

# Post-Covid Trends in the Dental Education System: Perception of Tooth Carving on Wax Blocks

Devika Jayarajan, Sudeendra Prabhu, Kavya Soundararajan, Riaz Abdulla, Maji Jose

## ABSTRACT

**Background:** Tooth carving exercise is fundamental in rendering the dental practitioner capable of identification of deciduous and permanent teeth, recognition and treatment of dental pathology and other rehabilitation procedures. The present study was aimed to determine the perception of the tooth carving exercise in the dental curriculum and its clinical implications amongst dental students (interns and post graduates), dental practitioners, and dental academicians all over India.

**Material and Methods:** The questionnaire consisted of 14 questions related to tooth carving and dental anatomy which was validated by two senior pathologists. The questionnaire was circulated via Google forms and the responses were collected through WhatsApp and emails over a period of 3 months. The Mann-Whitney U test was performed to find out the correlation between different groups

**Result and Conclusion:** The Response Rate of our study was 99.3 %, reflecting the positive attitude of participants towards the tooth carving exercises. According to our survey, majority of the subjects believed that tooth carving on wax blocks is quite valid and effective in future practice. 80% of the students (interns and postgraduates) and 91% of academicians and clinicians believed that tooth carving on wax blocks helped them forge and fortify their knowledge of tooth morphology and thereby identify associated pathologies. The study outcome indicates that carving on wax blocks is essential in terms of acquiring a basic understanding of the morphology of the teeth and its applications in clinical dentistry and thereby, reiterating its necessity to continue in the dental curriculum

**Keywords:** Dental carving; perception; post covid

## INTRODUCTION

The understanding of tooth morphology is critical to all aspects of dental practice. As a foundational course in the pre-clinical dental curriculum, dental anatomy introduces undergraduates to the anatomical and structural traits of human permanent and primary dentition.<sup>1,2</sup> In the post-pandemic world, the use of alternative methods such as 3-D models and computer simulation techniques were employed to impart education about the dental anatomy and facilitate reach amongst students as a part of remote learning across online teaching forums. Few academicians are of the opinion that these alternative modes of teaching, such as 3-D models and videos can replace the conventional tooth carving exercise.<sup>3</sup>

Most dental schools impart fundamental knowledge in lectures and cultivate students' psychomotor skills by an amalgamation of two-dimensional drawing projects and exercises to carve teeth from oversized wax blocks.<sup>4</sup> The purpose of the preclinical dental curriculum is to furnish the students with comprehensive and balanced preclinical exposure to endow them with essential knowledge and skills needed for proficiency in modern dental practice.<sup>5</sup> Students acquire the knowledge to identify teeth, detect tooth anomalies and treat or manage dental pathology.<sup>6</sup>

There is a current debate about the usefulness of tooth carving exercises in the undergraduate dental curriculum.

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Department of Oral Pathology, Centre for Forensic Odontology, Yenepoya Dental College, Yenepoya (Deemed to be) university, Mangalore

**Corresponding author:** Sudeendra Prabhu, Department of Oral Pathology, Inchargehead, Centre for Forensic Odontology, Yenepoya Dental College, Yenepoya (Deemed to be) university, Mangalore. E-mail – drsudeendra@yenepoya.edu.in

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Opinions vary on the value of the tooth carving exercises and subsequently, its application in the dental practice. Perception of students on the utility tooth carving is key in the structuring of the dental curriculum.<sup>3-6</sup>

This study was conducted in the post-pandemic period, wherein dental students were introduced to a hybrid mode of teaching with conventional carving exercises, supplemented by online aids such as 3-D animation videos etc., to understand their implications better and compare their opinions with conventional methods. The study aimed to assess the perception regarding tooth carving exercises using

wax blocks and its utility in general dental practice amongst dental interns, postgraduates, academicians and clinicians as well to know whether the suggested alternative techniques are a suitable replacement of the same.

