

# Perception of dental professors about the use of human teeth as an educational resource in pre-clinical activities

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## ABSTRACT

The present study aimed to assess the dental professor perception in relation to the use of extracted human teeth and artificial teeth in pre-clinical activities. A questionnaire was used with objective and subjective questions applied to professors of dental surgeons from the Dentistry Course Centro Universitário de Anápolis - UniEVANGÉLICA. Of the 50 professors who met the eligibility criteria, a response rate of 76% was obtained. The average length of time for professors to graduate is  $20 \pm 9.7$  years and the average teaching time is  $17 \pm 10.5$  years. When asked whether human teeth should be used as educational resources, the majority (89.4%) answered yes, and concerning the acquisition of psychomotor skills by students, 68.4% believe that human teeth are more advantageous. He mentioned the disadvantage of using aspects related to biosafety (36.8%), difficulty in obtaining teeth (21%), risks of commercialization (15.7%), and ethical aspects (15.7%). Most dental professors in the evaluated course understand that the use of human teeth in pre-clinical activities has greater pedagogical potential, in addition to favoring the development of motor skills compared to the use of artificial teeth.

**Descriptors:** Education, Dental. Tooth. Faculty, Dental.

## 1 INTRODUCTION

The National Curriculum Guidelines for undergraduate courses in Dentistry (DCN) published in 2002, as well as the opinion of its update (2018) 2, list the contents that must be addressed in an integrated manner during the student's education: biological and health sciences; human and social sciences; and dental sciences. Among the curricular components that work with the contents of the dental sciences, there are those that seek the improvement of psychomotor skills for the execution of clinical procedures. However, before training with patients, preclinical training is recommended. Traditionally, pre-clinical activities use extracted human teeth, currently, it is also used artificial teeth, of opaque or transparent resin, or even blocks of resin.

The studies have pointed out the advantages and disadvantages of the use of these different models. In regard to the use of human teeth stand out the need for disinfection and sterilization procedures such as the risk of cross-infection; the variability anatomical, which hampers the assessment of the individual performance of a student; and even the difficulty of obtaining tooth, which also highlights a moral and legal dilemma for the practice, which may favor illegal acts of commercialization of human teeth, as reported by undergraduate students in recent research on the topic.

Artificial teeth, on the other hand, pose no risk of infection, are available in large numbers and they are uniform, which allows a validated evaluation, and also to allowing students to practice the same procedure until they obtain consistently good results with a given technique or for a given anatomical challenge. On the other hand, the difference between the hardness of the resin compared to tooth and the difference in viscosity of the material of the pulp chamber and the root canal are pointed out as failures, which

makes it difficult to remove for endodontic practices.

Despite these differences between extracted human teeth and artificial teeth, research has sought to highlight the perception of professors and students in relation to the differences between these two groups, and whether it is possible to replace the use of human teeth with artificial teeth, comparing student performance during pre-clinical activities. This research investigated the perception of the professors of the Dentistry Course at the University Center of Anápolis - UniEVANGÉLICA about the use of human teeth in relation to artificial teeth in pre-clinical activities.

## 2 METHODOLOGY

This research was approved by the Research Ethics Committee of the Centro Universitário de Anápolis - Unievangélica (CAEE 80561317. 8.0000.5076). The study population consists of 67 professors. Nevertheless, only professors with a background in Dentistry were included in the sample and those directly involved, it was excluded the authors of the present study, thus, resulting in 50 eligible professors. Data collection took place through the application of a questionnaire sent by the GoogleForms® platform, which was resent twice, with an interval of 10 days. After this period, the non-responding professors were contacted in person, providing the opportunity to answer in a printed questionnaire.

## 3 RESULTS

From 50 professors eligible for the study, 38 responded to the questionnaires, with a response rate of 76%. The average time since the graduation of professors is 20 years ( $\pm 9.7$ ) and the average teaching time is 17 years ( $\pm 10.5$ ). Only one (2.6%) professor said he had not used

**General aspects**

1. In what year did you complete your Dental degree? \_\_\_\_\_
2. Currently, what is your area of expertise in the Dentistry course? \_\_\_\_\_
3. How long have you been teaching in this area (specify each)? \_\_\_\_\_

**Use of teeth as an educational resource**

4. During your graduation, did you use human teeth extracted in pre-clinical activities?  
 Yes  No  Do not remember
5. In which areas? You can tick more than one if applicable.  
 Anatomy and dental sculpture  Restorative Dentistry  Endodontics  Prosthesis  Others:  
 \_\_\_\_\_
6. How did you get access to these teeth (specify for each of the areas)? \_\_\_\_\_
7. Do you consider that extracted human teeth should be used in laboratory practice as an educational resource?  
 Yes  No  I don't know Please justify your answer \_\_\_\_\_
8. Are there any advantages to using extracted human teeth in laboratory practice?  
 Which are? \_\_\_\_\_
9. Are there any disadvantages to using extracted human teeth in laboratory practice?  
 Which are? \_\_\_\_\_
10. Regarding the didactic potential of the educational resource, what type of teeth would guarantee a more advantageous laboratory practice?  
 Artificial teeth  Human teeth  Both equally What kind of didactic potential is related to your answer? \_\_\_\_\_
11. Regarding the development of psychomotor skills by students, what type of teeth would guarantee a more advantageous laboratory practice?  
 Artificial teeth  Human teeth  Both equally Why? \_\_\_\_\_
12. What are the ethical and legal implications of using human teeth in pre-clinical practices in Dentistry courses? \_\_\_\_\_

