



# ORIGINAL RESEARCH PAPER

## Prosthodontics

### PROVISIONAL RESTORATIONS

**KEY WORDS:** Provisional Restoration, Temporary Prosthesis, Materials, Requirements, Fixed Partial Denture

**Dr. Kalpana D.**

Professor & HOD, Dept. of Prosthodontics, Dayananda Sagar College of Dental Sciences and Hospital, Kumaraswamy Layout, Bengaluru - 560078

**Dr. Rajesh K S**

Prof and HOD, Dept Artificial Intelligence & Machine Learning, Rajarajeswari College of Engineering, Bengaluru - 560074

#### ABSTRACT

Provisional restorations are temporary prosthesis that enhance esthetics, stabilization and function until being replaced by definitive prosthesis. Provisional restorations serve biological, mechanical and aesthetic requirements. Provisional restorative materials are widely used in fixed partial denture prosthodontics. This article is about material and requirements of Provisional Restorations.

#### INTRODUCTION

Provisional restoration must accomplish several functions for the duration of the use in the mouth. They should shield pulpal tissue against physical, biochemical and thermal injuries, maintain positional stability and occlusal function, should provide strength, retention and aesthetics for the prepared teeth. In addition, they may be used for correcting irregular occlusal plane, altering vertical dimensions and changing the contour of the gingival tissue.

Ideal Requirements of Provisional Restoration: Biological, Mechanical, Aesthetics.

- Biological Requirements: Pulp protection, Periodontal health -good marginal fit, Positional stability, Prevention of fracture.
- Mechanical Requirements: Functional-good compressive and flexural strength, Loss of retention, Removal for reuse.
- Aesthetic Requirements: Match the shape, size, colour and texture of the restored tooth, colour stability.

Since the 1930s, provisional restorative materials have changed greatly from acrylics and prepared crowns (first generation) to modern bis-acryl materials and heat cure Polymethyl Methacrylate (PMMA) blocks that are being used for Computer Aided Design/ Computer Aided Manufacturing (CAD/CAM) restorations.

Extensive prosthetic treatment requires temporary restorations with high mechanical strength for long-term use. When restorations replace several teeth, in a long span, the strength and stability of the prosthesis are critical, and fractures may occur so that fracture strength of temporary restorations is directly related to the flexural strength and the elastic modulus.

Bis-acryl composite were introduced with an aim to overcome the negatives of the methacrylate. They are available as preloaded syringes or cartridges and mixed through an auto mixing tip. This provides consistent mixture with no air incorporation into the final mix. Bis-acryl composites consist of bi-functional substrates to provide cross linkage with one another and form monomer chain cross linkage leading to increase in impact strength and toughness. They also contain inorganic fillers to increase their abrasion resistance.

Bis-acryl composite resins have low polymerization shrinkage, low exothermic reaction, reduced tissue toxicity, good wear resistance and strength. But these materials are expensive, brittle and have less polish ability and their repair is difficult. Good marginal adaptation is essential for the success of temporary restorations because it supports gingival health between tooth preparation and final replacement implantation. Additionally, it protects the pulp from thermal, microbiological, and chemical assaults. A

poorly designed temporary restoration causes plaque to build up and cause periodontal disease, which can cause gingival inflammation and periodontal support to break down. Proper fit of provisional restoration and low solubility of cement are two factors that would reduce any discomfort for the patient during the interim period before permanent restoration delivery.

Particularly with long-span interim prosthesis with short height pontics and connectors, and when the patient exhibits parafunctional tendencies like clenching and grinding, the flexural strength of interim prosthesis is a crucial component. Flexural strength is particularly crucial during the restorative stage of implant reconstructive surgeries and when these restorations are worn for an extended period of time to evaluate the effectiveness of treatments for periodontal, endodontic, and temporomandibular joint dysfunction.

Provisional restorations serve a variety of purposes, including covering exposed dentine to prevent sensitivity and plaque build up, to prevent unintentional tooth movement, to maintain function properly, to facilitate oral hygiene, to prevent gingival overgrowth, to provide an adequate interim appearance, and to assess the impact of occlusal and aesthetic changes. Partially edentulous patients typically need ongoing provisional restoration planning to allow the clinician evaluate the success of the eventual restoration in terms of its mechanical, esthetic, and functional features. Mechanically, they support inter-abutment alignment, strength, and retention. In addition, temporary repairs must be translucent and visually pleasing in colour. Visible light-cured microfilled composite resin was also used by some researchers and finally provisional restorations were introduced in implant dentistry in 1987.

