



## COMPOSITE RETENTION CAVITIES;

COMPARISON OF COMPOSITE RETENTION IN DEEP CLASS 1 CAVITIES BY TWO DIFFERENT TECHNIQUES IN ALTAMASH INSTITUTE OF DENTAL MEDICINE KARACHI—A CLINICAL STUDY.

1. BDS, FCPS-II Resident.  
Department of Operative Dentistry  
Altamash Institute of Dental  
Medicine, Karachi.
2. BDS, FCPS  
Associate Professor and Head  
Department of Operative Dentistry  
Altamash Institute of Dental  
Medicine, Karachi.
3. BDS, FCPS  
Associate Professor and Head  
Department of Operative Dentistry  
Hamdard College of Medicine and  
Dentistry,  
Hamdard University, Karachi.
4. BDS.  
Senior Registrar  
Department of Operative Dentistry  
Altamash Institute of Dental  
Medicine, Karachi.

#### Correspondence Address:

Dr. Sara Jamil  
House #:90/2/2, 14<sup>TH</sup> Lane,  
KH-E- Sehar, Phase 7, DHA, Karachi.

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Sara Jamil<sup>1</sup>, Rizwan Jouhar<sup>2</sup>, Syed Abrar Ali<sup>3</sup>, Muhammad Saqib<sup>4</sup>

**ABSTRACT... Objectives:** To compare clinical retention of a low-shrinkage posterior resin composite by using incremental versus bulk placement technique in deep Class I cavities. **Setting:** Operative Dentistry Department, Altamash Institute of Dental Medicine, Karachi, Pakistan. **Period:** 6 months from 1<sup>st</sup> Oct 2017 – 30<sup>th</sup> March 2018. **Study Design:** Randomized control trial. **Materials and Methods:** This study was a randomized control trial study which consists of total of 94 teeth having class I cavity of 3mm minimum depth on occlusal surface. The restorative material evaluated in this study was Filtek Z250 (3M, ESPE) and the cavities were restored according to two different techniques. Patients in Group A were treated with bulk fill technique and patients in Group B were treated with incremental technique. The retention of the composite were clinically evaluated after 6 months (180 days) post-operatively. SPSS version 23 was used to analyze data. **Results:** The result of 6 months observation revealed retention of 43(91.4%) incremental fill composite and 39(85.4 %) bulk fill composite resin restorations which was statistically insignificant. **Conclusion:** Outcomes of incremental fill composite resin in terms of retention is equal to bulk fill composite resin with Filtek Z250 (3M, ESPE) in class I restorations of permanent molar teeth.

**Key words:** Bulk-fill Technique, Incremental Fill Technique, Restoration, Retention, Class I Cavity, Composite Resin.

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## INTRODUCTION

In the last century the invention of resin based composite-technology to restorative dentistry is one of the most significant contributions to dentistry.<sup>1</sup> The advantages of fortified rebuilding efforts join protection of increment maintenance, sound tooth structure, avoidance of postoperative affectability, diminishment of microleakage, intermittent caries, peripheral recoloring, dispersion and transmission of useful worry over the holding interface to the tooth.<sup>2</sup> Bonded reclamations similarly offer the potential for tooth support, broke down rebuilding efforts can be repaired with insignificant or no additional loss of tooth material, recontouring of teeth with almost no arranging, corrective reclamation and lessened necessities for use of bases and liners.<sup>3</sup>

Advancement in formulations, improvement of properties” and the advancement of new

techniques” for placement have made the restoration of direct composite more predictable and reliable.<sup>4</sup> Modern composites experience “shrinkage” ranging from “2-6% by volume during”setting.<sup>5</sup>”During polymerization resin composite may pull far from the slightest retentive cavity margins, resulting in loss of restoration.<sup>6</sup>

The incremental position strategy, composite is set in little expansions, each increment is under 1 to 1.5mm thickness and each increment allowed to set before the following one is added.<sup>7</sup> In incremental placement approach, there is minimal contact of the material with the cavity walls during the setting and this decreases shrinkage and gap development which is charge for increase achievement of restoration.<sup>8</sup> Whereas, the bulk placement technique is the approach in which the composite resin is put in a single increment into the entire cavity and permitted to set.<sup>2</sup>

As countless new improved resin brands and procedures are being released to the market, it is imperative for dental practitioners to know about the probable life span and likely modes of failure in retention of posterior composite restorations in oral conditions. Hence, the rationale of this study was to evaluate 6-months clinical retention of a low-shrinkage posterior resin composite using two different techniques i.e. bulk and incremental placement techniques in Class I cavities.”

