Association between Teeth Requiring Deep Caries Management and Vital Pulp Therapies: A Retrospective Analysis

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Abstract

Caries prevalence remains high throughout the world, with the burden of disease increasingly affecting older and socially disadvantaged groups in Western and Indian cultures. If caries is left untreated, it advances leading to pulp necrosis. The purpose of this study was to assess the deep caries management and Vital Pulp Therapies (VPT) of patients who visited a Private Hospital in Chennai. The study was carried from June 2019 to April 2020 on 333 patients (201 males and 132 females). All available data were recorded from an electronic dental record of 86000 patients case sheets and results were obtained through SPSS analysis software version 23.0. In this study, we observed that the highest number of pulp capping procedures were done in lower molars and it is more prevalent in the age group between 18-32 years. Caries excavation was highest in lower molars showing 42.52% patients who did indirect pulp capping after caries excavation whereas 84% patients did direct pulp capping after caries excavation (p value=0.03). The study concluded that 70.9% patients had undergone vital therapies after deep caries management and the study was significant statistically.

Keywords:

Caries; Direct; Indirect; Pulp capping; Pulp therapies

Introduction

Caries is the most common, infectious and a non-communicable disease with a greater prevalence in patients from disadvantaged social groups. [1,2]

Recent epidemiological data highlights global prevalence which remained over 25 years. One of the most critical factors in determining the prognosis of the tooth after restrictive treatment in case of deep caries lesion is preserving the vitality of pulp. [3]

In deep caries lesion, which are closer to the pulp, there occurs increased number of macrophages, lymphocytes and occasional polymorphonuclear leukocytes. [4]

Dilatation of blood vessels become apparent, however the pulp remains structurally intact.
[5]

Vital Pulp Therapy (VPT) is a potential alternative to Root Canal Treatment (RCT). VPT is a restorative dental procedure that is focusing on treating teeth with compromised dental pulp without the full removal or excavation of all healthy pulp tissue.

Recent research on the deep carious tissue management supports less invasive strategies, highlighting that complete soft remnant of soft dentine to leave a thin barrier of residual dentine may not be necessary or desirable. [6-8]

To aid management, the deep caries can be further subdivided into deep and extremely deep caries lesions.

Management of deep caries has traditionally been complete or non-selective caries removal and in the event of pulp exposure Root Canal Treatment (RCT). [9,10]

The treatment of deep carious lesions that approaches a healthy pulp presents a significant challenge to the practitioner. [11,12]

The traditional management of carious lesions of any kind dictates the removal of all infected and affected dentin to prevent further cariogenic activity and provide a well-

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mineralized base of dentin for restoration. When the procedure risks exposing or even breaching the pulp, the course of treatment becomes less predictable and may require such measures as indirect pulp capping. [13,14]

Minimally invasive caries excavations are not necessarily new. There are different excavation methods to avoid pulp exposure which is suggested. However, caries excavation must be complete before any vital pulp therapies and incomplete excavation concepts have neither become established in teaching institutions, nor in dental practices. Previously our team has a rich experience in working on various research projects across multiple disciplines. [15-29] Now the growing trend in this area motivated us to pursue this project.

The aim of this study was to assess the deep caries management procedure performed and vital pulp therapies among patients. [30]

Materials and Methods

The retrospective study was conducted in the Department of Conservative dentistry and endodontics in a Private Hospital in Chennai from June 2019 to March 2020. The data was collected from an electronic dental record which included cases sheets of 86000 patients which was reviewed and patients relevant to the study were chosen. The data was verified by another examiner to avoid bias errors. Cross verification was done using photographs and RVGs. Sampling bias was done by verifying the photographs by an external reviewer. After verification of the data reports, records of all patients undergoing endodontic treatment were tabulated in Microsoft excel sheets. Incomplete data and radiographs which were not of adequate diagnostic accuracy were excluded from the study. Chi square statistical test was done using SPSS software version 23.0. The statistical descriptive statistics were used to evaluate type of age, pulp capping, and caries excavation. Independent variables were gender. Ethical approval number is SDC/SIHEC/2020/DIASDATA/0619-0320.

