

Effect of Light Curing Time on Polymerization of Bulk-Fill Resin Composites

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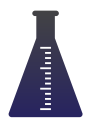
INTRODUCTION

Nowadays with increasing demand for esthetic, tooth colored restorations like resin-based composites are being use for posterior teeth restoration. In order to save the procedure time of placement the large restoration and with less pronounce void, there is an innovation created with single placement called bulk-fill resin composites. The curing time is one of the factor that affect the polymerization, the evaluation of surface microhardness of a resin composites is an effective method to indirectly determine the degree of monomer conversion.



OBJECTIVE

First objective is to investigate the effect of curing time to the polymerization of Bulk-fill resin composites, and second is to investigate the effect of depth to the polymerization of Bulk-fill resin composite



MATERIALS AND METHODS

Three types of bulk-fill composite were Filtek™ Bulk -Fill, Tetric ® N-Ceram and SureFil ® SDR flow+. Each types of composites were prepared in 2mm, 4mm and 5mm. Then light cured for 20s, 40s and 60s. Each were cured with the light intensity of 1,200 mW/cm². All the samples were placed in the artificial saliva incubated at 37 degree celsius for 24 hours. Specimens were tested using Vickers microhardness machine, 5 points tested at the top and bottom surface, the mean value of top surface and bottom surface were calculated. The microhardness ratio is used to analyzed the polymerization of each Bulk-Fill resin composites, the bottom microhardness also be used to further analysed the result. All data were analysed by One-way ANOVA and T-test.



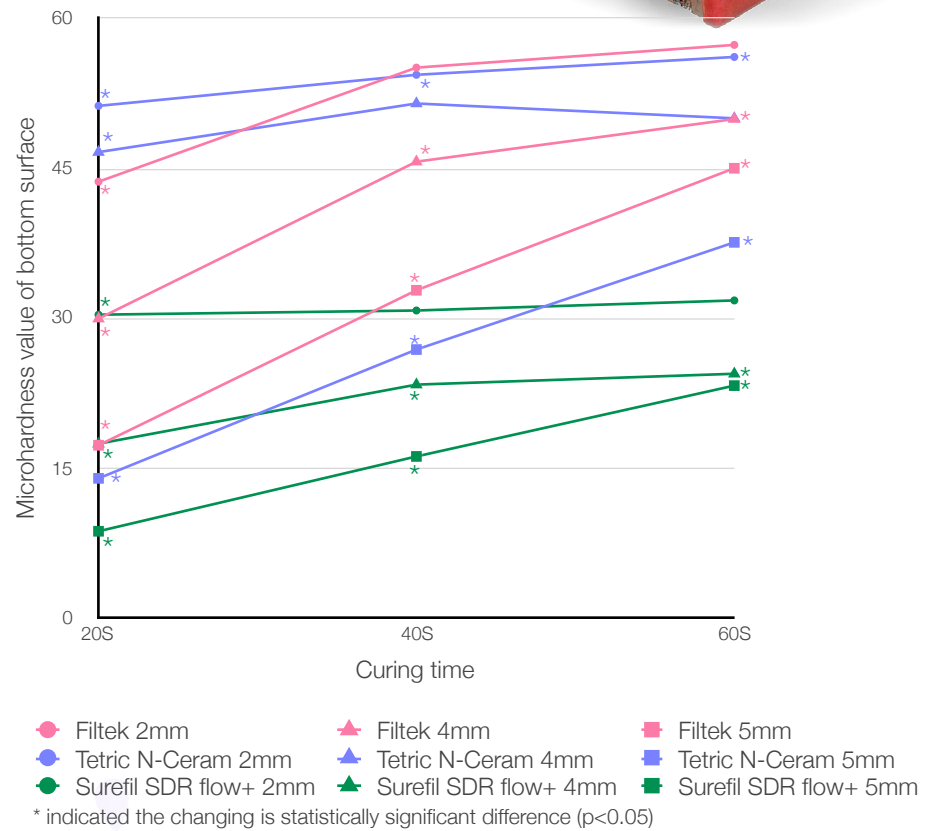
DATA ANALYSIS

Table 1 Mean and standard deviation of the microhardness ratio of each type of Bulk-fill resin composites classified due to the variable of curing times and depths

