KNOWLEDGE, ATTITUDE AND PRACTICE REGARDING PROTOCOLS FOLLOWED FOR PULP CAPPING AGENTS AMONG POST GRADUATES, GENERAL PRACTITIONERS AND SPECIALISTS

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Abstract

Aim: The aim of the present study was to assess the knowledge and practice of, and attitudes toward, protocols followed for pulp capping agents among post graduates, general dentists and specialists.
Materials and Methods: A cross-sectional, observational survey was conducted using a closed ended, multiple-choice questionnaire evaluating the knowledge and practice of, and attitudes toward, protocols followed for pulp capping agents, which was formulated and attended by 209 dentists in chennai city. Descriptive statistics were done, followed by chi square test to test the association.
Results: 40.66% of the respondents were females and 59.33% were males. The majority (70.33%) of respondents had less than 5 years of experience in clinics. Majority of participants were of the opinion that MTA is a better pulp capping agent as compared to calcium hydroxide and stated that the major reason for the failure of a pulp capped tooth is because of improper seal(36.84%). Respondents felt that MTA(44.01%) has a higher clinical success rate as a pulp capping agent as compared to biodentine (32.53%). 42.58 of the respondents stated that they only performed pulp capping sometimes but highly recommended the use of a rubber dam isolation (64.59%).
Conclusion: The participants of this survey had a general knowledge about pulp capping, but it can be emphasised that special training for the same would be required to acquire the adequate knowledge along with proper handling of readily available materials required for this procedure.

Keywords: indirect pulp capping, direct pulp capping, calcium hydroxide, MTA, biodentine permanent dentition

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1. Introduction

Protecting the pulp helps to maintain the vitality of the tooth in which pulp tissue has been exposed due to trauma, caries, or restorative procedures. Most procedures like indirect or direct pulp capping are the common treatment options(1,2).The major concern in pulp capping relies on the type of pulp capping to be used along with the right material of choice for the relevant clinical scenario.

Caries which were partially removed or completely removed and very close to pulp were restored by indirect pulp capping. Several studies show restored teeth with partial caries removal have equal success compared to restored teeth with complete caries removal(3–5). When pinpoint pulp exposures occurred after carious tissue removal without spontaneous bleeding, iatrogenic pulp exposures or trauma direct pulp capping was done(6,7).The pulp capping material should have the following properties , material must be sterile , radiopaque , bactericidal or bacteriostatic , maintain pulp vitality and stimulate reparative dentin formation .

Calcium hydroxide was introduced by Hermann which has been considered as the "Gold Standard" for direct pulp capping material from several decades. Although calcium hydroxide has long been used for pulp capping as the material of choice, it has a number of disadvantages, like insufficient adherence to dentin, dissolution of the material with time and dentin bridges with multiple tunnel defects (1,7,8) and causing liquefaction necrosis of the pulp due to the high pH(8,9). Mineral trioxide aggregate (MTA) is a recommended alternative to calcium hydroxide as it stimulates the formation of dentin-bridge faster, which allows pulp healing and results in high success rates in clinical practice. But, few properties such as prolonged sitting time, higher material cost, difficulty in handling, and discoloration of teeth makes this material disadvantageous(9,10).

A new calcium-silicate-based restorative cement called Biodentine (Septodont) has been introduced, which has similar applications as that of MTA and called as dentin substitute. Biodentine can be directly applied as a bulk dentin substitute in the cavity without the need for preconditioning and it also has a shorter setting time(11) . Biodentine demonstrates mechanical strength, less solubility and a tighter seal. Biodentine possesses an ease of handling and needs much lower time for setting . It also revealed a significantly more pronounced antibacterial effect in comparison to MTA(9). Biodentine possesses significantly higher push-out bond strength after 24 hours setting time than MTA. One major advantage of biodentine over MTA is that it can be easily manipulated due to its high viscosity and also its much shorter setting time (12).

