



Comparison of Hypersensitivity in Metal Ceramic Crowns cemented with Zinc Phosphate and Self-adhesive Resin: A Prospective Study

¹Thatapudi Shankar, ²Mirna Garhnayak, ³Lokanath Garhnayak, ⁴Angurbala Dhal, ⁵Aswini K Kar

ABSTRACT

Background: Luting agents used to fix artificial prostheses, such as fixed partial denture (FPD) to tooth are basically viscous in nature and show chemical reaction for fixation. Postcementation hypersensitivity is a frequent complaint of patients. The present study was conducted to compare postcementation hypersensitivity with zinc phosphate and self-adhesive resin in complete coverage crown.

Materials and methods: This study included 30 patients in which 60 porcelain fused to metal crowns was placed. Two metal crowns were placed in each patient in nonantagonistic contralateral quadrants. First crown was cemented with zinc phosphate cement, while the other was cemented with self-adhesive resin. Hypersensitivity was evaluated by visual analog scale (VAS) score and by clinical test. For clinical evaluation of sensitivity, hot and cold water was applied to the cervical margin of restoration for 5 seconds and response was recorded.

Results: This study consisted of 30 patients in which 60 crowns were given. There was no statistical difference in VAS score of mastication in zinc phosphate cement recorded at baseline, 1 week, 4 weeks, 6 months, 1 year, and 2 years ($p > 0.05$). Cold response also did not show a significant difference at six time points. Warm response showed slight decrease in subsequent time points but was nonsignificant ($p > 0.05$). Similarly, with self-adhesive resin cement, VAS score during mastication, hot and cold response was statistically nonsignificant ($p > 0.05$).

Conclusion: Postcementation hypersensitivity is a frequent complaint that patient may experience. However, we found no statistically significant difference in both cements tested.

Clinical significance: Postcementation hypersensitivity is an unpleasant sensation experienced by patients. This may affect the success of any prosthesis. Thus, selection of luting agent for cementation plays an important role to eliminate this symptom.

Keywords: Luting, Postcementation hypersensitivity, Self-adhesive resin, Zinc phosphate.

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INTRODUCTION

Luting agents used to fix artificial prostheses, such as FPD to tooth are basically viscous in nature and show chemical reaction for fixation. Hypersensitivity after placement of full coverage crowns may be attributed to the luting agents. In dentistry, numerous luting agents are used, such as glass ionomer, resin-modified glass ionomer, polycarboxylate resins, and zinc phosphate.¹ An ideal luting agent should be nonirritating to pulp, should be anticariogenic in nature, should not cause hypersensitivity after placement of prostheses, and should be viscous, heat resistant, light transparent, etc. It is very difficult to have all properties in a single luting agent. Hence, the selection of it requires great skill and depends upon the experience of dental professional.²

Among different shortcomings of luting agents, postcementation hypersensitivity is a frequent complaint that a patient experiences. Hypersensitivity after placement

^{1,5}Department of Prosthodontics, Kalinga Institute of Dental Sciences, KIIT University, Bhubaneswar, Odisha, India

²Department of Prosthodontics, Institute of Dental Sciences Siksha 'O' Anushandhan University, Bhubaneswar, Odisha, India

^{3,4}Department of Prosthodontics, Sriram Chandra Bhanj Dental College & Hospital, Cuttack, Odisha, India

Corresponding Author: Thatapudi Shankar, Department of Prosthodontics, Kalinga Institute of Dental Sciences, KIIT University, Bhubaneswar, Odisha, India, Phone: +919441333906 e-mail: thatapudi1@gmail.com

of full coverage crowns may be attributed to the luting agents.³ Glass ionomer cement (GIC) was widely used as luting agent and with addition of resin (20%) it has become resin-modified GIC. It has advantage over other cements, such as zinc phosphate, polycarboxylate in terms of higher compressive and tensile strength. It has better adhesion properties due to presence of carboxyl group in polyalkenoic acid. One of the drawbacks of GIC is sensitivity after placing FPDs owing to low setting pH.⁴ Zinc phosphate cement was one of the choices of luting agent. Despite frequent use, it has also disadvantage of postcementation sensitivity. After placement of cement, there is immediately dissolution of smear layer and smear plug, leading to sensitivity. Recently, resin-based cements as luting agents have been introduced with higher pH and lower solubility. Recent studies suggest that with resin-based cements postoperative sensitivity is less because the smear layer is not removed. The other cause of postcementation hypersensitivity is polymerization shrinkage due to marginal discrepancy.^{5,6} Considering this, the present study was conducted to compare post-cementation hypersensitivity with zinc phosphate and self-adhesive resin in complete coverage crown.

