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COMPARATIVE STUDY OF SOME MECHANICAL PROPERTIES OF DIFFERENT COMPOSITE RESINS

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ABSTRACT

Objective: The aim of this in vetro study is to determine the differences ofsome mechanical properties between Bulk Fill and conventional composite resins.
Material and Methods: Two Bulk Fill and one conventional composite materials were used with a total of 60 samples prepared in a 6*4 mm length cylindrical metal mold and divided into three groups of different composite resin conventional increment, high viscosity and low viscosity BulkFill. 3M Filtek®, Tetric N Ceram BulkFill® and SDR® respectively. Instron Universal Testing Machine used to test the samples at 1mm/min Ramp Rate with 5 kN Cell Load, reading conducted by the computer and printed directly. Using SPSS21 to analyze the data.
Results: Statistical analysis was performed using one way ANOVA and Tukey Post Hoc tests ($P < 0.0005$). The high viscosity Bulk Fill group performed with almost the same as the incremental conventional placement in the load and stress with no significance statistical difference ($P < 0.0005$), whereas the low viscosity Bulk Fill had inferior significance statistical difference than the conventional and high viscosity.
Conclusions: Using the high viscosity Bulk Fill composite resins would represent some of the mechanical function of the traditional composite with benefits of saving the time.

INTRODUCTION

Composite is a filled resin material. It became the basis for the restoration materials used in the field of restorative dentistry, since 1962 (Edward *et al*., 2012). Basically, composite restorative materials consist of a continuous polymeric or resin matrix in which an inorganic filler is dispersed. This inorganic filler phase significantly enhances the physical properties of the composite. Composites are usually classified primarily on the basis of the size, amount, and composition of the inorganic filler. Different types of composite used since its introduction include macro fill composites, micro fill composites, hybrid composites (including traditional hybrid, micro hybrid, and nano hybrid composites), and nanofill composites (Edward *et al*., 2012). Recently, the popular kind of composite used is nano hybrid. It was developed in an effort to combine the favorable physical and mechanical properties characteristics of macrofill composites, with the smooth surface typical of the microfill composites. Subsequently the nano hybrid have an ultra-smaller nano filler that would add superior properties. Despite all these characteristic, still the handling technique of the restoration is time consuming which lead to manufacture a new class acomposite, claimed to enable restoration in thick layers, up to 4mm by replacing the conventional base the 2mm increment. A group of 31 dentist from 21 country asked to restore a Cl II cavity in premade mold, a clock set to time them. The duration difference found between restoring 4mm in depth cavity prep was 64% faster in Bulk Fill which enhancing the dentist's time (Tantbirojn *et al*., 2011). Still with debate about the mechanical properties if used as a posterior restoration, which needs to be investigated to know if it will substitute or function as the traditional composite especially in posterior restorations.

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MATERIALS

Material	Type	Company
Tetric N Ceram ™ Bulk Fill	High viscosity Bulk Fill	IvoclarVivadentInc
SDR™ Bulk Fill	Low viscosity Bulk Fill	DENTSPLY
Feltak 3M™	Incremental addition	DENTSPLY

METHODS

This in vetro study aimed to conduct a total of 60 samples to be prepared in a 6*4 mm length cylindrical Metal mold. The samples were divided into three group of different composite resins. The control group 1st group is the conventional incremental addition up to 6mm in length, 2nd group high viscosity Bulk Fill 6 mm in length and the 3rd group Low viscosity Bulk Fill 4 mm with 2 mm conventional composite on top. The groups will be polymerized using blue phase LED™ curing lights©2014 IvoclarVivadent Increstricting to the manufacturer instructions. Using glass slap to create the base of the material smooth and shiny also other glass chill on top. Specimens were Stored in distilled water at 37°C, each group in single titled container. Using Instron Universal Testing Machine to test the compressive strength for 20 sample of each group with 1mm/min Ramp Rate with 5 kN Cell Load. Over all the preparation and testing is handled at King Saud University Research Center in Riyadh. The results of each group conducted and printed immediately after the test by the machines computer. Data analyzed using SPSS21with one way ANOVA.

RESULTS

Statistical analysis was performed using one way ANOVA and Tukey Post Hoc tests ($P < 0.0005$). Table 1 shows significant differences which were identified among the three groups overall, high viscosity Bulk Fill group performed with almost the same as the incremental conventional placement with no significant statistical difference at the load and stress ($P < 0.346$) Fig 1,2 whereas the low viscosity is inferior significant different with the control group and the high viscosity ($P < 0.0005$) Fig 1,2. Conversely the strain between the control and the High viscosity group was significant difference ($P < 0.0005$) Fig 3 and with no statistical difference compared to the low viscosity ($P < 0.877$) Fig 3.

