

# Cements Used: Maxillary FPD vs. Mandibular FPD

Reshma Thirunavakarasu<sup>1</sup>, Rakshagan V<sup>2\*</sup> and Balaji Ganesh S<sup>3</sup>

<sup>1</sup>Department of Prosthodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Science, Saveetha University, Chennai, India; <sup>2</sup>Department of Prosthodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Science, Saveetha University, Chennai, India; <sup>3</sup>Department of Periodontology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Science, Saveetha University, Chennai, India.

Corresponding author: Rakshagan V, Department of Prosthodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India, E-mail: rukhsaar.gulzar@gmail.com

## Abstract

Fixed partial dentures depend on the type of luting cement used to ensure its longevity. There have been many luting agents that have been introduced claiming to be clinically better and superior compared to other luting agents. These various cements which have been introduced are to improve the characteristics. Various agents which are commonly used are glass ionomer, resin modified GIC, compomers, resin cements, zinc phosphate, zinc polycarboxylate, etc. Long term clinical success of fixed prosthodontics restoration is influenced by many factors which include luting agents. Completed case sheets were collected from Saveetha dental college and hospitals. Case sheets were taken from June 2019 to April 2020. Data was retrieved and evaluated by 2 reviewers. The study sample was 829 fixed partial dentures. Data was tabulated based on gender, fixed partial denture (maxillary and mandibular FPD) and cements used. Total number of fixed partial dentures cemented was 829 of which maxillary FPD was 467 and mandibular FPD was 362. It showed that in both male and females, maxillary FPD was the most cemented (35.45% and 30.88% respectively). Association between fixed partial dentures cemented and gender was found not to be of statistical significance (Chi square test: 1.86; p value: 0.667; p>0.05). The most common cement used in both maxillary and mandibular FPD is GIC with 49.34% and 38.36% respectively. Association between various cements and fixed partial denture was found to be statistically significant (Chi square test: 5.881; p value: 0.053; p=0.05). Luting agents seal the interface between restoration and prepared tooth. There are advantages of various luting agents, thus it's the told of the clinician to select appropriate cement for cementation of FPDs.

**Keywords:** Fixed partial denture; Luting agents; GIC; Resin modified GIC; Panavia.

## Introduction

There are multiple factors which affect the success of fixed prosthesis such as preparation design, oral hygiene/microflora, mechanical forces and restorative materials.<sup>[1]</sup>

It was also stated that removable partial denture are considered widely accepted for replacing missing teeth<sup>[2]</sup> Fixed dental prosthesis have become more popular than removable prosthesis<sup>[3-6]</sup>

Implants are also an option for replacement of missing teeth.<sup>[7]</sup> However the comfort function and esthetics must be estored altogether for a patient<sup>[8,9]</sup> the most important factor is to select the proper luting agent and aid in the longevity of the fixed partial denture. Loss of retention can lead to its failure and this fact was found to be the second leading cause.<sup>[1,10]</sup>

There has been another study which listed that uncemented restoration as the third leading cause of prosthetic replacement<sup>[1,10,11]</sup> Luting agents occupy the interface between the prepared teeth and the restoration.<sup>[12,13]</sup>

Dental cement used to attach indirect restoration to prepared teeth is called a luting agent.<sup>[14,15]</sup> The work 'luting' is derived from a latin word Lutum which means mud<sup>[1]</sup>

The primary function of a luting agent is to fill the voids at restoration-tooth interface. As well as mechanical lock the restoration in place to prevent its dislodgement during mastication.<sup>[16]</sup> An ideal luting agent has to meet the basic