## METHODOLOGY

A randomized controlled trial was conducted in Department of Operative dentistry and Endodontics at Altamash Institute of Dental Medicine, Karachi, Pakistan for six month duration after the approval of institutional ethical committee. Sample size was estimated using Open Epi sample size calculator. Taking statistics for retention in bulk fill composite resin group as 73%<sup>9</sup> and layered composite resin group as 92.3%<sup>9</sup>, power of test 80% and 95% confidence level, the estimated sample size was 47 in each group. The non-probability consecutive sampling technique was used. Total 94 teeth of patients aged 15-60 years were included in this study who gave written consent for participation and presented with deep Class I cavities present on the occlusal surface of molars with minimum depth of 3mm, determined by clinical and radiographic examination. Patients having mixed dentition, root canal treated & 2 grossly teeth were excluded.

All fillings were done by principle investigator. Local anesthesia was administered followed by isolation with rubber dam application. Occlusal preparation was done by pear shaped carbide bur to finish outline form. Following this preparation, soft infected dentin was removed by slow speed handpiece and carbide round bur #04. 2% Chlorhexidine antibacterial solution was used as a disinfectant of the cavity and lightly air dried. Cavity depth was measured with the help of Michigan O' periodontal probe. The cavity margin and walls were treated with 37.5% phosphoric acid for 15 seconds, washed for 15 seconds and lightly air dried with compacted air as per manufacturer's directions. Then bonding

agent (Prime & Bond) were put for 15 seconds and light cured for 20 seconds. The restorative material evaluated in this study was Filtek Z250 (3M, ESPE). Randomization was processed using random number table and sealed envelopes to allocate the cavities to be restored according to two different techniques. Patients in Group A were treated with posterior composites by incremental technique and patients in Group B were treated with posterior composites by bulk technique. “For setting of the material, a LED light-curing unit were used.

Rubber dam was removed. Occlusion of the teeth was checked and adjusted with the multifluted tungsten carbide burs. Then finishing and polishing was accomplished with cone shaped polishing tips. The retention of the composite was clinically evaluated after 6 months post-operatively.”

Statistical software for social sciences (SPSS ver. 23) was used to analyze data. Proportions and Percentages were computed for retention and gender. Mean and SD were computed for age. The chi-square test was used to compare post-operative retention for both stimuli between two placement techniques. The level of significance was set as  $P < 0.05$ .

## RESULTS

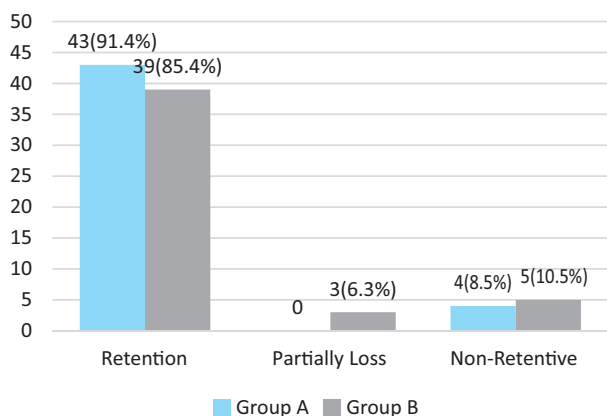
94 total patients with average of  $31.55 \pm 9.40$  years were included in the study. Out of 94, 47.9% were males and 52.1% were females. More class I cavities were found in mandibular teeth (64.9%) than in maxillary teeth (35.1%). About 52.1% cavities were in 1<sup>st</sup> molars and 47.9% in 2<sup>nd</sup> molars teeth. (Table-I)

Out of 94 patients, 47 had bulk fill and 47 had incremental fill composite resin. The retention was observed as 91.4% among incremental fill composite resin and 85.4% among bulk fill composite resin at the end of 180 days (6 months). About 6.3% showed partial loss in bulk group whereas no partial loss was observed in incremental fill composite resin group. The non-retention was observed in 8.5% of incremental fill resin composite and 10.6% in bulk fill resin

composite (Figure-1). Hence, the differences between two groups in terms of retention were statistically insignificant ( $p > 0.05$ ).

