



## POSTman: Pediatric Occlusion Stamp Technique

Dr. Aishwarya Savakiya, Dr. Anupkumar Panda, Dr. Mira Virda, Dr. Deepika Chari, Dr. Unnati Bhudhrani, Dr. Roocha Shah

(Department of Pediatric and Preventive Dentistry, CDSRC- Ahmedabad, Gujarat- India) Corresponding  
Corresponding Author: Dr. Aishwarya Savakiya (MDS\*, Post Graduate Student)

Other Authors: Dr. Anupkumar Panda (MDS, Head of the Department)

Dr. Mira Virda (MDS., Ph.D\*, Professor)

Dr. Deepika Chari (MDS., Ph.D\*, Senior Lecturer)

Dr. Unnati Bhudhrani (MDS\*, Post Graduate Student)

Dr. Roocha Shah (MDS\*, Post Graduate Student)

**ABSTRACT :** Background : An exponential progression in dentistry has occurred in the second decade of the new millennium be it from extractions to functional restorations, to finally, the era of 'bio-mimetic dentistry'. Direct restorations may be technique sensitive and not necessarily result in precise reproduction of tooth form and occlusion, time needed for finishing and polishing of the restoration is double. So, a newer technique that is Stamp technique consists of fabricating an occlusal matrix that mimics the natural occlusal anatomy of posterior teeth. Aim: To evaluate the anatomical retention in primary mandibular second molars using occlusal stamp. Methodology: 50 primary mandibular second molars diagnosed with Class I dental caries (acc. to GV Black) were selected from 3 to 7 years of age. They were divided into two groups. Group 1: composite restoration without using occlusal stamp, Group 2: Composite restoration using occlusal stamp. Pretreatment universal metal occlusal stamp was formed from ideal cast. Then clinical evaluation at one week, one month, three months and six months will be carried out by using Ryge criteria. Results: Statistical analysis indicated significant changes in marginal discoloration (MD), Marginal adaptability and anatomical form criteria between both the group ( $p < 0.05$ ). No significant difference seen in color match, secondary caries, surface texture and post-op sensitivity between both the group ( $p > 0.05$ ). Conclusion: Composite restoration using occlusal stamp gives better marginal adaptability, better retention of anatomical form so better esthetic and decrease chances of secondary caries compare to restoration without using occlusal stamp over an evaluation period of six month.

**KEYWORDS:** Occlusal stamp, Primary mandibular second molar, Composite Restoration

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### I. INTRODUCTION

Nowadays amalgam restorations are increasingly replaced by posterior composite restorations due to mercury-related health hazards and non-esthetic appearance. Introduced about half a century ago, resin-based composites are now widely used as an esthetic alternative to amalgam for restoring carious lesions.(1)

Another contributing factor for more use of composite resin restoration is the introduction of minimally invasive restoration procedures which stress on the conservation of sound tooth structure and use of adhesive materials.(2)

Dentistry has seen exponential progress in the second decade of the new millennium, evolving from extractions to functional restorations and into the era of 'bio-mimetic dentistry.' However, achieving a cusp-fossa relationship and occlusal harmony in posterior composite restorations remains challenging, demanding significant operator skill and clinical time. Final polishing and adjustments are particularly time-consuming and taxing in a busy practice, requiring more time than amalgam restorations. (3)

One technique that is proposed by Dr. Waseem Riaz a London based practitioner is a 'Stamp technique' practiced for direct composite resin restorations to obtain the precise occlusal topography easily. It has also been reported for vertical bite reconstruction of worn-out dentitions.(4)

So, the purpose of this research is to evaluate the anatomical retention in primary mandibular second molars using occlusal stamp and to minimize the high points in composite restoration using occlusal stamp.

## II. MATERIALS AND METHOD

### Materials:

Rubber Dam Kit  
Flowable Composite Kit for occlusal stamp preparation  
Packable Composite Kit for restoration  
Finishing polishing kit

### Method:

The protocol for this study was independently reviewed and approved by the ethical committee. A total of 50 healthy children from the department of Pediatric and Preventive Dentistry, College of Dental Sciences and Research Centre, Ahmedabad were recruited for this study. They were randomly divided into two group using computer generated random number method.

