

Clinical Evaluation of Restorations Made of ELS versus APT Resin Composite

F. ÖZTURK-BOZKURT¹

T. TOZ-AKALIN^{1,*}

M. KUŞDEMİR¹

A. ÖZSOY¹

M. ÖZCAN²

Introduction and Objectives

The increasing demand for aesthetic restorations has revolutionized modern dentistry and brought about the widespread use of adhesive restorative materials to improve tooth tissues with minimal preparation and long term restorations.¹ In order to achieve optimal long term performance, one of the prerequisites is to control polymerization stress buildup following restoration.² Low-shrinking composites help to avoid clinical problems such as post-operative sensitivity, enamel cracks, rapid discolouration, deterioration of restoration margins and early development of caries. With a new formula and improved sculptability, low shrinkage resin composite materials have been developed but information on their clinical performance is limited.³ The objective of this controlled clinical trial was to evaluate the clinical performance of restorative materials based on Extra Low Shrinkage (ELS) versus Advanced Polymer Technology (APT) in Class I and Class II cavities in permanent teeth.

Materials and Methods

Between 12.12.2017 - 26.10.2018, 30 patients (22 females, 8 males, mean age: 25.2) referred to the Department of Restorative Dentistry, Medipol University, Dental School, Istanbul, Turkey, received randomly 30 pairs of restorations (N=60) using either ELS (Saremco Dental AG, Rebstein, Switzerland) or APT (Saremco Dental AG) composite in Class I and Class II cavities (CTRN: NCT03306576) (Tables 1,2). For both ELS and APT, the same adhesive was used (ELS Unibond). Two operators performed all restorations and two independent calibrated operators evaluated the restorations 2 weeks after placement (baseline), at 6 months and 1 year using FDI criteria (Scores 1-5) for surface staining, marginal staining, marginal gap, marginal fracture, marginal irregularities, secondary caries, marginal tooth integrity, surface lusture, color match and translucency, fracture of material and retention, occlusal wear, approximal contact point, patient view, tooth integrity, post-operative sensitivity. The changes in the FDI parameters were analyzed using McNemar test (alpha=0.05) and Kaplan-Meier.

Brand	Type	Manufacturer	Chemical Composition
ELS	Low shrinkage resin composite	Saremco Dental AG, Rebstein, Switzerland	Inorganic filler (barium glass and silica 74 %wt, 49 %v, particle size: 0.04-3.00 µm, median 0.7 µm, BisGMA, BisEMA, catalysts, inhibitors, pigments
APT	Low shrinkage resin composite	Saremco Dental AG	Inorganic filler (barium glass and silica 74 %wt, 49 %v, particle size: 0.04-3.00 µm, median 0.7 µm, aromatic urethane methacrylate, BisEMA, silica, catalysts, inhibitors, pigments
ELS Unibond	Self-Etch adhesive	Saremco Dental AG	Ethanol, water, BisEMA, methacrylated phosphoric salt, initiators

Table 1. The brands, types, manufacturers chemical compositions of the main materials used in this study.

Location	Teeth	One-sided (O)		Two-sided (MO/DO/BO)		Three-sided (MOD)	
		ELS	APT	ELS	APT	ELS	APT
Maxilla	Premolar	0	1	9	9	0	1
	Molar	0	1	8	8	0	0
Mandible	Premolar	0	0	3	3	0	0
	Molar	5	3	4	4	1	0
TOTAL		5	5	24	24	1	1

