Evaluation of preference of interim cements used for provisional restorations in fixed dental prosthesis - a retrospective study

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Abstract: Provisional or temporary cements play an important role in Fixed prosthodontics. There are numerous types of temporary cements, mainly used temporary materials are eugenol-based, non-eugenol based, and resin based. The aim of this retrospective cross-sectional study was to assess the preferred type of provisional cements used in temporization of fixed prosthesis. A cross-sectional, descriptive study was conducted in a university, on randomly selected individuals. The study group consists of adult patients who attended the outpatient Department of Prosthodontics from June 2019-March 2020. 86,000 case sheets were reviewed and sampling was done using simple random sampling. Descriptive analysis and chi square test is done in SPSS software version 23.0 by IBM to evaluate the correlation between age and profession with the type of provisional cement used. In 71.9% of the cases zinc oxide eugenol was prefered for temporary cementation. Association of graduation level and choice of temporary cement showed statistical significance(p<0.00, p<0.05). We conclude that Zinc Oxide Eugenol was preferred for temporary cementation of provisional restorations, followed by Temp bond and IRM. Most of the postgraduates preferred IRM for temporary cementation of provisional restorations.

Keywords: Eugenol, IRM, TempBond, Temporary crowns, Zinc Oxide innovative technique

INTRODUCTION
Provisional or temporary cements play an important role in Fixed prosthodontics. They are used for the cementation of temporary crowns, fixed partial dentures (FPDs), CAD-CAM milled Temporaries, Implant crowns as well as for temporary cementation of definitive restorations of the same types. There are numerous types of temporary cements, mainly used temporary materials are eugenol-based, non-eugenol based, and resin based. The newest form of temporary cements in dentistry is glass ionomer. There are several criteria that are important when selecting a temporary cement. Although there may not be a single cement that is ideal for every clinical situation.(Ariga et al., 2018);(Jyothi et al., 2017)

There are important features that must be included while selecting a Temporary cement is According to Farah and powers -2005 Ideal temporarily cement should exhibit Easy removal of excess cement from the margins,Good marginal seal to minimise the sensitivity,Good retention but easy removal of temporary prosthesis,Low solubility in Oral Fluids(Kannan and Venugopalan, 2018) and compatibility with provisional resin restorations,Resin core materials, Bonding agents and permanent cements.(Albert and El-Mowafy, 2005);(Duraisamy, Krishnan, RamaSubramanian, Sampathkumar, Mariappan and Sivaprakasam, 2019)

Some of the earliest provisional cements were made from zinc-oxide powder and eugenol liquid. Wallace showed a formula for a predictable zinc-oxide eugenol temporary cement in 1933(Doray, Li and Powers, 2001)Eugenol is known to have a sedative effect on the pulp(Selvan and Ganapathy, 2016). One problem with eugenol-containing cements is that they inhibit the setting reaction of acrylic resins by inhibiting free radical polymerization in the resins used for provisional restorations, and they soften acrylic resins.(Gegauff and Rosenstiel, 1987);(Selvan and Ganapathy, 2016)

Many manufacturers have introduced eugenol-free cements to address the problem. These cements tend to be a bit more rigid and retain the restoration better and the cleanup is much easier.

Most clinicians will use more than one type of provisional cement. If maximum retention is needed, a resin-based cement may be the material of choice. The problem with some of the resin-based cements is they may bond to composite core materials(Venugopalan et al., 2014). This may cause the build-ups to be removed from the tooth when the provisional is removed. If Vaseline is used, this may inhibit the final set of the definitive cement.

It also prevent microleakage from the provisional restoration and also prevents sensitivity from cold and hot stimuli till the final prosthesis is arrived.It has adequate strength and also with stand the masticatory load.

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Woody and Davis 1992 suggested that poor dentin bond strength is seen after temporary cementation; it may be the result from the presence of cement remnants not from just eugenol,(Woody and Davis, 1992). There are numerous studies that assess the different Physical and Chemical properties of different Provisional cements. There are few studies regarding Clinical use of different provisional cements.

