

Clinical evaluation of a new micro-hybrid composite material for direct restoration of posterior sectors

F. Inchingolo, V. Picciariello, F. Inchingolo, G. Dipalma, A. Fioriello, M. Tatullo, A. M. Inchingolo, F. Pettini, M. Marrelli, A. D. Inchingolo, M. De Carolis, A. Palladino

AIM: The aim of the present study is the clinical evaluation of a new composite material, specifically designed for direct restorations of posterior sectors of the oral cavity (*Estelite Sigma Quick Posterior*[®] - Tokuyama Dental). This material has excellent mechanical, physical properties and introduces important innovations, such as RAP technology (*Radical Amplified Photopolymerization Technology*), allowing for a rapid material polymerization (the polymerization time is about one-third shorter than other composite resins) and a good stability to light. Another advantage is the presence of *hybrid fillers*, constituted by 0.2 μm spherical particles obtained by sol-gel process (ensuring excellent material moldability and polishing) and 3 μm irregular particles obtained by smash process, which implement the mechanical characteristics.

MATERIALS AND METHODS: our clinical experimentation was based on 10 direct restorations of posterior sectors, using the above-mentioned material (restorations performed between June 2010 and March 2011). We evaluated the clinical characteristics of the material and patient feedback both at time zero (immediately after restoration) and at time one, that is to say six months after restoration.

The criteria we used are based on the modified *United States Public Health Service (USPHS) criteria*, which constitute a system of clinical evaluation suggesting an anamnestic, visual and instrumental (bodkin) analysis, in order to evaluate: *color harmony; integrity of restoration; marginal integrity; anatomical form of the marginal ridge; anatomical form of the whole surface; margin discoloration; abrasion; postoperative sensitivity; patient satisfaction*. Each of these criteria was rated (A= excellent; B = acceptable; C = filling reconstruction; D = unacceptable), allowing for a global evaluation of the characteristics of the material.

RESULTS: Both at time 0 and time 1, Estelite Posterior produced excellent results for all the examined criteria, with a few infrequent exceptions, confirming the properties advertised by the manufacturer, from both a mechanical and clinical perspective (See the graph below). Therefore, this material can be included in the category of the best commercially available composite materials for restorations of posterior sectors.

Medical protocol:

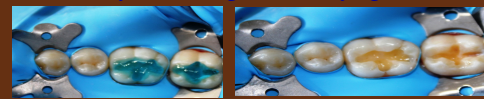
- 1) Diagnosis of carious lesion
- 2) Tooth isolation using the dental dam



- 3) Tissue removal using a diamond coated cylindrical burr, mounted on a turbine, followed by cavity finishing using a tungsten carbide round bur mounted on a micromotor.



- 4) The mordant was 37% phosphoric acid for 30s on the enamel and for 20s on the dentin, followed by 30s rinsing and 20s drying



- 5) Application of EDTA for 20s, followed by rinsing and application of 0.2 % chlorhexidine for other 20s.

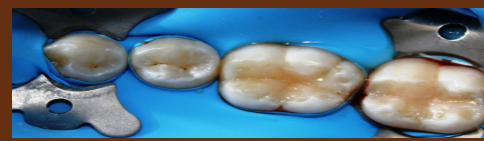
- 6) Application of primer

- 7) Application of bonding, followed by polymerization for 20s.

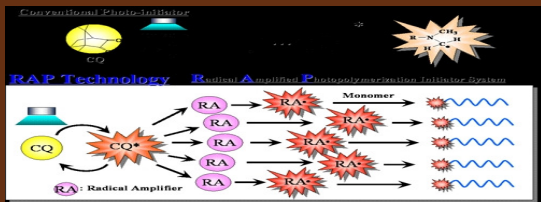
- 8) Application of composite using the incremental procedure, modeling each layer which is then polymerized for 20s.

- 9) Occlusal control after dam removal.

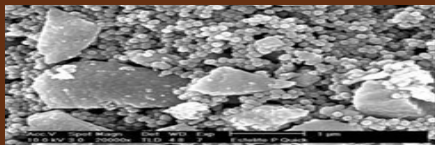
- 10) Finishing and polishing



Estelite Σ Quick Posterior[®]



RAP TECHNOLOGY: a single CQ molecule, if excited, allows to obtain more molecules of radical anions (RA), which cause concurrent polymerization of more monomers.



Filler characteristics: SEM vision (2000 X magnification)

MAIN CHARACTERISTICS

- ☐ Filler volume: 86%
- ☐ Compressive strength: 443 MPa
- ☐ Flexural strength: 215 MPa
- ☐ Vickers hardness: 87 Kg/mm after 30s of polymerization
- ☐ Contraction stress: 0.73 mPa
- ☐ Volume contraction: 1.5%
- ☐ Light stability: 50s at 10000 lux
- ☐ Radiopacity: 298% aluminium radiopacity
- ☐ Polymerization time: 10s

References

- 1) Brenna, Breschi, Spreafico et al: *Odontoiatria Restaurativa, procedure di trattamento e prospettive future*, Ed. Elsevier, 2009;
- 2) J.L. Ferracane: *Developing a more complete understanding of stresses produced in dental composites during polymerization*. J. Dent Mater 21 (1) (2006).
- 3) S.C. Bayne, G. Schmalz: *Reprinting the classic article on USPHS evaluation methods for measuring the clinical research of performance of restorative materials*; Clin Oral Invest, 2005.

