Prima Journal of Oral and Dental Sciences
Vol.1, No.2, Oktober 2018, hal.25-28
ISSN: 2615-1235 (online)
http://jurnal.unprimdn.ac.id/index.php/PrimaJODS

Differences in microleakage in bulk-fill composite resin and fiber reinforced composite restorations in class I cavities with the bulk-fill technique

Verawati Ashari[1]*, Gita Tarigan[1], Wilvia[1]

[1]*Departemen Konservasi Gigi, Fakultas Kedokteran Gigi Universitas Prima Indonesia*

INFO ARTIKEL

***Corresponding Author**
Email: gitatarigan@unprimdn.ac.id

DOI: 10.34012/primajods.v1i2.1240

ABSTRACT

Micro leakage is one of the most frequent failures of old restorations and new restorations. Many factors can cause micro leakage among other types of restorative materials. Addition of fiber into the resin is said to increase resistance to fracture and strengthen restorations and reduce micro leakage than fiberless resins. **Objective:** To know the difference of micro leakage on bulk-fill composite resin and fiber reinforced composite materials in class I cavity by bulk-fill technique. **Method:** pure experimental study, the sample in this study used post-extraction molar teeth of 32 free from caries. The sample was first soaked a 0.9% NaCl solution for 1 day to condition the teeth in the mouth, then sample will be done cavity class I preparation and will be restored with two different restorative materials. After the restoration will be done soaking on 2% methylene blue liquor for 1 day, after that thermocycling process with temperature 5° and 55°, after that cutting and observation of micro leak with stereomicroscope Result: Average of micro leakage happened more large on bulk-fill composite resin compared with fiber reinforced composite. with p value = 0.000 (p <0,05). **Conclusions:** The average micro leakage occurring is greater in composite bulk-fill resins than with composite reinforced fiber composite resins. Micro leakage that occurs smaller in composite resin fiber resin than composite bulk-fill resin due to differences in composite resin content.

Keyword: microleakge, fiber reinforced composite, bulk-fill

INTRODUCTION

Resin composite is one of the dental restoration materials that have a color similar to teeth, easily modifiable, good strenght, as well as providing a good restoration results. New composite resins, namely fiber reinforced composite.[1] The addition of glass fiber in resin composite can increase the resistance to fracture of restoration and strengthening, particularly in the teeth with cavity. This is because glass fiber has the supple power, compressive strength, modulus of elasticity and an almost resembles the dentin, so hopefully it can add retention on the teeth which received great Mastication pressure.[2]

Restoration materials is one of the factors that determine the success of a restoration. Many composite materials that are on the market today have a good quality and reliable as a restoration, however, the process of restoration on posterior teeth is more difficult and requires quite a long time if used to cavity.[3] There are two types of composite resin restoration techniques, namely incremental technique and the technique of bulk-fill. The use of the technique of bulk-fill has more advantage of less empty space in restoration materials and the restoration process faster compared to incremental technique.[4]

The cause of the occurrence of microleakage in the restoration is usually associated with this type of restoration materials are used, the load penumpatan technique, chew used, polymerization shrinkage and that resulted in the formation of gaps.[5] This research aims to see the difference the leakage of micro composite resin restoration materials in bulk-fill and fiber reinforced composite at kavitas klas I with bulk-fill techniques.

METHOD

Design study

This research uses pure experimental research design (true experimental) with posttest only approach. The research was conducted at Research Center Laboratory of Faculty of Mathematics and Natural Sciences University of Sumatera Utara for 4 (four) months, starting from August until November 2017. The sample of the research was post-extraction molar teeth obtained from dental practice, Puskesmas, RSUD, and RSGM. A total of 16 teeth for bulk-fill composite resin restoration and 16 gears for restoration with fiber reinforced composite with technique used Bulk-Fill. Inclusion criteria: Dental caries, Teeth with caries depth of enamel, Teeth extracted for periodontal reasons, No restorations, no cracked / fractured teeth, Root formed perfectly. Exclusion Criteria: Deciduous Tooth, Fluorosis Teeth, Teeth with caries with an irreversible pulpitis diagnosis.