Results

From the results of the study, 60.4% were males and 39.6% were females. Association of tooth type and age wise distribution is shown in Figure 1.

Among upper anteriors 1.87% pulp capping procedure was done in the age group 33-47 years and 48-62 years. Among upper premolars, 3.74% procedures were performed in the age group between 18-32 years, 3.27% in the age group between 33-47 years and 0.47% in the age group between 48-62 years. Among upper molars, 10.75% procedures were done in the age group between 18-32 years, 9.35% in the age group between 33-47 years,1.40% in the age group between 48-62 years and 0.93% in the age group between 63-77 years.

Among lower premolars,1.40% in the age group between 18-32 years and 0.93% in the age group between 48-62 years. Among lower molars, 43.93% procedures in the age group between 18-32 years, 7.76% in the age group between 33-47 years, 1.40% in the age group between 48-62 years and 0.93% in the age group between 63-77 years.

Using Pearson chi-square test for the above description the p value=0.01(<0.05).

Figure 2 shows caries excavation and tooth type. Among upper anteriors caries excavation was done in 3.27% patients and not done in 0.47% patients.

Among upper premolars caries excavation was done in 4.67% patients and not done in 2.80%patients. Among upper molars caries excavation was done in 14.49% patients and not done in 7.94% patients.

Among lower premolars caries excavation was done in 1.87% patients and not done in 0.47% patients.

Among lower molars caries excavation was done in 45.79% and not done in 18.22%patients. Using Pearson's chi-square test for the above description p value=1.925 (>0.05).

Association of pulp capping and caries excavation is shown in Figure 3.

27.57% patients performed direct pulp capping procedure after caries excavation and not done in 6.07% patients whereas 42.52% patients did Indirect pulp capping after caries excavation and did not in 23.83% patients. Using Pearson's chi-square test p value=0.031(<0.05).

Discussion

One of the most common controversial dilemmas in endodontics is management of deep caries lesions. Vital pulp therapy aims to preserve and maintain pulp tissue that has been compromised but not destroyed by caries, traumas or restorative procedures.

A study done by Chauhan et al. analysed the primary posterior teeth with indirect pulp capping of 132 patients in which sufficient carious dentin was left to preclude pulpal exposure. [31,32]

Vital pulp therapies are mostly performed in young permanent teeth where root development may be complete. [33-35]

Several studies did not focus on partial caries removal nevertheless relevant to the treatment of deep carious lesions. There has been evidence for many decades that caries development is being arrested in sealed lesions. [36,37]

No studies showed age-difference in patient's relative to tooth number. In this study we observed that most pulp capping procedures were relatively higher in age-group 18-32 years [Figure 1].

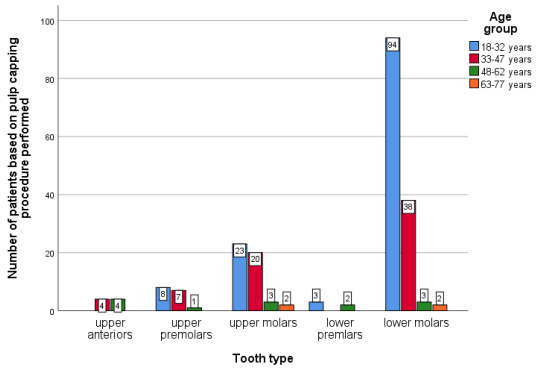

Figure 1: Bar graph depicting association of tooth type and age group distribution. The x-axis denotes tooth type and y-axis denotes number of patients in each age group. 18-32 years (blue), 33-47 years (red), 48-62 years (green) and 63-77 years (orange). From the graph, pulp capping procedure done by patients in the age group 18-32 years was highest in lower molars. Using Pearson's Chi square test value=53.498a, It was observed that the association between age and number of patients in each tooth type was found to be significant statistically with p value=0.01 (<0.05).

Mostly studies that performed caries excavation did not emphasize on a particular sextant or tooth type for its prevalence. [38] Hence this study showed particularly lower molars were the highest with number of pulp capping procedures done after caries excavation [Figure 2].

