


Integration of Dental Sculpture and Removable Partial Denture courses in developing instructional material for pre-clinical use

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Abstract The objective of this experience report was to integrate the curricular components of Dental Sculpture and Removable Partial Dentures through the creation of macromodels with rest seat in anterior and posterior teeth to be used as auxiliary teaching material. The methodology had a descriptive approach. Wax macromodels were made of the following teeth: upper and lower canines, upper premolar and upper and lower molars. Next, rest seats were prepared in the elements, reproducing the characteristics of the Type II or Prosthetic Mouth Preparation stage. Macromodels with the individual characteristics of single and double (interdental) occlusal rest seats in posterior teeth were obtained, as well as rest seats in cingulum, both created by wear and with composites. Given the knowledge of dental anatomy and the manual skill developed in Dental Sculpture, the macromodels made enabled better visualization of the morphological characteristics of the rest seats, being considered a complementary resource in the teaching-learning process in Removable Partial Prosthesis.

Descriptors: Education, Dental. Models, Dental. Sculpture. Denture, Partial, Removable. Inlay Casting Wax.

Integración de los componentes curriculares Escultura Dental y Prótesis Parcial Removible en el desarrollo de material didáctico auxiliar para el preclínico

Resumen El objetivo de este relato de experiencia fue integrar los componentes curriculares Escultura Dental y Prótesis Parcial Removible mediante la creación de macromodelos con nichos en dientes anteriores y posteriores para ser utilizados como material didáctico auxiliar. La metodología tuvo un enfoque descriptivo. Se realizaron macromodelos en cera de los siguientes dientes: caninos superiores e inferiores, premolares superiores y molares superiores e inferiores. A continuación, se prepararon nichos en los elementos, reproduciendo las características de la etapa de Preparación de la Boca Tipo II o Prótesis. Se obtuvieron macromodelos con las características individuales de nichos oclusales simples y dobles (interdentales) en dientes posteriores, así como nichos en cingulados, ambos creados por desgaste y adición. Dado el conocimiento de la anatomía dental y la habilidad manual desarrollada en la Escultura Dental, los macromodelos realizados permitieron una mejor visualización de las características morfológicas de los nichos, considerándose un recurso complementario en el proceso de enseñanza-aprendizaje en Prótesis Parcial Removible.

Descriptor: Educación em Odontología. Modelos Dentales. Escultura. Dentadura Parcial Removible. Colado de Cera para Incrustaciones.

Integração dos componentes curriculares Escultura Dental e Prótese Parcial Removível no desenvolvimento de material didático auxiliar para a pré-clínica

Resumo O objetivo deste relato de experiência foi integrar os componentes curriculares Escultura Dental e Prótese Parcial Removível por meio da confecção de macromodelos com nichos em dentes anteriores e posteriores a serem usados como material didático auxiliar. A metodologia teve abordagem descritiva. Foram confeccionados macromodelos em cera dos seguintes elementos dentários: caninos superiores e inferiores, pré-molar superior e molares superiores e inferiores. Em seguida, nichos foram preparados nos elementos, reproduzindo as características da etapa de Preparo de Boca Tipo II ou Protético. Macromodelos com as características individuais de nichos oclusais simples e duplo (interdental) em dentes posteriores foram obtidos, bem como com nichos em cingulos, tanto confeccionados por desgaste como por acréscimo. Diante do conhecimento da anatomia dental e a habilidade manual desenvolvidos na Escultura Dental, os

macromodelos confeccionados permitiram uma melhor visualização das características morfológicas dos nichos, sendo considerado um recurso complementar no processo ensino-aprendizagem em Prótese Parcial Removível.

Descritores: Educação em Odontologia. Modelos Dentários. Escultura. Prótese Parcial Removível. Moldagem de Cera para Incrustações.

INTRODUCTION

Edentulism is a public health problem that reflects the severity of the oral health conditions of a given population¹, with alternative dental prosthesis being indicated to restore the absence of those elements. Therefore, prosthetic rehabilitation aims to maintain the patient's function, aesthetics, health and quality of life, replacing lost teeth with prosthesis on mucosa, teeth or implants².