Procedure

Samples of molar tooth were first immersed in a 0.9% NaCl (Sodium Chloride) solution for 1 day. Then planted on two plaster beams (15 cm long, 3 cm wide, and 3 cm high). Tooth preparation with modified design principles. Preparation as minimally as possible with round bur already in pairs of stopper and using bur fissure to widen laterally and then restoration according to procedure (etching for 15-20 seconds, apply bonding material on etched parts and put restoration material into cavity by restoration technique bulk-fill then do the irradiation for 20 seconds, and the last is conturing, finishing, and polishing).

The sample was removed from the plaster cast and thoroughly cleaned and thermocycling was performed with water at 5° and 55° alternately in both groups. The sample is then coated with clear nail color and sticky wax on the root of the tooth to avoid leakage then Sample soaked in 2% methylene blue solution for 1 day and rinse with water. After that the sample is placed on the bais (a cutting tool during cutting) and the sample is split vertically by using a disc bur. Observation of micro leakage using stereomicroscope.

Data analysis

Mann Whitney test to see differences in micro leakage between group I (bulk-fill composite resin) with group II (Fiber reinforced Composite).

RESULT

The results of micro leakage research data that occurred on bulk-fill composite resin and fiber reinforced composite can be seen in Table 1, as follows.

Tabel 1. Distribution of micro leakage data on bulk-fill composite resin and fiber reinforced composite

Bulk-Fill Composite Resin			***Fiber Reinforced Composite***		
Gigi	Kebocoran mikro		Gigi	Kebocoran mikro	
	Bukal	Lingual		Bukal	Lingual
1	3	3	17	3	3
2	3	3	18	1	1
3	3	3	19	0	0
4	3	3	20	1	1
5	3	3	21	1	1
6	3	3	22	2	2
7	3	3	23	3	3
8	3	3	24	3	3
9	2	2	25	0	0
10	3	3	26	1	1
11	3	3	27	1	1
12	2	2	28	0	0
13	3	3	29	0	0
14	2	2	30	3	3
15	3	3	31	0	0
16	3	3	32	1	1

Criteria for leakage: 0 = no color penetration, 1 = inlet dye until enamel, 2 = incoming dye to dentin, 3 = incoming dye to cavity base.

Tabel 2. Frequency distribution of micro leakage on bulk-fill composite resin and fiber reinforced composite

Kebocoran Mikro	Resin Komposit			
	Bulk-Fill		*Fiber Reinforced Composite*	
	n	%	n	%
Tidak ada penetrasi warna	0	0	5	31,25
Pewarna masuk hingga enamel	0	0	6	37,5
Pewarna masuk hingga dentin	3	18,8	1	6,25
Pewarna masuk hingga dasar kavitas	13	81,2	4	25

There were 5 samples indicated by the numbers (0) in table 1 (31.25%) no micro leakage or no color penetration on fiber reinforced composite whereas in the bulk fill composite resin there was no tooth with no color penetration. While the color penetration to the cavity base was obtained 13 samples shown with the number (3) in table 1 (81.2%) on the bulk-fill composite resin and 4 samples indicated by the number (0) in table 1 (25%) on fiber reinforced composite (table 2).

Tabel 3. Average leakage of micro in bulk-fill composite resin and fiber reinforced composite

Resin Komposit	n	Rata-rata Kebocoran Mikro ($\bar{X} \pm$ SD)	p
Bulk-Fill	16	2,813 ± 0,403	0,000*
Fiber Reinforced Composite	16	1,250 ± 1,183	

In table 3. There was a significant difference where the larger micro leakage occurred in bulk-fill composite resins when compared with fiber reinforced composite with p = 0,000 (p <0.05).