MATERIALS AND METHODS

This 3-year study was conducted in the Department of Prosthodontics from 2013 to 2016. It included 30 patients in which 60 porcelain fused to metal crowns was placed (Table 1). Patients were informed regarding the study and written consent was obtained. Patient general information, such as name, age, and gender was recorded in case history pro forma. Only premolars and molars were involved in the study, while anterior teeth were excluded from the study. Two metal crowns were placed in each patient in nonantagonistic contralateral quadrants. First crown was cemented with zinc phosphate cement, while the other was cemented with self-adhesive resin. The preparation of abutment teeth was as standard guidelines recommended by Shillingburg et al.⁷ Each patient was recalled for evaluation of hypersensitivity at six time points (Table 2). Hypersensitivity was evaluated by two methods, one by VAS score and second by clinical test. All patients were asked to respond to the parameters (mastication, hot, and cold) by marking the sensitivity

Table 1: Distribution of patients

Gender	Male	Female
Number	15	15
Teeth	30	30

Table 2: Evaluation of VAS on different time points

Time point	
First	Baseline before treatment
Second	1 week after crown delivery
Third	After 4 weeks
Fourth	After 6 months
Fifth	After 1 year
Sixth	After 2 years

on line (10 mm) range from 0 to 10 where 0 indicates no sensitivity and 10 indicates severe sensitivity. For clinical evaluation of sensitivity, hot and cold water was applied to cervical margin of restoration for 5 seconds and response was recorded. Results thus obtained were subjected to statistical analysis; $p < 0.05$ was considered statistically significant.

RESULTS

Table 1 shows that equal number of males (15) and females (15) with equal number of teeth (30) were involved in this study. The difference was nonsignificant ($p > 0.05$). Table 2 indicates that each patient was recalled for evaluation of hypersensitivity at six time points: first at baseline before treatment, second after 1 week of crown delivery, third after 4 weeks, fourth after 6 months, fifth after 1 year, and sixth after 2 years. Table 3 shows VAS score during mastication, cold and hot response with zinc phosphate cement and Table 4 shows comparison of VAS score during mastication, cold and hot response with self-adhesive resin cement. There was no statistical difference in VAS score of mastication in zinc phosphate cement recorded at baseline, 1 week, 4 weeks, 6 months, 1 year, and 2 years ($p > 0.05$). Cold response also did not show significant difference at six time points. Warm response showed slight decrease in subsequent time points but was nonsignificant ($p > 0.05$). Similarly, with self-adhesive resin cement, VAS score during mastication, hot and cold response was statistically nonsignificant ($p > 0.05$). Comparison of both cements showed no statistical difference ($p > 0.05$).

Table 3: Comparison of VAS at different time points with zinc phosphate cement

	Baseline	1 week	After 4 weeks	After 6 months	After 1 year	After 2 years
Parameters	Mastication 1	Mastication 2	Mastication 3	Mastication 4	Mastication 5	Mastication 6
VAS score	4	4	3	3	3	3
Parameters	Cold 1	Cold 2	Cold 3	Cold 4	Cold 5	Cold 6
VAS score	3	3	3	3	2	1
Parameters	Warm 1	Warm 2	Warm 3	Warm 4	Warm 5	Warm 6
VAS score	4	5	4	4	3	3



Table 4: Comparison of VAS at different time points with self-adhesive resin

	Baseline	1 week	After 4 weeks	After 6 months	After 1 year	After 2 years
Parameters	Mastication 1	Mastication 2	Mastication 3	Mastication 4	Mastication 5	Mastication 6
VAS score	3	4	3	2	2	2
Parameters	Cold 1	Cold 2	Cold 3	Cold 4	Cold 5	Cold 6
VAS score	4	4	3	3	2	2
Parameters	Warm 1	Warm 2	Warm 3	Warm 4	Warm 5	Warm 6
VAS score	5	5	4	3	3	3

DISCUSSION

Luting cements are used to fix artificial prostheses, such as FPDs with abutments. Depending on their physical properties, they can be temporary or permanent. In dentistry, various cements are being used as luting agents. With modifications, the shortcomings have been overcome. However, it is not possible to have cement which possesses all the ideal features of cement.⁸ In the present study, we compared the zinc phosphate cement with self-adhesive resin cement as a luting agent in terms of hypersensitivity.

Hypersensitivity in cemented metallic crown is a frequent complaint among patients.⁹ Rosenstiel and Rashid¹⁰ in their study revealed that the incidence of postcementation hypersensitivity is generally underrated by majority of the dentists.

