Perception and Attitude regarding the Relevance of Tooth Morphology Carving Exercises: A Malaysian Undergraduate Dental Students Perspective

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Abstract

There is a growing consensus among experts that tooth carving exercises have become obsolete with ostensibly no place for them in the modern dental curriculum. Although many reasons have been cited in support of this argument, a sizable majority approve the idea of tooth carving being an integral part of the dental curriculum. In grappling with this conundrum, it was ascertained that there is a lack of studies on the students' perspective about the relevance of tooth carving exercises in Malaysia.

To assess the perception and attitude of Malaysian dental undergraduates towards tooth carving exercises and its relevance in the practical and clinical setting.

A cross-sectional study was undertaken among years 3 to 5 dental undergraduate (UG) students from 13 dental schools in Malaysia. A questionnaire was adopted from previous studies with permission. The survey was disseminated electronically via google forms and data was analyzed using SPSS 22 and presented as percentage.

About 75% of the students agreed that tooth carving exercises helped them identify and reproduce the morphology of teeth in lab and clinical settings and differentiate normal from anomalous teeth. However more than 90% of the students believed that computer aided 3D software would help them learn tooth carving more effectively. Overall, 71% of them felt that tooth carving exercises were useful.

Tooth carving exercises are perceived as useful and add value to dental anatomy learning. However, to make the exercises more appealing to the students, implementation of alternate teaching methods, is recommended.

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Introduction

The practice of dentistry is essentially, an art and a science, as a dentist is obligated to be knowledgeable, possess psychomotor skills and aesthetic perception to restore tooth structure that is lost, and restore function and appearance[1]. The foundation for this scientific and artistic skill is laid down during the initial years of the dental undergraduate course, through the subject of dental anatomy[2]. The course aims to instill in students the knowledge and skills necessary to identify anatomical and morphological characteristics of human teeth and differentiate primary from permanent, and normal from anomalous teeth. Tooth morphology has a pivotal role in the dental curriculum and provides one of the significant foundations of clinical practice[3]. Sound knowledge of tooth anatomy is pertinent for restoring teeth[4], endodontic treatment[5], forensic investigations[6], research in anthropology[7], and fabrication of functional prostheses that need to be in harmonious occlusion with the remaining natural teeth[4]. It can be very useful in routine procedures such as rubber dam and matrix band placements[8].

There have been tremendous advancements in both dental technology and education over the past few decades, including teaching methods. Several universities across the globe have implemented innovative and

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novel methods of teaching dental anatomy and tooth morphology with startling results. Virtual reality simulation and haptic technology are newer trends utilized in dental anatomy to diminish the divide between pre-clinical and clinical courses[9,10]. Notwithstanding all these innovations and advancements, many universities are still relying on traditional methods[8].While lectures are the main mode of conveying the theoretical component; two-dimensional drawing, exercises on extracted natural teeth and tooth carving exercises using wax blocks or soap are the conventional practical components of the course[11].

The situation is no different in Malaysia. There are 13 dental schools in Malaysia and more than 90% of the dental schools in Malaysia are following the traditional way of teaching dental anatomy through lectures and tooth carving exercises. However, over the past few years this teaching method has received some dissension. It has become a subject of many debates and controversies. Some dental educators recommend that the carving exercises be limited to the carving of teeth crowns only. They claim that it is clinically more relevant rather than waste students' and teachers' time in carving entire teeth including the roots[12,13]. There are a few others who are of the opinion that the tooth carving exercise is not a useful drill but a waste of time and tons of wax, for dental students and teachers. They opine that these exercises are more relevant for dental technicians and not dental students and have even proposed to eliminate tooth carving from the curriculum of dentistry[14,15]. However, others have tactfully pointed out the shortsightedness of such drastic decisions. They have suggested a revision of the dental curriculum by reducing both the number of hours dedicated to tooth carving exercises, and the weightage given to the carving exercise component, when it comes to examinations and assessments[16].

There are different schools of thought on the effectiveness of the tooth carving exercise and its relevance to dental practice later on in a student's life. The differences of opinions are based only on the personal perspectives of educators[12-17]. Students' views of their educational system are vital sources of information for curriculum planning and revision. Dental curriculum planning regarding dental anatomy exercises like tooth carving, should include the advocacy from dental students, dental educators and clinicians[18]. There are studies from different parts of the world which have tried to interpret the students' perception, knowledge and attitude, towards the usefulness of the carving exercise, as well as the efficacy of the methodologies implemented to teach it[4,18]. A study carried out in India six years ago demonstrated the fact that an overwhelming majority of Dental Practitioners recommended tooth carving to be continued in the undergraduate Dental Curriculum while a comfortable majority opined that tooth carving had a cognizable impact on their clinical practice[19]. Nevertheless, there has not been such a study in Malaysia to evaluate the perception and attitude of the dental students towards the tooth carving exercises and its relevance during their future clinical years. Hence, we proposed to assess the perception and attitude of dental students towards the dental anatomy tooth carving exercises, so that we can ascertain whether there is a need for improving teaching and learning methodologies in dental anatomy at our University, so that it is delivered in a more effective manner.

