Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies ***NLM ID:*** *101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Index Copernicus value = 85.10

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Original Research

Evaluation of microleakage of metallic copings cemented with three luting agents

Humaira Mushtaq

MDS, Prosthodontist and implantologist, Private practitioner, J & K

ABSTRACT:

Background: The ultimate goal of any prosthetic treatment is providing the patient with a precisely fabricated restoration which preserves the long term integrity of natural abutments of fixed partial dentures and their pulpal vitality. Zinc phosphate cement is one of the most popular cements, which has been in use for many years. The success of this material has been attributed to high retentive and fatigue strength as well as its minimal film thickness of <25 µ. Polycarboxylate cement and glass ionomer cement have attracted attention due to their ability to bond chemically with various restorative materials and to tooth structure. **Aim of the study:** To evaluate microleakage of metallic copings cemented with three luting agents. **Materials and methods:** The present study was conducted in the Department of Prosthodontics of the institute of dental studies and technologies dental institution (IDST). The ethical clearance for the study was approved from the ethical committee of the hospital. For the study, we selected a total of 50 mandibular prepared molars. An assembly with the airotor mounted on the dental model surveyor was used to achieve a uniform taper of six degrees. The prepared teeth were cleaned with pumice and water.The cemented specimens were thermocycled after 24 hours between 5°C and 50°C. After thermocycling, the teeth were treated with 50% silver nitrate solution for 60 minutes and placed under a 150 watt flood lamp for five minutes to allow proper fixation of any unfixed stain.**Results:** In the present study, a total of 50 mandibular molars were prepared to evaluate microleakage of three cements, glass ionomer cement, resin modified glass ionomer cement and resin cement. Table 1 showed mean microleakage with different cements. It was observed that highest microleakage was seen with resin cement.**Conclusion**:Within the limitations of the present study, it can be concluded that marginal microleakage is seen in all the cements. GIC provides maximum efficiency and has minimal microleakage as compared to resin modified GIC and resin cements.

Keywords: Microleakage, marginal microleakage, glass ionomer cement, resin cement

Received: 1 May, 2020 Accepted: 20 May, 2020

Corresponding author: Dr. Humaira Mushtaq, MDS, Prosthodontist and implantologist, Private practitioner, J & K

This article may be cited as: Mushtaq H. Evaluation of microleakage of metallic copings cemented with three luting agents. J Adv Med Dent Scie Res 2020; 8(6):138-141.

INTRODUCTION

The ultimate goal of any prosthetic treatment is providing the patient with a precisely fabricated restoration which preserves the long term integrity of natural abutments of fixed partial dentures and their pulpal vitality. [1] An extracoronal restoration that has been completed precisely with attention to detail on a sound foundation has the best and most predictable prognosis. [2] Despite the material advancements and precise laboratory techniques, cement lines are inevitable in fixed prosthodontics and some degree of marginal discrepancy is always expected. [3] Zinc phosphate cement is one of the most popular cements, which has been in use for many years. The success of this material has been attributed to high retentive and fatigue strength as well as its minimal film thickness of <25 µ. [4, 5] Polycarboxylate cement and glass ionomer cement have attracted attention due to their ability to bond chemically with various restorative materials and to tooth structure. According to some studies, glass ionomer cement seems to have higher retentive and compressive strength than other luting cements. [4, 6] Certain disadvantages of these cements, such as low retentive values despite several advancements, have led scientists to develop methods in an attempt to improve the essential properties of luting cements. Resin cement, for example, is particularly attractive because of its high retention, low solubility in oral fluids, and its ability to adhere to different materials.[4-6] Hence, the present study was conductedto evaluate microleakage of metallic copings cemented with three luting agents.