**MATERIALS AND METHODS**

A self-administered, systematized, and validated questionnaire of 19 questions (Table 1.) was distributed amongst individuals via email and WhatsApp as a Google form and the obtained data were considered for analysis. The participants were grouped as: - Dental Interns, Dental Post-graduates, Academicians, and Clinicians. The questionnaire form consisted of two parts wherein the first part had 5 questions that collected the demographic details. The second part comprised 14 questions, which was focusing on the perception of tooth carving exercises on wax blocks amongst dental practitioners (interns, post-graduates, academicians, and clinicians). These questions were framed based on the perception of the tooth carving exercise on wax blocks and its application in the various specialties along with alternative methods, which were designed to understand the relevance of the tooth carving exercise in the dental curriculum.

The Google form also had an informed consent form along with the participant information form attached to the circulated questionnaire, in the English language which was forwarded to the respondents personally by the author via email and

WhatsApp application.

The participants responded to the questionnaire without any external influence and submitted their responses to the authors on the same day.

**RESULTS**

The Response Rate of our study was 99.3 %, reflecting the positive attitude of participants towards the tooth carving exercises. To be precise, about 151 participants willingly participated in the study by submitting their consent forms and answering all the questions. The distribution of the group of respondents is depicted in a pie-chart format (Figure 1). Maximum response was received by postgraduates and interns (44.3%), followed by clinicians (22.6%), academicians who are also clinicians (15.7%) and finally from academicians alone (12.2%). The overall data was compiled and entered into an MS office Excel sheet and subjected to statistical analysis using SPSS software version 22 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize frequency and percentage for categorical data i.e. postgraduates and interns along with academicians and clinicians. The association between different categories of participants was analyzed using a Chi square test with p value < 0.05 as statistically significant.

According to our survey, with respect to the impact of tooth carving on wax blocks, the majority of the subjects believed that tooth carving on wax blocks is quite valid and effective

**Table 1:** Questionnaire with all the list of questions

S.NO	QUESTIONS
1	Do you think dental tooth carving exercise on wax blocks helps in improving the knowledge of tooth morphology?
2	Do you think the tooth carving exercise that you did during undergraduation contributed to enhancing your clinical practice?
3	Do you think the tooth carving exercise can improve understanding about root morphology which is essential while doing endodontic treatment?
4	Do you think tooth carving helps in improving psychomotor skills?
5	Do you think the knowledge of tooth morphology and the skill acquired through carving exercise helps you while restoring the tooth with silver amalgam/contouring composite and GIC?
6	Do you think the tooth carving exercise should continue in the undergraduate dental curriculum?
7	Do you think knowledge of the crown morphology alone i.e training only in the carving of the tooth crown is sufficient in the dental practice?
8	Do you think tooth carving exercise on wax blocks help you in establishing proper morphology in esthetic dentistry?
9	Do you think the knowledge in tooth carving exercise helped you in crown and bridge rehabilitation in prosthodontic treatment?
10	Do you think the knowledge acquired about root morphology through tooth carving exercise helps in assessment and treatment plan in extraction of teeth?
11	Does dental tooth carving exercise help in recognizing and diagnosing tooth anomalies and in treating/managing dental pathologies?
12	Do you think digital methods such as 3-D animated videos, computer software image simulation techniques can be an adjunct to conventional tooth carving on wax blocks?
13	In esthetic rehabilitation (due to caries or fracture of teeth), do you think wax carving will help in defining the precise gender-wise morphological characteristics of teeth?
14	Do you think instead of conventional tooth carving, alternative digital techniques has to be considered suitable for present day hi-tech dentistry, which can be accommodated in online teaching mode as well?



in future practice. The survey results are calculated and given in the table. The results were highlighted in bar graph formats (Figure 2-4) which shows the significance of tooth carving on wax blocks in terms of understanding the tooth anatomy.

