



**EFFECTIVENESS OF CASEIN PHOSPHOPEPTIDE-AMORPHOUS CALCIUM
PHOSPHATE (CPP-ACP) VARNISH IN REDUCTION OF SENSITIVITY
FOLLOWING TOOTH PREPARATION - A PILOT STUDY**

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ABSTRACT

Introduction

Patients frequently complain about the sensitivity of the teeth after teeth preparation of the abutment teeth for the fabrication of a fixed prosthesis. This sensitivity is generally observed during the temporization period and after the final cementation of the full coverage restorations. This sensitivity can be reduced by using desensitizing agents. These desensitizing agents are not easily available and are expensive. The aim of this study was to evaluate the effectiveness of a commercially available inexpensive material based on Casein phosphopeptide-amorphous calcium phosphate (CPP-ACP) varnish on reduction of sensitivity following tooth preparation.

Materials and method

This prospective study consisted of 15 patients who had missing teeth and desired replacement with fixed partial dentures. CPP-ACP Varnish (Mi Varnish, GC, Japan) was applied over the prepared tooth surfaces using an applicator brush. Patient evaluation was done immediately after tooth preparation and after a 3 day follow up. At both these appointments a 10 point VAS score was provided and the participants indicated their levels of

sensitivity on the scale. The VAS score data was statistically analyzed using the Wilcoxon Signed ranks test in IBM SPSS software version 20.

Results

The MI varnish application post tooth preparation resulted in a statistically significant ($p < 0.05$) reduction in the sensitivity following immediate application of the varnish after tooth preparation. There was no significant difference observed in the reduction of sensitivity after a 3 day follow-up.

Conclusion

Application of MI varnish following tooth preparation is recommended to manage post-preparation sensitivity.

Keywords: CPP-ACP, MI Varnish, Sensitivity, Tooth preparation, Fixed partial denture

INTRODUCTION

Tooth preparation done for crowns and bridges on vital teeth have the potential to induce post-operative pain, pulpal irritation and dentinal hypersensitivity.

A number of possible causes that can cause tooth sensitivity following tooth preparation include aggressive preparation of the teeth, ill-fitting provisional crowns and bridges, bacterial contamination due to micro leakage, desiccation of the tooth and removal of the protective smear layer. All these factors lead to the exposure of the dentinal tubules causing increased sensitivity [1]. To reduce the risk of sensitivity in vital abutment teeth, sealing the exposed dentinal tubules with desensitising agents following tooth preparation is recommended [2]. This sensitivity is generally observed immediately following preparation, during

the temporization period and for a short while after the final cementing of the full coverage restorations.

Sensitivity can be reduced by using desensitising agents such as GLUMA (Heraeus Kulzer) & Aqua Prep F In-Office Desensitizing Agent (BisCo.Inc), Ultradent Universal Dentin Sealant (Ultradent-products. Inc), PRG Barrier Coat (Shofu) etc. Desensitizing agents are not easily available and expensive. The aim of this study was to evaluate the effectiveness of a readily available material Casein phosphopeptide–amorphous calcium phosphate (CPP-ACP) varnish for the reduction of sensitivity following tooth preparation [3].

The present study was conducted in the Department of Prosthodontics and

Implantology Saveetha Dental College, Chennai.

The inclusion Criteria for the study were

1. Patients with missing teeth and willing for crowns &/or bridges
2. Vital teeth to be prepared for crowns &/or bridges
3. The abutment teeth were healthy showing no periodontal pathology radiographically.
4. The teeth had no previous history of hypersensitivity observed.

MATERIALS AND METHODS

The study consisted of 15 participants who had missing teeth and replacement with crowns & or bridges. The patients were informed about the study and were recruited after obtaining informed consent. A CPP-ACP Mi Varnish (GC, America) was applied over the prepared teeth.

The application of the varnish was done immediately after tooth preparation and after a 3 day follow up. At both these appointments the VAS score related to the sensitivity of the teeth was evaluated and noted. The VAS score data was statistically analyzed using the Shapiro-Wilk normality test followed by the Wilcoxon Signed ranks test.

The teeth were prepared for full coverage restorations according to standard prosthodontic protocols with a high speed airtor hand-piece with copious irrigation. Application of the MI varnish was done on the prepared abutment teeth immediately following preparation (**Figure 1, 2**). The visual analogue score was measured from 0 to 10 cm using a customized scale after immediate application of the restoration.

Provisional restorations were made using auto-cured tooth colored resin for crown and bridges (Tooth molding powder, DPI) using the indirect method of temporisation. After taking the final impression the fabricated provisionals were inserted on the prepared teeth. The patient was recalled after 3 days and evaluated for sensitivity. The patient was asked to grade their discomfort with the VAS scale during this review.

Evaluation

Immediate evaluation after application and evaluation after 3 days followup

Each patient's sensitivity was scored on the VAS scale as 0 to 10 cm. The scale consisted of a 10cm line where zero was equivalent to no pain and 10 equivalent to severe pain.



