ORIGINAL RESEARCH

Evaluation and Comparision of Marginal Adaptation of Cast Metal Restoration using Different Luting Agents in Fixed Prosthodontics- An Invitro Study

P.Rupkumar[1], G.Sriramaprabu[2], C.Sabarigirinathan[3], K.Vinayagavel[4], M.Rajakumar[5], S.Elavarasan[6]

1,2,5- Associate professor, Department of Prosthodontics, Tamil Nadu Government Dental college and Hospital, Chennai. 3- Professor and HOD, Department of Prosthodontics, Tamil Nadu Government Dental college and Hospital, Chennai. 4- Professor, Department of Prosthodontics, Tamil Nadu Government Dental college and Hospital, Chennai. 5- Senior Assistant Professor, Department of Prosthodontics, Tamil Nadu Government Dental college and Hospital, Chennai. 6- Resident, Department of Prosthodontics, Tamil Nadu Government Dental college and Hospital, Chennai.

Correspondence to:
Dr. K.Vinayagavel, Professor, Department of Prosthodontics, Tamil Nadu Government Dental college and Hospital, Chennai.
Contact Us: www.ijohmr.com

ABSTRACT

The marginal adaptation of the restoration is a critical factor to prevent or minimize the marginal leakage. Film thickness of the luting agent is one of the vital factors for the complete seating of the restoration. Here the marginal adaptation and retentive ability of cast metal restoration in relation to different luting cements were evaluated. The Aim of the study is to evaluate the marginal adaptation and retentive ability of cast metal restoration in relation to different luting cements.

KEYWORDS: Restoration, Luting Agents, Glass Ionomer Cement, Resin Cement

INTRODUCTION

Luting cements play an important role in retaining the restorations with prepared tooth structure. Most often, improper and inadequate cementation causes failures. The marginal adaptation of the restoration is another critical factor to prevent or minimize the marginal leakage. Film thickness of the luting agent is one of the vital factors for the complete seating of the restoration.[1] Normally the luting cement is selected according to clinical situations combined with the physical, biologic and handling properties. In this study Glass Ionomer cement and Resin cements were used

The Aim of the study is to evaluate the marginal adaptation and retentive ability of cast metal restoration using different luting cement.

MATERIALS AND METHODS

This study was performed to evaluate the marginal fit of two different types of luting agents in use. Table 1 shows the materials tested in this study.

Serial no.	Luting cement used	Form	Manufacturer's name
1	Glass Ionomer	Powder, liquid	GC Fuji I radio opaque luting cement, GC, Corp. Tokyo, Japan
2	Resin cement	Paste, paste	Multilink, Ivoclar Vivadent, Italy

Table 1

METHODOLOGY:

Preparation of sample and other procedure as follows: Mounting of teeth, Tooth preparation, Impression and preparation of die, Wax pattern, Spruing, Investing, Casting, Finishing of casting, Mounting of finished casting, Grouping of Samples. Twenty samples were prepared totally for the proposed study, and ten samples are allotted for each luting agent.

The steps in preparation of Sample are as follows:

Mounting of teeth:Twenty recently extracted caries-free maxillary first premolar teeth are taken for this study. The teeth were mounted in the auto polymerizing acrylic resin blocks measuring 1.5cm x.51cm x 6cm. The teeth are embedded in the acrylic block 2.5mm below the cemento enamel junction. A hole is drilled in the root of the tooth, through which the stainless steel wire was placed perpendicular to the tooth which helps in retaining the tooth in the resin and prevents dislodgement of tooth from resin block while testing the samples.[2]

Twenty samples are prepared for the proposed study and ten samples for each luting agent to test marginal fit.

Tooth preparation: Teeth are prepared with the regular procedure by the axial reduction of 6 degree convergence.[3] Impression making and die fabrication using addition silicone impression material, preparation of wax pattern and spruing are done. The casting is done

How to cite this article:
Rupkumar P, Sriramaprabu G, Sabarigirinathan C, Vinayagavel, Rajakumar M, Elavarasan S. Evaluation and Comparision of Marginal Adaptation of Cast Metal Restoration using Different Luting Agents in Fixed Prosthodontics- An Invitro Study. Int J Oral Health Med Res 2015;2(2):29-31.

using the Ni-Cr alloy. The cast crowns (Fig:1) with its attached sprue are mounted in the acrylic resin block using steel die 1.5cmx1.5cmx6cm (Fig:2).

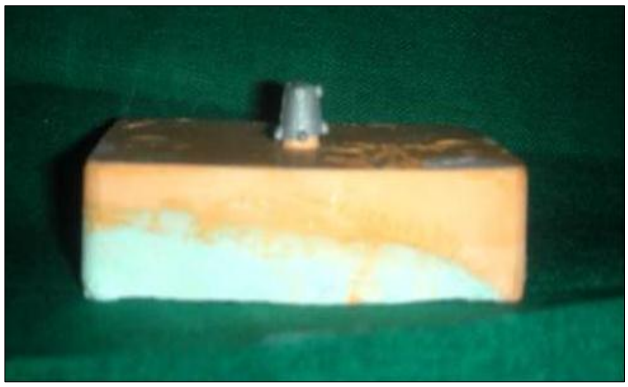

Fig 1: Cast Metal Crowns

Fig 2: Steel Die

Testing Procedure

Cementation: The samples are luted with corresponding cements according to manufacturer's instructions. After 72 hours, they are subjected to marginal fit study. The samples were evaluated under traveling microscope (Fig:3) and the marginal gap existing between the metal margin, and finish line was measured. Then, all the samples were luted with corresponding cements (Table 2)

Fig 3: Travelling Microscope

under standard conditions according to manufacturer's instructions.[4] The samples are focused under the eyepiece of traveling microscope. The distance from the finish line and the metal margin was measured, which gives marginal gap value after cementation. The results were tabulated.