#### Inclusion Criteria:

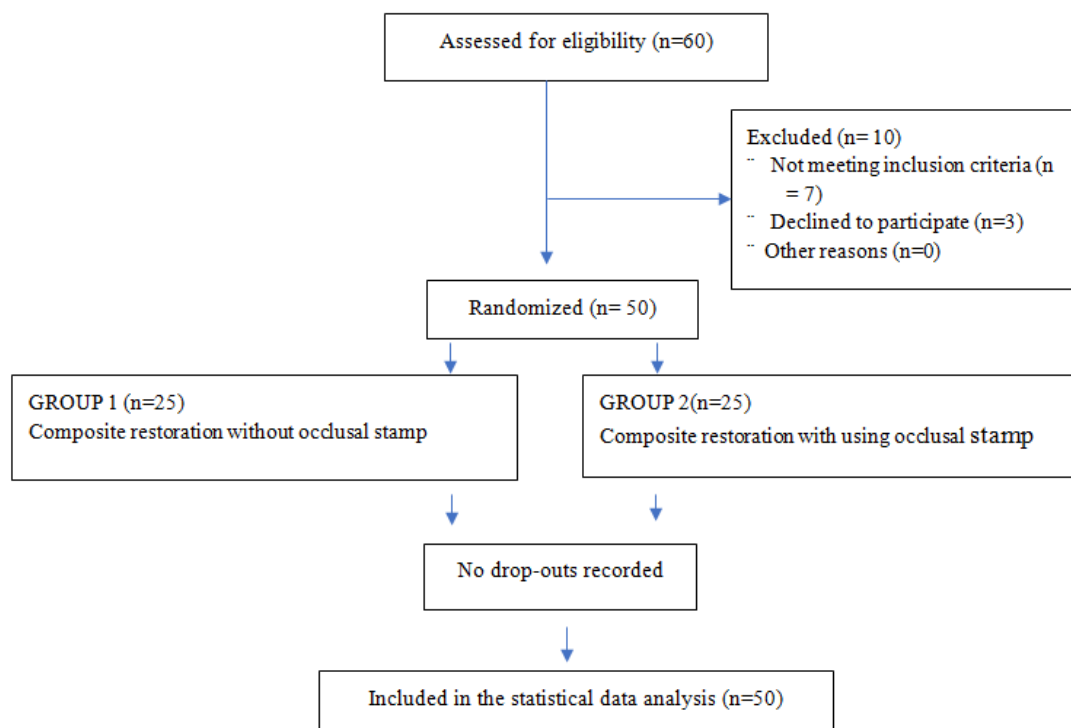
- Subjects ranged from 4 to 8 years of age.
- Medical histories indicated that the patients were free of any disease.
- All intraoral and extraoral conditions were within normal limits, periodontally sound.
- Normal occlusion.
- Children with caries in primary molars not involving pulp.

#### Exclusion Criteria:

- Grossly Carious teeth
- Heavy bruxism habits
- Known allergic reactions against any components of the used materials
- Pathologic pulpal diagnosis with pain (nonvital)
- Fractured or visibly cracked teeth,

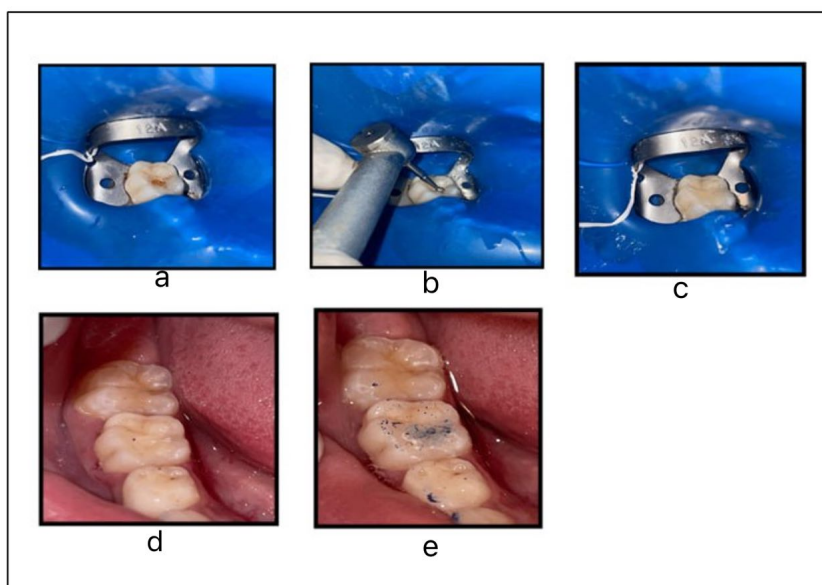
The study was explained to parents to include the need for evaluations at baseline, one month, three month and six months. An informed consent form was obtained at the start of the study.

