

Perception Regarding Tooth Carving Using wax Block among the Dental Practitioners

Ram Sudhan Lamichhane,¹ Rajib Chaulagain,² Amita Pradhan,³ Suman Khadka⁴

ABSTRACT

Background: The various pedagogical methods applied for teaching dental anatomy to dental students includes lectures, analysis of extracted natural teeth and carving of wax blocks to accurately replicate the morphology of teeth. The thorough knowledge of dental morphology is indispensable for a successful dental practice. This study was thus aimed to assess the perceived relevance of tooth carving using wax block among the dental practitioners.

Methods: A cross-sectional study was designed with the objective of involving dental practitioners working in Kathmandu. Self-administered questionnaires were used for the data collection. The results were later analyzed for descriptive statistics using the Statistical Package for the Social Sciences (SPSS) 16 software.

Results: About 232 (98.3%) participants practiced tooth carving using wax block to study dental anatomy. More than 96% of the participants agreed that tooth carving exercises have helped them better understand tooth morphology and more than 85% feel that their manual dexterity was developed by these exercises. A total of 223 (94.5%) were of the opinion that tooth carving should be continued in the BDS preclinical curriculum.

Conclusions: The dental wax carving is an effective pedagogical strategy to develop manual dexterity of dental students by recreating tooth morphological features using a wax block, thereby achieving the mandatory psychomotor skills.

Keywords: Dental students; dental specialities; questionnaires survey

INTRODUCTION

Dental anatomy is one of the foundation courses in the preclinical dental curriculum where the students are taught the morphology of different human dentitions and their relationship within the teeth of oral cavity.¹ The knowledge thus gained is later routinely used in the dental practices.^{2, 3}

In Nepal, dental anatomy is still being taught using traditional teaching methods such as lectures, practical sessions involving carving tooth models using wax blocks.⁴ Studies have shown positive impact of learning tooth carving among dental practitioners and students and its application in restorative and laboratory procedures.⁵⁻⁷

However, differences in opinion do exist whether to retain or ban this preclinical exercise for future dental graduates as many subject experts feel this to be an age old time consuming procedure with no relevance in modern day dentistry.⁸⁻¹² This study was thus aimed to assess the perception regarding tooth carving using wax block among dental practitioners.

METHODS

A descriptive, cross-sectional study was conducted among the dental practitioners of Kathmandu. The duration of study was three months from September 2018 to December 2018. The ethical clearance to conduct the study was obtained from the Institutional review committee of KIST Medical College and Hospital (IRC NO: 2075/76/47).

Based on the study of Nayak et al,⁶ taking $p=0.691$, $q=1-p=0.309$, $d=0.06$ and Z at 95% confidence interval, and using formula $n=Z^2pq/d^2$ and the sample size was obtained as 227.848. However, to avoid non-response rate, a total of three hundred questionnaires set prepared in English language were distributed electronically using Google drive to dental practitioners working at different places in Kathmandu. Convenience sampling technique was used to collect the data. All practicing dentists who provided written consent for the study and submitted all the fully filled questionnaires were only included in the study.

Correspondence: Dr Ram Sudhan Lamichhane, Department of Oral and Maxillofacial Pathology, KIST Medical College and Teaching Hospital, Imadol, Lalitpur, Nepal. Email: drramsudhan@gmail.com, Phone: +9779851137183.

The self-administered questionnaires were taken from previous published studies^{2,6} and modified after discussing with experts in the field. The study was also pretested among 10% of the total sample to ensure that the participants could understand and answer the questions without any help. The responses of pretesting obtained from the participants were not included in the final study. The questionnaires comprised of two parts, the first component of the questionnaires included questions related to the demographic details of the participants while the second component consisted of 17 questions related to the tooth carving exercise. The questionnaires were distributed to the participants included for the study and later collected by the principal investigator on the same day.

Written consent was obtained from the participants. Confidentiality of information was assured to the participants.

Out of 300 questionnaires only 236 questionnaires which were fully filled were included in the data analysis. The data was later entered in Microsoft Excel and was analyzed for descriptive statistics using Statistical Package for the Social Sciences (SPSS) 16 software.

RESULTS

Out of the total 300 questionnaires that were given to the dental practitioners only 236 sets which were completely filled were included for the data analysis (response rate 78.6%). The majority of respondent were females 160 (67.8%) while males accounted for 76 (32.2%). Among the respondents 180 (76.3%) were Bachelor in Dental Surgery (BDS) graduates while 56 (23.7%) were specialized dental practitioners with majority (189) having a work experience ranging between 1-5 years (80.1%) (Table1).

Table 1. Sociodemographic parameters of study participants.

