

# POST CEMENTATION SENSITIVITY IN VITAL ABUTMENTS OF METAL-CERAMIC FIXED PARTIAL DENTURES

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## ABSTRACT

*This randomized clinical trial was carried out to compare post cementation sensitivity in vital abutments of metal-ceramic fixed partial dentures using glass ionomer luting cement and resin based luting cement. It analyzed the results of 182 patients whose records were completed during study duration of 09 months at Department of Prosthodontics, AFID, Rawalpindi. Cold sensitivity tests were used to compare post cementation sensitivity in vital abutments of fixed partial dentures using resin based luting cement and glass ionomer luting cement. Sensitivity was assessed on a modified visual analogue scale of 0-10; scores of 1-4 signified mild sensitivity, 5-7 moderate sensitivity, 8-10 severe sensitivity and score of 0 signified no response. The sensitivity results were checked at base line, at 1 week, at 1 month, at 3 months. Data of 182 subjects of mean age  $26.15 \pm 3.15$  was evaluated. Chi-square test was used to see the association of type of cement used and the postoperative sensitivity. The p values for the chi square test were insignificant P-values ( $P > 0.05$ ) at all appointments in abutments of fixed partial denture with either resin based or glass ionomer luting cement. The study showed that there is no significant difference between resin based luting cements and glass ionomer luting cements in terms of post cementation sensitivity in vital teeth.*

**Key words:** Sensitivity, Abutments, Fixed partial denture, Luting cement

## INTRODUCTION

Metal ceramic fixed partial dentures (FPDs) are a commonly used treatment option for replacing missing teeth.<sup>1,2</sup> Studies have demonstrated that posterior abutments of FPDs show greater survival rate of pulp as compared to anterior abutments.<sup>1</sup> This is to say that when premolars and molars are used as abutments for fixed partial dentures they can maintain their pulp vitality in a much better way as compared to when anterior teeth are used. The tooth preparation for metal ceramic FPDs requires significant amount of tooth structure to be removed, however, in most cases pulp vitality can be maintained in abutments provided prepared abutments are protected after tooth preparation with provisional fixed partial dentures luted with temporary luting cement, which is an essential and key

step in successful fixed prosthodontic treatment.<sup>3</sup> Post cementation sensitivity is one of the most significant complications in fixed Prosthodontics, especially when the prosthesis is cemented on teeth with vital pulps. However, the incidence of this post cementation complication is underestimated by most clinicians. The selection of permanent luting cement for fixed partial dentures is critical as it has an important role to play in controlling the post cementation sensitivity and success of the final prosthesis.<sup>4</sup>

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 sensitivity<sup>5</sup> when the prosthesis is being cemented on teeth with intact pulp

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vitality. Resin based luting cements exhibit lower solubility in comparison to conventional Glass Ionomer cements and their pH at placement is also higher as compared to Glass Ionomer cements.<sup>6</sup> However resin based luting cements have also been reported to cause post operative sensitivity because their main shortcoming is marginal defects and gaps caused by polymerization shrinkage during placement. Since resin based luting cements have only been introduced in recent years no comprehensive studies exist which compare post cementation sensitivity of the two luting cements under similar conditions. This study was done to establish that which one of these luting cements offers better results in terms of post cementation sensitivity in abutments of fixed partial dentures having vital pulps with full coverage restorations.

## METHODOLOGY

This randomized clinical trial was carried out at the Department of Prosthodontics, Armed Forces Institute of Dentistry, Rawalpindi. The duration of the study was 09 months from February 2009 till Oct 2009. Permission was taken from hospital's ethical committee and informed written consent was also taken from the patients who fulfilled the selection criteria for the study. Patients of both genders and age range of 20-30 years were included in the study. All of these patients were candidates for posterior fixed partial denture with missing mandibular permanent 1<sup>st</sup> molar, having vital abutment teeth. Patients who had sensitivity in the abutment teeth, who had generalized gingival or dental sensitivity or had restorations on abutments approximating pulp were not included in the study.

Initially a total of 208 Patients (pts) were allotted serial numbers and random allocation was done by dividing the pts into Group A (104 pts) and Group B (104 pts) by lottery method using Research Randomizer (single blind technique was observed). However, data could only be completed for 182 patients. Teeth of patients were prepared for Metal Ceramic FPD with occlusal reduction of 1.5-2.0 mm, circumferential reduction of around 1.5 mm with supragingival shoulder margin on the buccal and reduction of around 1-1.5mm with supragingival chamfer margin on lingual aspect. The prepared vital abutments were protected by a provisional custom made FPD luted with a temporary luting cement (Provicol) for 14 days. After temporization the patients in Gp A were provided metal ceramic FPD luted with resin based luting cement (Panavia F 2) and the patients in Gp B were provided metal ceramic FPD luted with Glass Ionomer Cement (Fuji GC-II).