Many times, the treatment remains incomplete either due to the lack of knowledge on the part of general dentists regarding pulp therapy in permanent teeth which increases the number of invasive procedures like root canal treatment. It is, therefore, important that practitioners must recognize their crucial role regarding the pulp therapy and familiarize themselves with the suitable pulp medicament, with proper final restoration and the knowledge of when to refer to a specialist. As the dental care setup for general practice remains similar, investigations should be aimed whether qualification and year of experiences hold similar views for the success of the treatment. So this questionnaire study was done to assess the general knowledge attitude and practises of various protocols followed for pulp capping among the various types of dental practitioners and to observe the effect of various demographic and clinical parameters on the clinical success.

2. Materials and Methods

It was a cross‑sectional questionnaire study conducted in the month of November 2020 – February 2021 in the city of Chennai, Tamil Nadu.

Source of participants

The study participants include dental practitioners of varying educational qualifications such as general practitioners, the endodontic residents pursuing post-graduation in conservative dentistry and endodontics at various colleges, endodontists either working in a hospital or having their own private clinics. All participants who were dentists aged between 20 to 60 years with any number of years of clinical practice were included in the study.

Ethical approval

The study was registered with the Institutional Review Board of the Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India. Ethical approval was obtained from the Institutional Review Board of the SIMATS. Informed consent was obtained from all participants before including them in the study.

Questionnaire

The survey consisted of two parts. The first part contained questions regarding profile of respondents including age, sex, and demographics. The second part contained 15 questions regarding knowledge and opinions on the protocols followed using pulp capping agents and their application in a clinical scenario. These questions can be divided into three

parts, namely knowledge, attitude, and practice. To all these questions there were either 3 or 4 options in the form of multiple choice questions.. If the dental professional was busy, then the questionnaire was left to be filed by the professional. Based on responses from the participants to this multiple choice-based questionnaire, the survey was analyzed.

Statistical Analyses

The collected data was tabulated into Microsoft office Excel 2013 transferred to SPSS version 26.0 software (SPSS, Chicago, IL, USA) for statistical analysis. Demographic details of study participants and their knowledge, attitude, and practice scores were analyzed using descriptive
statistics. The questionnaire data was analyzed by the number of responses as a percentage of the total responses to gain an insight into the majority opinions of the participants. Correlation between knowledge, attitude, and practice among study participants and correlation between demographic variables with knowledge, attitude, and behavior on the protocols followed while using pulp capping agents was analysed. This data was analyzed statistically using the chi square test to evaluate differences in the preference of the various materials used with their clinical success and to see if the results were statistically significant. The confidence interval was set at 95%.

3. Results

A total of 209 dental practitioners were interviewed. A 15‑item questionnaire was generated to measure knowledge, attitude, and practice of dental professionals regarding the protocols followed while using pulp capping agents. The questionnaire results are shown in Table 1.

