

Effect of Immediate Dentin Sealing in Prevention of Post-Cementation Hypersensitivity in Fullcoverage Restorations

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Abstract:

Aim: The aim of this study is to investigate the effect of immediate dentin sealing with dentin bonding agent on preventing post-cementation hypersensitivity in vital abutment teeth restored with a full-coverage restoration.

Method: A total of 50 patients were enrolled in this study who received three unit fixed dental prosthesis on vital abutments in mandibular posterior region, 25 each in the age ranges of 21-30 and 31-40 years. Sixth generation bonding agent was applied after tooth preparation and before impression making. Final prosthesis was luted using GlassIonomer luting cement. The sensitivity assessment was done after 1 week, 1 month and 6 months. **Results:** There was statistically significant difference in the reduction of sensitivity with the use of a dentin bonding agent at 1 week and 1 month but not at 6 months. There was no significant difference between the age groups.

Conclusion: Preventive treatment with immediate dentin sealing using a dentin bonding agent significantly reduces immediate post-cementation hypersensitivity.

Keywords: Post-cementation hypersensitivity; Luting cement; Dentin bonding agent.

I. Introduction

Fixed prosthodontic treatment involves the replacement and restoration of teeth by artificial substitutes that are not readily removable from the mouth by the patient and serve to restore function, esthetics and comfort. The tooth preparation for metal ceramic fixed dental prosthesis requires significant amount of tooth structure reduction; however, in most cases pulp vitality of the abutments can be maintained by protecting the tooth preparation with provisional fixed prosthesis luted with temporary luting cement, which is an essential and key step in successful fixed prosthodontic treatment.

Post-cementation hypersensitivity is a symptom characterized by a short, sharp pain when contacting thermal and chemical stimuli to the vital abutment teeth after permanent cementation of the restoration. In spite of following a standard protocol, some patients suffer from hypersensitivity following cementation of restorations on teeth. According to the survey by Rosenstiel and Rashid, the incidence of post-cementation hypersensitivity is about 10%.¹ Increased sensitivity to hot or cold stimulation is an occasional, but perplexing, unwanted consequence of a newly cemented crown or fixed partial denture.²

There are many factors considered to be associated with the occurrence of post-cementation hypersensitivity such as overheating and desiccation during tooth preparation³, infiltration of bacteria that were either left behind or gained access to the dentin due to microleakage⁴ and the amount of tooth reduction⁵. Glass Ionomer luting cement which is one of the most commonly used permanent luting agents for cast restorations has a comparatively low initial setting pH at the time of placement and this has been implicated as a cause of post-cementation sensitivity⁶ when the prosthesis is being cemented on vital teeth.

Immediate dentin sealing (IDS) is a new approach in which the dentin is sealed immediately after tooth preparation and prior to impression making. A clean dentin surface is mandatory for optimal seal and adhesion. Freshly cut dentin is uncontaminated and clean, thus more easily capable of resin infiltration. Immediate sealing of dentin protects it from contamination from bacterial leakage or remnants of temporary cements.⁷ Capturing the hybrid layer into the impression will eliminate the concern for gap formation and ill-fitting restorations.

II. Materials and Methods

A total of 50 patients were enrolled in this study who received three unit fixed dental prosthesis on vital abutments in mandibular posterior region. They were divided into two groups of 25 each. Group A consisting of 25 patients in the age group of 21-30 years or younger group and Group B consisting of 25 patients in the age group of 31-40 years or middle aged group. Treatment was carried out with the patients' informed consent. All patients received detailed particulars (verbal and written) on the course of treatment and the purpose of the study. The patients were included in the study only after obtaining a signed consent form. A Double Blind

approach was utilised; all the tooth preparations were done by one operator and the assessment done by another evaluator blinded to the procedure.

A split-mouth design was used and two vital abutment teeth in each patient were allocated randomly into Subgroup 1 (study group) and Subgroup 2 (control group).

So, four categories were thus formed consisting of A1, B1, A2 and B2. (Table 1)

Work Plan:

The two abutment teeth of each patients were randomly allocated into either Subgroup 1 or 2 and each subgroup included 50 teeth. Teeth in Subgroup 1 were treated with Dentin Bonding Agent immediately after tooth preparation and before impression making whereas teeth in Subgroup 2 were used as a control and therefore left untreated.

Every tooth in Subgroup 1 and Subgroup 2 was prepared for receiving a wingless metal-ceramic full coverage restoration according to the standard procedure using diamond rotary cutting instruments. Margins were maintained supragingival.

After tooth preparation, the entire prepared surface of Subgroup 1 was coated with Self Etching Primer and left for 20 seconds. Afterwards, the tooth was dried via mild blown air using the Chip Blower taking care to avoid desiccation of the dentin.