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mechanical, biological and handling requisites like compatibility to the tooth and tissue, sufficient working time flow ability, compressive strength, minimal micro leakage, low solubility in oral fluids, adhesiveness, aesthetics, low cost, ease of excess removal.<sup>[14]</sup> At this time, there are 5 types of commercially available luting agents for the long term cementation of fixed partial denture/ fixed prosthesis and they include zinc phosphate, polycarboxylate, glass ionomer, resin composite and resin modified GIC or 'hybrid' glass ionomer cements. Each of these cements are physically and chemically unique and it is said that there are no luting agents are ideal in all situations<sup>[17]</sup> There have been cases in which discrepancy of marginal fit which leads to salivary infiltration and micro leakage which leads to dissolution of luting agents<sup>[18]</sup> Masticatory forces cause fatigue to the dental luting agent<sup>[19-22]</sup> Previously our team has a rich experience in working on various research projects across multiple disciplines.<sup>[23-37]</sup> Now the growing trend in this area motivated us to pursue this project.

The aim was to study the most commonly used cements in maxillary and mandibular FPDs done in Saveetha dental college in a given period of time. With the data obtained we can determine the commonly used luting agents mostly used by clinicians in a dental practice.

## Materials and Methods

This is a retrospective study regarding the most commonly used cements used for fixed partial dentures (maxillary and mandibular FPDs) which were done in Saveetha dental college and hospitals in between June 2019 to April 2020. The approval for this university setting was obtained from the institution of ethics board. The institutional ethical committee provided approval for the study (SDC/SIHEC/2020/DIASDATA/0619-0320). Exclusion criteria were patient records that were incomplete or repetitive. All available data was collected and sorted. The variables retrieved are FPD type, gender and cements used. There were three people involved in this study, the guide, the reviewer and researcher. Cross verification of the data was done by the second reviewer in order to avoid any missing or repetitive data.

### Statistical analysis

Once the results have been tabulated based on the parameters, the data is then exported to SPSS software. Frequency and percentage were employed in the analysis. Chi square test was used to detect the significance between gender, FPD (maxillary FPD/mandibular FPD) and cement used (GIC/resin modified GIC/panavia).

## Results and Discussion

Total of 829 FPDs have been cemented from June 2019 to April 2020. Table 1 and Figure 1 show the distribution of FPDs with gender. It shows that the highest number of fixed partial dentures cemented was in maxillary FPD (n=467). Based on gender, the maximum number of FPDs cemented

was in females (n=449). It showed that in both male and females, maxillary FPD was the most cemented (35.45% and 30.88% respectively). P value was >0.05, statistically not significant (Chi square test). Table 2 and Figure 2 show the distribution of various cements based on fixed partial denture. In both maxillary and mandibular FPD, the commonly used cement is GIC (n=727) followed by resin modified GIC (n=75) and finally panavia (n=27). In both maxillary and mandibular FPD is GIC with 49.34% and 38.36% respectively. The least common cement used in Panavia in both maxillary and mandibular FPD with 1.21% and 2.05%. P value was=0.05, statistically significant (Chi square test).

Based on the results from our study, GIC was found to be the most used dental cement in fixed partial dentures. Glass ionomer cement has been defined by McLean Nicholson and Wilson as the 'cement that consists of a basic glass and an acidic polymer which is set by an acid-base reaction between these components.'<sup>[38]</sup> In a study, it was found that glass ionomer cement and resin modified glass ionomer cement are the most preferred cement used in long span fixed partial dentures in areas of high masticatory stress when abutment teeth are not sensitive<sup>[1]</sup> Glass ionomer cement has found to have advantages which are chemical bonding, sustained fluoride release and ability to absorb fluoride from oral environment (fluoride recharge) makes the cement of choice in patients with high caries rate<sup>[39,40]</sup> and coefficient of thermal expansion similar to tooth.

