



Comparing Post-Operative Pain of Nanohybrid and Bulk Fill Composite Resin Restorations (In-vivo Study)

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KEYWORDS

*Post-Operative Pain,
Hypersensitivity, Bulk Fill,
Total Etch, Self Etch, Incremental.*

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ABSTRACT

Aim: Post-operative pain is one of the main disadvantages of composite resin restorations, so the study will evaluate it after one day one week, and one month postoperatively. **Subjects and methods:** A total No. of 60 patients were selected randomly for the study, class II cavity preparation was performed with two different placement techniques; Bulk fill Tetric Evo-ceram and Nanohybrid composite Z250 XT. Two different adhesive systems were used Self Etch Clearfill SE and Adper Single bond. Post-operative pain is evaluated at one day, one week, and one month post-operative. One-way ANOVA analysis was used for statistics of the results. **Results:** From the results of the study there was no statistically significant difference between the tested groups, but it was noticed that all the groups gave higher results after one day postoperative, and all of them are decreasing after one week and more decreasing after one month post-operative. It was recorded that bulk fill has decreased post-operative pain and also self-etch groups have the lowest values than total-etch groups in both types of composite resin restorations. **Conclusion:** Post-operative pain and hypersensitivity in both bulk fill and incremental placement techniques is decreasing with time, and the adhesive system has no significant role in decreasing post-operative pain and hypersensitivity.

INTRODUCTION

Composite resin restorations have achieved high success in restoring decayed teeth, so huge efforts exerted by manufacturers to simplify the placement technique. Polymerization shrinkage stress is the main drawback of composite resin restorations, because it may lead to poor marginal adaptation, then microleakage and subsequent secondary caries which may lead to pulp inflammation⁽¹⁾. Degree of conversion is the second drawback associated with composite resin restorations, which affect physical properties of restoration and increase the monomer proportion⁽²⁾, which may lead to Post-operative sensitivity and it could lead to early failure of composite resin restorations.⁽³⁾

It was found that the incremental placement technique of 2 mm each increment is the best method, as it allows penetration of the curing light to the full thickness of the composite materials and also it decreases the polymerization shrinkage^(4,5). But this incremental technique is time consuming while dentists seek easy and quick techniques, so the bulk packing technique was introduced as it reduces half of the time of composite manipulation⁽⁶⁾. So this study was conducted to compare the post-operative pain of both incremental and bulk fill placement techniques.

MATERIALS AND METHODS

The patients were chosen complaining of carious lesions Class II and planned for composite resin restorations at the clinics of the faculty of dentistry, Al-Azhar University-Assiut branch. One operator was chosen to perform the procedure for all patients. Another participant in the study was chosen to be the data manager. The study continued for procedures and patient collections for 4 months beginning in October 2021.

Patients selection,* blinding and consenting:

During 4 months 60 patients were selected, their age was (40±5 years old), examined, and diagnosed, the number was increased to 64 patients to overcome losing the patients during follow-up periods. To evaluate the periapical area and caries proximity to pulp a periapical x-ray was taken also the vitality test was essential to evaluate pulp vitality.

The operator had no idea about the type of composite and bonding agents because the data manager placed a symbol on two similar tubes for composite and placed the bonding agents in two similar bottles, the symbols data was saved in a closed envelope by the data manager.

* The ethical committee of the faculty of dental medicine, Al-Azhar university, Assiut gave the acceptance to this study No. AURC20020048-11

All the patients were informed about the study and signed in a consent including all patient data, medical history, dental history, chief complaint, and acceptance or not to coincide to the study and promise to attend at follow up visits.

Each patient took a Visual Analog Scale, which is a Numeric Pain Rating Scale which has a line measuring 10 cm beginning at zero scale with no pain 5 number is moderate pain while 10 number is severe pain as shown in the following figure, and the patients informed to put a vertical line when he feels pain at the number of the day of the scale.

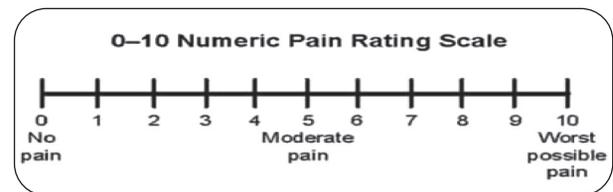


Fig. (1) Visual Analog Scale

The procedure:

The same procedure was performed on each patient according to the manufacturer's instructions the cavity depth was 3mm measured by a graduated periodontal probe and at box 5 mm depth. Group TS; received Tetric Evo-ceram bulk fill (Ivoclar Vivadent, America) and self-etch bonding agent Clearfil SE (Kuraray America). Group TT; received Tetric Evo-ceram bulk fill and total-etch bonding agent Adper Single Bond 2 (3M ESPE United Kingdom), Group ZS; received Z250 XT (3M Filtek, USA) nanohybrid composite resin and Self-etch adhesive Clearfill SE, and Group ZT; received Z250xt and Total etch bonding agent Adper Single bond, the same shade A2 for both types of composite resin was used.