S. no.	Group	No of samples	Luting cement used
1.	I	10	Glass Ionomer
2.	II	10	Resin cement

TABLE 2

RESULTS

In this in vitro study marginal fit about luting cements were tested by using appropriate testing devices. The results of the tests were obtained and calculated and analyzed.

Marginal Gap: The marginal gap that exists between the margin of the cast metal crown and the finish lines are measured before and after cementation.

Table 3 and 4 shows the marginal fit discrepancy in relation to two different types of luting cements namely, Glass Ionomer and resin cement respectively.

The results are analysed using two statistical analysis tests:

1. One-way ANOVA test – to compare between groups
2. Turkey-HSD test – to assess the significant difference between and within groups.

Table 3 and 4 – shows the marginal gap difference in A & B samples (glass ionomer and resin cement)

Group I (Glass Ionomer Cement)	Marginal Gap (µm)	Group II (Resin Cement)	Marginal Gap (µm)
1	21	1	53
2	27	2	55
3	29	3	59
4	30	4	60
5	36	5	61
6	30	6	53
7	36	7	55
8	29	8	59
9	27	9	60
10	21	10	61
MEAN	28.6	MEAN	57.6

TABLE 3 Marginal Gap

Source	Degree of Freedom	Sum of squares	Mean squares	F ratio	Probability
Between Groups	3	9264.15	3088.05	210.4293	0.0000**
Within Groups	16	234.80	14.6750		
Total	19	9498.95			

TABLE 4 (Analysis of Variance ANOVA Group I – II) ** Denotes significance at 5% level

Interpretation of Results:
TABLE 3 shows the means and standard deviations of marginal gap difference due to various luting cements Group I (Glass Ionomer cement) Group II (resin cement). TABLE 4 shows the degree of freedom between groups is 3, and within groups is 16. Using the sum of squares, mean squares, F ratio is calculated, and the P value is found to be <0.001.

The Null hypothesis: The marginal gap difference values of Group II A – II D are equal. Since P value is <0.001, null hypothesis are rejected and shows that there exists a significant difference between groups.

So, by comparing the marginal gap due to luting cements, there exists a significant difference between groups.

DISCUSSION

The retentivity of the luting cements were assessed by their adhesive capacity of the tooth surface over the metal surface. Glass Ionomer cements were introduced in early 1970 and they exhibit higher compressive strengths than zinc phosphate cement.[5]

White S.N. et al. investigated the ability to seat restorations with the resin cements and noticed the increased film thickness when compared to other luting agents. Also have reported that the glass ionomer cement possess low film thickness and maintain relatively constant viscosity after mixing.[6] This result in improved seating of cast metal restorations compared with zinc phosphate cement.

In this study, it was found that the increased film thickness of resin cement could be attributed to the factors which influence the film thickness of luting material, the size or shape of filler particles, viscosity of unset material and its rate of set.

The observations of results of marginal fit in this study shows an increased gap in glass ionomer cement. Resin cement is the next one to expose more marginal gap but lesser than Glass ionomer cement.

SUMMARY & CONCLUSION

The strength of the cement joint is the function of the quality of the bond and other mechanical properties of the cements. This study was performed to evaluate the marginal fit of different types of luting cements used in clinical practice.

The study samples are divided into 2 groups with 10 samples for each of the luting cement taken up. 10 samples for each luting agent are chosen for assessing the marginal fit. The results were tabulated and statistically analyzed. Resin cement possesses good marginal fit when compared with other luting agents. Glass Ionomer cement had the better tensile bond strength and low film thickness, with its adhesive ability makes it a good luting agent. The resin cement has the higher bond strength and better marginal fit, when compared to other luting agents.

REFERENCES

1. Anusavice KJ: "Phillips'science of dental materials" 10th edn. Philadelphia:WB Saunders;1996, p.555-81.
2. Cox JR. "A clinical study comparing marginal and occlusal accuracy of crowns fabricated from double-arch and complete-arch impressions." Aust Dent J. 2005 Jun; 50(2): 90-4.
3. Jesus Suarez M, Lozano JF, Paz Salido M, Martinez F. "Marginal fit of titanium metal-ceramic crowns." Int J Prosthodont 2005 Sep –Oct; 18(5): 390-1.
4. Petteno D, Schierano G, Bassi F, Bresciano ME, Carossa S. "Comparison of marginal fit of 3 different metal-ceramic systems: an in vitro study." Int J Prosthodont 2000 Sep-Oct; 13(5): 405-8.
5. Rosenstiel SF, Land MF, Fujimoto J "Contemporary Fixed Prosthodontics" 3rd edition. Mosby.
6. White SN, Zhokun Yu, "Film thickness of new adhesive luting agents." J Prosthet Dent 1992; 67:782-5.

Source of Support: Nil
Conflict of Interest: Nil