Sociodemographic parameters	Frequency (Percent)
Sex	
Male	76 (32.2%)
Female	160 (67.8%)
Level of Education	
BDS	180 (76.3%)
Master in Dental Surgery(MDS)	56 (23.7%)
Mode of practice	

Private practice in own clinic/hospital	16 (6.8%)
Employed in private clinics/hospitals	44 (18.6%)
Working in an educational institute	161 (68.2%)
Working in governmental hospital	12 (5.1%)
Non governmental organization(NGO) run programme	3 (1.3%)
Years of experience	
1-5	189 (80.1%)
5-10	32 (13.6%)
>10	15 (6.4%)

A majority of participants 232 (98.3%) practiced tooth carving using wax block to study dental anatomy as part of their under graduate dental curriculum. Very few of respondents 9 (3.8%) felt root carving was a waste of time. Nearly all of the participants, 235 (99.6 %) used wax block for tooth carving exercise while soap was used by a single respondent. More than 96% (227) of the participants agreed that tooth carving exercises have helped them better understand tooth morphology and more than 85% (201) feel that their manual dexterity was developed by these exercises. More than 80% (192) of the participants believed that carving exercises helped improve their clinical restorative skills (Table 2).

A total of 223 (94.5%) were of the opinion that tooth carving should be continued in the BDS preclinical curriculum while 77 (32.6%) were of the opinion that these exercises were more relevant to dental technicians. A majority 53.8% (127) felt that practicing tooth carving on extracted teeth and manikin models was not enough to learn dental anatomy and acquire manual dexterity. More than 80% (189) of the participants were of the opinion that live demonstration and videos along with computer aided learning would help to better learn dental anatomy (Table 2).

Table 2. Perception of dental practitioners regarding tooth carving.

Questions	Response	Frequency (Percent)
Did you practice tooth carving exercise during your undergraduate dental study?	Yes	232 (98.3%)
	No	4 (1.7%)
Do you think carving sessions were waste of time?	Yes	9 (3.8%)
	No	221 (93.6%)
	Don't know	6 (2.5%)

Did you carve complete set of teeth?	Only full permanent set	45 (19.1%)
	Both deciduous and permanent full set	72 (30.5%)
	Only few permanent teeth	119 (50.4%)
Which part of tooth anatomy do you think is important for your clinical practice?	Crown	53 (22.5%)
	Root	1 (0.4%)
	Both crown and root	182 (77.1%)
Which materials did you use to practice tooth carving?	Wax block	235 (99.6%)
	Soap	1 (0.4%)
Has tooth carving exercises helped you better understand tooth morphology?	Yes	227 (96.2%)
	No	4 (1.7%)
	Don't know	5 (2.1%)
Has the carving of tooth helped you develop your manual dexterity?	Yes	201 (85.2%)
	No	8 (3.4%)
	Don't know	27 (11.4%)
Has the carving session helped you familiarize with lab instruments and understand the proper grip of instruments?	Yes	187 (79.2%)
	No	22 (9.3%)
	Don't know	27 (11.4%)
Was tooth carving useful in restorative dentistry?	Yes	211 (89.4%)
	No	12 (5.1%)
	Don't know	13 (5.5%)
Did carving of tooth help you to understand dental occlusion?	Yes	176 (74.6%)
	No	39 (16.5%)
	Don't know	21 (8.9%)
Did carving help you to improve your clinical skills?	Yes	196 (83.1%)
	No	18 (7.6%)
	Don't know	22 (9.3%)
Is the total time allotted for tooth carving in UG dental syllabus relevant?	Yes	149 (63.1%)
	No	53 (22.5%)
	Don't know	34 (14.4%)
Do you think carving should be continued in undergraduate dental syllabus?	Yes	223 (94.5%)
	No	6 (2.5%)
	Don't know	7 (3%)

Do you think the knowledge of tooth carving is more important for dental technician rather than dental graduates?	Yes	77 (32.6%)
	No	128 (54.2%)
	Don't know	31 (13.1%)
Do you think practicing carving on extracted tooth and manikin models would be enough?	Yes	60 (25.4%)
	No	127 (53.8%)
	Don't know	49 (20.8%)
Which method do you think would have been helpful in the process of carving?	Live demonstration	46 (19.5%)
	Substitution with videos	1 (0.4%)
	Live demonstration and videos	189 (80.1%)
Do you think computer software with image simulation techniques will help in learning tooth anatomy better?	Yes	202 (85.6%)
	No	15 (6.4%)
	Don't know	19 (8.1%)

DISCUSSION

In the present era of technological advancement with rapid use of artificial intelligence, majority of dental procedures are still being performed using manual skills and hence dental practice is considered as a combination of both art and science. Excellent technical skills are therefore needed to be learnt and acquired by dentists for successful clinical practice. The main objective of learning tooth carving is to restore the form and function of the tooth thereby re-establishing the lost balance in the physiology of mastication.⁶ Comprehensive knowledge of dental anatomy is therefore essential for practicing most specialities in dentistry, as tooth carving may help in the fabrication of crowns and bridges and also contouring of composite restorations which accounts for majority of dental clinical procedures performed on daily basis^{6, 7}

