

Knowledge of current trends in dental caries excavation among dental students in Chennai

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ABSTRACT

Aim: This study aims to determine the understanding regarding current methods in dental caries excavation among dental students. **Objective:** The objective of the study was to create awareness and determine the understanding of current methods in dental caries excavation among dental students. **Materials and Methods:** This study was conducted based on questionnaire which consists of 10 questions through a web-linked application called SurveyPlanet. A convenient sample size of 100 consecutive dental students who currently pursuing in Saveetha Dental College, Chennai, participated in the study. **Results:** As an overall result, most of the participants are not aware of current methods in dental caries excavation in dentistry. Participants had lack of knowledge about current methods of caries excavation. **Conclusion:** As a conclusion, the awareness and knowledge of the usage of current methods in dental caries excavation among dental students have to be improved. Furthermore, they need to be trained on these grounds to help them treating their patients with current methods of dental caries excavation to consume time and better prognosis.

KEY WORDS: Burs, Chemomechanical, Current trends, Dental caries, Excavation

INTRODUCTION

The potential to bond restorative materials to tooth structure has altered the general principles of cavity preparation.^[1] While new steps were added to cavity preparation procedures, especially for bonding, such as cutting retentive cavity, geometries were omitted. In light of the minimally invasive dentistry concept, the macroretentive cavities by GV Black have been replaced by cavities limited to the removal of carious dentin that is at most extended with some additional rounding off of sharp margin edges and/or bevelling, the latter to the direct benefit of the subsequent bonding process.^[2]

However, the extent to which carious dentin should be removed to achieve a mechanically and biologically successful restoration is still a matter of debate. In particular, no definite diagnostic tool is today available to clinically define the caries-removal

endpoint, enabling complete removal of infected tissue without overextending cavity preparation. In addition, the different techniques presently available for caries removal/cavity preparation produce residual dentin substrates of different natures and thus different receptiveness for adhesion.^[3]

The extent of carious dentin excavation, the type of dentin substrate generated by each caries excavation technique, and the additional effect bonding agents exert on the residual dentin substrate are reviewed in this article, along with an in-depth discussion on aspects of dental caries histopathology.^[4] The latter is of direct importance for proper understanding of the rationale behind the different caries removal techniques.^[5]

The techniques are conventional excavation with burs which are carbon steel or tungsten carbide burs. Tungsten carbide burs replaced carbon steel burs once the process of hardening steel with tungsten carbide was introduced to the dental bur industry.^[6] Microscopic tungsten carbide particles are held together in a matrix of cobalt or nickel at the head

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of the bur. The head has typical spiral-like cutting edges with or without additional cross cuts to improve cutting efficiency. Carbon steel burs possess the same caries removing properties as tungsten carbide burs and are less expensive, but they are much more prone to corrosion and dulling. For caries removal, a round bur is recommended with diameters corresponding to the size of the carious lesion.^[7]

Next, ceramic burs which are a new line of slow speed rotary cutting instruments made of ceramic materials are now commercially available for the removal of carious dentin. All-ceramic round burs made of alumina-yttria-stabilized zirconia and are available in different diameter sizes. The manufacturer claims that besides its high cutting efficiency in infected, soft dentin, the use of this instrument for caries removal replaces both the explorer and the excavation spoon by simultaneously providing tactile sensation, self-evidently reducing preparation time.^[8]

Other than burs, caries-disclosing dyes are also once of the early transmission electron microscopy and biochemical characterization of carious dentin revealed that the most superficial carious layer is necrotic, highly decalcified, and contains irregularly scattered granular crystals and irreversibly denatured collagen fibrils.^[9,10] Underneath this caries-infected dentin, the deeper caries-affected dentin layer exhibits decreased collagen crosslinks, but comprises needle-like apatite crystals, regularly attached to collagen fibrils with no signs of bacterial invasion.^[11] Based on this knowledge, the ideal caries-disclosing dye should stain solely the caries infected, but not the caries-affected dentin.^[12]

There are also chemomechanical excavation methods using sodium hypochlorite-based agents available. In the first attempt to develop a chemical solubilizer that would selectively act on carious dentin resulted in a sodium hypochlorite solution buffered with an amino-acid-containing mixture made up of amino butyric acid,^[13] sodium chloride and sodium hydroxide.^[14] Even though sodium hypochlorite is a non-specific deproteinizing agent, the capability to selectively remove carious dentin was attributed to the buffering effect of the amino acid mixture, originally intended to reduce the aggressiveness of sodium hypochlorite on sound dentin and to enhance the disrupting effect on degenerated collagen within carious dentin.^[15] After chlorination and cleavage of the partially degraded collagen fibrils in the carious lesion, the resultant friable collagen fibrils could be more easily removed with a spoon excavator.^[16]

In this latest era, laser excavation places an important in dentistry as the technology developed. The word laser is an acronym for “Light Amplification by Stimulated Emission of Radiation,” which means

that laser devices produce beams of coherent and high-intensity light. The indications for the use of lasers in dentistry are nowadays broad, varying from caries diagnosis, disinfection of periodontal pockets or root canals, photodynamic therapy of oral tumors, soft-tissue surgery, caries removal, and cavity preparation. Especially in the field of operative dentistry, erbium lasers have been pointed out as most promising due to their specificity in ablating enamel and dentin without side effects to the pulp and surrounding tissues when the appropriate parameters are employed.^[17]

Therefore, this study was conducted to determine the knowledge and awareness of current methods for caries excavation among dental students in Chennai.