The prevalence of use and need for prosthesis by the Brazilian population is still high, at 78.2% and 68.7%, respectively. According to data from the SBBrazil 2010 epidemiological survey, approximately 40% of adults (aged between 35 and 44 years) needed a partial prosthesis³.

The Removable Partial Denture (RPD) presents itself as a rehabilitation option with ease of cleaning by the patient and reversibility given the minimally invasive preparations that are performed^{4,5}. However, in order for it to achieve the objectives of restoring all functions, the mouth must be prepared to receive the prosthetic device⁶. This phase is defined as type II or prosthetic mouth preparation and is an essential step for the success of RPD, in which procedures are carried out that involve modifying the anatomy of the supporting teeth and changing the contour of the crown, such as: preparing guide planes, enlargement of girdles⁷, creating retentive areas, adaptation of the prosthetic equator to the retention and opposition arm, in addition to creating rest seats which are cavities prepared to house the respective supports, constituting elements responsible for transmitting chewing loads and supporting the prosthesis^{8, 9}.

In a change of concept of the RPD curricular component of the Dentistry course at the Federal University of Paraíba (UFPB), active methodology techniques, such as Case-Based Learning, Brainstorming and the Inverse Classroom, as well as complementary teaching resources such as infographics have been introduced during practical activities, seeking to improve the teaching-learning process¹⁰. However, technical skill regarding the mouth preparation stages is essential for training dental surgeons, and continues to be developed in the pre-clinical laboratory, without modifications over the last few years using practical demonstration on dental mannequins by professors which are then reproduced by the students.

The use of dental macromodels as a complementary resource in teaching has already been evidenced in the literature in the practice of Dental Sculpture¹¹ and appears as an alternative for use in practical RPD classes, providing the student with better visibility and easy identification of the morphological characteristics of the teeth prepared with the rest seats and their respective details, in an expanded form. Therefore, the objective of this study was to integrate the curricular components Dental Sculpture and Removable Partial Denture courses through participation of a student monitor in creating macromodels of anterior and posterior teeth with rest seats preparations to be applied as a complementary teaching resource in practical RPD laboratory classes.

EXPERIENCE REPORT

This experience report presents the Dental Sculpture and Removable Partial Denture curricular components of the UFPB Dentistry Course as scenarios, developed by professors and an undergraduate student (monitor).

Plaster macromodels already used in the practices of the Dental Sculpture curricular component were reproduced with industrial silicone (Blue Silicone Rubber PS- Redelease®, Campinas, SP, Brazil) by RPD professors to create the following elements: upper and lower canines, upper premolar and upper and lower molars. Then, the Dental Sculpture monitor and professors continued with casting each of the matrices using inlay wax (Opaque Wax PK-Kota®, São Paulo, SP, Brazil). The finishing of the wax macromodels was carried out with a Hollenback 3S sculptor (Golgran®, São Caetano do Sul, SP, Brazil) and silk stockings, following the individual characteristics of each element, as recommended in the UFPB Dental Sculpture classes. Detergent, cotton and water were used for polishing.

Once the polishing stage of the wax macromodels was completed, the rest seat preparation phase began, which were created using the Hollenback 3S carver, reproducing all the characteristics of the occlusal and cingulum rest seat, and executed in the Mouth Type Preparation stage II or Prosthetic, as recommended in the literature and detailed below.

Rest seat in posterior teeth

Simple occlusal rest seat (upper premolar and molar): the marginal ridges on the occlusal surfaces of the posterior teeth are limited by secondary grooves that generate mesial and distal fossa⁷, important for guiding the beginning of preparation. The rest seat for the premolar and molar elements (Figures 1 and 2) were prepared in the mesial fossa with grinding of the marginal crest using the Hollenback 3S carver. The simple occlusal rest seat has a triangular shape with the base facing the marginal crest and the apex facing the center of the tooth, which enables better decomposition of forces^{12,13}. The pulp wall is flat, which generates forces closer to the long axis of the tooth^{13,14}, and expulsive axial walls. Although it has a triangular shape, the apex must be rounded, as well as the external margins¹⁴, which gives it a spoon shape, with internal angles and the angle between the pulpal wall of the rest seat and the proximal surface, referring to the guide plane, rounded, so that there is no concentration of occlusal support forces on the tooth during function¹⁵. Furthermore, these rounded angles provide better adaptation of the metallic structure¹². Its dimensions were half the width of the distance between the buccal and lingual cusps, and in the mesio-distal direction it involved half of the root in a single-rooted tooth and covered one of the roots in a bi-rooted tooth⁸, which is also equivalent to 1/3 of the mesio-distal distance¹³. The depth of the rest seat must be approximately 1.5 mm so that there is no exposure of dentin¹² and the occlusal support has adequate resistance¹⁶.