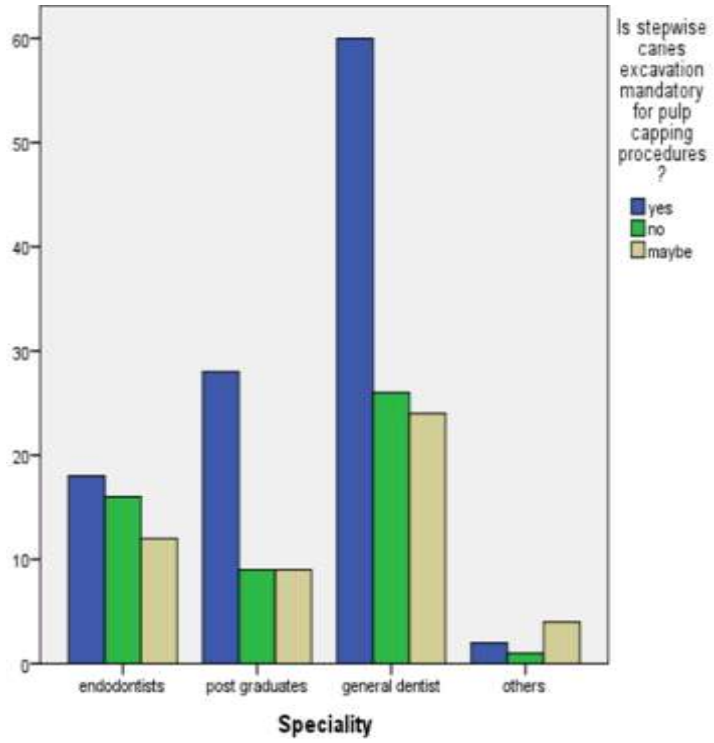

Figure 1 : As it is represented in the above graph , when compared among Endodontists , Post graduates of endodontics , general dentists and other specialities above 55% of the general dentists have stated that the stepwise caries excavation is mandatory during pulp capping procedures .

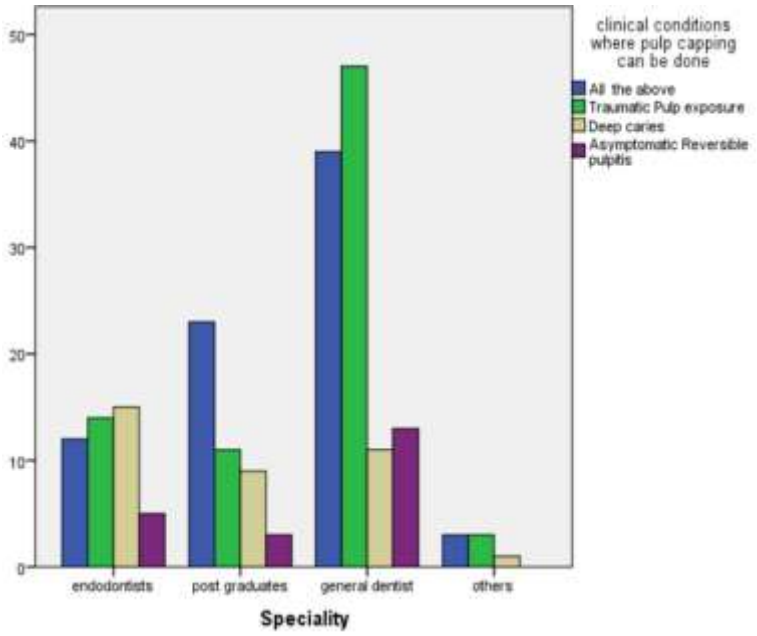

FIGURE 2: In the above graph comparing amongst Endodontists , Post graduates of endodontics , general dentists and other specialities 2 above 45 % of the general dentists had been shown that during traumatic pulp exposure is the most important condition where pulp capping is indicated

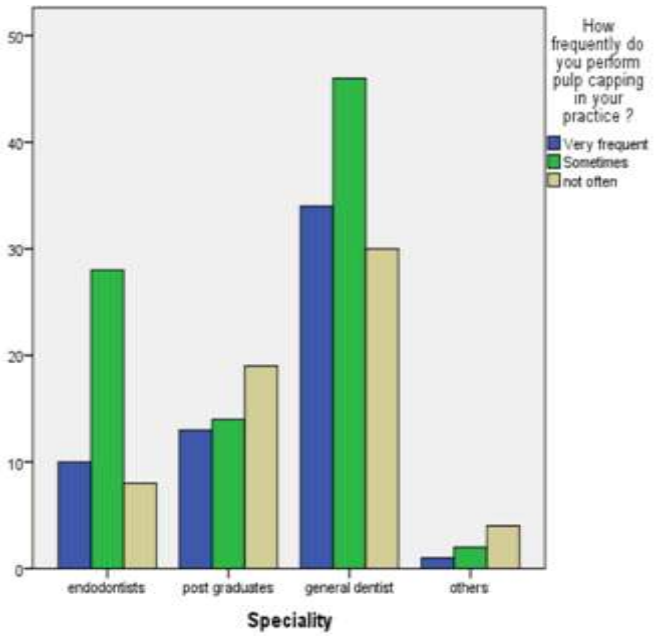

FIGURE 3 : As the above graph represents that , among endodontists , post graduates ,general dentists and other specialities, pulp capping procedures are most commonly followed amongst the general dentists of about 45 % when compared to other groups .