Materials and methods

This descriptive cross-sectional study targeted dental undergraduate students studying in years 3 to 5 at 13 dental schools in Malaysia, who had experienced tooth carving during their first-year dental anatomy practical sessions. The study was approved by the institutional ethics committee (SEGiEC/SR/FOD/13/2019-20).

There are thirteen dental schools in Malaysia. Among them, six are public schools and seven private. We wrote to the deans of all thirteen dental schools seeking their permission to conduct our survey among their students. However only nine dental schools consented to take part in the study.

A modified questionnaire adopted from previous studies[4,18] was used to collect the required data. The questionnaire had nineteen close-ended items on a 5-point Likert scale, and 1 open-ended item, prepared in google form. The questionnaire contained items ranging from interest in tooth carving, type of tooth carving exercises undertaken, opinion on the practical significance to recommendations regarding tooth carving.

The google link to the questionnaire was emailed to all the undergraduate students studying in years 3,4 and 5, at the nine dental schools, following consent from the respective deans. Data was analyzed as percentages using SPSS V22.0.

Results

Nine out of the thirteen dental schools participated in this study. This comprised of three public schools (50%) and six private schools (85.7%). The questionnaire was sent out to a total of 1689 students, of which 571 were in public schools and 1118 in private schools. Out of 1689 students, 515 responded to the survey yielding a response rate of 30.5%.

Out of 515 (100%) respondents, 282 (54.8%) were from private schools and 233 (45.2%) were from public schools. One hundred and forty seven (28.5%) students were from year 3, 191 students (37.1%) were from year 4 and 177 students (34.4%) were from year 5. Overall, the response rate for the three years varied between 27.6% and 33.6%.

Results of descriptive statistics are included in Table 1. “Strongly agree” and “agree” percentages were combined together and similarly, “disagree” and “strongly disagree” were combined together for ease of analyses of the results.

Overall, 77.3% of the students felt that the tooth carving exercises helped them to identify the morphology of teeth during their laboratory sessions; while the percentage of students, who felt that the tooth carving exercises helped them to identify the morphology of teeth in the clinical setting was less, at 71.1%. The percentage increased from year 3 to year 5.

About 43% of the students agreed that they had demonstrational videos shown to them before or during tooth carving exercises by their faculty members. While less than 10% had computer-aided 3-D software to assist them, more than 90% felt that it would be useful to have.

When it came to tooth carving exercises helping the students to reproduce tooth morphology, there was a slight drop in the perceived usefulness for both laboratory sessions (73.5%) and clinical sessions (68.3%), compared to just identifying the teeth. The percentage who felt that tooth carving would assist them in identifying an abnormal tooth was 71%, while less than half (48.7%) felt that it was useful in differentiating between primary and permanent teeth. In relation to forensic investigation, 61% felt that tooth carving will be helpful in the identification of teeth. The highest percentage (83.3%) recorded was for students who perceived that tooth carving exercises helped with their manual dexterity.

In response to the number of teeth required to be carved, Nearly one quarter of the students (23%) felt that they did not have to carve so many teeth, and more than one third (35.5%) felt that it would be better to carve a few teeth in one quadrant of each arch.

About 88% of the students had carved both crowns and roots. Half the students (50.8%) did not agree that it was better to carve only the crowns of the teeth, and 38.7% did not agree that carving the roots was more time-consuming than carving the crowns.

Nearly 60% of the year 5 students felt that the tooth carving exercise helped them in their general practice sessions and about 70% of the students found the tooth carving exercises very useful.

Discussion

Dental anatomy is one of the core subjects to acquire knowledge and skills needed to practice all phases of dentistry [19]. It is considered one of the most basic and fundamental courses during the early clinical phase of the dental curriculum, for the development of the manual and psychomotor dexterity, vital to dentistry [8]. There is a debate about the value of tooth carving exercise in the undergraduate dental curriculum. While some educators opine that these exercises are more relevant for dental technicians, others suggest revision of the dental curriculum to reduce the number of hours dedicated to tooth carving exercises.

As we were amidst a curriculum review process at our University, we wanted to know if changes were needed to be implemented in delivering the dental anatomy course. One of the ways to ascertain this need was to know the students’ perspective, and hence this study was undertaken. We decided to include only the clinical year students in our study. This was because we realized that they would be better candidates to gauge the usefulness of the course, with the opportunity to apply their knowledge of

carving in clinical and simulation lab settings. About 70% of the respondents in our study felt that tooth carving exercises helped them reproduce tooth morphology in clinical as well as simulation lab settings.