Many studies which involved case reports (Ashok et al., 2014),surveys(Ashok and Suvitha, 2016a), systematic reviews (Ganapathy, Kannan and Venugopalan, 2017),(Ganapathy, Kannan and Venugopalan, 2017; Ariga et al., 2018),(Kannan and Venugopalan, 2018), literature reviews (Venugopalan et al., 2014),(Vijayalakshmi and Ganapathy, 2016),(Subasree, Murthykumar and Dhanraj, 2016; Vijayalakshmi and Ganapathy, 2016),(Selvan and Ganapathy, 2016). In Vivo studies, (Jyothi et al., 2017),(Jain, Ranganathan and Ganapathy, 2017),(Duraisamy, Krishnan, Ramasubramanian, Sampathkumar, Mariappan and Navarasampatti Sivaprakasam, 2019). In vitro studies (Ganapathy et al., 2016),(Ajay et al., 2017)and retrospective studies(Basha, Ganapathy and Venugopalan, 2018) were carried out by our team previously. We are currently focusing on epidemiological studies.

Our department is passionate about research we have published numerous high quality articles in this domain over the past years (Abraham et al., 2005; Devaki, Sathivel and BalajiRaghavendran, 2009; Neelakantan et al., 2010, 2015; Arja et al., 2013; Ramshankar et al., 2014; Sumathi et al., 2014; Surapaneni and Jainu, 2014; Surapaneni, Priya and Mallika, 2014; Ramamoorthi, Niveditha and Divyanand, 2015; Manivannan et al., 2017; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; J et al., 2018; Ravindiran and PraveenKumar, 2018; Malli Sureshbabu et al., 2019; Mehta et al., 2019; Krishnaswamy et al., 2020; Samuel, Acharya and Rao, 2020; Sathish and Karthick, 2020)

This study aims to assess the preferred type of Provisional cements used in temporization of fixed prosthesis.

MATERIALS AND METHODS:

**Study Setting:** The study was conducted with the approval of the Institutional Ethics Committee [SDC/SIHEC/2020/DIASDATA/0619-0320]. The study consisted of one reviewer, one assessor and one guide.

**Study Design:** The study was designed to include all dental patients of the ages 18-65 years who are undergoing treatment for fixed prosthesis. The patients who did not fall into this inclusion criteria were excluded.

**Sampling Technique:** The study was based on a non probability consecutive sampling method. To minimise sampling bias, all case sheets of patients who are undergoing treatment for fixed prosthesis were reviewed and included. The internal and external validity of the sample selected and all the samples are selected based on a simple random sample.

**Data Collection and Tabulation:** Data Collection was done using the patient database with the timeframe work 01 June 2019 and 31 march 2020. About 997 case sheets were reviewed and those fitting under the inclusion criteria were included. Cross verification of data for errors and measures are taken to minimise sampling bias all data were included. The inclusion criteria was all the patients who are undergoing fixed prosthesis treatment. The exclusion criteria was patients with systemic illness. Data was downloaded from DIAS and imported to Excel, Tabulation was done. The values were tabulated and analysed.

**Statistical Analysis:** Descriptive statistics was used to evaluate preference of interim cements used for provisional restorations in fixed prosthodontics. Chi-Square test was performed and the p value was determined to evaluate the significance of the variables it was used to evaluate. The correlation between gender and profession with type of interim cement were evaluated and statistics were carried using SPSS Software version 23.0 by IBM. The results were obtained in the form of graphs and tables.

**RESULTS AND DISCUSSION**

A total of 996 reports are assessed and in the present study 71.9% of them preferred Zinc Oxide Eugenol for interim restoration and 15.2% of them preferred Tempbond and 12.8 % of them preferred IRM ( Table 1). The study results show that the correlation between Gender and level of study with Type of Temporary cement preferred has p value .000 (p-value<0.05) and .000 (p-value<0.05) respectively making them significant statistically (Table 2)

The provisional restoration protects the tooth by minimizing extreme changes in temperature of food and beverages ingested, and the cement provides a seal against microleakage for the period of time that the provisional restoration will be in place.(Mash et al., 1991);(Mash et al., 1991; Pan et al., 2006);(Subasree, Murthykumar and Dhanraj, 2016)

Provisional cements were opaque in color because of the materials being used. Recently, more tooth-colored provisional cements have been introduced to not interfere with the color evaluation of translucent restoration materials(Basha, Ganapathy and Venugopalan, 2018). Examples of color neutral, shaded, or translucent provisional materials include...