Interim restorative substances can be categorised into four following constitutions:

1. Polymethyl methacrylate (PMMA)
2. Polyethyl or Butyl methacrylate
3. Microfilled bisphenol A Glycidyl Methacrylate (Bis-GMA) composite resin and
4. Urethane Dimethacrylate (UDMA) (light-polymerising resins).

Polymethyl methacrylate (PMMA) resins are comparatively economical, have good colour stability, good marginal accuracy, and superior ability to be polished. However, the main drawback of this type of resin is high polymerisation shrinkage, an exothermic reaction, low strength and wear resistance as well as pulpal irritation due to surplus free monomer. Latest bis-acryl materials have resolved the disadvantages related to traditional acrylic.

In the 1960s Bowen developed Bis-GMA, the backbone for

most composite resins used to date. It also made bis-acryl self-cured composites possible. Bis-acrylate comes in a handy syringe applicator and is offered in a wide range of colours, including bleach, and has a low exothermic reaction, less shrinkage, and a milder odour. The ease of breakage when put in high-stress regions is a negative, however they are simple to fix.

Urethane Dimethacrylate (UDMA) (light-polymerising resins) is available in an adaptable putty consistency and is light cured. It offers a good marginal fit in addition to a polished surface, exhibiting low shrinkage and no exothermic reaction. A disadvantage is its availability in a single shade. UDMA is well suited for immediate load implant prosthesis. The provisional restorative materials should possess a number of ideal mechanical and physical properties, such as a high flexural strength, increased resistance to wear, high fracture strength, dimensional stability, minimal marginal gap formation and increased resistance to staining and discoloration. One of the important aspects of provisional restorations is their flexural strength which plays a critical role in both functional as well as parafunctional conditions. The materials used for fabrication of provisional restorations includes pigments, monomers, filler and an initiator, all combining to form an esthetic restorative substance. The important characteristics of the material are determined by the primary monomer. The ability of this monomer to convert to a polymer allows the material to set into a solid that is durable enough to withstand the oral environment and occlusal forces for an interim period.

Komiyama O, et al, conducted an in vitro study to test the marginal fit and color stability of three provisional restorative materials and a control. Two auto cure materials and one dual cure material were tested against SNAP, a polyethyl methacrylate control. A maxillary right central incisor invorine tooth was prepared for a full coverage ceramic crown, with a 1.5mm chamfer margin. For color stability, 10mm diameter x 2mm thick discs were fabricated and immersed clinically in tea for 1 week in a Tucillo / Nielsen apparatus. Color measurements were recorded for each specimen at baseline and after staining. The authors concluded that dual-cure temporary material exhibited significantly more discrepancy at the margin than the auto-cure bis-acryl materials or acrylic control. Protemp Garant exhibited clinically noticeable change in shade after 1 week in staining solution.

Gabriela Queiroz de Melo Monteiroa conducted the study to evaluate polymerization shrinkages of resin composites using a coordinate measuring machine, optical coherence tomography and a more widely known method, such as Archimedes principle. Two null hypothesis were tested; (1) there are no differences between the materials tested; there are no differences between the methods used for polymerization shrinkage measurements.

Binkley CJ, et al, conducted an in vitro study to evaluate and compare the marginal fit of provisional restoration fabricated using light cure acrylic resin with other commercially available temporary resin crown materials. A total of 60 stone dies were prepared and they were divided into three groups 20 dies for each material to be tested. Three provisional restorative materials involved in the study are cold cure acrylic resin, Protemp – II and Revotek LC. 10 samples from each group were subjected to thermocycling for 2500 cycles between 5°C and 55°C with a dwell time of 5 seconds in each water bath. The marginal discrepancy was significantly different among the groups according to ANOVA F-test after thermocycling and water immersion respectively. The provisional restorative materials used in this study showed some marginal discrepancy before and after thermalcycling and water immersion But GC Light cure acrylic resin had a better fit when compared to Cold Cure acrylic resin and

Protemp – II provisional restorative materials before and after thermocycling and water immersion.

One of the most frequent problems of provisional fixed partial dentures is the fracture of the material. Mechanical forces such as: excessive occlusal forces, parafunctional habits and bruxism, contributes to deformation and the fracture of the provisional restoration. This will lead to the necessity to fabricate a new provisional restoration with added cost in materials and dissatisfied patients.