### CONSORT FLOWCHART



### Clinical Procedures:

**Procedure for group 1:** Isolate the tooth with rubber dam (Figure 1-a). Caries removal done using small round bur (Figure 1-b). The walls of the preparations were slightly convergent with rounded internal line angles. After the caries removal cavity selective etching done with 37% phosphoric acid for 15 seconds prior to rinsing with an air-water spray for 20 seconds. The single-bottle adhesive system (Excite, Ivoclar Vivadent) was applied according to the manufacturer's instructions and the composite resin material (Tetric Ceram, Ivoclar Vivadent) was incrementally placed and light-cured for 40 seconds (Figure 1-c). A final finish was achieved after one week with carbide finishing burs and Ivoclar Vivadent polishers (Ivoclar Vivadent) (Figure 1-d). Clinical evaluation done using modified USPHC criteria at Immediately (Figure 1-e), 1 month, 3 month and 6 months



**Figure 1: a- Isolation using rubber dam, b- Caries removal, c- Composite restoration without using occlusal stamp, d-After finishing polishing, e- Evaluation using USPHC criteria**

**Procedure for group 2:**

Isolate the

oth surface was done using a micro brush. A stamp was made with application of flowable composite on the intact occlusal surface of tooth. The occlusal stamp was fabricated using a micro brush which was placed into the flowable composite and cured, which was further used to act as a guide to replicate the occlusal anatomy (Figure 2-b). After Stamp formation caries removal done using small round bur (Figure 2-c). The walls of the preparations were slightly convergent with rounded internal line angles. After the caries removal cavity selective etching done with 37% phosphoric acid for 15 seconds prior to rinsing with an air-water spray for 20 seconds. The single-bottle adhesive system (Excite, Ivoclar Vivadent) was applied according to the manufacturer's instructions and the composite resin material (Tetric Ceram, Ivoclar Vivadent) was incrementally placed and light-cured for 40 seconds. Stamp was placed after last layer of composite before curing (Figure 2-d). Then remove the stamp and cure the composite. A final finish was achieved after one week with carbide finishing burs and Ivoclar Vivadent polishers (Ivoclar Vivadent) (Figure 2-e). Clinical evaluation done using modified USPHC criteria at Immediately (Figure 3), 1 month, 3 month and 6 months.