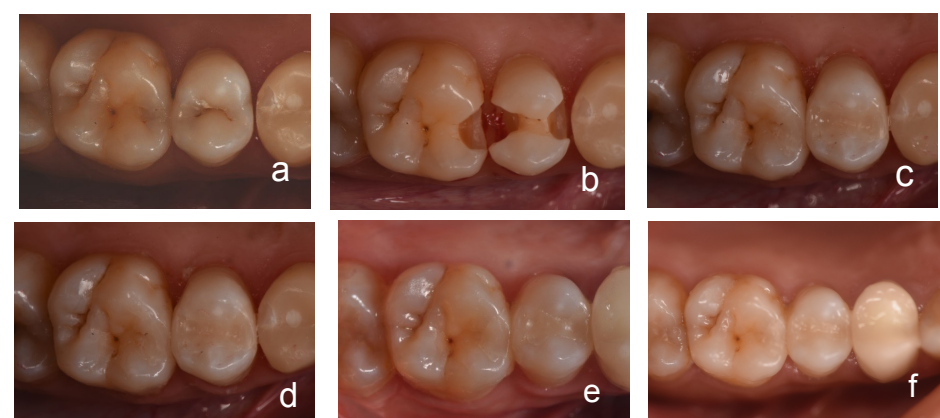
Table 2. Distribution, type and location of the restorations in the maxilla and mandible.

Results

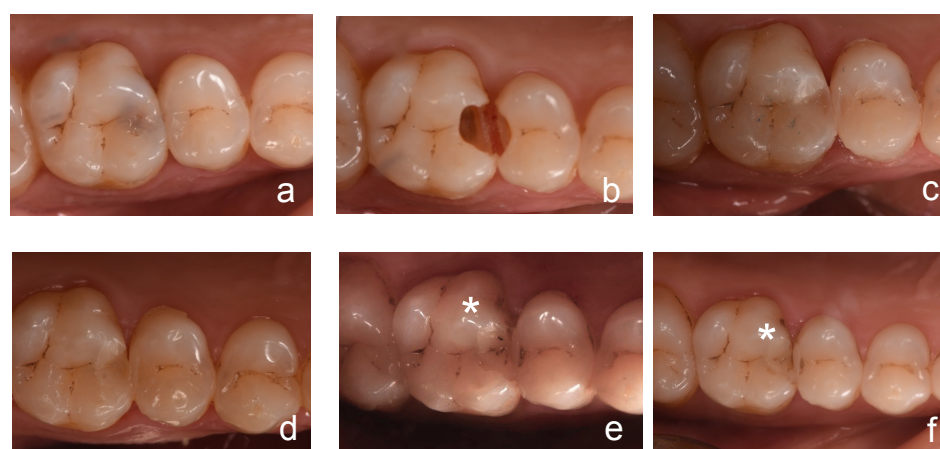
Mean observation period was 7.8±4.2 months. Fifty-four restorations (90%) completed their 6-months while twenty-eight restorations (46%) their 1-year follow up. Only one patient could not be followed up at 1 year recall, due to moving to another city. Patients rated the fillings highly satisfactory after 1 year. No cases of occlusal wear or loss of contact points requiring repair, incidence of endodontic complications or post-operative sensitivity was noted with both materials. Predominantly good colour match, no difference in shade and/or translucency or minor deviations were observed. At 6-month recall, one restoration from APT showed moderate marginal staining that did not require any intervention (surface staining criteria-Score 2a) (Table 3). At 6 months and 1-year recall, two restorations (one from ELS and one from APT) showed distinct but acceptable deviations (Score 2b) (Figs. 1a-f, 2a-h). One debonding (APT) and one fracture (ELS) were observed at 1-year recall. FDI parameters did not show significant difference between ELS and APT resin composite at final follow up period (p>0.05).