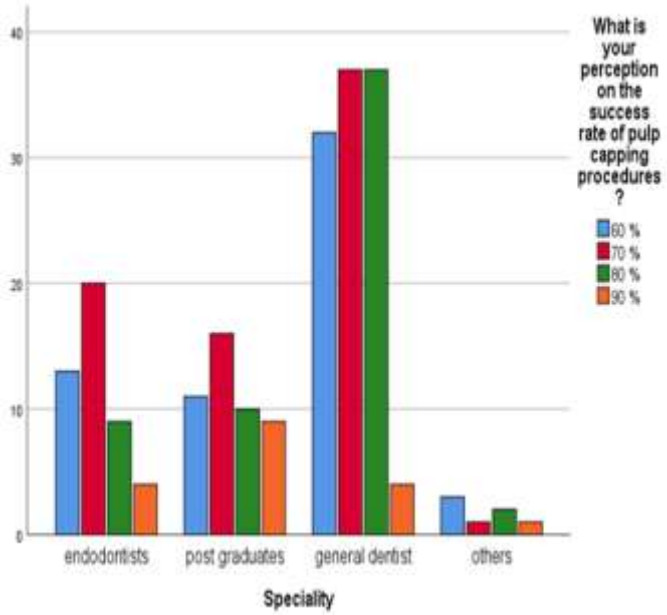

FIGURE : 4 Among the specialities which had been compared , it has been assessed that above 35% general dentists stated that there is 70 %-80%of success rate of pulp capping procedures .

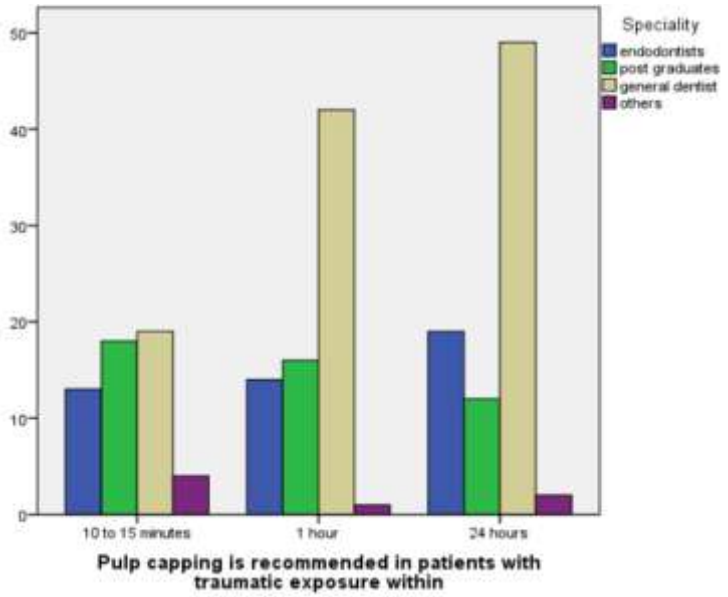

FIGURE 6 : The above graph states that the majority of the general dentists represented that the pulp capping is recommended in patients with the exposure time of 24 hours followed by post graduates and endodontists .

Profile of participants

Most of the participants were in the age group of 20-30 year. (40.66%) of the respondents were females and (59.33%) were males. (52.13%) of dentists who participated were general dentists (21.05%) were post graduates, (22%) of participants were endodontist and (3.34%) were others such as undergraduates, specialists from other branches of dentistry. The majority (70.33%) of respondents had less than 5 years of experience in clinics. There were a comparable number of participants both from the private sector(45.93%) and the educational sector (45.45%).