The statistical analysis of our study shows the p value of 0.752 which indicates a positive correlation. The Mann-Whitney U test value in this study is 2729 which indicates moderately strong association. Our study shows that there is an association between the categories i.e. interns, post graduates and the faculty and clinicians. In this study, 80% of the students (interns and postgraduates) and 91% of academicians and clinicians believed that tooth carving on wax blocks helped them improve their knowledge of tooth morphology and thereby identify associated pathologies. While some of the participants

considered techniques like 3-D models, computer software image simulation (46.4%) to the conventional tooth carving exercise as an adjunct, and some of the participants disagreed (35.8%) or were not sure (17.9%) (Figure 4). When considering the replacement of the conventional tooth carving exercises by these alternative techniques (digital techniques) which could be incorporated in online teaching as well, where 18.5% agreed, 72% disagreed and 9.5% were not sure (Figure 4) and 86% were of the opinion that the tooth carving exercise is a requisite in the dental curriculum. Therefore, the study outcome indicates that carving on wax blocks is essential in terms of knowing the morphology of the teeth and for treatment planning and its necessity to continue in the dental curriculum.

**DISCUSSION**

Dental anatomy deals with the anatomical and morphological study of human dentition (both permanent and deciduous) along with their positions and relationships with associated oral structures.<sup>7</sup> For clinical practice in dentistry, knowledge of dental anatomy is critical. Often, the time assigned for the teaching of dental anatomy and morphology is very limited. However, the demands for comprehending dental morphology and anatomy are considerable and cumulative over the course of dentistry.<sup>8</sup> Traditional teaching and learning techniques for dental anatomy include lectures, books, tooth atlases, carvings, drawings of specific teeth, and natural teeth that have been extracted. Furthermore, teaching is aided by the creation of macro models of teeth to provide accurate visualization of tooth morphology and occlusion.<sup>9</sup>

Tooth carving aids in the acquisition of knowledge to identify both deciduous and permanent teeth, identify and diag-

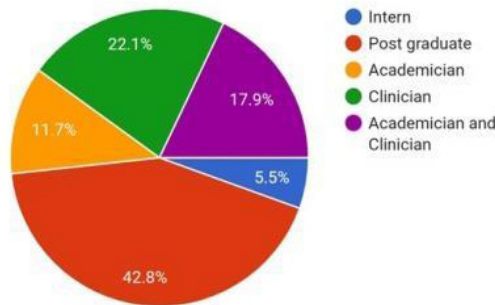


Fig. 1: The distribution of the group of respondents.

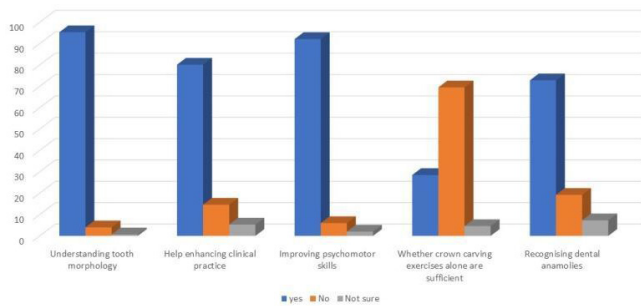


Fig. 2: General perception pertaining to the implications of the carving exercise in dentistry.

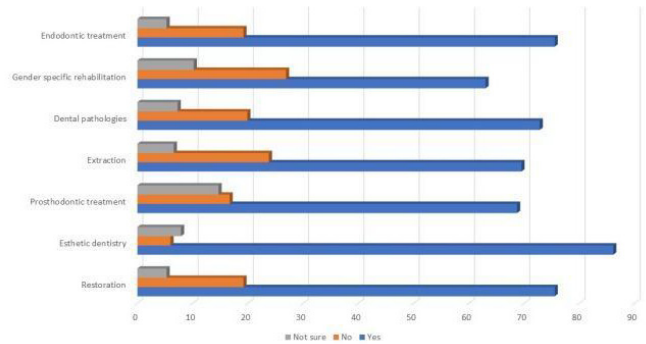


Fig. 3: Whether tooth carving exercise is helping in different specialties of clinical dentistry.