## CONCLUSION

Provisional Restorations is essential immediately after tooth preparation to prevent the tooth from injury, abnormal tooth movement. It should fulfil the ideal requirements and accepted by patients.

## REFERENCES

- Regish KM, Sharma D, Prithviraj DR. Techniques of fabrication of provisional restoration: an overview. *Int J Dent*. 2011;134659.
- Anca jivanescu, diana hrelescu mihutescu, luciana goguta, liviu daniel pirvulescu, materials plasticer 2016 (3):56.
- Zafar MS. Prosthodontic Applications of Polymethyl Methacrylate (PMMA): An Update. *Polymers (Basel)*. 2020 Oct 8;12(10):2299.
- KJ Anusavice; Phillips' science of dental materials(10th ed), WB Saunders, Philadelphia (1996), pp. 237-271.
- SD Tylman; Theory and practice of crown and bridge prosthodontics(5th ed), CV Mosby, St Louis (1965), pp. 1197-1217.
- Orsi IA, Soares RG, Villabona CA, Panzeri H. Evaluation of the flexural strength and elastic modulus of resins used for temporary restorations reinforced with particulate glass fibre. *The Gerodontology Society and John Wiley & Sons A/S, Gerodontology* 2012;29:e63-e68e63.
- Kurtzman GM, Strassler HE, Provisional fixed restorations *Dental Economics* 2006 3:1-12.
- Nejatidanesh F, Momeni G, Savabi O, Flexural strength of interim resin materials for fixed prosthodontics *J Prosthodont* 2009 18:507-11.
- Haselton DR, Diaz-Arnold AM, Vargas MA, Flexural strength of provisional crown and fixed partial denture resins *J Prosthet Dent* 2002 87:225-28.
- Wang RL, Moore BK, Goodacre CJ, Swartz ML, Andres CJ, A comparison of resins for fabricating provisional fixed restorations *Int J Prosthodont* 1989 2:173-84.
- Osman YI, Owen CP, Flexural strength of provisional restorative materials *J Prosthet Dent* 1993 70:94-96.
- Srimaneepong V, Heboyan A, Zafar MS, Khurshid Z, Marya A, Fernandes GVO, Rokaya D. Fixed Prosthetic Restorations and Periodontal Health: A Narrative Review. *J Funct Biomater*. 2022 Feb 1;13(1):15.
- Komiyama O, Lobbezoo F, De Laat A, Iida T, Kitagawa T, Murakami H, Kato T, Kawara M. Clinical management of implant prostheses in patients with bruxism. *Int J Biomater*. 2012;2012:369063.
- Binkley CJ, Irvin PT. Reinforced heat-processed acrylic resin provisional restorations. *The Journal of Prosthetic Dentistry*. 1987;57(6):689-693.
- Krastl et al. Trauma and Endodontic management *International Endodontic Journal*, 54, 1221-1245.
- D'Souza D, Dua P. Rehabilitation strategies for partially edentulous-prosthodontic principles and current trends. *Med J Armed Forces India*. 2011 Jul;67(3):296-8.
- Espósito P, Dal Canton A. Clinical audit, a valuable tool to improve quality of care: General methodology and applications in nephrology. *World J Nephrol*. 2014 Nov 6;3(4):249-55.
- Singh A, Garg S. Comparative Evaluation of Flexural Strength of Provisional Crown and Bridge Materials-An In vitro Study. *J Clin Diagn Res*. 2016 Aug;10(8):ZC72-7.
- Sukhleen K, Rafia K, Robindera K, Iqbal S, Ishani S. Comparative evaluation of flexural strength and elastic modulus of interim resin materials for fixed prosthodontics: An in vitro study. *International Journal of Applied Dental Sciences* 2020;6(1):217-219.
- Jafarzadeh-Kashi TS, Mirzaei M, Erfan M, Fazel A, Eskandarian S, Rakhshan V. Polymerization behavior and thermal characteristics of two new composites at five temperatures: refrigeration to preheating. *J Adv Prosthodont*. 2011 Dec;3(4):216-20.
- Singh A, Garg S. Comparative Evaluation of Flexural Strength of Provisional Crown and Bridge Materials-An In vitro Study. *J Clin Diagn Res*. 2016 Aug;10(8):ZC72-7.
- Kalpana D. Telescopic bridge revisited: Apt solution for tilted molar teeth-A case report. *International Journal of Scientific Research*. 2018 May;7(5).
- Gabriela Queiroz de Melo Monteiroa. Alternative method for determining shrinkage in restorative resin composite. *Dental materials* 201;27:176-85.