The bonding agents were placed according to the manufacturer's instructions and Tetric Evo-ceram was placed in bulk packing as one increment and the nanohybrid composite Z 250 XT was placed incrementally, 2mm each increment. Palodent sectional matrix was used (Dentsply Sirona USA), then finishing and polishing by Soflex kit (3M ESPE United Kingdom).



Any premature contacts were selectively ground and polished again. Then the patients were dismissed after taking their phone numbers for follow up which was after one day one week and one month postoperative. During the study we lost 3 patients not attending at 1 month visit and one patient not attending at a one week follow up visit, their data were excluded from the study. The data was statistically analyzed by ONE Way ANOVA analysis.

RESULTS

The patients who suffered from post-operative pain were 43 patients totally, no one of them needed analgesics, 2 patients had severe pain during mastication (3.33%) after one day postoperative and pain decreased gradually, 4 patients have moderate pain with cold (6.66%), and the remaining 37 patients noticed mild pain (61.66%) rating between 1 and 2 scale, 28 patients marked on one scale and 9 patients marked on two scale

From the results of the study, there was no statistically significant difference between the tested groups, but it was noticed that all the groups gave higher results after one day postoperative, and all of them decreased after one week and more decreasing after one month post-operative. It was recorded that bulk fill decreases post-operative pain and also self-etch groups have the lowest values than total-etch in both types of composite resin restorations.

Table (1) Number of the patient who recorded post-operative pain

Group	One day	One week	One month
Tetric-Self etch(n=15)	4	1	1
Tetric Total etch(n=15)	5	3	1
Z250XT-self etch(n=15)	7	4	1
Z250 XT Total etch (n=15)	8	5	3

Table (2) The percentage of Patients who recorded post-operative pain

Group	One day%	One week%	One month%
Tetric-Self etch	26.66	6.66	6.66
Tetric Total etch	33.33	20	6.66
Z250XT-self etch	46.66	26.66	6.66
Z250 XT Total etch	53.33	33.33	20

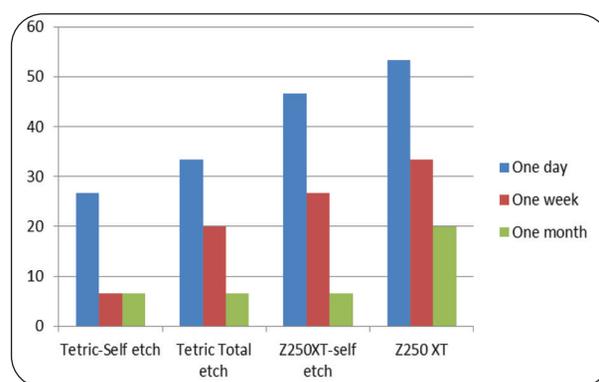


Fig. (1) The Chart showing the percentage of patients suffered from Post-operative pain in all the tested groups

Table (3) One-way ANOVA analysis between self-etch and total-etch of Tetric Evo-ceram

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	66.73335	1	66.73335	0.428938815	0.548261146	7.708647422
Within Groups	622.3111333	4	155.5777833			
Total	689.0444833	5				

* Significant at $P \leq 0.05$

No statistically significant difference between self-etch and total etch of Tetric Evoceram bulk fill restorations

Table (4) One-way ANOVA analysis between self-etch and total etch of Z250Xt Nanohybrid composite

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	118.6370667	2	59.31853333	0.130575184	0.882319029	9.552094496
Within Groups	1362.859267	3	454.2864222			
Total	1481.496333	5				

* Significant at $P \leq 0.05$

- No statistically significant difference between self-etch and total-etch of Z250 XT nanohybrid composite

Table (5) One-way ANOVA analysis between all the tested groups

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	811.3444917	3	270.4481639	1.089873852	0.407388699	4.066180551
Within Groups	1985.1704	8	248.1463			
Total	2796.514892	11				

* Significant at $P \leq 0.05$

No statistically difference between all the tested groups

DISCUSSION

Post-operative sensitivity, margins discoloration, caries recurrence, and restorations margins fractures may be due to the marginal leakage which explains why polymerization shrinkage is the major disadvantage of composite resins. Liners, glass ionomer, and bonding agents can minimize the contraction gap formation and decrease bacterial and saliva leakage at tooth restoration interface.⁽⁷⁾

Therefore, the aim of this study was to evaluate and compare post-operative sensitivity of Bulk fill composite placement and incremental Nano resin composite with different dentin adhesives strategies (total-etch or self-etch).

In this study, the intensity and risk of postoperative sensitivity were recorded when applying composite resin in a bulk-fill or conventional 2 mm incremental technique, as an ideal composite resin and it was found that no difference was considered between the two placement techniques.