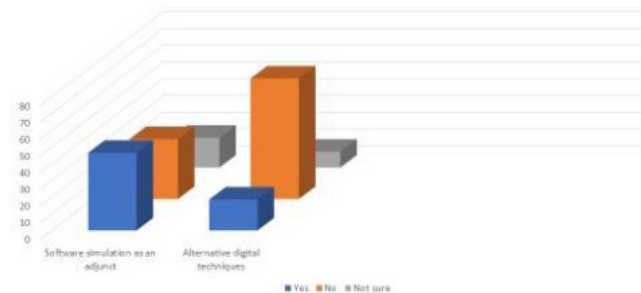


Fig. 4: Soft ware simulation as n adjunct and Alternative digital / computer aided methods shall replace the conventional tooth carving learning

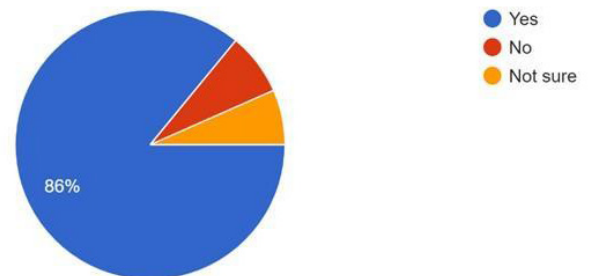


Fig. 5: Continuing tooth carving exercise in dental curriculum



nose defects, and treat dental pathology. Identifying and distinguishing a tooth within a group of teeth, as well as detecting morphologically normal teeth from teeth with some form of abnormality, are essential skills for dentists.<sup>10</sup> This cognitive ability involves mental operations of classifications based on the observation of differences in the dental anatomic features of each tooth such as size, crown/root proportion, skewing, etc.<sup>11</sup> 2D-drawing and 3D-wax carving activities have been widely utilized to assess the psychomotor skills to manipulate a tooth. The latter has demonstrated low cost, simple handling, and good reproducibility by utilizing relatively larger wax blocks. In recent times, during the COVID lockdown, many academicians believed these conventional exercises be replaced with computerized 3-D models.<sup>3</sup>

This survey was conducted in order to assess the perception factors of tooth carving on wax blocks for dental students (Interns and Postgraduates), academicians, and clinicians all over India. Though the innovative methods like 3D models of teeth were effective in knowing the morphology of the teeth, most of the subjects, i.e. precisely more than 85% of them believed that the impact of the traditional learning method, i.e. carving of teeth on wax blocks was better in understanding the knowledge on tooth morphology and for clinical practice.

Our study indicates that tooth carving is one of the most enjoyable exercises, and the majority of students implied that it is vital and helpful for them in the coming years, contrary to several studies that portray it as an unpleasant exercise and mechanical science. A large majority of the participants believed it should continue in the dental curriculum (Figure 2), thus establishing that these exercises are an integral part of the course which was in agreement with a survey conducted by R Chaulagain et al.<sup>12</sup> In our survey, 80% of the students (interns and postgraduates) and 91% of academicians and clinicians believed that tooth carving on wax blocks helped them improve their knowledge of tooth morphology and treatment planning. Similar findings were reported in a previous study by some researchers, where 62.3% of survey respondents agreed that carving influenced their knowledge of tooth anatomy.<sup>13</sup> According to a study by Lamichhane et al, more than 95% of the students believed that tooth carving on wax blocks helped them to understand tooth morphology better.<sup>14</sup>

Though there is an opinion from one section of academicians' questioning the relevance of tooth carving exercises in improving psychomotor skills and if root carving was essential,<sup>3</sup> the results of this study reinforce that the tooth carving exercises help in cultivating psychomotor skills (92.1%) and root carving is integral to practicing endodontics (75.5%).

## CONCLUSION

Tooth carving is the preliminary step in laying the foundation for a sound knowledge of tooth morphology. Such thorough knowledge is essential in not just the identification of pathologies but in the treatment planning of the same.

Therefore, it is established from this study that the tooth carving exercises on wax blocks are fundamental in the dental curriculum and cannot be omitted. Although recent advances in education such as 3-D animation, simulation, videos, and mobile applications seem promising and help in furthering the understanding of tooth morphology to an extent, this study indicates that it cannot serve as a complete replacement for the conventional tooth carving exercises, but rather, as an adjunct.

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