Sufficient Dentin Bonding Agent was then dispensed onto the prepared tooth surface with a disposable microbrush and blown gently for 5 seconds to make sure the surface has a uniform, glossy appearance. Two coats of the bonding agent were applied. It was then light-cured for 20 seconds

The definitive impression was made after sealing the dentin. Provisional three unit prosthesis was fabricated in autopolymerizing acrylicresin and cemented using a Eugenol free temporary cement. Final Prosthesis was cemented using Type I Glass Ionomer Luting Cement within 1 Week.

Assessment:

The sensitivity assessment was performed 1 week, 1 month and 6 months after cementation of final prosthesis. The adjacent teeth were covered with cotton pellets. Compressed air from a three-way syringe was then blown over the buccal cervical margin area of the abutment teeth at a distance of 3 cm for 2 seconds. Patients were then asked to rate the level of sensitivity they experienced on a four-point Category Discomfort scale (pain scale) from 0-No pain (patient experiences no discomfort), 1-Mild pain (almost unnoticeable pain), 2-Moderate pain (noticeable pain, but patient can still engage in routine daily activities) and 3-Severe pain (very noticeable pain which disturbs the patient's daily routine) and the values were recorded.

III. Results

The incidence of mild to moderate post-cementation hypersensitivity in the control groups in the age range of 21-30 years was found to be 64%, 40% and 8% at 1 Week, 1 Month and 6 Months respectively and that in the age range of 31-40 years was found to be 72%, 44% and 2% at 1 Week, 1 Month and 6 Months respectively.

The incidence of mild to moderate post-cementation hypersensitivity in the study groups in the age range of 21-30 years was found to be 24%, 4% and 0 at 1 Week, 1 Month and 6 Months respectively and that in the age range of 31-40 years was found to be 28%, 4% and 0 at 1 Week, 1 Month and 6 Months respectively.

The comparative values of A1 and A2 at 1 Week were found to be highly statistically significant with a P value of .000. Similar comparison of B1 and B2 was also highly statistically significant with P value of .000

Also, the comparative values of A1 and A2 at 1 Month were found to be statistically significant with a P value of .008 which is $<.05$. Similar comparison of B1 and B2 was also statistically significant with P value of $.001<.05$ In contrast, the comparative values of A1 and A2 at 6 Months were statistically insignificant with P value of .157 which is $>.05$. In a similar manner, when B1 and B2 were compared, the result obtained was again statistically insignificant with P value of $.317<.05$ (Table 2).

It was observed at all the three periodic intervals that the P values were statistically insignificant ($p>0.05$) in the study as well as the control groups. This meant that there was no significant difference found in the incidence of post-cementation hypersensitivity between the two age groups of 21-30 years and 31-40 years (Table 3). Application of a dentin bonding agent immediately after tooth preparation and before impression making significantly reduces immediate post-cementation hypersensitivity at 1 Week and 1 Month but it does not make a significant difference over a period of time.

IV. Discussion

Post-cementation hypersensitivity usually occurs due to pulp hyperemia.⁸ Selection of the luting cement for vital abutments is considered critical as it plays an important role in controlling post-cementation hypersensitivity and success of the final prosthesis. Various studies have been carried out comparing different

luting agents in terms of their ability to control postoperative hypersensitivity when used for cementation of fixed prosthesis on vital abutments.^{6,9} Type I glass ionomer cements and resin based luting cements are the two most commonly used luting agents.^{10, 11} Glass ionomer cement can displace certain amount of dentinal fluid, which may cause excessive hydrostatic pressure leading to post-cementation hypersensitivity. Johnson et al in their in vitro study found that, use of a resin sealer resulted in 55% increased retention when used with glass ionomer cement. They concluded that a dentin bonding agent can be used successfully with type I glass ionomer cement.¹² In this study, it was found that there was no statistically significant difference in the incidence of post-cementation hypersensitivity between the two age groups. The hypersensitivity which occurred after cementation was found to be of mild to moderate type. The incidence of post-cementation hypersensitivity was found to be higher initially, and as time progressed, the incidence decreased. Pameijer CH and Nilker K in their study found post-cementation hypersensitivity to be a negligible problem.¹³

Effective sealing of dentin addresses the challenges of hydrodynamic fluid movement in dentinal tubules which has been shown to induce sensitivity.¹⁴ In the present study, it was evaluated whether immediate dentin sealing using a dentin bonding agent successfully reduced or eliminated post-cementation hypersensitivity. It was found that the P values were statistically significant ($P < .05$) in both the age groups at 1 Week and 1 Month after cementation. However, the P value was insignificant ($P > .05$) in both the age ranges at the end of 6 Months. These results are in concurrence with another similar study carried out by Hu J. et al.¹⁵ Also, in all the subjects who reported with sensitivity, only mild or moderate form was observed. This supports the findings of Saadet al¹⁶ who also found that negligible number of patients experienced severe sensitivity. This can be due to proper provisionalization.¹⁷ The cause for this hypersensitivity is not very clear. A number of etiologic factors have been proposed and care needs to be taken to avoid them during the procedure.