Overwhelming majority of the respondents in our study have acknowledged that they had undergone tooth carving exercises during their BDS study. In almost all dental colleges in Nepal tooth carving using wax block has been a mandatory preclinical exercise for the students to learn and understand dental anatomy for more than two decades. More than two-third majority 182 (77.1%) were of the opinion that both crown and root anatomy is important for clinical practice while 221(93.6%) of the respondents thought that root carving

was a waste of time which was in accordance with the recommendation made by Sivapathasundharam that root carving is an absolute waste of time, energy and of course large quantity of wax.⁸

In our study, more than 95% (227) of the participants believe that tooth carving exercises have helped them better understand tooth morphology. This finding is in accordance with the study done by Nayak et al.⁶ while in contrast to recommendation and suggestion made by various authors that tooth carving exercises have no relevance for later clinical practice and should be discontinued from BDS curriculum.⁹⁻¹²

Although few authors are of the opinion that tooth carving exercises have shifted the concept of dentistry being a biological science into a mechanical science and suggest that learning tooth morphology through carving help become a good technician and not a better clinician and suggested that tooth carving can safely be discarded from the undergraduate dental syllabus.^{1,13,14} The majority of the respondents in our study did not agree with above opinion and believed that tooth carving help develop manual dexterity as well as clinical skills required for restorative and prosthodontics practices.

Tooth carving helps students acquire knowledge to identify both deciduous and permanent teeth, recognize and diagnose anomalies and help them treat the dental pathology. Some educators believe that dental anatomy could also be learnt from the extracted teeth without the need for tooth carving as a mandatory exercise which is in contrast to the finding in our study where majority believe that learning with the help of extracted teeth and manikin models would not be enough. The majority of respondents in our study felt that time allocated for the tooth carving exercises in the curriculum was adequate and should be continued in BDS curriculum which is in contrast to the recommendation made by few authors.⁹⁻¹²

Most of the concerned specialist until now have been imparting the knowledge of dental anatomy through traditional lectures which included power point presentations, tooth models, drawings on the paper for the theoretical aspects followed by practical live demonstrations of tooth carving exercises,^{4, 13, 14} which is in accordance with the findings in our study that live demonstration is a useful tool to teach tooth carving. Our study has also highlighted the need for introduction of newer teaching modalities such as video demonstration, computer assisted learning, electronic

learning (e-learning), which would help in better and easier learning of the dental anatomy as suggested by vast majority of respondents which is also supported by the findings in a number of studies.¹⁵⁻¹⁹

Nance et al. also suggested that amalgamation of both Computer assisted learning with conventional laboratory-based tooth carving methods would amplify students learning capacity.²⁰ Computer assisted learning also have an advantage that students can repeat the demonstration technique whenever needed until the skill is perfectly acquired.²⁰⁻²²

The limitation of the study was that it was conducted among dental practitioners practicing in Kathmandu valley so generalization of the study would not be appropriate

CONCLUSIONS

Tooth carving using a wax block is an integral part of preclinical learning of dental anatomy. Tooth carving during the undergraduate curriculum had helped them develop their manual dexterity required in clinical practice. Also clinically applicable learning improves conceptual understanding and psychomotor skills. Hence a fundamental knowledge of dental anatomy is vital for not only acquiring early manual dexterity, passing exams during student life but also for practicing various dental specialties. Based on the results of this study, dental wax carving has been highlighted is an effective pedagogical method to master the mandatory clinical skills by recreating tooth morphology. However, the need for introduction of video demonstration and other innovative, interactive, and clinically relevant adjuvant pedagogical methods such as e-learning, computer-aided learning and others in the curriculum should also be considered an important priority which helps the students learn in a better way and with much ease.

ACKNOWLEDGEMENT

The authors would like to acknowledge all the dental practitioners who participated in this study for their contribution to complete the survey by providing their valuable and professional opinions.