Knowledge, attitude and opinion towards pulp capping agents

More than half the participants (56.45%) have acknowledged the fact that calcium hydroxide is the most commonly used material in pulp capping. But the majority of participants were of the opinion that MTA is a better pulp capping agent as compared to calcium hydroxide. Majority of participants feel that the major reason for the failure of a pulp capped tooth is because of improper seal(36.84%). Hardly one third of the respondents (33.01%) knew the contraindications of pulp capping. The recall period after pulp capping procedure which is about 50 - 60 days was known by only about 46.88% of the respondents. Only 38.75 of the respondents knew that teeth traumatised within 24hrs can be restored by pulp capping procedure.

Clinical application of pulp capping agents

Stepwise caries excavation is recommended as a mandatory procedural protocol by half of the participants (51.19%). Only one third of the respondents (36.84%) affirmed that pulp capping can be used in traumatic pulp exposures, deep caries and asymptomatic reversible pulpitis. Slightly more than one third of the participants (38.75%) knew the indications of direct pulp capping. Respondents felt that MTA (44.01%) has a higher clinical success rate as a pulp capping agent as compared to biodentine (32.53%). 42.58 of the respondents stated that they only performed pulp capping sometimes but highly recommended the use of a rubber dam isolation (64.59%).

4. Discussion

Success of any pulp capping procedure greatly depends upon the circumstances under which it is performed and the prognosis depends upon the age, type, site and size of pulp exposure(13).

In this study we can see that 34.44% of dentists perceive only a 70% success in pulp capping procedures.

Pulpal diagnosis, cavity sealing, and control of caries activity are of paramount importance for a successful IPT. This gives a meaningful insight into the probable fact that most dentists lack knowledge when it comes to usage of proper protocol(14). The rate of restoration failure in permanent teeth is also reported to be no higher after incomplete caries excavation compared to complete caries excavation. It is also proven that a well sealed restoration increases the success rate of pulp capping as compared to the additional placement of a liner(4,15–17). Respondent stated that calcium hydroxide(24.88%) showed least microleakage as compared to resin modified gic(36.84%) and resin composite(37.32%).

56.45% of the respondents still use calcium hydroxide for pulp capping. It is known that the self-cure formulations are highly soluble and are subject to dissolution over time,(18) although it has been noted that, by the time the calcium hydroxide is lost due to dissolution, dentin bridging has occurred(19). As recent advances such as Hydroxy apatite is one of the most thermodynamically stable form of synthetic calcium phosphate ceramics. It has good biocompatibility with neutral P.H of (7.0) which can be used as a scaffolding for the newly formed mineralized tissue Miyakoshi et al. Calcium hydroxide has no inherent adhesive qualities and provides a poor seal(20). Hence trisilicate based cements are more preferred. However, some studies show no significant clinical and histological difference in results when MTA and calcium hydroxide were used(21).

One of the interesting observations to show that 56.45% agree that MTA is better than calcium hydroxide. The less usage could cause increased cost. MTA is a promising material, but calcium hydroxide shows a long-term track record of clinical success that MTA cannot claim at the present time. MTA was introduced by Torabinejad in early 1900s . A new calcium silicate based restorative cement with dentin like mechanical properties . In direct contact with the pulp tissue promotes reparative dentin formation . Biodentine is been reported as superior to calcium hydroxide for mechanically exposed teeth Atsuko Niinuma et al . A clinical study of 36 months of follow up by Lima et al has showed the clinical success rate of 85.4% and 79.6% was observed in the Biodentine and with White MTA . Fatou Leye Benoist et al has stated that the success rate after 6 months for MTA is 89.6% and for calcium hydroxide has 73.3% . Calcium hydroxide has been the material of choice amongst various pulp capping agents . Studies have been reported that the partial pulpotomies carried out with calcium hydroxide in cariously exposed young permanent molars Baratieri et al . A review of 14 clinical studies, including over 2,300 cases of calcium hydroxide pulp capping, noted success rates of up to 90% when done by experienced

clinicians(22). Nowadays, MTA is the present reference control recommended by ISO 7450 (2008)(23).