Figure 1: Application of Varnish in the teeth in the maxillary arch immediately after tooth preparation without local anaesthesia



Figure 2: Application of the Varnish in the teeth in the mandibular arch immediately after tooth preparation without local anaesthesia

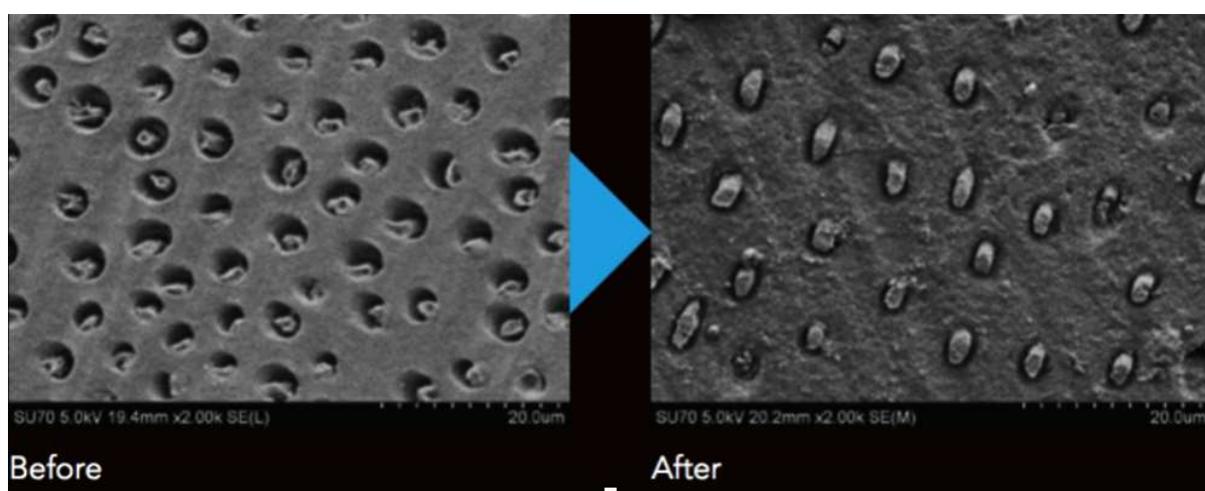


Figure 3: Scanning electron microscopic image of the closure of pores of the dentinal tubules after immediate application of the varnish

RESULTS

The non parametric data were analyzed using IBM SPSS software version 20. The p value of less than 0.05 was considered statistically significant. The Visual analogue scale data was compiled and evaluated using the Wilcoxon signed ranks test. Statistically significant results ($p < 0.05$) were found after immediate application of the CPP-ACP Varnish (MI

Varnish, GC, America). No statistical significance was found in the VAS data collected after the 3 day follow up ($p > 0.05$) (**Table 1**). This showed that the CPP-ACP (MI Varnish, GC, America) was effective in reducing the sensitivity immediately following tooth preparation. SEM images of the dentinal tubules show the before and after application of the varnish (**Figure 3**).

Table 1: The table showed a statistically significant difference in the VAS score for reduction in pain after immediate application compared to the pain intensity after follow up of 3 days

	Immediate Application	Follow-up After 3 days
Mean	3.39	4.67
Standard deviation	0.799	0.488
Wilcoxon Signed rank test	$p < 0.05$ Significant	$p > 0.05$ Not Significant

DISCUSSION

For years the application of fluoride agents in various forms has been the most effective and frequently employed method used in the prevention of dental caries [4, 5].

Recently, a new fluoride varnish containing CPP-ACP (MI Varnish, GC America) became commercially available on the dental market. There aren't any studies reporting the effect of this product on reduction of tooth sensitivity following tooth preparation. Tooth sensitivity immediately following tooth preparation is the major cause of discomfort. This Study reported statistically significant reduction in tooth sensitivity following immediate

application of CPP- ACP (MI Varnish, GC America)

It is a special milk-derived protein that releases calcium, phosphate and fluoride. This varnish brings bio-available calcium, phosphate and fluoride to the tooth surface releasing high levels of fluoride. - working in concert with the sodium fluoride (NaF). Macromolecules block the dentinal tubules thus reducing the tooth sensitivity [5, 6, 7]. Our results show that the use of application of the MI varnish immediately after tooth preparation showed a statistically significant difference in the reduction of sensitivity ($p < 0.05$). There was no statistically significant difference in the reduction of sensitivity after a 3 day followup.

Various clinical trials have shown that application of fluoride solution can decrease the DH [8, 9].

Fluorides decreases the dentinal permeability by precipitation of calcium fluoride crystals inside the dentinal tubules [10].

The calcium fluoride crystals thus formed are partially insoluble in saliva

SEM revealed granular precipitates in the peritubular dentin after application of fluorides [11]. Various fluoride formulations are used to treat DH. These include sodium fluoride, stannous fluoride, sodium monofluorophosphate, fluoro-silicates and fluoride combined with iontophoresis [12]. The acidulated sodium fluoride can form precipitates deep inside the tubules [13].

Also, some authors have recommended the use of iontophoresis along with sodium fluoride [14]. The electric current is supposed to increase the ion diffusion [15].

This varnish can also lead to precipitates of fluoridated apatite, they can form stable crystals and deposit them deep inside the dentinal tubules [16].

A study was done evaluating the fluoride, calcium and inorganic phosphate ions released from fluoride varnishes with different material composition. They found the calcium and fluoride ion release to be highest with MI Varnish

SEM studies done earlier have reported a remineralized layer which was homogenous present on enamel surfaces which were treated with CPP-ACP paste [17]. The limitations of the study was the limited sample size as well as the evaluation of the effect of the varnish post cementation of the prosthesis.

CONCLUSION

Within the limitations of this study, the application of MI varnish following tooth preparation is recommended to manage post-preparation sensitivity.

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