Since glass ionomer cement is a fluoride containing aluminosilicate glass reacts via an acid base reaction with polyalkenoic acid to form a hydrogen matrix. It undergoes an initial rapid setting reaction followed by several stages of maturation which may take up to several months-to reach completion<sup>[41]</sup> Thus it has been said that the restoration has to be seated before the cement loses its gloss. It is not recommended for luting posts because vibration from tooth preparation may reduce the retention provided by the cement. There has been a study which shows the glass ionomer cement may cause tooth sensitivity ranges from minor 1 or 2 days, cold sensitivity to major increasing pain that eventually requires endodontic therapy.<sup>[42]</sup>

Panavia is the second most common luting agent used for cementations of fixed partial denture. Panavia is a self-etching, self-adhesive, dual-cure, fluoride releasing cement that can be cured with any halogen, plasma ARC or LED lights. This was found to be the first commercial product that contains 10-Methacryloxyethyl Dihydrogen Phosphate (MDP).<sup>[1]</sup> It is also found that it has been mostly used with multiple teeth with post and core, as well as teeth prepared to receive partial veneer crowns or retainers. These resin cements have an ability to adhere to multiple substrates, high strengths, insolubility in the oral environment and shade matching potential have been made resin composite cements the adhesive of choices for esthetic type restorations which includes inlays, onlays, all ceramic inlays and onlays, veneers, crowns, FPDs and newly developed fiber-reinforced composite restoration.<sup>[17]</sup> These cements are highly

recommended for luting base metal resin bonded FPDs (Maryland type). It is also stated that resin cements are useful when preparation lacks optimal retention and resistance forms.

Lastly, the other cement which is also used for cementation of fixed partial dentures is resin modified GIC. Only a few fixed partial dentures cemented using resin modified GIC as a luting agent. RMGIC is less susceptible to early erosion during setting, less soluble and has higher compressive and tensile strength compared to unmodified glass ionomer cement. Resin modified glass ionomer cements are indicated for luting of crowns and bridges.<sup>[43]</sup>

RMGIC cement is easy to handle and are suitable for routine application with metal based crown and bridgework. It has a limitation however which is non-retentive surfaces, mainly

seen in ceramics. HEMA is released in these materials which have a variety of damaging biological properties, ranging from pulpal inflammation to allergic dermatitis.<sup>[44]</sup> They are also contradicted in cementing all-ceramic crowns and posts in non-vital teeth.<sup>[17]</sup> This cement is highly recommended for luting metal or porcelain-fused to metal crowns and FPDs to tooth, amalgam, resin composite or glass ionomer core build ups<sup>[17]</sup> our institution is passionate about high quality evidence based research and has excelled in various fields.<sup>[45-50]</sup> We hope this study adds to this rich legacy.

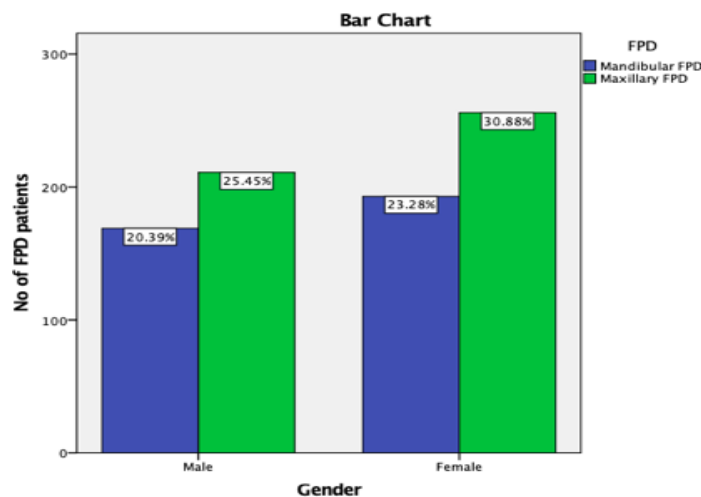
Thus with the variety of cements made available we can observe that each cement has its advantages and disadvantages GIC, RMGIC and Panavia are the commonly used cements based on the data that was collected for this study.