The abutment teeth which were prepared for metal ceramic fixed partial dentures were given only metal coverage on their lingual aspect so that cold sensitivity tests using ethyl chloride impregnated cotton pellets could be easily performed. Sensitivity was assessed on a modified visual analogue scale of 0-10; scores of 1-4 signified mild sensitivity, 5-7 moderate sensitivity, 8-10 severe sensitivity and score of 0 signified no response. The sensitivity results were checked at base line (i.e. at the time of cementation of the fixed partial denture), at 1 week, at 1 month and at 3 months post cementation. Patient's whose abutments became nonvital during the study were not considered in the results. All statistical calculations were performed using SPSS version 14. Chi square test was used to see the differences in proportion regarding sensitivity between the 2 types of cements in Gp A and Gp B pts.

## RESULTS

Based on the inclusion and exclusion criteria data of 182 pts was completed and analyzed. The mean age of the patients that were included in the study was  $26.15 \pm 3.15$  years (see Fig 1). The mean sensitivity response for both cements i.e the glass ionomer luting cement and the resin based luting cement decreased gradually at each follow up appointment. The mean sensitivity score for anterior vital abutments was always greater than the mean sensitivity score of the posterior vital abutments at all four instances when the sensitivity tests were carried out (see Table 1).

This is to say that irrespective of the type of luting cement used the mean sensitivity score of anterior teeth was greater than that of the posterior teeth at all four appointments i.e. at the appointment for cementation, at the 1<sup>st</sup> follow up after 1 week, at the 2<sup>nd</sup> follow up after 1 month and at the 3<sup>rd</sup> follow up after 3 months. Also the most evident variations in sensitivity responses were seen at the 1<sup>st</sup> sensitivity test after cementation of fixed partial dentures as evident by the much greater values of standard deviation of 0.64 and 0.65 for anterior and posterior teeth respectively (see Table 1).

The sensitivity results showed that majority of the patients exhibited only mild to moderate sensitivity irrespective of the type of cement used. So much so that more than 90% of the pts only had mild to moderate sensitivity in either tooth at all the post cementation appointments when the sensitivity tests were carried out. The sensitivity values were mild to moderate in around 98% of the patients at all follow up appointments for both groups, with the exception of the 1<sup>st</sup>

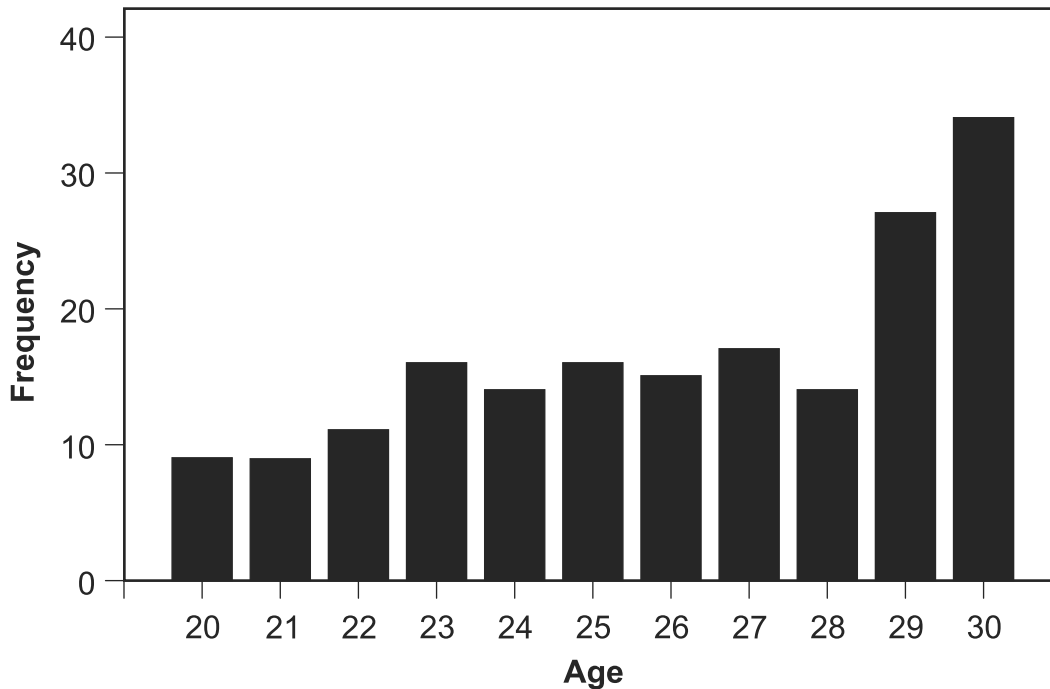


Fig 1: Frequency of Ages of the Patients. n=182

TABLE 1: SENSITIVITY RESPONSES OF ANTERIOR AND POSTERIOR ABUTMENTS

	Sensiti- vity at cemen- tation A0	Sensiti- vity at 1 week A1	Sensiti- vity at 1 month A2	Sensiti- vity at 3 months A3	Sensiti- vity at cemen- tation P0	Sensiti- vity at 1 week P1	Sensiti- vity at 1 month P2	Sensiti- vity at 3 month P3
Mean	2.55	2.24	2.10	2.02	2.43	2.09	2.04	1.98
Std.Deviation	.643	.487	.386	.363	.650	.403	.354	.348