Considering the limitations of this study, further research is required to evaluate the effects of various dentin sealing agents on reducing post-cementation hypersensitivity and the effect of sealing on bonding of glass ionomer luting cement.

V. Conclusion

Most of the studies documented in literature have shown that application of a dentin bonding agent significantly reduces post-cementation hypersensitivity. So, although the sensitivity of untreated teeth may seem to be self-healing in the long term, tooth hypersensitivity in the initial period may cause pain and discomfort to the patients. Hence, in order to reduce the incidence of tooth hypersensitivity, immediate dentin sealing can be performed using a dentin bonding agent.

Manufacturers' Details:

Sixth generation Dentin Bonding Agent (Clearfil SE[®], Kuraray, Japan)
Eugenol free temporary cement (Freegenol Temporary Pack[®], GC, Japan).
Type I Glass Ionomer luting cement (GC, Japan)

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Table: 1

Group Name	Type	Age Range	Sample Size
A1	Study	21-30 Years	25
A2	Control	21-30 Years	25
B1	Study	31-40 Years	25
B2	Control	31-40 Years	25

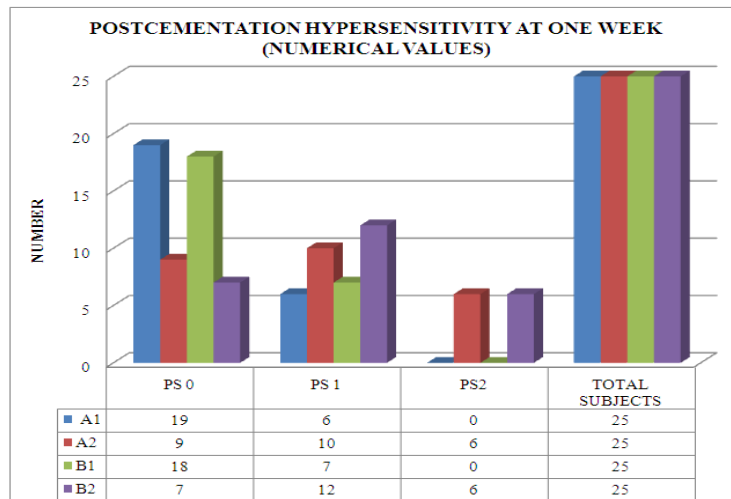
Table: 2

Groups		1 Week	1 Month	6 Months
A1 & A2	Z	-3.557	-2.653	-1.414
	Asymp. Sig. (2-tailed)	.000	.008	.157
B1 & B2	Z	-4.123	-3.207	-1.000
	Asymp. Sig. (2-tailed)	.000	.001	.317

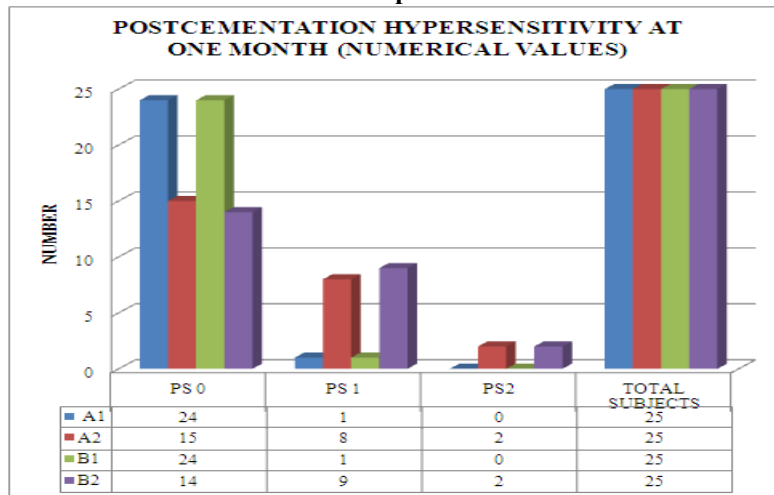
Table 3

Comparison between	Yates' P Value		
	1 Week	1 Month	6 Months
A1 and B1 (Study Groups)	P= 1.0	P= .47	P= .88
A2 and B2 (Control Groups)	P= .76	P= 1.0	P= 1.0

GRAPH 1



Graph 2



Graph 3