Tooth carving exercises are part of the dental curriculum in Malaysia and hence all universities have tooth carving sessions. However, the mode of delivery or conducting tooth carving exercises varies across universities. The dental anatomy course is delivered in a traditional way in many universities in Malaysia. At our university, tooth carving exercises are carried out in a traditional way through lectures and hands on exercises on carving tooth morphology on wax blocks. Students need to carve the crowns and roots of all the teeth in the permanent dentition. Only 7% of the students in our study were provided with computer aided 3D software and about 43% of the students had demonstration videos before or during their carving exercises. This means that almost 50% of the students learnt it the traditional way. More than 90% of the respondents who learnt carving in the traditional way, felt that 3D software would greatly help them. It will not be wrong to interpret this percentage as the expressed needs of the students for a modification in delivering carving exercises. Dental educators have been advocating the notion that learning tooth morphology through the traditional techniques of carving wax, plaster or resin models needs to be updated. There are strong recommendations from dental educators for developing alternative methods, like computer-graphics, to aid in teaching three-dimensional anatomy of the adult dentition, in order to motivate and teach students [20,21]. Digital media as an adjunctive tool has the advantage of offering excellent visualization, thus allowing students to have access to the information at any time. It helps them to review the material as many times as needed and allows flexible hours for studying [22,23]. There have been studies which used audiovisual techniques to enhance knowledge of a disease and compared it with traditional methods in younger individuals with success [24].

Tooth carving exercises are considered time consuming by many educators. A study suggested that carving root anatomy is a waste of time and energy, and that carving root anatomy is a dreadful exercise that does not contribute to students' overall understanding of tooth anatomy[13]. In our study 88% of the students had carved both crowns and roots during their tooth carving sessions. However, less than 25% of the students opined that carving roots was time consuming and hence it was sufficient to carve only crowns, or that they should carve only roots of single rooted teeth, or a few teeth in each quadrant. This means that the majority of the students did not have any problem carving both crown and roots and carving all the teeth. The reason could be that carving exercises have helped them identify and reproduce the morphology of different teeth in the sim lab, clinical setting and forensic investigation, as agreed by about 75% of the respondents in our study.

Knowledge of dental anatomy is of great importance in the practice of dentistry. In oral rehabilitation, without this knowledge, it is impossible to practice dentistry. Dental carving plays a major role in training dental students develop their manual dexterity**.** In our study, about 83% of the students agreed that carving helped them in the early development of manual dexterity.

Conclusions

This study was done with the intent of gleaning student views as regards the perceived relevance of tooth carving exercises in contemporary dental curriculum. Predictably, tooth carving was deemed to be useful by a majority of the dental undergraduates with a caveat. Keeping in mind, the gargantuan leap in modern technology and all the attendant benefits, the colossal possibilities of improving the mode of delivery for teaching tooth carving and dental anatomy are but a given.

Virtual reality simulation and introducing 3D software as an adjunct to traditional methods are just two ways of enhancing student understanding and skills and as modern studies underline their effectiveness, the future beckons with beguiling possibilities. Thus, we have peremptory reasons to appraise and update the dental curriculum to include more varied methods of delivery and widen the scientific horizons of today's dental students and future dental practitioners.

Declaration of Interest

The authors report no conflict of interest.

S.No	Questions	Strongly Agree+ Agree	Neutral	Strongly disagree +Disagree
1	Tooth carving exercises helped me to identify the morphology of teeth well during my simulation lab sessions	398 (77.3%)	84 (16.3%)	33 (6.4%)
2	Tooth carving helped me to reproduce the required tooth morphological features during my simulation lab sessions	379 (73.5%)	91 17.7)	45 (8.8%)
3	Tooth carving helps in the early development of manual dexterity (hand skills)	429 (83.3%)	62 (12%)	24 (4.7%)
4	Tooth carving enables me to differentiate an anomalous (abnormal) tooth from a normal tooth	366 (71%)	112 (21.7%)	37 (7.2%)
5	Tooth carving allows me to differentiate between primary and permanent teeth easily	251 (48.7%)	177 (34.4%)	77 (16.7%)
6	Tooth carving exercises have been useful in identifying the morphology of teeth well in the clinical setting	366 (71.1%)	93 (18.1%)	56 (10.8%)
7	Tooth carving exercises have been useful in reproducing the required morphological features in my clinical restorative sessions	352 (68.3%)	109 (21.2%)	54 (10.5%)
8	I feel knowledge of tooth morphology gained through the carving exercises will help in identification of teeth during forensic investigation	314 (61%)	151 (29.4%)	50 (9.6%)
9	I had online demonstration videos of tooth carving before and/or during our tooth carving exercises	223 (43.3%)	17 (3.3%)	275 (53.4%)
10	Our faculty provided computer-aided (digital) 3D software to help us learn tooth carving	38 (7.4%)	7 (1.4%)	470 (91.3%)
11	All my teeth carvings involved carving of both crowns and roots	453 (88%)	0	62 (12%)
12	It is better to carve only the crowns of teeth rather than whole teeth	113 (22%)	140 (27.2%)	262 (50.8%)
13	Carving the roots of teeth was more time consuming than carving crowns	117 (23%)	198 (38.3%)	200 (38.7%)
14	It is better to carve the roots of single rooted teeth only	77 (15%)	258 (50%)	180 (35%)
15	I need not have to carve so many teeth to identify and reproduce tooth morphology	118 (23%)	229 (44.4%)	168 (32.6%)

16	It is better to carve a few teeth on one quadrant of each arch	183 (35.6%)	262 (50.8%)	70 (13.6%)
17	I found the tooth carving exercises very useful overall	366 (71%)	108 (21.1%)	41 (7.9%)

Table 1. Questionnaire responses of the participants.

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