The selection of luting agent is very important as they have been known to add significantly to postcementation hypersensitivity.¹¹

The present study comprised 30 patients (males 15, females 15) with 60 teeth (males 30, females 30). In each patient, two full coverage crowns were placed in nonantagonistic contralateral quadrants. We compared both cements in terms of mastication, hot and cold response recorded at subsequent recalled visits. Six time points were taken into consideration, such as baseline, 1 week, 4 weeks, 6 months, 1 year, and 2 years. The VAS score was recorded in each patient in two crowns, one cemented with zinc phosphate cement and the other with self-adhesive resin cement. Our study showed no statistically significant difference with both cements. Our results are in agreement with those of Behr et al¹² in their study; bleeding and plaque score, attachment level, percussion, and pulp vitality were compared with zinc phosphate and self-adhesive resin cement. They also found no significant difference with both cements. Jokstad and Mjör¹³ in their 10-year clinical study compared hypersensitivity with three cements and found that postcementation hypersensitivity usually resolves after a couple of days. They evaluated the patient response for 5 years to hypersensitivity but failed to establish these luting agents as exact cause. This was a 3-year clinical study of evaluation of hypersensitivity to mastication, hot

and cold response. However, the exact cause of hypersensitivity with these luting agents cannot be established. Bebermeyer and Berg¹⁴ in their study of comparison of GIC with zinc phosphate suggested that there can be multiple reasons for postcementation hypersensitivity and selection of luting agents can be one of them. We found that there was difference in VAS score in both gender. Females usually respond with higher frequency to pain.¹⁵ The present study has the limitation of having less number of patients, and their response may vary from patient to patient.

CONCLUSION

The selection of luting agent plays an important role in the success of any restoration. Postcementation hypersensitivity is a frequent complaint that patients may experience. We found no statistically significant difference in both cements.

REFERENCES

- Hill EE, Lott J. A clinically focused discussion of luting materials. *Aust Dent J* 2011 Jun;56 (Suppl 1):67-76.
- Christensen GJ. Resin cements and postoperative sensitivity. *J Am Dent Assoc* 2000 Aug;131(8):1197-1199.
- Diaz-Arnold AM, Vargas MA, Haselton DR. Current status of luting agents for fixed prosthodontics. *J Prosthet Dent* 1999 Feb;81(2):135-141.
- Radovic I, Monticelli F, Goracci C, Vulicevic ZR, Ferrari M. Self-adhesive resin cements: a literature review. *J Adhes Dent* 2008 Aug;10(4):251-258.
- Kern M, Kleimeier B, Schaller HG, Strub JR. Clinical comparison of postoperative sensitivity for a glass ionomer and a zinc phosphate luting cement. *J Prosthet Dent* 1996 Feb;75(2):159-162.
- Johnson GH, Powell LV, DeRouen TA. Evaluation and control of post-cementation pulpal sensitivity: zinc phosphate and glass ionomer luting cements. *J Am Dent Assoc* 1993 Nov;124(11):38-46.
- Shillingburg, HT Jr.; Sather, DA.; Wilson, EL Jr.; Cain, JR.; Mitchell, DL.; Blanco, LJ.; Kessler, JC. *Fundamentals of fixed prosthodontics*. 4th ed. Chicago (IL): Quintessence Publishing; 2012. p. 131-149.
- Stamatacos C, Simon JF. Cementation of indirect restorations: an overview of resin cements. *Compend Contin Educ Dent* 2013 Jan;34(1):42-44, 46.
- Shetty RM, Bhat S, Mehta D, Srivatsa G, Shetty YB. Comparative analysis of postcementation hypersensitivity

- with glass ionomer cement and a resin cement: an *in vivo* study. *J Contemp Dent Pract* 2012 May;13(3):327-331.
10. Rosenstiel SF, Rashid RG. Postcementation hypersensitivity: scientific data versus dentists' perceptions. *J Prosthodont* 2003 Jun;12(2):73-81.
 11. Hu J, Zhu Q. Effect of immediate dentin sealing on preventive treatment for postcementation hypersensitivity. *Int J Prosthodont* 2010 Jan-Feb;23(1):49-52.
 12. Behr M, Rosentritt M, Wimmer J, Lang R, Kolbeck C, Bürgers R, Handel G. Self-adhesive resin cement versus zinc phosphate luting material: a prospective clinical trial begun 2003. *Dent Mater* 2009 May;25(5):601-604.
 13. Jokstad A, Mjör IA. Ten years' clinical evaluation of three luting cements. *J Dent* 1996 Sep;24(5):309-315.
 14. Bebermeyer RD, Berg JH. Comparison of patient-perceived postcementation sensitivity with glass-ionomer and zinc phosphate cements. *Quintessence Int* 1994 Mar;25(3):209-214.
 15. Dao TT, LeResche L. Gender differences in pain. *J Orofac Pain* 2000 Summer;14(3):169-184, discussion 184-195.