MATERIALS AND METHODS

The present study was conducted in the Department of Orthodontics of the Dental institution. The ethical clearance for the study was approved from the ethical committee of the hospital. For the study, we selected a total of 50 mandibular prepared molars. Tooth preparation was carried out on the mounted molars by following standardized tooth preparation procedures with the help of an airotor. An assembly with the airotor mounted on the dental model surveyor was used to achieve a uniform taper of six degrees. The prepared teeth were cleaned with pumice and water. Wax patterns were to be prepared for each prepared tooth. Three coats of the die spacer were applied on the tooth to provide space of 24-25 µm for the cement layer. Care was taken to keep it short of the margins by 1 mm. The wax patterns for the copings were fabricated using the dip wax technique to get a close adaptation of the wax to the tooth surface. The casting was carried out in the induction casting machine with nickel-chromium base metal alloy. The copings were placed back on the respective prepared teeth to check the fit and the marginal adaptation was observed under an optical microscope. Copings with marginal discrepancies of more than 39 µm were rejected and castings were repeated for accurate marginal fit. The castings were cemented with three luting agents, namely, a glass ionomer cement-KetacCem, a resin-modified glass ionomer cement-RelyX Luting 2 and a resin cement-RelyX ARC under ideal conditions. The cemented specimens were thermocycled after 24 hours between 5°C and 50°C. After thermocycling, the teeth were treated with 50% silver nitrate solution for 60 minutes and placed under a 150 watt flood lamp for five minutes to allow proper fixation of any unfixed stain. The samples were embedded in clear epoxy resin and allowed to set for 24 hours.

Microleakage was categorized as follows:

- 0: No evidence of stain penetration at the interface of the crown and tooth surface.
- 1: Evidence of slight stain penetration-less than half the height of the axial wall of the preparation.
- 2: Evidence of stain penetration equal to half the height of the axial wall of the preparation.
- 3: Evidence of stain penetration in excess of half the height of the axial wall and extending to the occlusal aspect of the preparation.

The sections were observed under the stereomicroscope and stain penetration was recorded at the tooth-cement interfaces.

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student's t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistically significant.

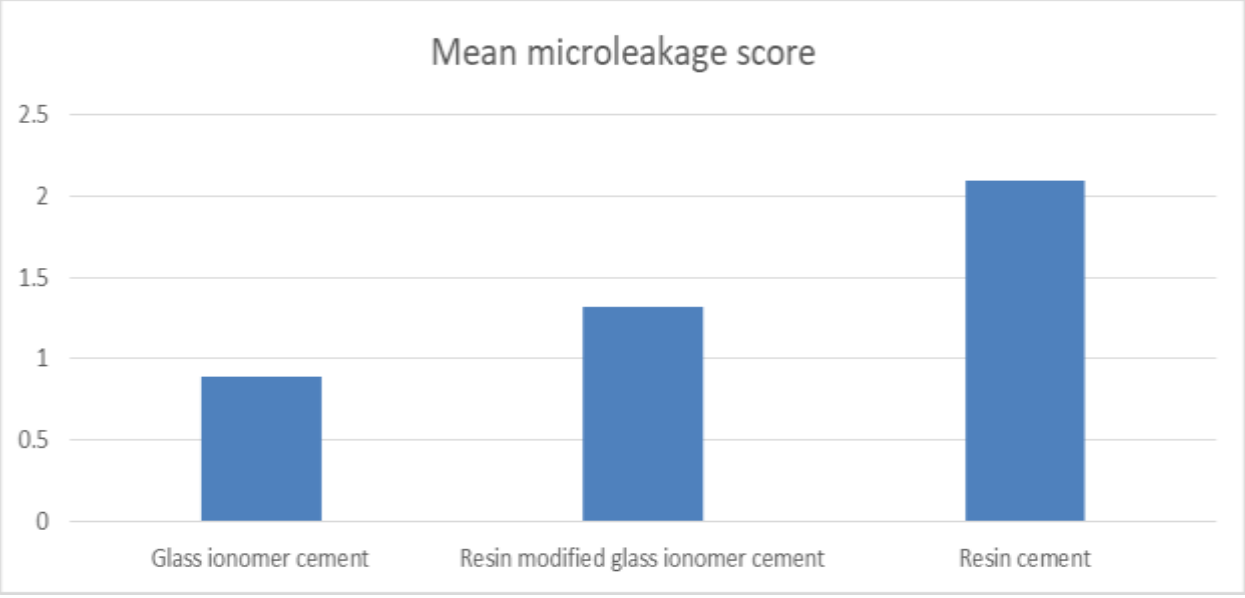
RESULTS

In the present study, a total of 50 mandibular molars were prepared to evaluate microleakage of three cements, glass ionomer cement, resin modified glass ionomer cement and resin cement. Table 1 showed mean microleakage with different cements. It was observed that highest microleakage was seen with resin cement. The minimum microleakage was seen in glass ionomer cement [Fig 1].