ZONE (DUX Dental, Oxnard, CA), NexTempTM (Premier Dental Products, Plymouth Meeting, PA), TempBond® Clear (Kerr Corporation, Orange, CA), and Systemp.link (Ivoclar Vivadent, Amherst, NY).

When a FPD has been provisionally cemented, after removal and reevaluation, it is not unusual for some modifications and adjustments to be made where the pontic is contacting the ridge. In some cases, as in a patient who relates a history of dentinal hypersensitivity after tooth preparation and provisional restoration placement, the definitive restoration may be temporarily cemented to assess pulpal health. In these cases, the use of a eugenol-containing provisional cement may have a sedative effect on the pulp.(Pashley, Tao and Pashley, 1988; Mash et al., 1991; Pan et al., 2006);(Jain, Ranganathan and Ganapathy, 2017)

Use of a Eugenol containing provisional cement is the negative effects the eugenol has on dental resins. These cements, if there is residual eugenol remaining after setting, can act as a plasticizer of dental resins, with their greatest effects on acrylic resins, resulting in softening of the resin with a decrease in physical properties.(Vijayalakshmi and Ganapathy, 2016)

From the above study we conclude that Zinc Oxide Eugenol was preferred for temporary cementation of provisional restorations and FPD, followed by the use of Temp bond and IRM for cementation. Most of the postgraduates preferred using IRM as a temporary cement. There is no one provisional cement to meet all clinical needs. It may be necessary to have at least two different provisional cements to accommodate the dental practice.

Limitations:
From the study we have compared only 3 provisional restoration like Zinc Oxide Eugenol,IRM and Tempbond. There are so many brands available Now-a-days. Choosing the Material of choice depends mainly on clinician judgment and type of Temporisation material used and how much time required for the final prosthesis coming from the lab

CONCLUSION
From the above study we conclude that Zinc Oxide Eugenol was preferred for temporary cementation of provisional restorations and FPD, followed by the use of Temp bond and IRM for cementation. Most of the postgraduates preferred using IRM as a temporary cement. There is no one provisional cement to meet all clinical needs. It may be necessary to have at least two different provisional cements to accommodate the dental practice.

AUTHOR CONTRIBUTIONS:
First author (Neppala Gowtham) performed the analysis and interpretation and wrote the manuscript. Second author (Nabeel Ahmed) contributed to conception, data design, analysis, interpretation and critically revised manuscript. Both authors have discussed results and revised the manuscript.

Conflict of interest: Nil

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Table 1: Frequency distribution of the preference of different types of temporary cements for fixed partial denture. Zinc oxide eugenol was most commonly preferred as temporary cement.

<table>
<thead>
<tr>
<th>Type of cement</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc oxide Eugenol</td>
<td>717</td>
<td>71.9%</td>
</tr>
<tr>
<td>Temp Bond</td>
<td>152</td>
<td>15.2%</td>
</tr>
<tr>
<td>IRM</td>
<td>128</td>
<td>12.8%</td>
</tr>
<tr>
<td>Total</td>
<td>997</td>
<td>100%</td>
</tr>
</tbody>
</table>
Fig. 1: Bar graph depicting the association between different types of temporary cement and level of study, X axis represents different types of provisional cement and Y axis represents number of population. The graph shows Zinc Oxide Eugenol is used more by Undergraduates (blue) and IRM is used more by Postgraduates (green). Chi Square test represents there is statistical association between different types of temporary cement and level of study having p-value - 0.000 (p value < 0.05) making it statistically significant.

Fig. 2: Bar graph depicting the association between different types of temporary cement and gender. X axis represents different types of provisional cement and the Y axis represents number of population. The graph shows that Zinc Oxide Eugenol is used more followed by Tempbond and very less by IRM. Chi Square test represents there is statistical association between different types of temporary cement and gender having p-value - 0.000 (p value < 0.05) making it statistically significant.