Variables	n (%)
<b>Age in Years</b> (Mean±SD)	31.55±9.40
<b>Gender</b>	
Female	49(52.1%)
Male	45(47.9%)
<b>Jaw</b>	
Mandibular	61(64.9%)
Maxillary	33(35.1%)
<b>Molar</b>	
1st Molar	45(52.1%)
2nd Molar	49(47.9%)

**Table-I. Characteristics of study variables**



**Figure-1. Comparison of retention between both groups**

**DISCUSSION**

The interest and popularity for resin based posterior restorations has been expanding consistently since the presentation of these materials in the mid-1950s. The societal spotlight on aesthetics and in addition the overall advance toward wiping out amalgam restoration materials has contributed to this phenomena.<sup>10</sup> Manufacturers are working aggressively to enhance resin composite materials by changing segments to diminish polymerization shrinkage, to enhance physical and mechanical properties, and to upgrade handling characteristics.<sup>11</sup> Unfortunately the achievement and failure of resin-based composite restorations is dependent upon factors that might be troublesome for the operator to control, hence of the major challenges in dentistry. Clinical information show

that regardless of which planning configuration is adopted or the kind of posterior resin-based restoration that is used, the expert must give cautions consideration to the caries status i.e. cavity size, caries risk, cavity type, position of the tooth in the mouth & number of the restored surfaces of the patient and change proposals for restorative materials appropriately.<sup>12,13</sup>

In the placement of posterior composites the utilization of small increments is suggested by many authors for polymerization and insertion with the goal that the eventual outcome of shrinkage stress can be decreased. Considering anterior composite restorations, though the position of progressive increments helps to knockdown the impacts of polymerization shrinkage stress, errors in layering procedures result in restorations which are excessively opaque or translucent. So to guarantee esthetically satisfying outcomes, layering idea ought to be clear, reproducible and standardized.<sup>14</sup> On the other hand, the bulk fill new resin based material has been presented in the past few years & has been considered by some authors to diminish stress at the cavosurface margins.<sup>15</sup> While anterior composite restorations are pervasive, breakthrough different layering techniques using a range of opacities, shades and translucencies remains the area of relatively few professionals. The following essential dual-shade and more muddled multilayered (polychromatic) placement sequences are exhibited as precise rules for all clinicians yearning to make more natural-looking direct anterior composite restorations.<sup>14</sup>

In the present study, we have evaluated 6-months clinical retention of a low-shrinkage posterior resin composite using two different techniques i.e. incremental fill composite resin & bulk composite resin in Class I restorations. The outcomes of this study showed that direct restoration by 3mm incremental fill composite resin had better clinical outcomes as compared to bulk composite in terms of retention although it was statistically insignificant. The rate of retention of incremental fill composite was 91.4% which is in disagreement with previous studies by Roggendorf MJ et al & Frankenberger R SM

et al.<sup>16,17</sup> Another study by Kapoor et al. also concluded that bulk fill composites revealed less gap formation and better adaptability than the incremental composites at the pulpal floor.<sup>18</sup>

In the study conducted by “Nadig et al. showed lower micro-leakage by incremental approach as compared to bulk. Among the incremental approaches, split horizontal incremental approach showed slightest microleakage followed by centripetal technique and oblique placement technique at occlusal margin of Class II restoration. However, there were no significant difference in microleakage between oblique placement technique and centripetal incremental technique, and split horizontal incremental technique showed least microleakage.<sup>19</sup> This study was in agreement with the present study. Another study by Heintze et al. conducted in 2015 concluded that the marginal integrity of composite resin placed in one increment was similar when compare to restorations placed in several increments. Furthermore, the differences between the resin restorations placed in bulk and those placed in several increments was not statistically significant and the semi quantitative evaluation of the marginal quality with an explorer at low magnification is an effective and rapid method to predict the clinical performance of direct restorations.<sup>20”</sup>

## LIMITATIONS

The main limitations of the study includes a single-center experience. The sample size of this study also limit its applicability because it is not conducted in a generalized larger population and is conducted in a small urban environment.

## CONCLUSION

The outcomes of incremental fill resin in terms of retention is equal to bulk fill composite resin with Filtek Z250 (3M, ESPE) in class I restorations of permanent molar teeth.

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**Ability is nothing without opportunity.**



*“Napoleon Bonaparte”*

#### AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Sara Jamil	Clinical researcher and data collector & correspondent.	
2	Rizwan Jouhar	Supervisor and data analyst.	
3	Syed Abrar Ali	Proof reading.	
4	Muhammad Saqib	Data collector	