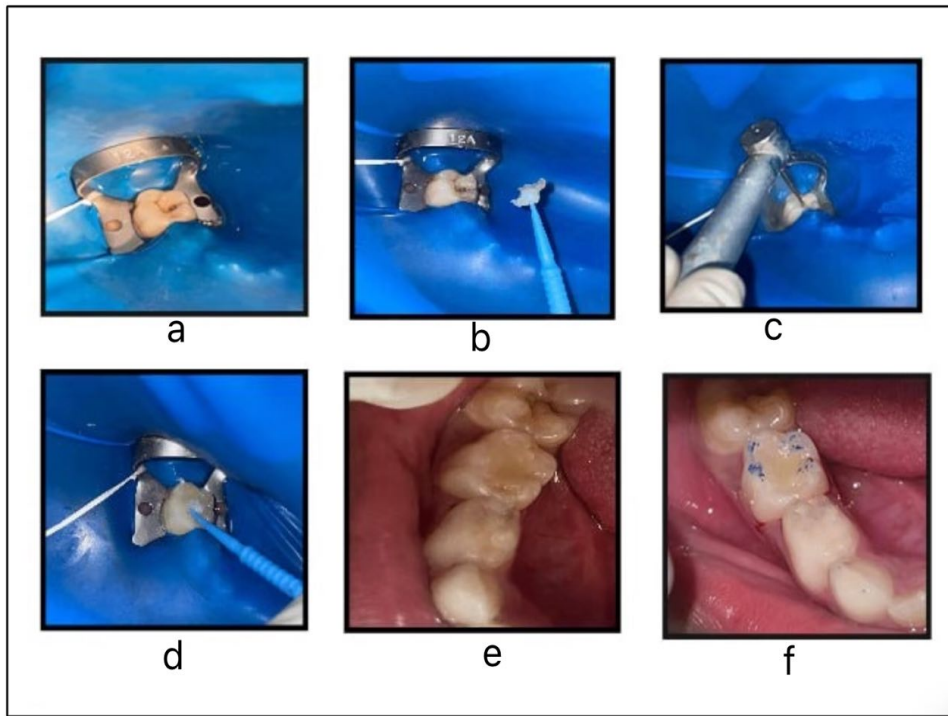


Figure 2: a- Isolation using rubber dam, b- Stamp formation using flowable composite, c- Caries removal, d- Restoration using stamp, e- After finishing polishing, f- Evaluation using USPHC criteria

**Figure 3:  
Modified  
USPHC  
Evaluation  
Criteria**

Comparisons of ratings for restorations and follow-up examinations were analyzed by Fischer and McNemar Chisquare tests for each category, with p values  $\leq 0.05$  (95th percentile) considered to demonstrate statistically significant differences.

			low-up (up to 4 shades)	follow-up (up to 8 shades)	Delta of color com- the 2-week Change of color compared to the 2-week follow-up (more than 8 shades)
Surface texture	Sound	Rough			
Anatomical form	Sound	Slight loss of material (chipping, clefts), superficial	Strong loss of material (chipping, clefts), profound	Total or partial loss of the bulb	
Marginal integrity (enamel)	Sound	Positive step, removable by finishing	Slight negative step not removable, localized	Strong negative step in major parts of the margin, not removable	
Marginal discoloration (enamel)	None	Slight discoloration, removable by finishing	Discoloration, localized not removable	Strong discoloration in major parts of the margin not removable	
Secondary caries	None	Caries present			
Gingival inflammation	None	Slight	Moderate	Severe	
Restoration color stability	No change	Change of color compared to baseline condition			

III. RESULTS

The mean age of the 50 participants included in this study was  $5.69 \pm 0.76$  years. A total of 23 males and 27 females were included in this study. Clinical evaluation done at baseline, 1 month, 3 month and 6 months. The evaluated categories and evaluation technique followed modified USPHS criteria. The results of the clinical evaluations of group 1 (table 1) and group 2 (table 2) are shown in table. The Alfa (A) value indicated that conditions were clinically ideal, Bravo (B) ratings indicated clinical acceptability. Charlie (C) indicated clinically unacceptable situation.

Criteria	Value	Group-1- without stamp			
		Baseline %	1 month %	3 month %	6 month %
C.M	A	100	100	100	88
	B	0	0	0	12
M.D	A	96	88	88	80
	B	0	12	12	20
M.A	A	96	88	88	80
	B	0	12	12	20
S.C	A	100	100	100	92
	B	0	0	0	8
S.T	A	100	100	88	76
	B	0	0	12	24
A.F	A	72	72	68	68
	B	28	28	32	32
Post op.s.	A	100	100	100	92
	B	0	0	0	8

**Table 1- Values for group 1- restoration without stamp**

Criteria	Value	Group-2 with stamp			
		Baseline %	1 month %	3 month %	6 month %
C.M	A	100	100	100	96
	B	0	0	0	4
M.D	A	100	100	100	92
	B	0	4	4	8
M.A	A	100	100	100	92
	B	0	4	4	8
S.C	A	100	100	100	96
	B	0	0	0	4
S.T	A	100	100	100	100
	B	0	0	0	0
A.F	A	100	100	100	100
	B	0	0	0	0
Post op.s.	A	100	92	100	96
	B	0	8	0	4

**Table 2: Values for group 2- restoration using occlusal stamp**

Statistical analysis indicated significant changes seen in marginal discoloration (MD), Marginal adaptability and anatomical form criteria at six-month evaluation between both the group ( $p < 0.05$ ). No significant difference seen in color match, secondary caries, surface texture and post-op sensitivity at baseline, one month, 3 month and 6-month evaluation between both the group ( $p > 0.05$ ).