Interdental rest seat (lower molars): indicated to contain the respective interdental rest, it is characterized as two simple occlusal rest seat joined at the base. Its dimensions are the same as those described for the simple occlusal rest seat, however channels must be opened in the buccolingual direction for the retention arms to pass through and opposition of the double circumferential clasp through wear of the proximal aspects of the respective cusps, without compromising the proximal contact point⁸ (Figure 3).



Figure 1. Simple occlusal rest seat prepared in maxillary premolar macromodel.

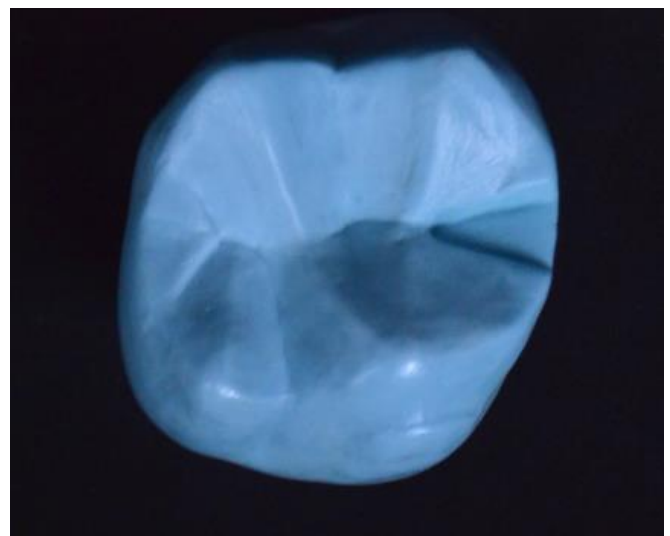


Figure 2. Occlusal rest seat prepared in maxillary molar macromodel.



Figure 3. Interdigital rest seat prepared in a macromodel of lower molars.

Rest seat in anterior teeth (upper and lower canines)

The crown of the upper canine resembles a pentagon, convex in all directions, with a well-developed cingulum on its lingual surface⁷, which enables preparing the rest seat by wear in this region. In addition to favoring aesthetics, preparing rest seat in the cingulum region results in a reduction in the lever arm due to its proximity to the fulcrum center of the tooth, and consequently transmitting chewing loads closer to the long axis of the supporting tooth¹². In the presence of a prominent cingulum with sufficient enamel thickness, the rest seat is made with the following shape: half-moon or inverted smile, starting at a marginal ridge passing over the cingulum and ending at the other marginal ridge (lingual view). It is concave or in a V14 shape in the buccolingual direction (Figure 4). In the case of less prominent cingulum, the rest seat may have a step shape with the long axis of the tooth and rounded internal angles⁸. Furthermore, when located on the most distal supports with free ends, the rest seat must be prepared on the palatal/lingual surface most displaced towards the mesial of the element, in a proportion equivalent to 1/3 of the mesio-distal distance and 1/3 of the bucco-lingual distance¹³ (Figure 5).



Figure 4: Cingulum rest seat prepared in maxillary canine macromodel.



Figure 5: Cingulum rest seat displaced mesially in lower canine macromodel.

Rest seat with composite in anterior tooth (lower canine)

The lower incisors and canines generally have poorly developed cingulum, making it necessary to prepare rest seat by addition. Furthermore, due to the reduced bucco-lingual distance, especially of lower lateral and central incisors, this addition of light-cured resin is essential to contain the supports and provide adequate support to the RPD. The addition rest seat must reproduce the characteristics previously described for rest seats prepared by wear. These restorations are normally necessary in lower Kennedy Class I due to the anatomy and extension of the lingual surface of the lower teeth and the non-interference with the patient's occlusal contacts. In the most distal supports of partially edentulous arches, the restoration must be fabricated further towards the mesial side of the lingual surface⁸. In the macromodel, the addition was carried out with dark blue encrustation wax, using dripper no. 2 heated in an alcohol lamp. After sculpting with a Hollenback 3S sculptor following the characteristics of rest seat preparation in an anterior tooth, finishing and polishing followed (Figure 6).