**Table 1: Gender and Fixed Partial Dentures (FPD).**

Gender	FPD		Total	Chi square value, P Value
	Mandibular FPD	Maxillary FPD		
Male	169	211	380	1.86
Female	193	256	449	0.667
Total	362	467	829	

This table shows association between gender and Fixed Partial Dentures (FPD) cemented in maxillary/mandibular arch the number of maxillary FPD was 467 and mandibular FPD was 362. There were more maxillary FPDs cemented compared to mandibular FPDs. Based on gender, the

maximum number of FPDs cemented was in females (n=449). Chi square test shows no statistical significance between gender and fixed partial dentures (FPD) cemented in maxillary/mandibular arch. (Chi square test: 1.86; p value: 0.66; p>0.05).

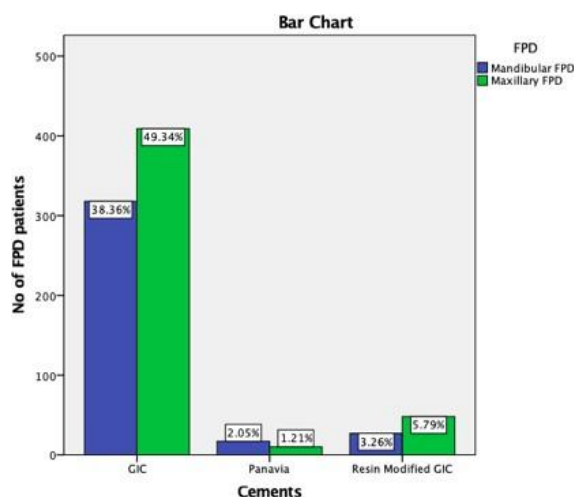


**Figure 1:** This graph represents the association between gender and fixed partial dentures (FPD) cemented. X axis represents the genders and Y axis represents the number of fixed partial dentures cemented in mandibular arch (blue) and maxillary arch (green). Chi square test shows no statistical significance between fixed partial dentures cemented and gender. (Chi square test: 1.86; p value: 0.667; p>0.05). However, the highest prevalence of FPD cementation was observed in maxillary arch when compared to mandibular arch in females than males.

**Table 2: Fixed partial dentures cemented.**

FPD	Cements			Total	Chi square value, P value
	GIC	Panavia	Resin modified GIC		
Mandibular FPD	318	17	27	362	5.881
Maxillary FPD	409	10	48	467	0.053*
Total	727	27	75	829	

This table represents the association between fixed partial dentures cemented in maxillary/mandibular arch and types of cements used for the same. In both maxillary and mandibular FPD, the commonly used cement is GIC (n=727) followed by resin modified GIC (n=75) and finally panavia (n=27). Chi square test shows statistically significant association between various cements used and fixed partial dentures cemented in maxillary/mandibular arch (Chi square test: 5.881; p value: 0.053; p=0.05).



**Figure 2:** This graph represents the association between fixed partial dentures cemented in maxillary/mandibular arch and types of cements used. X axis represents the type of cements used (Glass Ionomer Cement (GIC), Panavia and Resin Modified PRM) and Y axis represents the number of fixed partial dentures cemented in maxillary(green)/mandibular arch (blue). Chi square test shows statistical significance between various cements and fixed partial denture (Chi square test: 5.881; p value: 0.053 ; p=0.05). It shows that the most common cement used in both maxillary and mandibular FPD is GIC with 49.34% and 38.36% respectively.

## Conclusion

In the present study, it was found that the most preferred luting agent was glass ionomer cement. However after GIC, resin modified GIC and Panavia are also commonly used as luting agents for cementation of fixed partial dentures. There is a statistical significance between the three cements mentioned in this study and fixed partial dentures cemented in maxillary/mandibular arch. Further studies can be done to

determine the longevity of fixed partial dentures which used various cements.

## Author Contribution

Reshma Thirunavakarasu: Data collection and interpretation, drafting the article.

Dr. V Rakshagan: Critical revision of the article and final drafting of the article.

Dr. Balaji Ganesh: Final drafting of the article to be published.

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## Conflict of Interest

The authors declare no conflict of interest.

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