Type of resin composites	Curing time	Depth		
		2mm	4mm	5mm
Filtek™ Bulk-Fill	20s	74.54 ± 1.97 A,a	51.11 ± 1.36 A,b	30.19 ± 0.79 A,c
	40s	95.59 ± 1.02 B,a	75.62 ± 1.95 B,b	54.59 ± 1.79 B,c
	60s	96.24 ± 0.75 B,a	82.19 ± 1.42 C,b	74.78 ± 1.49 C,c
Tetric ® N-Ceram	20s	84.15 ± 1.01 A,a	78.39 ± 2.85 A,b	23.18 ± 1.49 A,c
	40s	87.45 ± 1.82 B,a	83.27 ± 1.48 B,b	42.46 ± 1.69 B,c
	60s	80.48 ± 0.85 C,a	76.56 ± 0.36 C,b	54.40 ± 1.10 C,c
SureFil ® SDR flow+	20s	91.71 ± 1.65 A,a	56.94 ± 3.51 A,b	27.86 ± 1.13 A,c
	40s	93.64 ± 2.56 A,a	73.85 ± 1.45 B,b	48.34 ± 1.33 B,c
	60s	89.45 ± 1.49 B,a	74.94 ± 1.74 B,b	69.34 ± 2.26 C,c

As the curing time increase, the capital letter (A) with different alphabet indicated statistically significant difference data, comparing in the same column. On the other hand, as the depth increase represent through the lower case letters (a) which indicate that all the results show statistically significant difference, comparing only within the same row.

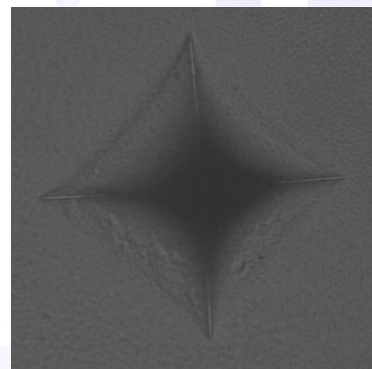
According to Table 1, after the investigation of the microhardness ratio of each type of Bulk-fill resin composites by classified them due to the variables of curing time and depth, the result shown that at different depths the microhardness ratio of Filtek™ Bulk-fill resin composites increase as the time increased. When taking different time into consideration, it shown that as the depth increases, the mean of the microhardness ratio is decreased. For Tetric ® N-Ceram and SureFil ® SDR flow+ bulk-fill resin composites, it shown that at the different depths (2mm and 4mm)



the microhardness ratio are changed in the same direction which is as the time increase from 20s to 40s contribute to the highest microhardness ratio and decrease as the time increased into 60s. For SureFil ® SDR flow+, at 2mm depth the microhardness ratio increase when the time is increase from 20s into 40s but the microhardness ratio decrease when curing time is changing from 40s to 60s.



RESULT



According to our result, depth had an effect on microhardness ratio at 20s, 40s and 60s including all 3 group of Bulk-fill resin composite which were Filtek™ Bulk-fill, Tetric ®N-Ceram, SureFil ® SDR flow+. As the depth increase, the microhardness ratio is decreased. The result shown that the microhardness ratio were statistically significant differences at the 0.05 level.

Time has an effect on microhardness ratio at 2mm, 4mm and 5mm including all 3 group of Bulk-fill resin composite which are Filtek™ Bulk-Fill, Tetric ®N-Ceram, SureFil ® SDR flow+. Mostly, the result shown that the micro hardness ratio were statistically significant differences at the 0.05 level. As the time increase, the microhardness ratio is also increased. But some value (Tetric N ceram at 2mm, 4mm from 40s to 60s and Sirefil SDR flow+ at 2mm from 40 to 60s) shown that the microhardness ratio decreased eventhough the time increased.



CONCLUSION

Within the limitation of this study, the curing time, depth and type of Bulk-fill resin composite has an effect on the polymerization. From this study, the appropriate curing time of Bulk-fill resin composite is 40 seconds.



KEYWORD