We also come to understand that the respondents in general are not much much familiar with biodentine or its clinical advantages as 44.01% of the respondents felt that MTA was better pulp capping material as compared to biodentine. As we have already discussed, MTA does pose some significant disadvantages like discoloration (33.97%), long setting time(30.14%) and expensive (22%).Aeinehchi et al cliical study had stated that thicker dentinal bridge and more frequent presence of an odontoblastic layer was evident when pulp capping was done with MTA compared to Calcium hydroxide . Barrieshi- Nusair et al evaluated the outcoem radiographically and clinically using Grey-MTA for partial pulpotomies in young permanent teeth where the pulp is exposed by caries . The study has concluded by stating that Grey -MTA was material of choice for partial pulpotomy in cariously exposed young permanent first molars . Trope et al had stated that partial pulpotomy with Calcium hydroxide dressing and a good coronal restoration was preferable over direct pulp capping for the inflammed pulp .

Majority of the clinicians (64.59%) knew that non-contact with oral fluids is necessary, thus making rubber dam mandatory when using any material as pulp capping material to avoid contamination.

Indirect pulp capping was more favored as the a successful treatment option by dentists(36.84%)

The success of both direct and indirect pulp capping procedures is contingent on the health and vitality of the pulp complex (24).Successful pulp capping has vital pulp and dentine bridge formation within 50 to 60 days (46.88%). Studies indicate greater tissue repair efficiency of calcium silicate compared with that of Ca(OH)2 because of the recruitment of pulp stem cells by the silicate cements. Stimulation of cell proliferation and differentiation may be related to calcium silicate itself, which is one of the main components of MTA and Biodentine (25,26). Other researches(27) after direct pulp capping in animal teeth noticed that Biodentine showed significantly higher stimulatory activity on pulp cells in comparison with MTA, resulting in thicker reparative dentin bridges and greater incidence of ectopic pulp calcification in developing teeth. In a study by Norwicka et al dentin bridges in the Biodentine group showed the highest maximum thickness and maximum volumes.(28)

Failure of a pulp capped tooth was either due to Improper case selection(29.66%), Improper isolation(17.7%), improper seal(36.84%) and Wrong choice of materials(14.35%) according to the respondants. One of the studies stated that treatment failure is referred to in some studies as occurring in the first weeks after therapy, mainly due to previous impairment of the pulp state (2).

Few of the limitations in this study was the small sample size and the distribution of the participants from the various specialties was not equally distributed due to which the actual trend in the usage of material and success of the procedure could not be exactly identified.

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Our team has extensive knowledge and research experience that has translate into high quality publications (Neelakantan et al. 2013; Aldhuwayhi et al. 2021; Sheriff et al. 2018; Markov et al. 2021; Jayaraj et al. 2015; Paramasivam et al. 2020; Li et al. 2020; Gan et al. 2019; Dua et al. 2019; Mohan and Jagannathan 2014)

5. Conclusion

The participants of this survey had a general knowledge about pulp capping, but it can be emphasised that special training for the same would be required to acquire the adequate knowledge along with proper handling of readily available materials required for this procedure. More of such surveys should be conducted to evaluate the response on a larger scale. More survey research like this should be conducted amongst health-care providers in other geographic locations that would help in understanding the global awareness on this topic. Further, research coupled with professional training will have a far-reaching effect on success of pulp capping and will, thus, benefit the patients and preserve the vitality of the tooth

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Conflict of interest
There are no conflicts of interest.

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