Author Affiliations

¹Department of Oral and Maxillofacial Pathology, KIST Medical College and Teaching Hospital, Imadol, Lalitpur, Nepal

²Chitwan Medical College and Teaching Hospital, Bharatpur, Nepal

³Department of Community Dentistry, People's Dental College & Hospital, Naya Bazar, Kathmandu, Nepal

⁴Lokanthali Dental Clinic, Bhaktapur, Nepal

Competing interests: None declared

REFERENCES

- Lone M, McKenna J, Cryan J, Downer E, Toulouse A. A Survey of tooth morphology teaching methods employed in the United Kingdom and Ireland. *Eur J Dent Educ.* 2018 Aug;22(3):e438-43. [\[Article\]](#)
- Oweis Y, Eriefej N, Eid RA. Students' perceptions of dental anatomy course at The University of Jordan. *J Med J.* 2015;49 (3):147-54. [\[Article\]](#)
- Obrez A, Briggs C, Buckman J, Goldstein L, Lamb C, Knight WG. Teaching clinically relevant dental anatomy in the dental curriculum: description and assessment of an innovative module. *J Dent Educ.* 2011;75(6):797-804. [\[Article\]](#)
- Chaulagain R, Lamichhane RS, Pradhan A. Perception regarding tooth carving using wax block among dental students in Kathmandu. *J Nepal Dent Assoc.* 2019;19(2):18-22. [\[Article\]](#)
- Eid RA, Ewan K, Foley J, Oweis Y, Jayasinghe J. Self-directed study and carving tooth models for learning tooth morphology: perceptions of students at the University of Aberdeen, Scotland. *J Dent Educ.* 2013;77(9):1147-53. [\[Article\]](#)
- Nayak MT, Sahni P, Singhvi A, Singh A. The perceived relevance of tooth carving in dental education: Views of practicing dentists and faculty in West India. *Health Educ. J.* 2014;27(3):238. [\[Article\]](#)
- Patil S, Sowmya S, Rao RS, Raj T. Knowledge, attitude and practice of tooth morphology among dental students. *J. adv. clin. res. insights.* 2015;2(3):124-30. [\[Article\]](#)
- Sivapathasundharam B, Protyusha GB. Root carving in tooth morphology - Is it really necessary? *J Oral Maxillofac Pathol.* 2021;25(1):22. [\[Article\]](#)
- Baskar P. Tooth carving. *Indian J Dent Res.* 2009;20(1):130-1. [\[Article\]](#)
- Ponniah I. Why tooth carving? *Indian J Dent Res.* 2010;21(3):463. [\[Article\]](#)
- Rao A. Tooth carving. *Indian J Dent Res.* 2010;21(1):146. [\[Article\]](#)
- Sivapathasundharam B. Tooth carving. *Indian J Dent Res.* 2008;19(3):181. [\[Article\]](#)
- Keshwar S, Shrestha A, Sarraf D, Shrestha S. Perception of tooth carving among undergraduate dental students at a tertiary hospital in eastern Nepal. *J Nepal Dent Assoc.* 2020;20(31):88-93. [\[Article\]](#)
- Singh D, Pandey P, Kudva S, Singh MK, Chandra S. Perception of Dental Students about Tooth Carving in Dental Education at a Tertiary Level Health Care Facility. *Med.-Leg. Update.* 2020;20(4):1493-9. [\[Article\]](#)
- Bogacki RE, Best A, Abbey LM. Equivalence study of a dental anatomy computer-assisted learning program. *J Dent Educ.* 2004;68(8):867-71. [\[Article\]](#)
- Ennes JP, Souza AS, Cunha IPd, Nacasato RP, Gardim DCM. Teaching tools in dental carving: models, virtual resources, and interactivity. *Rev ABENO.* 2018;18(1):45-55. [\[Article\]](#)
- Wang H, Xu H, Zhang J, Yu S, Wang M, Qiu J, et al. The effect of 3D-printed plastic teeth on scores in a tooth morphology course in a Chinese university. *BMC Medical Education.* 2020 Dec;20(1):1-7. [\[Article\]](#)
- Conte DB, Zancanaro M, Guollo A, Schneider LR, Lund RG, Rodrigues-Junior SA. Educational interventions to improve dental anatomy carving ability of dental students: a systematic review. *Anat Sci Educ.* 2021;14(1):99-109. [\[Article\]](#)
- Pandarathodiyil AK, Priyadarshini H, Daud S, Islam MN, Monerasinghe E. Perception and attitude regarding the relevance of tooth morphology carving exercises: a Malaysian undergraduate dental students perspective. *J. Int. Dent. Medical Res.* 2021 Apr 1; 14(2): 660-5. [\[Article\]](#)
- Nance ET, Lanning SK, Gunsolley JC. Dental anatomy carving computer-assisted instruction program: an assessment of student performance and perceptions. *J*

- Dent Educ. 2009;73(8):972-9.[\[Article\]](#)
21. Kwon SR, Hernández M, Blanchette DR, Lam MT, Gratton DG, Aquilino SA. Effect of computer-assisted learning on students' dental anatomy waxing performance. J Dent Educ. 2015;79(9):1093-100.[\[Article\]](#)
22. Juneja S, Juneja M. Role of computer-based learning in tooth carving in dentistry: An Indian perspective. Int J Appl Basic Med Res. 2016;6(3):164-5.[\[Article\]](#)