized structures, situated in the initial section of the digestive system. Their origin is the oral mucosa epithelium. Human teeth are distributed in the maxilla and mandible. Among their many functions are skull-facial growth, chewing, deglutition, phonation, aesthetics, and protection to soft tissues. Human teeth have a rich variety of anatomic

characteristics and thus deserve detailed study (2).

The professional (surgeon/dentist) who is committed to the preservation of human teeth should have a clear understanding of the characteristics and fundamentals of dental morphology and must develop enough manual dexterity to reproduce any part of the dental system, maintaining perfect correlation with the whole. Of great importance is a knowledge of function and anatomic dental elements, a knowledge that is intimately related to most dental areas. The use of computer-graphics to aid in teaching three-dimensional dental anatomy (3) and the development of a computer-assisted learning program designed to teach the anatomy of adult dentition (4) are current realities in teaching. Nonetheless, drawing and dental carving are considered to be very practical and objective methods for teaching and motivating dental students to obtain this knowledge (5).

The purpose of this study was to present the

Correspondence: Dr. Mathias Vitti, Faculdade de Odontologia de Ribeirão Preto, USP, Avenida do Café s/n, Monte Alegre, 14040-904 Ribeirão Preto, SP, Brasil. e-mail: mvitti@forp.usp.br

educational material that was used for teaching and learning dental morphology in the discipline of Dental Anatomy of the Faculty of Dentistry of Ribeirão Preto (FORP-USP).

MATERIAL AND METHODS

In agreement with the morphology of natural teeth without attrition, macro models were carved out using Horus dental carving wax (Petrópolis, RJ, Brazil) associated with Horus utility wax. A digital caliper rule (Mitutoyo Absolut Digimatic, Japan) was used to obtain the measurements of the natural permanent teeth of both the maxillary and mandibular arches of the same individual. The following measures were made: length of crown, width of crown in mesiodistal (MD) and buccolingual (BL) directions, width of tooth necks in MD and BL directions, and cervical curves mesial (M) and distal (D). The length, width and thickness of the



Figure 1. Crown macro model in wax carving of a first mandibular left molar. Lingual view.

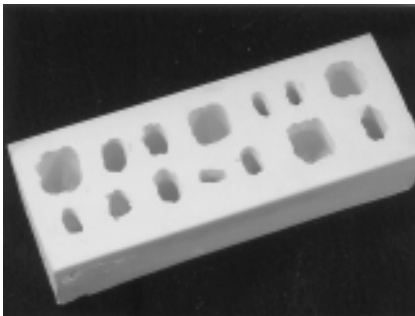


Figure 2. Crown alginate mold.

roots were also measured. Areas of greater width between the points used as a reference to obtain tooth measurements were also considered for both the crown and the root. The obtained measurements were then magnified 6X to establish the proportion between the macro models and the natural teeth (6:1) and the wax carving was then made. In this phase, only the crown was carved (Figure 1). After carving, the wax was smoothed using a wax carver and silk stockings. These wax macro models were then molded with alginate (Jeltrate, Dentsply, Petrópolis, RJ, Brazil), thus obtaining the mold (Figure 2). Next, the mold was filled with Wilson plaster stone type III (São Paulo, SP, Brazil), which was leaked with the aid of a plaster vibrator, to avoid the inclusion of air bubbles. Hence, macro models of permanent teeth crowns were obtained (Figure 3).

After all macro models of the crowns of all permanent teeth were finished, they were mounted one by one in a base of wax #7, thus obtaining the maxillary and mandibular arches (Figure 4). These macro models were mounted in occlusion.

These wax mounted arches were molded again using Jeltrate Dentsply alginate and the mold was then immediately filled with plaster stone type III (Wilson), obtaining the maxillary and mandibular arches totally in plaster (Figure 5).

Complete macro models (crowns and roots) were



Figure 3. Crown macro model in plaster stone of a first maxillary right premolar. Distolingual view in which anatomical accidents of the occlusal face can be observed.

also made from auto-polymerized acrylic. In order to obtain the macro models in auto-polymerized acrylic, macro models were initially carved using dental carving wax. The crown and the root were carved in agreement with the morphology and initially obtained measurements of the natural permanent teeth, which were later magnified 6X (Figure 6). In the same way, the wax was smoothed and then the mold was obtained with the Jeltrate alginate (Figure 7). Colorless auto polymerized acrylic resin (Jet, São Paulo, SP, Brazil) was used to immediately fill the mold, with the aid of a plaster



Figure 4. Macro models mounted in wax base. *Top*: maxillary arch. *Bottom*: mandibular arch.

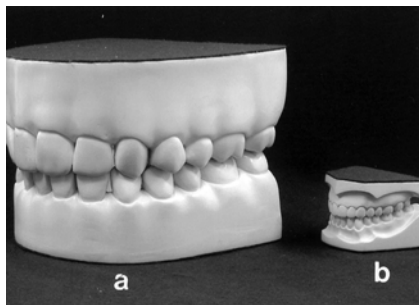


Figure 5. Plaster arches in occlusion. a) Macro models. b) Models with normal size.

vibrator.

Following the polymerization of the acrylic, we proceeded to polishing using sandpaper ribbon and a mandrel coupled to a low-speed instrument. Pumice



Figure 6. Macro model (crown and root) in wax carving of a first maxillary right molar. Distopalatine view.

