

Influence of different curing methods (halogen, LED, laser) on micro-hardness of two restorative posterior composite dental resins.

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INTRODUCTION: The aim of this study was to determine the curing rates of new technology light curing units¹⁻²⁻³ (halogen DeguluxTM DEGUSSA DENTAL, LED 1st generation EliparTM Freelight and LED 2nd generation EliparTM Freelight 2 from 3M ESPE, laser Dental 300TM from HGM MEDICAL LASER) using a micro-hardness mechanical study of two posterior dental composite resins (QuixFilTM from DENTSPLY DETREY and FiltekTM P60 from 3M ESPE).

METHODS: Two restorative dental posterior composite resins were used (table 1)

	Filler/matrix ratio (by vol).	Hv	Curing depth Iso 4049 (mm)	Particle size	Volume contraction rate.	Curing time PD	Tint
QuixFil® Dentsply Detrey	66.4/33.6	88	4.4	1 to 10 µm	1.70 %	20 s > 500 mW/cm ²	Univ
Filtek P60 3M ESPE	61/39	92	2.5	0.01 to 3 µm	2.25 %	20 s > 430 mW/cm ²	A 3
Theoretical values from manufacturers							

Table 1 Composite resin characteristics

Twelve samples (6 mm diameter and 2 mm depth) were cured by each curing run. Table 2 shows the main technical characteristics of the curing light and laser used⁴.

	Unit type	Light at the unit	Spectrum nm	Power density
Degulux (Halogen)	Quartz-tungsten filament	White	400 to 500	800 mW/cm ²
Elipar Freelight 1 (L.E.D I)	Semiconducting	Blue	440 to 490	400 mW/cm ²
Elipar Freelight 2 (L.E.D II)	Semiconducting	Blue	430 to 480	1000 mW/cm ²
Dental 300 (L.A.S.E.R)	Amplified radiation	Blue	Green	488 and 515

Table Technical characteristics of the curing units used.

A Vickers microhardness study was performed (five measurements per face for each sample)⁵.

RESULTS: After statistical analysis (Kruskal-Wallis, Anova, Bonferoni), the experimental results (table 3) show that the DeguluxTM and the EliparTM Freelight 2 curing lights have identical performance (p=1). This performance is better than that of EliparTM Freelight 1 and Dental 300TM (p<0.001). The average micro-hardness value of the posterior dental composite material FiltekTM

P60 is higher than that of QuixFil'sTM (p<0.001). However both these materials are ranked among the best as regards micro-hardness.

	QuixFil TM			Filtek TM P60		
	Cured faces	Non-cured faces	% variation	Cured faces	Non-cured faces	% variation
Degulux Soft-Start TM	84.04	75.29	10.41	94.14	76.79	18.43
Elipar TM Freelight 1	68.39	57.24	16.30	82.2	62.28	24.23
Elipar TM Freelight 2	86.84	77.4	10.87	94.02	79.26	15.70
Dental 300 TM	57.61	54.01	6.25	73.65	62.23	15.50

Table 3 Comparative average micro-hardness values for the cured and non-cured composite resin faces.

CONCLUSION: The new curing light units help to reduce the curing time while improving the composite resin curing rate.

Posterior dental composite curing resins seem to offer real advantages with therapeutic indications: clinical protocol simplified, mechanical properties improved and esthetic properties sufficient.

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