Table 1. Multiple Comparisons

Dependent Variable		(I) SAMPLE	(J) SAMPLE	Mean Difference (I-J)	Std. Error	Sig.
LOAD	Tukey HSD	Control	High	212.981766	167.489434	.417
			Low	1375.456365*	171.735721	.000
		High	control	-212.981766	167.489434	.417
			low	1162.474598*	169.731981	.000
		Low	control	-1375.456365*	171.735721	.000
			high	-1162.474598*	169.731981	.000
	Dunnett t (2-sided)[b]	High	control	-212.981766	167.489434	.346
		Low	control	-1375.456365*	171.735721	.000
STRESS	Tukey HSD	Control	high	16.948551	13.328386	.417
			low	109.455347*	13.666295	.000
		High	control	-16.948551	13.328386	.417
			low	92.506795*	13.506842	.000
		Low	control	-109.455347*	13.666295	.000
			high	-92.506795*	13.506842	.000
	Dunnett t (2-sided)[b]	High	control	-16.948551	13.328386	.346
		Low	control	-109.455347*	13.666295	.000
STRAIN	Tukey HSD	Control	high	-.064196*	.008031	.000
			low	-.003508	.008235	.905
		High	control	.064196*	.008031	.000
			low	.060688*	.008139	.000
		Low	control	.003508	.008235	.905
			high	-.060688*	.008139	.000
	Dunnett t (2-sided)[b]	High	control	.064196*	.008031	.000
		Low	control	.003508	.008235	.877

Table 1 shows the mean, standard divination and the significance between the three groups

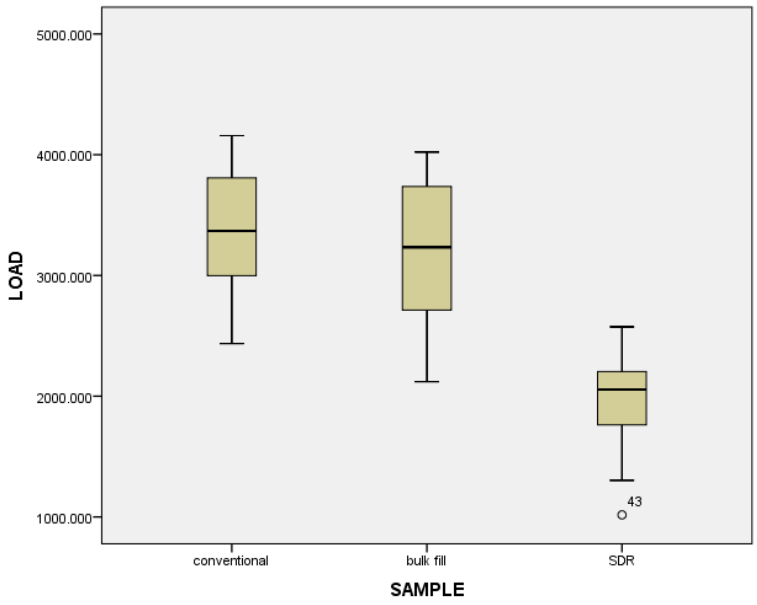

Figure 1. The relationship between the 3 groups in the load the conventional and high viscosity group at a par conversely to the low viscosity

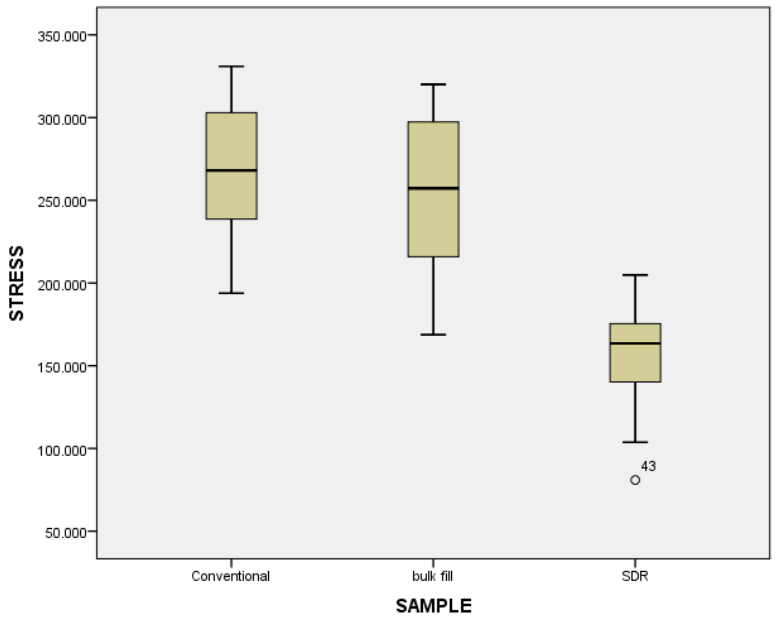

Figure 2. The relationship between the 3 groups in the stress the conventional and high viscosity group at a par conversely to the low viscosity