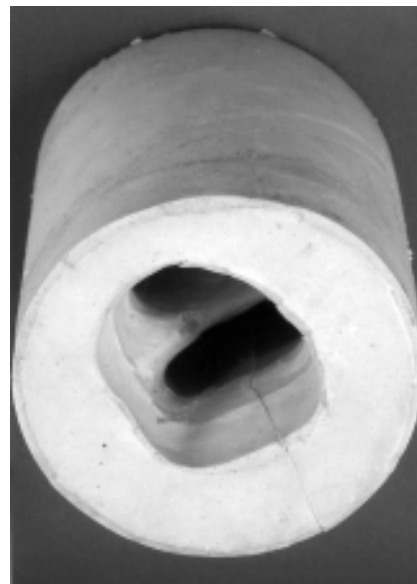


Figure 7. The alginate mold of the macro model in wax.

stone and water were also used together with a felt wheel, coupled to a buffing wheel, providing better smoothing and burnishing of the macro model (Figure 8).

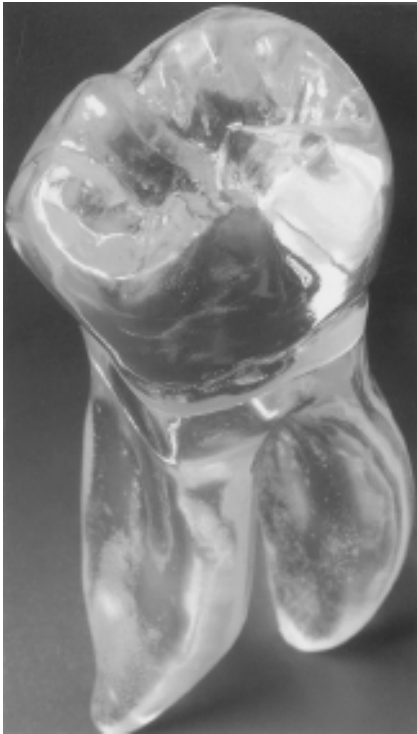


Figure 8. Macro model in autopolymerized acrylic resin of a first mandibular left molar. Distolingual view.

RESULTS

This work resulted in the production of plaster crown models of the maxillary and mandibular arches, mounted with all dental crowns in occlusion, as well as macro models in autopolymerized acrylic with the crown and dental root.

This educational material is reproduced yearly in plaster models for each student of the Dental Anatomy Discipline of FORP-USP and used during the practical classes of this discipline for teaching and learning to aid the student during individual dental carving, as well as for the interpretation of dental occlusion.

DISCUSSION

Together with anatomy and dental morphology

studies, dental carving techniques and methods are extremely important. Research and activities in dental anatomy carving can also be directly related to the practice of Restorative Dentistry. The importance of the recognition of morphologic and anatomy-functional characteristics of teeth, seeking adaptation to individual conditions, has been acknowledged (6).

The development of alternative methods, such as computer-graphics, to aid in teaching three-dimensional dental anatomy (3) and Tooth Morphology, which is a computer-assisted learning program designed to teach the anatomy of the adult dentition (4) are important for motivating and teaching students. The Tooth Morphology program, in combination with interactive class meetings, has replaced traditional dental anatomy lectures (4); however, it does not replace the practice of dental sculpting.

The purpose of carving is the reintegration, by means of total or partial reconstruction, of one or more dental elements in its form and function inside the arch, re-establishing the lost balance in the physiology of mastication. Secondly, it is a precious auxiliary method in the assimilation or re-memorization of the anatomical knowledge and a process of manual ability, which is useful and necessary in professional activities (5).

Professionals require the knowledge of dental element morphology on a daily basis as a direct consequence of the need to constantly restructure the dental organ and reinstate its function. Dental form is extremely varied and difficult to reproduce. The normal anatomical form of teeth assures the efficiency of mastication (5).

The external anatomy of teeth should be very well known. Theoretical studies are not enough. The student should study the detailed description of the tooth with copies of them in their hands. Besides the study of extracted natural teeth, macro models made of plaster or resins and dental arch models help to understand the aspects that must be taught. The drawing and carving of teeth in wax are also valuable means of learning dental anatomy, besides developing psychomotor ability (7).

Macro models facilitate the assimilation or re-memorization of anatomy because they show all anatomical details that need to be reproduced. In this way, the student who practices dental carving exercises is able to develop normal anatomical form of teeth, rees-

tablishing the function of the dental element. Macro models allow a better visualization of the morphologic characteristics of permanent teeth and students of dental anatomy of the Dentistry course of FORP-USP are able to easily carve permanent teeth into wax guided by the macro models. Macro models of the dental arches allow a better visualization and an easier understanding of the occlusion of permanent teeth.

RESUMO

O objetivo deste trabalho é de apresentar um material didático que permita ao aluno de odontologia, identificar com maior facilidade, as características morfológicas dos dentes permanentes assim como entender mais facilmente a oclusão dos dentes. Para isto, foram confeccionados macromodelos de dentes permanentes sem desgaste, que foram obtidos da seguinte maneira: foram esculpidos macromodelos em cera; posteriormente estes foram moldados com alginato e os moldes foram preenchidos com gesso pedra e resina acrílica. Os macromodelos de gesso pedra foram montados em oclusão em uma base de cera #7 sendo obtidas desta maneira as arcadas superior e inferior. Estas arcadas montadas em cera foram moldadas novamente e o molde foi preenchido com gesso pedra, obtendo então as duas arcadas totalmente em gesso. Os autores concluíram que os macromodelos permitem uma melhor visualização das características morfológicas dos dentes permanentes bem como da oclusão; os alunos conseguem esculpir dentes permanentes em cera, com maior facilidade, quando observam macromodelos.

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