(A – Anterior /premolar abutment, P – Posterior/molar abutment)

sensitivity test when 90% patients had either mild or moderate responses. Chi-square test was used to see the association of type of cement used and the postoperative sensitivity in vital abutments after cementation of fixed partial denture. The p values for the chi square test were 0.901, 0.745, 0.262, 0.482, 0.608, 0.952, 0.906, 0.930. The insignificant P-values ( $P > 0.05$ ) at all appointments in both anterior and posterior abutments of fixed partial denture with either resin based or glass ionomer luting cement exhibited that there was no difference between the two cements in terms of post cementation sensitivity.

**DISCUSSION**

Postoperative sensitivity after cementation of fixed prosthesis is a common complaint especially in cases where the abutments have vital pulp.<sup>7</sup> A study carried out by Rosenstiel et al<sup>8</sup> showed that the incidence of this postoperative complication is usually underestimated

by most dentists. When fixed partial dentures are used to replace missing single tooth especially in young patients most of the time the abutment teeth are vital. In these clinical situations the dentist has to make the critical decision whether to carry out elective endodontic treatment for the vital abutments or to try and preserve pulp vitality.<sup>9,10</sup>

It has been observed that unlike anterior teeth vitality of most posterior teeth prepared for fixed prosthesis can be preserved without the need for any elective endodontic treatment, provided proper precautions are taken during and after tooth preparation procedure.<sup>1,10</sup> Postoperative sensitivity is usually due to pulp hyperemia.<sup>11,12</sup> The selection of the luting agent for fixed prosthesis with vital abutments is considered critical as it has an important role to play in controlling post cementation sensitivity and success of the final prosthesis. Numerous studies have been carried out

comparing different luting agents in terms of their ability to reduce or control postoperative sensitivity when used for cementation of fixed prosthesis on teeth with vital pulps.<sup>5,13</sup> Two of the most commonly used contemporary luting agents are glass ionomer cements and resin based luting agents. The initial low setting pH of glass ionomer has been reported and implicated as a cause for post cementation sensitivity.

In the present study we compared resin based luting cement and glass ionomer luting cements in terms of post cementation sensitivity in vital teeth cemented with fixed partial dentures. The comparison was drawn at the day of cementation, one week after cementation, one month after cementation and three months after cementation of fixed partial dentures. The insignificant p values ( $P > 0.05$ ) at all these appointments are indicative of the fact that there is insignificant difference, if any, between the two luting cements in terms of post cementation sensitivity. So both glass ionomer cements and resin based luting cements can be used for cementation of fixed partial dentures or any other indirect restoration on vital teeth. This result is more or less similar to what was concluded by Denner et al<sup>5</sup> in their comparison of resin based and glass ionomer luting cement.

In the present study majority of the patients reported mild and moderate sensitivity (over 95%) even on cold provocation test which supports the findings of Saad et al<sup>14</sup> who also concluded that in most of the vital teeth luted with full coverage restorations negligible number of patients experienced severe sensitivity. This can be contributed to provisionalisation of abutments as performed in this study.<sup>15</sup>

In this study the mean sensitivity scores for anterior abutment of FPDs i.e the premolars decreased from 2.55 to 2.04 and for posterior abutment teeth of fixed partial denture decreased from 2.48 to 1.98 from the first sensitivity test to the fourth sensitivity test at 03 months follow up. It was also noteworthy that the mean sensitivity scores of premolars were always greater than the mean sensitivity scores of molars. This finding is in concurrence with another study by Cheung et al<sup>1</sup> which is also suggestive of the fact that molars can tolerate pulpal trauma related to tooth preparation much better as compared to the premolars and the anteriors.

## CONCLUSION

Within the limitations of this study, the following conclusions were drawn:

- Majority of the patients exhibited either mild or moderate sensitivity on cold sensitivity tests, with a very small percentage experiencing severe sensitivity.
- The sensitivity responses mellowed down with time with both the luting cements.
- There was no significant difference ( $p > 0.05$ ) between the resin based luting cement and glass ionomer luting cement in terms of post cementation sensitivity in vital teeth with fixed restorations.

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