FDI Criteria	Material	Baseline			6 month			1 year			
		Score 1	Score 2	Score 3	Score 1	Score 2	Score 3	Score 1	Score 2	Score 3	
FDI 2b	Marginal staining	ELS	30	-	-	23	3	-	10	2	-
	APT	30	-	-	24	1	1	11	1	-	
FDI 2a	Surface staining	ELS	30	-	-	24	1	1	10	1	1
	APT	30	-	-	24	1	1	10	1	1	
FDI 6a	Marginal gap	ELS	30	-	-	26	-	-	11	-	-
	APT	30	-	-	26	-	-	11	-	-	
FDI 6b	Marginal fracture	ELS	30	-	-	26	-	-	11	-	-
	APT	30	-	-	26	-	-	11	-	-	
FDI 6c	Marginal irregularities	ELS	29	1	-	25	1	-	11	-	-
	APT	30	-	-	26	-	-	10	1	-	
FDI 12	Secondary caries	ELS	30	-	-	26	-	-	11	-	-
	APT	30	-	-	26	-	-	11	-	-	
FDI 13	Tooth integrity (marginal)	ELS	30	-	-	26	-	-	11	-	-
	APT	30	-	-	26	-	-	11	-	-	
FDI 1	Surface lusture	ELS	30	-	-	-	26	-	-	10	1
	APT	30	-	-	-	26	-	-	10	1	
FDI 3	Color match and translucency	ELS	30	-	-	-	26	-	-	11	-
	APT	30	-	-	-	26	-	-	11	-	
FDI 5	Fracture of material and retention	ELS	30	-	-	26	-	-	10	1	-
	APT	30	-	-	26	-	-	10	1	-	
FDI 6	Occlusal wear	ELS	30	-	-	26	-	-	11	-	-
	APT	30	-	-	26	-	-	11	-	-	
FDI 10	Patient view	ELS	30	-	-	26	-	-	11	-	-
	APT	30	-	-	26	-	-	11	-	-	
FDI 13	Tooth integrity (tooth fractures)	ELS	30	-	-	26	-	-	11	-	-
	APT	30	-	-	26	-	-	11	-	-	
FDI 11	Postoperative (hyper-)sensitivity	ELS	30	-	-	26	-	-	11	-	-
	APT	30	-	-	26	-	-	11	-	-	

Table 3. Distribution of scores for clinical observations according to FDI criteria at baseline/6 m/1y (N=60, n=30 per group (ELS and APT) Fifty-four restorations completed their 6-months follow up while twenty-eight restorations completed their 1-year follow up.



Figs 1a-f. Representative photos before and after cavity opening, immediately after placement of ELS (tooth number: 16) and APT (tooth number: 15) resin composites, 2 weeks after filling placement (Baseline), 6 months and 1 year follow up.



Figs. 2a-h. Representative photos before and after cavity opening, immediately after placement of ELS (tooth number: 16) and APT (tooth number: 15) resin composites, 2 weeks after filling placement (Baseline), 6 months and 1 year follow up. *Restorations showed minor surface staining at 6 months and 1 year recalls.

Conclusions

1 year follow up of restorations in Class I and II cavities restored with ELS and APT resin composites indicated the following:

- 1- Similar clinical behaviour was observed for both ELS and APT resin composite restorations.
- 2- No endodontic complications, no hypersensitivity were observed.
- 3- Secondary caries, tooth fracture were not observed in any of the restored teeth but one debonding (APT) and one repairable composite fracture (ELS) were experienced at 1 year recall.

References:

1. van Dijken J. A randomized controlled 5-year prospective study of two HEMA-free adhesives, a 1-step self etching and a 3-step etch-and-rinse, in non-carious cervical lesions. Dent Mater. 2013;29:271-280.
2. Atsushi M et al. Effect of low-shrinking composite on the bonding effectiveness of two adhesives in occlusal Class-I cavities Dent Mater J. 2012; 34:418-426.
3. Shahidi C, Krejci I, Dietschi D. (2017) In vitro evaluation of marginal adaptation of direct Class II composite restorations made of different "Low-Shrinkage" systems. Oper Dent. 2017;42:273-283.

¹Medipol University, Dental School, Center for Restorative and Regenerative Medical Research, Biomaterials and Translational Dental Research Laboratory (REMER), Istanbul, Turkey

²University of Zurich, Dental Materials Division, Center for Dental and Oral Medicine, Zurich, Switzerland

E-mail: mutluozcan@hotmail.com