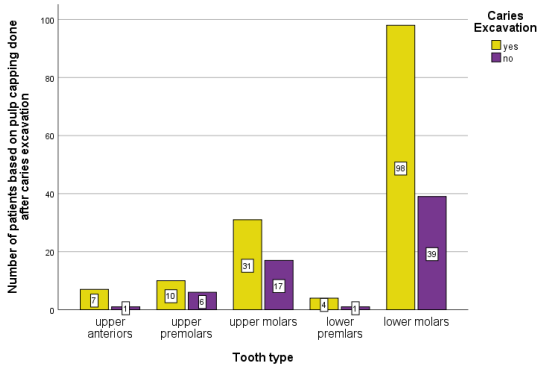

Figure 2: Bar graph depicting association of number of patients in which carries excavation was done and tooth type. The x-axis denotes tooth type comparing caries excavation where, yes (yellow) and no (purple) with y-axis denoting the number of patients in each age group. From the graph, the number of patients who did caries excavation based on pulp capping procedure was highest in molars amongst all other tooth type. Using Pearson's chi square test value=2.661a, caries excavation and tooth type was not statistically significant with p value=1.925 (>0.05).

Partial removal of caries from deep lesions usually involves complete removal of carious tissue from cavity walls but limited removal from the pupil floor and axial wall. [39,40] Our institution is passionate about high quality evidence based research and has excelled in various fields. [41-47] We hope this study adds to this rich legacy.

In this study caries excavation was performed higher in indirect pulp capping than direct pulp capping [Figure 3]. The primary aim of pulp capping is to preserve the vitality of the exposed pulp. [48,49]

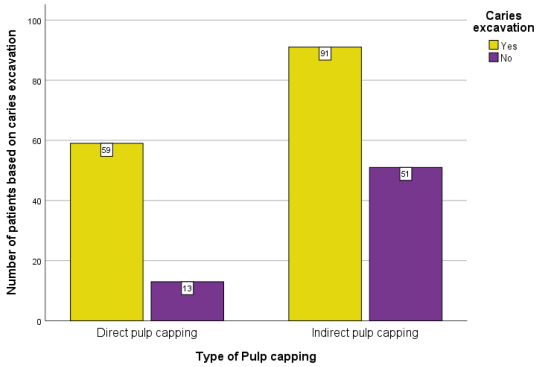

Figure 3: Bar graph depicts the association of type of pulp capping done among patients comparing whether complete caries excavation was done or not. The x-axis denotes type of pulp capping and y-axis denotes number of patients based on caries excavation. Yes (yellow) and no (purple). From the graph, number of caries excavation done was highest in indirect pulp capping than direct pulp capping. Using Pearson's chi square test value=7.270a, the association between pulp capping and caries excavation in each tooth type was found to be statistically significant with p value=0.031 (<0.05).

The maintenance of pulp vitality and the promotion of biologically-based management strategies are at the core of deep caries management. Further knowledge and studies are needed to assess the prevalence of caries in all vital pulp therapy. [36,50,51] The limitation of this study was population taken in a private set up. Further studies need to be performed in a diverse population and detailed studies on materials used in vital pulp therapies.

Conclusion

Within the limitations of the present study, there is a significant relation between age and type of pulp capping procedure. Indirect pulp capping among patients was highest comparing direct pulp capping mostly because all or most of the caries is removed at the initial appointment. Percentage of pulp capping among lower molars are highest since they are more prone to caries. Hence complete caries excavation is required to reduce post-operative symptoms caries excavation acts as an elective treatment option in management of deep carious lesions in everyday practice. Further studies are required to focus on caries management and pulp therapies performed on individual tooth type to prevent further disease progression.

Authors Contribution

Monisha K performed the analysis, and interpretation and wrote the manuscript. Surendar S contributed to conception, data design, analysis, interpretation and critically revised the manuscript. Aravind Kumar S participated in the study and revised the manuscript.

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Conflict of Interest

The authors declare that there is no conflict of interests.

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