Table 1: Mean microleakage with different cements

	Glass ionomer cement	Resin modified glass ionomer cement	Resin cement
Mean microleakage score	0.89	1.32	2.09
p-value	0.02		

Fig 1: Mean microleakage with different cements



DISCUSSION

In the present study, we observed that microleakage is seen with all the cements, however, glass ionomer cement has minimum microleakage as compared to resin cement and resin modified glass ionomer cement. The results on comparison were found to be statistically significant. The results were compared to the previous studies from the literature. EftekharAshtiani R et al [7] assessed the marginal microleakage of four cements in metal ceramic restorations with adapted and open margins. Sixty sound human premolars were selected for this experimental study performed in Tehran, Iran and prepared for full-crown restorations. Wax patterns were formed leaving a 300 μm gap on one of the proximal margins. The crowns were cast and the samples were randomly divided into four groups based on the cement used. The least microleakage occurred in the Panavia F2.0 group and the maximum was observed in the Fleck group. The Fleck group displayed significantly more microleakage compared to the Fuji Plus and Panavia F2.0 groups in both closed and open margins. In open margins, differences in microleakage between the Fuji Plus and G-Cem as well as between the G-Cem and Panavia F2.0 groups were significant. In closed margins, only the G-Cem group displayed significantly more microleakage as compared to the Panavia F2.0 group. They concluded that Fuji Plus cement exhibited better sealing ability in closed and open margins compared to G-Cem and Fleck cements. Hooshmand T et al [8] evaluated the microleakage and marginal gap of two self-adhesive resin cements with that of other types of adhesive luting cements for noble alloy full cast crowns. Fifty noncarious human premolars and molars were prepared in a standardized manner for full cast crown restorations. The Rely X Unicem (with or with no pretreatment) exhibited the smallest degree of microleakage at both tooth-cement and cement-crown interfaces. The greatest amount of microleakage was found for Panavia F 2.0 resin cement followed by GC Fuji Plus at both interfaces. No statistically significant difference in the marginal gap values was found between the cementing agents evaluated. The self-adhesive resin cements provided a much better marginal seal for the noble alloy full cast crowns compared with the resin-modified glass ionomer or dual-cured resin-based cements.

Parisay I et al [9] evaluated the retentive strength of SSC cemented with four different luting cements. In this in vitro study, A total of 55 extracted primary first molars were selected. Following crown selection and cementation (one with no cement and four groups cemented with resin, glass ionomer, zinc phosphate, and polycarboxylate), all the specimens were incubated and thermocycled in 5°C–55°C. Retentive properties of SSCs were tested with a mechanical test machine. The results of the study showed that the specimens cemented with zinc phosphate exhibited higher retentive strength as compared to glass ionomer and polycarboxylate. They concluded that zinc phosphate cement showed the most promising results; thus, it can be preferably used for cementation of the teeth with no grossly broken down crowns. Bhandari S et al [10] evaluated marginal leakage under complete metal crowns using three adhesive cements, two resin cements (one self cure, one dual cure) and a glass ionomer cement. Metal crowns were prepared on sixty intact extracted premolars and were randomly divided into three groups of twenty each, with each group using a different cement for luting. All the samples were then subjected to thermocycling and were sectioned using a diamond saw. Between three groups, metal crowns cemented with multilink cement showed significantly less microleakage at both the interfaces. Glass ionomer cement recorded maximum combined microleakage amongst three cements irrespective of the interfaces. Within group, glass ionomer and multilink cement showed more microleakage at MC interfaces than at TC interface. A complex interaction between variables related to dental restoration, luting agent and tooth structure probably influence microleakage.