Figure 1. Questionnaire applied to faculty.

human teeth in his undergraduate training, all 37 (97.4%) remaining said, they had used teeth in Endodontic disciplines, 26 (66.6%) in dental disciplines. Dentistry; 22 (56.4%) in Anatomy and Dental Sculpture; 9 (23%) in Prosthesis; and 1 (2.6%) in both Surgery and Radiology.

Regarding the origin of the teeth they had used, it was observed that 19 (50%) are indication of dentists are from private clinics; public health services (“health posts” “municipal hospital”) for 11 (28.9%); undergraduate

colleagues for 4 (10.5%); and clinics at the college for 2 (5.2%). Only 6 (15.7%) stated that the discipline offered teeth, 1 (2.6%) through the Human Teeth Bank (BDH). In general, when teeth were supplied, it was the discipline of Anatomy and Dental Sculpture. Still 2 (5.2%) of them declared to have bought teeth and 2 (5.2%) did not answer.

When asked whether human teeth should be used as educational resources, the majority (34 - 89.4%) answered yes, 3 (7.8%) did not

and 1 (2.6%) said they did not know. For those who agree with the use, it was possible to perceive the categories "realism", "usefulness" and "ethical aspects". In the first category, 28 (73.6%) highlighted the anatomical characteristics of the crown, root, and root canal, the hardness of the enamel and dentin that allow a simulation closer to the characteristics that students will find in the clinic. In the "utility" category 2 (5.2%), they highlighted that, as a general rule, extracted teeth are discarded, thus, they could be used for teaching. In the "ethical aspects" category 4 (10.5%), they emphasized that the use should only be made with respect for ethical standards. For those who disagree, the category used was that of "alternative models", with resins with hardness close to that of dentin being cited and also the issue of the best use of teeth for storing stem cells.

Professors cited aspects related to biosafety (14 - 36.8%), difficulty in obtaining teeth (8 - 21%), commercialization risks (6 - 15.7%), and ethical aspects (6 - 15.7%). Also were cited as handicaps us the trivialization of the body, and may encourage the idea that teeth are less important, the stench caused by the drill used in human tooth active laboratory and tooth features accessed (color, presence of caries, etc.).

When asked about the didactic potential of the training resource 23 (60.5%) believe that human teeth are more advantageous, 4 (10.5%) prefer artificial teeth and 11 (28.9%) consider both equally. Regarding the perception of professors in relation to the acquisition of psychomotor skills by students, 26 (68.4%) believe that human teeth are more advantageous, 1 (2.6%) artificial teeth and 11 (28.9%) consider the two equally.

Finally, when questioned about the ethical and legal implications of using human teeth, 2 (5.2%) believe that they do not exist, since they are extracted teeth and will be discarded, 5 (13.1)

do not know or they did not answer. Only 8 (21%) cited the issue of the need for patient consent and only 3 (7.8%) the possibility that the use of teeth would encourage the practice of unnecessary extractions. Still, 7 (18.4%) cited the commercialization of human teeth and 16 (42.1%) gave more general responses that point to the need to follow rules (code of ethics and laws) in the use of human teeth. Still, 7 (18.4%) cited BDH as an institution that could serve to overcome these problems.

#### 4 DISCUSSION

Most professors understand that human teeth should be used in preclinical practices, which are of greater didactic potential and those that provide more opportunities for the development of students' psychomotor skills when compared to artificial teeth. The three studies presented in the following paragraphs are in agreement with that found in this research. A study carried out with 18 Brazilian professors of Endodontics sought to evaluate the anatomy and physical and radiographic characteristics of artificial teeth for teaching in the area. Professors from different courses were asked to perform simulations with the teeth of a commercial brand and answer a questionnaire about this experience.

The best-evaluated characteristics were the internal and external anatomy and the location of the root canal. However, 33% of the sample considered the material's hardness unsatisfactory for teaching practice, as it gives the wrong impression that there is not much resistance to access the pulp chamber in natural teeth.

Another study sought to compare the preparation time and perceptions of the difficulty of undergraduates in odontology and endodontists in making root canal preparations in opaque models of resin and extracted natural teeth. For this purpose, 10 5th year students and 10 specialists with a minimum of 5 years of

experience were selected and each prepared 2 teeth of each model. Both groups reported problems with anatomy, difficulty in irrigating and filling the canal, as well as interpreting the radiographs. Despite the time of completion of the procedures in human teeth have been higher, the study concluded that neither models showed characteristics enabling replacement of human teeth for teaching.

