Awareness regarding caries excavation among undergraduate dental students

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ABSTRACT

Introduction: Dental caries is one of the most prevalent chronic oral diseases across the world that can be both treated and prevented. There are several oral carious lesions, of which certain lesions can be excavated and certain lesions such as arrested caries are not essential to be removed. Hence altering the mode of treatment. The aim of this study is to analyze the knowledge regarding caries excavation among undergraduate dental students because many dental students are not aware about caries distinguishing features which may lead to misdiagnosis and eventually altering the treatment in their clinical practices. Materials and Methods: A total of 200 undergraduate dental students belonging to various dental institutions were given a questionnaire consisting of 10 questions regarding caries excavation. Results: According to the data analysis, even though the students were aware about caries excavation to some extent, a thorough knowledge was lagging in common among all the undergraduate dental students. Conclusion: All the students should be taught precisely regarding caries excavation using innovative ideas to improve better understanding, resulting in better treatment.

KEY WORDS: Arrested caries, Excavation, Infected dentin, Pulp, Treatment

INTRODUCTION

Dental caries is one of the most prevalent chronic diseases affecting people throughout the world. It is a multifactorial disease. Dental caries initially occurs on enamel surface, then progresses to dentin, and then reaches the pulp. To plan a treatment for the particular carious lesion, a thorough understanding about the types of caries, clinical features, histologic features, excavation characteristics, etc., are needed. It is a biofilm-mediated, sugar-driven, multifactorial, dynamic disease that results in the phasic demineralization and remineralization of dental hard tissues. Caries occurs both in primary and permanent dentitions which can damage the coronal portion of the tooth later involving the radicular portion. There should be a proper balance between the pathological and protective factors which when lost can lead to initiation and progression of the dental caries. Based on the above-mentioned factors, the individuals are classified as various caries risk categories. Partial removal of caries from deep lesions usually involves complete removal of carious tissue from cavity walls but limited removal from the pulpal floor and axial wall, which are sites of reduced bond strength to restorative material. Resin-based composite restoration polymerization shrinkage can result in retraction of the bonding agent from the pulpal floor or axial wall of sound dentin. Resulting gap can fill with fluid and with tooth deformation, and the fluid is forced down open dentinal tubules, causing post-operative “occlusal loading sensitivity.” While clinicians may find pulpal floor gaps more often when deep caries remains due to composite’s inability to bond completely to caries-infected and caries-affected dentin, the chance of post-operative hypersensitivity might be reduced because the pulp is protected from fluid flow in the tubules by the low-permeability zone in deep infected dentin. On the basis of these findings, one might suggest that infected dentin should be removed completely from preparation walls but selectively from the pulpal floor or axial wall. This study has been done to emphasize the awareness among undergraduate dental students about caries excavation to provide a proper treatment plan for various types of carious lesions found in the oral cavity.
Questionnaire

AWARENESS REGARDING CARIES EXCAVATION AMONG UNDERGRADUATE DENTAL STUDENTS

1) What is your opinion on caries excavation?
   a) Removing the affected dentin and preserving the infected dentin.
   b) Removing the infected dentin and preserving the affected dentin.
   c) Removing both affected dentin and infected dentin.
   d) Not sure

2) Which dentin is found close to the tooth surface?
   a) Infected dentin
   b) Affected dentin
   c) Both infected and affected dentin
   d) Not sure

3) How do you clinically identify whether the dentin is infected dentin or not?
   a) Infected dentin is found in deeper layers and appear pale yellow in colour
   b) Infected dentin is found in superficial layers and appear brown in colour
   c) Infected dentin if found in deeper layers and appear pale yellow in colour
   d) Not sure

4) What are the staining characteristics of infected dentin and affected dentin?
   a) Infected dentin can be stained by 0.5% fuchsin while affected dentin cannot be stained.
   b) Affected dentin can be stained by 0.5% fuchsin while infected dentin cannot be stained
   c) Both infected and affected dentin can be stained by 0.5% fuchsin
   d) Both infected and affected dentin cannot be stained

5) Which of the dentin is capable of remineralisation?
   a) Infected dentin
   b) Affected dentin
   c) Both infected and affected dentin
   d) Neither infected dentin nor affected dentin

6) Which are the caries that need not be excavated?
   a) Arrested caries
   b) Acute caries
   c) Rampant caries
   d) None of the above

7) Which of the following is correct regarding arrested and progressive caries?
   a) Arrested caries are located away from gingival margin, more black in colour, have smooth and hard surface without destruction of tooth structure.
   b) Progressive caries are located closer to gingival margin, have rough surface with destruction of tooth structure.
   c) Both of the above
   d) None of the above

8) What is the treatment for arrested caries?
   a) Arrested caries must be excavated and restored
   b) Arrested caries need not be treated
   c) None of the above
   d) Don’t know

9) How will you excavate deep caries approaching the pulp?
   a) Complete removal of carious tissue from cavity walls, pulpal floor and axial wall
   b) Complete removal of carious tissue from cavity walls and limited removal from the pulpal floor and axial wall
   c) None of the above
   d) Don’t know

10) Which of the following dyes can be used to detect the caries to be excavated?
   a) Basic fuchsin
   b) Carbolan green
   c) Acid red
   d) All of the above

MATERIALS AND METHODS

This study was performed following the ethical approval of the institution (Saveetha Institute of Medical and Technical Sciences) where the study has been carried out and conducted among other institute undergraduates following approval from the corresponding institutions.
Sample Size
A questionnaire survey consisting of 10 questions regarding caries excavation was circulated among 200 undergraduate dental students of various dental institutions in Chennai. The questionnaire included questions regarding the following:

- Caries excavation
- Infected dentin
- Affected dentin
- Properties of infected and affected dentin
- Arrested caries.