Memarpou et al [11] compared the ability of 5 luting cements to reduce microleakage at stainless steel crown (SSC) margins on primary molar teeth. Standard preparations were performed on 100 extracted primary molar teeth for SSC restoration. After fitting SSCs, samples were randomly divided into 5 groups of 20 teeth each, which were cemented with nonadhesive cement consisting of polycarboxylate (PC) or zinc phosphate (ZP), or with adhesive cement consisting of glass ionomer (GIC), resin-modified glass ionomer cement (RMGIC), or RMGIC with a bonding agent (RMGIC+DBA). Microleakage with adhesive cements was significantly lower than with nonadhesive cements. Differences between cements were statistically significant at P<.001. RMGIC+DBA showed the lowest microleakage, followed in increasing order by RMGIC, GIC, and ZP. The PC cement showed the greatest microleakage. Adhesive cements were more effective in reducing microleakage in stainless steel crowns than nonadhesive cements. Use of a bonding agent with a resin-modified glass ionomer cement yielded better results than using the latter alone.

CONCLUSION

Within the limitations of the present study, it can be concluded that marginal microleakage is seen in all the cements. GIC provides maximum efficiency and has minimal microleakage as compared to resin modified GIC and resin cements.

REFERENCES

1. Baldissara P, Comin G, Martone F, Scotti R. Comparative study of the marginal leakage of six cements in fixed provisional crowns. J Prosthet Dent. 1998;80:417–422. doi: 10.1016/S0022-3913(98)70005-8.
2. Lindquist TJ, Connolly J. In vitro microleakage of luting cements and crown foundation materials. J Prosthet Dent. 2001;85:292–298. doi: 10.1067/mpr.2001.113705.
3. Fusayama T, Ide K, Hosoda H. Cement thickness between cast restorations and preparation walls. J Prosthet Dent. 1963;13:35–64. doi: 10.1016/0022-3913(63)90181-1.
4. Dahl BL, Oilo G. Retentive properties of luting cements: An in vitro investigation. Dent Mater. 1986;2:17–20.

5. Ergin S, Gemalmaz D. Retentive properties of five different luting cements on base and noble metal copings. J Prosthet Dent. 2002;88:491–7.
6. Pathak S, Shashibhushan KK, Poornima P, Reddy VS. In vitro evaluation of stainless steel crowns cemented with resin-modified glass ionomer and two new self-adhesive resin cements. Int J Clin Pediatr Dent. 2016;9:197–200.
7. EftekharAshtiani R, Farzaneh B, Azarsina M, et al. Microleakage of Four Dental Cements in Metal Ceramic Restorations With Open Margins. Iran Red Crescent Med J. 2015;17(11):e19611. Published 2015 Nov 1. doi:10.5812/ircmj.19611
8. Hooshmand T, Mohajerfar M, Keshvad A, Motahhary P. Microleakage and marginal gap of adhesive cements for noble alloy full cast crowns. Oper Dent. 2011 May-Jun;36(3):258-65. doi: 10.2341/10-253-L. Epub 2011 Jul 8. PMID: 21740242.
9. Parisay I, Khazaei Y. Evaluation of retentive strength of four luting cements with stainless steel crowns in primary molars: An in vitro study. Dent Res J (Isfahan). 2018;15(3):201-207.
10. Bhandari S, Aras M, Chitre V. An In Vitro Evaluation of the Microleakage under Complete Metal Crowns Using Three Adhesive Luting Cements. J Indian Prosthodont Soc. 2012;12(2):65-71. doi:10.1007/s13191-011-0109-2
11. Memarpour, Mahtab&Mesbahi, Maryam &Rezvani, Gita & Rahimi, Mehran. (2011). Microleakage of Adhesive and Nonadhesive Luting Cements for Stainless Steel Crowns. Pediatric dentistry. 33. 501-4.