This is in agreement with Hirata R et al⁽⁸⁾ and Benetti AR et al⁽⁹⁾, that may be due to the higher translucency of (Tetric Evoceram ceram Bulk fill) material used in the current study, that translucency increasing depth of curing as it allows deeper penetration of blue light and decreasing light scattering^(10,11)

Mobarak EH, Daifalla LE mentioned in a previous study the new adhesive systems gave a reliable adhesive restoration interface with decreased post-operative hypersensitivity, that in agreement to the current study⁽¹²⁾

Moosavi H et al mentioned that practitioners preferred one step self-etch adhesives as it is a simplified and less sensitive technique and that is clearly noticed in the clinical practice⁽¹³⁾

Williamson A, Hoggart B. Pain in agreement in the method of measuring post-operative pain related to subjective patient evaluation by marking the



appropriate pain severity along ten cm line contain words “no sensitivity” at beginning to “intolerable sensitivity” at the other end ⁽¹⁴⁾

This study was conducted to evaluate the post-operative pain at two different placement techniques (bulk packing & incremental). It was found there is no significant difference between them, that in agreement with Hickey et al ⁽¹⁵⁾, who found that there is no significant difference after the 7th day postoperatively.

The difference between self-etch and total-etch adhesives was not significant, while self-etch adhesives recorded less sensitivity that in agreement with Perdigao et al ⁽¹⁶⁾

Resia A Et al ⁽¹⁷⁾ are also in agreement with the results of our study as they concluded the bonding system doesn't significantly affect post-operative pain in permanent teeth.

Similar results to our study recorded by Swift EJ et al ⁽¹⁸⁾ when they compared total-etch and self-etch adhesives they found that total etch has higher values post operatively and decreases with time till disappear of sensitivity in class I cavity preparations.

Ito S et al ⁽¹⁹⁾ and Arisu HD et al ⁽²⁰⁾ conducted other studies to compare post-operative pain of self-etch and total-etch adhesives and found similar results, no significant difference was found between both adhesive systems.

Our results are in agreement our results are those of Blanchard et al., who concluded that the type of dentin bonding agent used plays an important role in greatest sensitivity associated with ⁽²¹⁾.

The results demonstrated that low post-operative sensitivity is due to the careful application of the treatment steps, the right use of adhesive materials by following the manufacturer's instructions, and clinical placement techniques that might depend on resin composite materials used.

CONCLUSION

Post-operative pain and hypersensitivity in both bulk fill and incremental placement techniques decreased by time, and the adhesive system has no significant role in decreasing post-operative pain and hypersensitivity.

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مقارنة آلام ما بعد الحشو لحشوات النانو الهجينة وحشوات الملء الكلية للحشوات الراتنجية المركبة (دراسة داخل الجسم الحي)

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الملخص :

الهدف: أن من أحد العيوب الأساسية للحشوات الراتنجية المركبة هو آلام ما بعد الحشو، لذلك ستقيم تلك الدراسة آلام ما بعد الحشو لنوعين من الحشوات الراتنجية المركبة بعد يوم وبعد أسبوع، وبعد شهر من عمل الحشو.

المواد والأساليب: تم إختيار ستون مريضاً بشكل عشوائى لتلك الدراسة، تم عمل تحضير للحفرة من الصنف الثانى ووضع مادة الحشو بطريقتين مختلفتين، الطريقة الأولى الملء الكلى باستخدام تيتريك ايفو سيرام، والطريقة الثانية طريقة الملء الجزأ باستخدام الحشو الراتنجى النانو الهجين زت 250 إكس تى. وتم إختيار نوعين من اللاصق اللاصق ذو التخشين الذاتى كليرفيل إس إى ولاصق أدبر سنجل بوند. ثم تم تقييم آلام ما بعد الحشو بيوم ثم بأسبوع ثم بشهر. وتم جميع البيانات وعمل إحصاء باستخدام تحليل أنوفا أحادى الطريقة.

النتائج: بناء على نتائج الدراسة لا يوجد فرق جوهري بين كل الاربع مجموعات التى تم اختبارها ولكن من الملاحظ أن كل المجموعات أعطت أعلى قيم لاحساس المريض بالآلم بعد اليوم الأول والقيم أصبحت أقل بعد الأسبوع الأول لتسجل أقل قيم بعد شهر من إجراء الحشو. وقد تم تسجيل آلام أقل مع حشو الملء الكلى واللاصق ذاتى التخشين مقارنة بمجموعة التخشين الكلى، وذلك فى كلا من نوعى الحشو الراتنجى المركب المستخدمى فى الدراسة.

الخلاصة: أن آلام ما بعد الحشو تقل تدريجياً مع مرور الوقت سواء مع إستخدام طريقة الملء الكلى أو الجزأ وأن اللاصق له دور محدود فى تقليل حدوث آلام ما بعد الحشو والتحسن الزائد.

الكلمات المفتاحية: آلام ما بعد الحشو، حساسية الاسنان، وحشوات الملء الكلية، التخشين الكلى، التخشين الذاتى، مجزأ