In another study, 43 students were randomly allocated to two groups to perform endodontic treatments on human and artificial teeth. This research concluded that controlling the success of training students using natural teeth can be more reliable than when using artificial teeth.

More recently, a systematic review of the literature [15] sought to compare the educational results that could be achieved with the use of artificial teeth versus extracted teeth, specifically for Preclinical Endodontic Training. Only five studies were included that totaled the evaluation of 359 operators, being 349 (97%) undergraduate students, and 10 (3%) Endodontists.

Regarding technical results, no significant differences were found between training with artificial teeth and extracted teeth, and the performance tended to be better on artificial teeth. Operators trained only on artificial teeth appeared to be adequately instructed for the subsequent treatment of the root canal in the clinical setting. Based on the available evidence, the authors concluded that the use of artificial teeth for preclinical endodontic training achieved similar educational results compared to extracted teeth. Though, the experiences reported by operators have diverged and further studies need to be done.

Other studies have pointed to the use of virtual reality technologies to replace human teeth or even artificial models in pre-clinical

activities of dentistry students. A survey evaluated the skills of twenty students before and after their training using a haptic virtual reality system for Endodontics and concluded that they demonstrated learning to perform opening and access tasks faster and more consistently, with better biannual dexterity and better use of force.

A recent randomized study of 88 first-year undergraduate students in France brought similar results when comparing performance in groups that trained in plastic teeth and in virtual reality mechanisms. In their conclusions, they pointed to the advantages of using virtual reality as it saves time in supervision and teaching and reduces the need to use plastic materials.

The biggest disadvantage indicated by the professors of the current research in relation to the use of human teeth is related to the difficulties of Biosafety. This concern should be considered mainly because, as a general rule, students who are responsible for operationalizing the work material. A survey of 100 dentistry students in Iran found that not everyone took proper care in handling these teeth. For example, 87% of respondents disinfected extracted teeth, 79% of participants wore a mask, 84% wore gloves and a white apron, and 61% wore safety glasses while working. Another situation brought up by professors is related to the ethical and legal aspects of obtaining human teeth, as well as a concern for the exposure of vulnerable patients to unnecessary extractions if the extracted teeth receive great value in dental education. Regarding commercialization, a study using a questionnaire with 182 students found that 11% of them had already bought human teeth. Teeth were requested by 5 different disciplines, with the number of teeth requested for each student ranging from 2 to 14. Furthermore, it is important to note that although some professors have declared that the extracted tooth can be used without further consideration because it is

generally considered to be waste from the health service, it is mandatory to respect the patient's wishes, requesting their authorization for possible uses.

Ultimately, some professors mentioned the disadvantage of using human teeth extracted because they allow access to single stem cells. The use of dental stem cells has already demonstrated, in preclinical studies, favorable results for bone regeneration and in the treatment of periodontal diseases. Clinical studies are still being carried out in order to know the clinical viability of these approaches, making this disadvantage still powerful, since additionally to proving the possibility of clinical use, it is necessary that the technology used is accessible to the population.

## 6 CONCLUSIONS

The majority dental professors understand that the use of human teeth in preclinical activities have higher pedagogical powerful, in addition to promoting the development of motor skills compared to the use of artificial teeth.

## RESUMO

### Percepção de docentes de Odontologia sobre o uso de dentes humanos como recurso educativo em atividades pré-clínicas

O estudo teve por objetivo avaliar a percepção de docentes de Odontologia em relação à utilização de dentes humanos extraídos e dentes artificiais em atividades pré-clínicas. Utilizou-se um questionário com perguntas objetivas e subjetivas aplicado aos professores cirurgiões-dentistas do Curso de Odontologia Centro Universitário de Anápolis - UniEVANGÉLICA. Dos 50 professores que correspondiam aos critérios de elegibilidade, obteve-se taxa de resposta de 76%. A média do tempo de formado dos docentes é de 20±9,7 anos e a média do tempo de docência de 17±10,5 anos. Quando questionados se dentes humanos deveriam ser utilizados como recursos educativos, a maioria

(89,4%) respondeu que sim e em relação à aquisição de habilidades psicomotoras dos estudantes 68,4% acreditam que os dentes humanos são mais vantajosos. Citaram como desvantagem do uso aspectos relacionados à biossegurança (36,8%), dificuldade para obtenção dos dentes (21%), riscos de comercialização (15,7%) e aspectos éticos (15,7%). A maioria dos docentes de Odontologia do curso avaliado entendem que o uso de dentes humanos em atividades pré-clínicas tem maior potencial pedagógico, além de favorecer o desenvolvimento de habilidades motoras em comparação ao uso de dentes artificiais.

**Descritores:** Ensino Odontológico. Dente. Docentes de Odontologia.

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