DISCUSSION

From the results of this study, it was found that the average value of micro leakage occurring on bulk-fill composite resin of mesial and distal side were equal of 2.813 ± 0.403 (3 samples with micro leakage to dentin and 13 samples leaked to cavity base) and the average of micro leakage that occurred on the resin composite fiber reinforced composite mesial and distal composite is the same ie 1,250 ± 1,183 (5 samples no micro leakage, 6 samples have micro leakage to enamel, 1 sample has micro leakage to dentin and 4 samples experiencing micro leakage to the bottom of the cavity).

Based on the Mann-Whitney U Test data analysis, there was a significant difference from the average of micro leak occurring on bulk-fill composite resin with fiber reinforced composite, with p = 0,000 (p <0,05). The average micro leakage occurring is greater in composite bulk-fill resins than with composite reinforced fiber composite resins. This is also evident from the distribution of micro leakage frequencies in bulk-fill composite resins, where all samples have micro-leaks down to the dentine and cavity base, while the resin composite fiber reinforced composite contains five samples that have no micro leakage at all.

The results of this study are in accordance with research conducted by Bavaria et al. (2017) on the comparison of micro leaks against two different bulk-fill composite resins with reinforced composite fibers for class II cavity restorations indicating that fiber reinforced composite has the lowest micro-leakage results compared to other composite resins.8 In addition, Abouelleil et al. (2015) on the comparison of the physical properties of bulk-fill composites reinforced with short fiber orientations with packet bulk fill composites shows that with the addition of fibers can improve the physical properties and durability of restorations against fractures compared with fiberless restorations.[9]

Limitations in this study that cannot be controlled are the depth and size of the prepared cavities. This is because the preparation is done manually by the researcher, so the final result of cavity preparation cannot be exactly the same but to reduce the deficiency the researcher made the cavity outline before the preparation, and put the stopper on the diamond bur as a guide to reach the depth and great cavity.

CONCLUSION

There is a difference of micro leakage in bulk-fill composite resin and fiber reinforced composite resin in class I cavity by bulk-fill technique. Micro leakage was found in bulk-fill composite resins larger than fiber reinforced composite. So it can be used in dental clinic and can be used for class I not only class II.

REFERENSI

1. Lestari S. Efek Lama Penyinaran Terhadap Kebocoran Tepi Tumpatan Resin Komposit Flowable. J Ked Gi Unej.2012: 9(3):110-13.
2. Dhamayanti I. Nugraheni T. Restorasi Fiber Reinforced Composite Pada Gigi Premolar Pertama Kanan Mandibula Pasca Perawatan Saluran Akar. Maj Ked Gi. 2013. 20(1): 65-70.
3. Esterina H. Perbedaan Kekuatan Tarik Diametral Resin Komposit Nanofiller dan Resin Komposit Nanoceramic. J Conserv Dent. 2012. 2(1):1-7.
4. Garg N, dan Garg, A. Textbook of Operative Dentistry. Jaypee Brothers Medical Publishers (P) Ltd, New Delhi, 2015. p:121-132.
5. Diansari V, Eriwati YK, Indrani DJ. Kebocoran Mikro Pada Restorasi Komposit Resin Dengan Sistem Total-Etch dan Self-Etch Pada Berbagai Jarak Penyinaran. J Dent Ind. 2008. 15(2): 121-30.
6. YF Ren, L Feng, D Serban, HS Malmstrom. Effects of common beverage colorants on color stability of dental composite resins the utility of a thermocycling stain challenge model in vitro. J Dent. 2012. 40(1):48-56.
7. Bavaria SR, Shah NC, Shah RP, Makati DJ. A Comparative Evaluation of Micro Leakage of Two Diferent Bulk Fill Composites with Ever-X Posterior Composite for Class II Restorations By Dye Extraction Method. IOSR J Dent Med Sci. 2017. 16(3):72-7.
8. Abouelleil H. Pradelle N. Villat C. Attik N. Colon P. Grosgogeat B. Comparison of Mechanical Properties of a New Fiber Reinforced Composite and Bulk Filling Composite. Research Article. Restor Dent Endod. 2015. 40(4): 262-270.