#### IV. DISCUSSION

Resin composite technology has seen significant advancements. However, the pace of these advancements has outstripped the accumulation of long-term clinical data on specific products, due to the



frequent introduction of "improved" versions. While laboratory tests can offer insights into the potential performance and handling of filling materials, they fall short in adequately predicting clinical performance and handling characteristics. Additionally, in vitro studies are insufficient for determining the in vivo longevity of these tooth-colored restorations.(5)

50 primary mandibular second molars diagnosed with Class I dental caries (acc. to GV Black) in 25 children were selected from 4 to 7 years of age. Teeth were divided into two groups. Group 1: composite restoration without using occlusal stamp on one side and Group 2: Composite restoration using occlusal stamp on other side. Evaluation carried out at baseline, 1 month, 3 month and 6 months follow up using modified USPHC criteria.

Restoring the actual topography of tooth surfaces enhances patient compliance and acceptance of dental treatment. The stamp technique with flowable composite offers a simple method to achieve a good surface finish and accurate anatomy of direct posterior composites with minimal time investment. Bravo scores for marginal adaptation showed statistically significant differences between baseline and 6 months. Consistent with these findings, Kramer et al. reported 17% Bravo scores for marginal adaptation after a one-year clinical evaluation. Previous research indicates that initial evaluations of composites show minor changes compared to baseline. (6)

Loss of marginal adaptation and the presence of secondary caries are key predictors of failure in posterior resin-based composites, necessitating the replacement of the restoration. (7)

Marginal deterioration, characterized by poor marginal adaptation, can lead to marginal discoloration, postoperative sensitivity, and secondary caries, which are common reasons for replacing or repairing adhesive restorations. Composite restorations are prone to polymerization shrinkage due to the resin molecules' bonding and bulk reduction. The configuration factor (C-factor) significantly influences the extent of this shrinkage. (8)

When composite resin is placed on dentin or cementum, there is a high potential for marginal gap formation, which predisposes the restorative margin to microleakage, secondary caries, and marginal discoloration. Marginal leakage is defined as the passage of fluids, bacteria, or molecules between a cavity wall and the restorative material due to micrometric spaces. Marginal staining, a clinical sign of microleakage, depends on proper shade selection, the finish of restoration margins, and the patient's oral hygiene. (9)

In direct composite restoration, achieving a cusp-fossa relationship and occlusal harmony is challenging, demanding both operator skill and significant clinical time, particularly for final polishing and adjustments. The stamp technique, which involves fabricating an index before cavity preparation, addresses these challenges. Suitable for cases without extensive cavitation or tooth structure loss, the index is pressed against the final composite increment before curing to create a positive replica. This method mimics the pre-existing condition and reduces the time needed for excess material removal and polishing. (10)

The stamp technique minimizes post-restoration adjustments. The pressure applied during the reproduction of composite resin reduces microbubble formation and the oxygen inhibition layer in the final polymerization stage, thereby decreasing porosity and increasing composite strength. Additionally, this technique enables a polished surface to be achieved in less time. (11)

Limitation of stamp are fracture of stamp and additional expense of flowable composite material in the preparation of the stamp.

So, compare to without stamp technique, stamp technique gives better marginal adaptation, less microleakage so less marginal discoloration.

## V. CONCLUSION

Composite restorations using the stamp technique efficiently replicate and restore the exact tooth anatomy, requiring minimal time and resources for finishing and polishing. On the basis of the results and despite the limitations of this study, it seems reasonable to conclude that composite restoration using occlusal stamp gives better marginal adaptability, better retention of anatomical form so better esthetic and decrease chances of secondary caries compare to restoration without using occlusal stamp over an evaluation period of six month.

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