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Original Research Article

Comparative Evaluation of Vertical Marginal Accuracy of Chemically Polymerized Polymethyl Methacrylate Provisional Restorative Crowns Using Direct, Indirect and Combination Techniques: A Research

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ABSTRACT

Objective: A study was conducted to measure and compare the marginal accuracy of provisional crowns fabricated by direct, indirect and combination techniques.
Materials and Methods: For the present study stainless steel master dies representing unprepared teeth, prepared teeth, and arbitrarily prepared teeth were fabricated and were mounted on a stainless steel base. 15 provisional crowns were fabricated by direct, indirect and combination techniques each using additional silicone putty reline impression material in a custom tray. Vertical marginal discrepancy was measured with the help of scanning electron microscope before cementation. The crowns which showed least marginal discrepancy were decided to have good marginal fit.
Results: Mean marginal discrepancy for provisional crowns fabricated by direct technique was 158.91µ, for indirect technique was 121.42µ. The mean marginal discrepancy for crowns fabricated by combination technique was 101.43µ receptively.
Conclusion: The provisional crowns fabricated by combination technique show better marginal fit compared to those fabricated by direct & indirect techniques.

Key Words: Marginal accuracy, Provisional crowns, scanning electron microscopy.

INTRODUCTION

According to glossary of prosthodontic terms, provisional restorations are defined as removable/fixed prosthesis designed to enhance esthetics, stabilization and /or function for a limited period of time after which it has to be replaced by a definitive prosthesis.

Provisional restorations that are placed after tooth preparation protect the pulp from thermal changes; maintain proper contacts; restores occlusion, esthetics and function. [1, 2]

The most important factors that determine the success of a provisional restoration is adequate vertical marginal fit. [3] Obtaining the best possible marginal adaptation of provisional restoration effectively prevents plaque accumulation thereby maintaining gingival health and protects the pulp from thermal, bacterial and chemical insults. [4] Pronounced marginal discrepancy can result in development of

pulpal sensitivity, gingival recession and tissue inflammation. [5-7]

Thus current study was conducted to compare vertical marginal accuracy of chemically polymerized polymethyl methacry late provisional restorative crowns using direct, indirect and combination techniques.

MATERIALS AND METHODS

Materials used in the study are given in Table 1

Table 1: Materials used in the study

Materials Used	Manufacturer
DPI tooth colored chemically polymerized PMMA resin (powder-liquid system)	Dental Products of India.
Photosil Additional Silicone Putty & Light body impression material	Dental Products of India.

Preparation of test specimens:

1. Direct technique: 5 dies representing unprepared teeth were mounted on the stainless steel base. A matrix was prepared in additional silicone impression material. The dies representing prepared teeth were placed now on the stainless steel base replacing the existing dies. A thin film of petroleum jelly was applied on these dies. Manipulated auto polymerizing resin mix is placed in the matrix & seated on the mounted dies until it was removed & allowed to harden. Crowns were removed from the matrix & flash was trimmed under magnification.

15 such crowns were prepared. Later they were seated on the respective dies with the help of seating devise. The specimen was then subjected to visual & scanning electron microscopic evaluation of marginal fit.

2. Indirect technique: The dental stone replicas of mounted master dies representing unprepared teeth & prepared teeth were prepared in additional silicone impression material. A thin film of separating medium was applied on the dental stone replicas representing prepared teeth. 15 provisional crowns were fabricated by indirect technique. Crowns fabricated were seated on the master dies representing the prepared teeth& subjected for visual & scanning electron microscopic evaluation of marginal fit.

3. Combination technique: 15 resin shell crowns were fabricated on stone replica of the arbitrarily prepared master dies. These shells were later relined on metal master dies representing prepared teeth .Flash was later trimmed under magnification. Crowns were seated on the master dies & used for visual & scanning electron microscopic evaluation of marginal fit.

Scanning electron microscopic evaluation & image analysis: The provisional crowns were evaluated on the same day of fabrication of the crowns and subjected to scanning electron microscopic evaluation & images of marginal discrepancy were obtained. Images were later analyzed with the help of the computer.

RESULTS

Mean vertical marginal discrepancy, standard deviation, p value and inference using one way analysis of variance is given in Table 2.

Table 2: Mean vertical marginal discrepancy, standard deviation, p value and inference of the groups compared

Groups Compared	Mean(µ m)	Standard Deviation	p value	Inference
Chemically polymerized PMMA resin by direct technique	158.91	34.98	<0.0001	Significant
Chemically polymerized PMMA resin by indirect technique	121.42	26.69		
Chemically polymerized PMMA resin by combination technique	101.43	25.71		

DISCUSSION

Provisional restorations that are placed after tooth preparation protect the

pulp from thermal changes; maintain proper contacts; restores occlusion, esthetics and function for a limited period of time after which it is replaced by a definitive prosthesis. [1, 2]

Marginal fit is one of the most important factors that determine the success of a provisional restoration. [3] This study was undertaken to compare the vertical marginal discrepancy of polymethyl methacrylate crowns fabricated using different techniques. Polymethyl methacrylate is the most commonly used provisional restorative crown material. Provisional crowns using polymethyl methacrylate can be fabricated using direct, indirect and combination techniques. [6]

In the present study mean marginal discrepancy for provisional crowns fabricated by direct technique was 158.91µ, for indirect technique was 121.42µ. The mean marginal discrepancy for crowns fabricated by combination technique was 101.43µ receptively.

The above findings are comparable to the results of the study conducted by Crispin, Watson & Caputo, [8] Monday & Blais, [9] Lepe et al. [10] and M Brent Moulding. [11]

CONCLUSION

The provisional crowns fabricated by combination technique show better marginal fit compared to those fabricated by direct & indirect techniques.

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