Figure 6: Cingulum rest seat by composite prepared in a lower canine macromodel.

FINAL CONSIDERATIONS

The use of pedagogical tools and strategies that stimulate learning has been recommended by the National Curricular Guidelines¹⁷ and disseminated in Dentistry courses. The combination of techniques adapted from Case-Based Learning (CBL) and Brainstorming in the RPD laboratory classes at UFPB worked as a promising tool in stimulating critical thinking in clinical decision-making in the following curricular components¹⁰. In this context, the development of macromodels for use during practical mouth preparation activities functioned as a didactic resource that facilitates the teaching-learning process in the student's understanding during laboratory classes. Furthermore, it was noticed that the monitor was stimulated during the practice of dental sculpture as it worked on the development of a new didactic-pedagogical tool.

In Dental Prosthesis, as in other areas of Dentistry, the development of the student's manual skills is important for their training. Strategies that combine the use of macromodels and videos can improve learning and have shown positive results¹¹. The results of Souza et al. (2018)¹⁸ pointed out the students' understanding of the validity of using three-dimensional macromodels as a resource to facilitate understanding of the technique used, but highlighted that they do not replace the practical demonstration of preparations by the teacher.

In the pre-clinical Removable Partial Denture course at UFPB, the student's technical skill is developed in the laboratory on dental mannequins after practical demonstration by the professor. The objective of the faculty with this article was to take the first step: to describe the experience in creating this auxiliary teaching material to be used in laboratory practices, meaning to present a new approach to be implemented in teaching RPD as an alternative to the previously used model. The implementation of this teaching resource through visualizing macromodels distributed on the benches already carried

out this academic semester enabled the student to better sediment the content, helping them to understand the details and carry out the preparations appropriately. Future studies that qualitatively and/or quantitatively evaluate the impact of using these macromodels as a new tool in the learning of undergraduate Dentistry students at UFPB will be conducted.

The dissemination of teaching materials and strategies that stimulate the student-centered teaching-learning process must be encouraged. Furthermore, the current work allowed integrating student monitors and teachers, contributing to improve undergraduate courses, and stimulating teaching skills. The monitor actively participated in the process of making the macromodels, from wax reproduction to refinement, finishing and polishing, in accordance with the knowledge acquired in the Dental Sculpture curricular component. Their perception regarding their role in developing the material was interesting: *“Oral rehabilitation using prostheses, as it is a dense content in undergraduate courses, requires methodologies that enable theoretical knowledge and reinforce students’ skills. The integration of topics already covered previously, such as in the Dental Sculpture discipline, provides the basis for students and instructors to learn about anatomical particularities and reproduce the sculptures of dental elements in wax, facilitating understanding of the particularities of Removable Partial Dentures. The participation of monitors in the creation of wax macromodels generated questions regarding the use and structural modifications of the dental anatomy itself in favor of oral rehabilitation. In this process, the addition or wear of wax enabled continuous practice and the necessary adjustments requested by teachers, as dental wax is a material that is easy to manipulate and plastic, thereby allowing the necessary adjustments. The focus of this work on the elaboration of complete dental anatomy in wax followed by structural adjustments to support a RPD provided the monitors with a new vision of prosthetic rehabilitation through the perception of crucial aspects for the success of oral rehabilitation. The discussion between teachers and monitors about waxing also made it possible to dynamically associate different contents in the teaching and learning process. Furthermore, teamwork and the improvement of visual and manual skills of the monitors were developed, constituting characteristics which are part of the technical-scientific training of the dental surgeon”.*

The resulting knowledge of dental anatomy and the manual skill developed in the practice of Dental Sculpture, and the macromodels made enabled better visualization of the morphological characteristics of the rest seats, being considered a promising complementary resource in the teaching-learning process of Removable Partial Denture.

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