RESULTS
From the results, it has been found that 83% of UG students have considered basic fuchsin as caries detecting dye [Figure 1], while 78% were aware of the staining characterization of the infected and affected dentin [Figure 2]. The perception among undergraduate dental students on caries excavation was remarkable, where 144 responses were noted positive for removal of infected dentin and preserving affected dentin [Figure 3]. Equal number of responders, that is 83% have opted for the complete removal of carious tissue from cavity wall, axial wall and pulpal floor while the other half have opted to limit the removal from pulpal floor and axial wall in treatment of deep caries excavation approaching the pulp [Figure 4]. Around 66% of the responders, conserved of eburnated dentin [Figure 5]. About 40% of the responders were not aware for the treatment of arrested caries [Figure 6]. The opinion on arrested and progressive caries was 66% on positive [Figure 7]. While 94% of the responders found infected dentin in superficial layer with a brown in appearance, 76% found the same in deep layer with pale yellow in appearance [Figure 8]. 128 responders, responded that the dentin close to the tooth surface was affected dentin [Figure 9]. Out of 200 responders, 170 have agreed that the affected dentin is capable of remineralization. Majority of the students has been aware of the fact that infected dentin must be excavated while affected dentin can be left in the cavity. However, they were not aware about eburnated dentin. About 90% of undergraduates...
DISCUSSION

From the results, it was noted that knowledge, attitude, and practice regarding caries excavation considered arrested caries must be excavated and restored. From the results, it has been clear that UG students were not aware of the characteristics of infected dentin and affected dentin [Figure 10].
among undergraduate dental students were present to a certain extent. However, they were not aware about staining characteristics, arrested caries, and their treatment options in detail. It was observed that even though theoretical knowledge about caries excavation was taught to dental students in 2nd year level, their understanding about the subject and its clinical implications is better when they are exposed to clinical postings.

Caries-infected and caries-affected dentins are distinct substrates that have different chemical composition and morphological structures. The caries-infected dentin is a superficial necrotic zone of vastly demineralized substrate with degenerated collagen fibrils that lost their cross-linking, and it may also be seen as a bacterial biomass. Conversely, caries-affected dentin is considered a variation of reactionary dentin, formed in reaction to bland stimuli such as caries, presenting small alterations in the cross-linking of its collagen fibrils. In addition, it contrasts with sound dentin by the mineralized precipitates within the tubules. Investigations established that the caries-affected dentin may be remineralized, making a more reliable adhesion to this tissue. Therefore, it has been recommended to remove only the caries-infected dentin before the bonding procedures involving dentin carious lesions. Altered dentin characteristics can affect the resin/dentin bonding interface since caries-affected dentin leads to greater variability and a highly irregular composition along the interface.

Although clinically caries-affected dentin shows mineralized precipitates within the tubules, Pacheco et al. showed that similar mineral content concerning Ca, CO3, and PO4 and organic content such as CH bonds may be found also in vitro when Streptococcus mutans biofilm provided dentin carious lesions compared with the natural ones. The short- and long-term bond strengths to caries-infected and caries-affected dentins commonly present lower values for both substrates, though some of these bond strength values were found to be clinically acceptable, since there is some evidence that macrotensile and microtensile bond strength tests correlate with microtensile and tensile bond strength tests. There is a challenge on bonding to caries-affected dentin since the deposition of acid-resistant minerals at the intratubular regions makes this substrate almost impermeable to water. In addition, a more porous intertubular dentin may be found due to the partial demineralization. While these mineral deposits reduce dentin permeability from harmful agents, able to injure the pulp, they may impair an adequate bonding to dentin. This barrier to bonding procedures is clinically also true for the caries-infected dentin, due to the large alterations affecting this substrate. Therefore, there are still some concerns regarding the long-term bonding to these altered dentin substrates. Assessments in literature comparing the immediate, short-term (up to 6 months), and long-term (1 year or more) bond strengths on sound, caries-infected, and caries-affected dentins are inconclusive. High bond strength values can be verified immediately after the bonding procedures. However, these findings are not completely related to the long-term bond stability since the resin-dentin bonding degradation may start in earlier stages (6 months or less). This may be worsened for bonding to carious substrates after long-term water exposure. The bond strength and durability seem to be more associated with the hybrid layer quality than to other factors. Overall, some studies on bonding strength to carious-affected dentin showed a thicker hybrid layer and lower bond strength than those from bonding to sound dentin and more prone to hydrolytic degradation than the sound ones. In addition, compared with caries-affected dentin, the sound dentin interface showed remarkable differences in demineralization depth, adhesive infiltration, and interfacial bond strength.

CONCLUSION

By our research, we conclude that knowledge about caries excavation should be improved among dental students through continuous dental education programs for the betterment in their treatment modalities.

REFERENCES