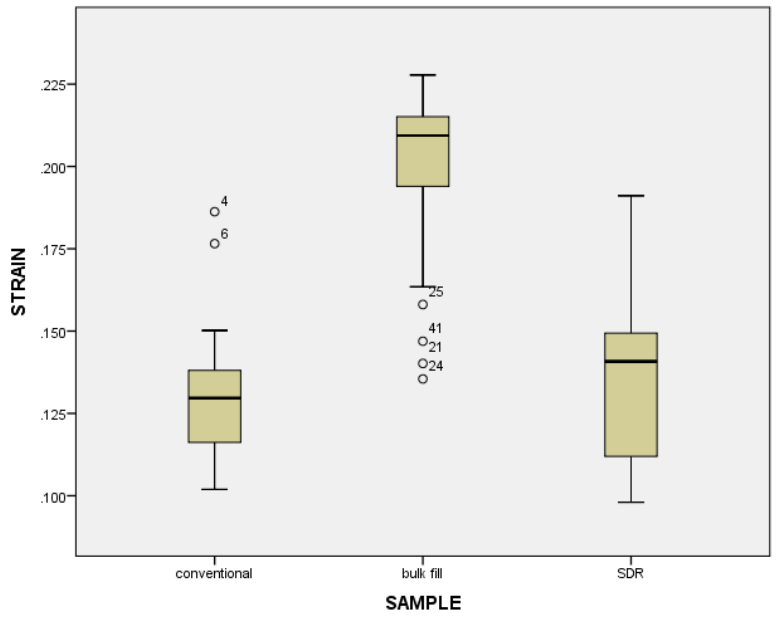

Figure 3. The relationship between the 3 groups in the strain the conventional and high viscosity group at a par conversely to the low viscosity

DISCUSSION

The recent introduction of "bulk-fill" restorative materials has reignited the debate of "bulk vs. incrementally" placed composites as the effect of shrinkage stress may be more pronounced with Bulk Fill since the entire mass polymerizes at one time rather than in small increments, An ideal Bulk Fill composite would be one that could be placed into a preparation having a high C-factor design and still exhibit very little polymerization shrinkage stress, while maintaining a high degree of cure throughout (Zaruba *et al*., 2013). Currently, Bulk Fill materials are available in different viscosities, which is low and high. The present study investigated whether Bulk Fill composites of different viscosities provide the same compressive strength as a substitution of conventional type when used to restore high load areas "posterior teeth" SDR (Smart Dentin Replacement) (Dentsply, Konstanz, Germany) was introduced to the market as flowable Bulk Fill composite which incorporates a new stress decreasing resin technology. However, it requires a conventional composite 2mm increment to be cured on top of the 4 mm thick flowable base (Furness *et al*., 2014). Tetric N Ceram Bulk Fill represents the high viscosity. The curing depth of 4 mm is achieved mainly due to the patented photo-initiator, Ivocerin, which is far more reactive than conventional initiators 6. And due to the limitation of using SDR without a 2mm at least of conventional resins on top, the samples were equivalent to 6mm height as manufacturer recommended. Among the 60 samples used the low viscosity Bulk Fill resins exhibited the least properties in the stress and load, this perhaps is due to the fact that all the samples weren't representing the actual picture of the restored tooth which indeed is lacking of the integration

in between the walls of the restoration and the tooth surface that in fact plays an important role, despite the high viscosity Bulk Fill that exhibited satisfactory result that might alternate the use of incremental addition as it performed at par with the incremental conventional placement at the load and stress which could save time.

Conclusion

Using the high viscosity Bulk Fill composite resins as substitution of the conventional composite resins is convenient if the time was the critical issue. And would might help in the clinical situation for the patient and operator in the time management specially, when used as build up. Eventually this will maximize the benefits of health care worker especially whom working in primary care clinics due to the ease of use and time saving to improve the quality of life.

REFERENCES

Edward, J. Andre, V. Harald, O. 2012. Sturdevant's art and science of operative dentistry. United Kingdom: Elsevier. 568.

Furness A, Tadros MY, Looney SW, Rueggeberg FA. 2014. Effect of bulk/incremental fill on internal gap formation of bulk-fill composites. *J Dent*, 42(4),439-49.

Tantbirojn D, Pfeifer CS, Braga RR, Versluis A. 2011. Do low-shrink composites reduce polymerization shrinkage effects?. *JDR*. 90 (5), 596-601.

Zaruba M, Wegehaupt FJ, Attin TJ Adhes Dent. 2013. Comparison between different flow application techniques: SDR vs flowable composite. *J Adhes Dent*, 15(2) 115-121.

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