MATERIALS AND METHODS

A convenient sample size of 100 consecutive dental students who currently pursuing in Saveetha Dental College, Chennai, participated in the study. A cross-sectional observational online-based study was conducted. Questionnaire was constructed in SurveyPlanet website with dichotomous responses and multiple choice questions. The questionnaire consists of 15 questions with the following criteria, as shown in Table 1.

A link containing these questionnaires was shared with all the participants and required them to answer the questions. All the responses were analyzed and recorded.

RESULTS

According to the results, 92% claimed that they knew the difference between affected and infected dentins, as shown in Figure 1. Remaining 8% of them were not confident about it. About 76% of them agreed with the statement of the presence of carious dentin results in

Table 1: The criteria of questionnaire questions

Included criteria of questionnaire

Awareness of the current methods of caries excavation
Knowledge of the current methods of caries excavation
Mechanism of the current methods of caries excavation
Interest of dentist on the current methods of caries excavation

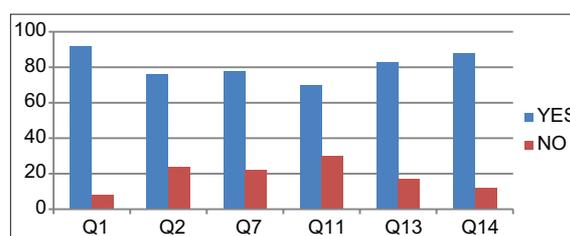


Figure 1: The percentage of answers for the dichotomous questions

thicker hybrid layer, whereas 24% of them had no clue about this statement. Next question was asked about methods of caries removal. In this question, 14% of the participants answered air followed by 20% of them answered chemicals. Remaining 16% and 50% chose burs and all of the choices, respectively. When asked about types of bur used to remove caries, 46% of them chose tungsten carbide burs and 22% of them chose carbon steel. Only 32% of them actually knew that both of the burs can be used for caries removal.

Following questions were asked regarding lasers, 38% of the participants answered correctly for these questions. Questions were also asked regarding papain gels for caries removal. The knowledge of the participants was less regarding this topic as only 44% of them answered correctly.

DISCUSSION

On a related study, it has been observed by Kumar J, Nayak M, Prasad K L, and Gupta N that the time for caries removal with Carisolv and Papacarie were 11.67 ± 3.25 min and 10.48 ± 2.96 min ($P > 0.05$), respectively. The mean volume of carious tissue removed with Papacarie (135.99 ± 66.43 mm³) was higher than that with Carisolv (126.33 ± 53.56 mm³); however, the difference was not significant.^[18]

Caries removal in children has always been challenging. Any technique in this regard which is efficacious and reduces the pain and anxiety has always been desired. It has been postulated by Bohari *et al.* that the techniques such as Chemomechanical caries removal (CMCR) and laser irradiation have been established to be minimally invasive methods and less painful. Airtor, Carisolv, Papacarie, and Er: YAG laser were compared to evaluate the efficacy and efficiency of caries removal.

It was ascertained that airtor and laser were more effective and efficient method in removal of caries, whereas laser and CMCR methods were observed to be more comfortable methods. Kochhar *et al.* also corroborated that chemomechanical removal of caries with Papacarie and Carisolv was found to be effective measures of caries removal and could be considered as viable alternatives to painful procedures like airtor in the management of dental caries, especially in children.^[19]

Although associated with longer duration of treatment, it can be disadvantageous in pediatric patients when it is difficult to intend to show cooperation for a prolonged duration. While the anxiety is reduced, when no drilling is carried out.^[20]

Caries may sometimes approach pulp. Any method used in caries removal should not cause any deleterious

effect on pulp, leading to pulpal inflammation, as this may result in severe pain or infection. This was eventually proved by Dammaschk *et al.*, as they concluded that the pulpal and pre-dentin fibrils, as well as, the dentin fibrils appeared to be intact and did not differ from the controls.

In another study by Dammaschke *et al.*, it was observed that pulp reaction was essentially the same as those reported in the past being typical for the effect of calcium hydroxide as a direct pulp capping agent. Thus, it was concluded that compared to Ca(OH)₂, Carisolv did not cause any different or additional pulp reaction in healthy teeth.^[21]

CONCLUSION

Majority of the medical students within the study were not aware and lack of knowledge regarding the current methods of caries excavation. However, this study was limited to one particular institute which is Saveetha Dental College, Chennai, and only 100 participants. Further study should be conducted in a larger scale area and sample size to get a proper overview regarding this topic within the dental students concerning the new advent technologies.

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