PROBLEMS WITH POSTERIOR COMPOSITES

PROBLEMI S KOMPOZITIVNOM ISPUNOM STRAŽNJIH ZUBI

BICLESANU, Cornelia; DESPA, Gabriela; STANCIU, Liana; FLORESCU, Ana Maria & TUDOSE, Andreea

Abstract: *The placing of posterior composites is regarded as a difficult operative procedure because of the difficulty in attaining ideal proximal contacts. Pulp protection is essential. Incremental build-up is mandatory; the material must be placed in several layers to minimize polymerization shrinkage during light curing. However, polymerization shrinkage 1.5-2.5% by volume is inevitable. The occlusion must be adjusted meticulously. It is exceedingly difficult to finish composites in the gingival proximal areas. Occlusal wear will take place in areas of occlusal contact. In this study several methods for optimizing restoration techniques with dental composite resins will be presented.*

Key words*: posterior composites, proximal contacts, polymerization shrinkage, incremental build-up.*

Sažetak: *Kompozitivna ispuna stražnjih zubi težak je operativni postupa zbog teškoća vezanih uz postizanje idealnog proksimalnog kontakta. Odgovarajuća ispuna je bitna. Materijal mora biti postavljen u nekoliko slojeva kako bi se polimerizacijsko skupljanje svelo na minimum. Bez obzira na sve polimerizacijsko skupljanje od 1.5 – 2.5% je neizbježno.Okluzija mora biti izvedena pažljivo.U ovom radu biti će predstavljeno nekoliko optimalnih tehnika kompozitivnih adhezija.*

Ključne riječi: *kompozitivna ispuna stražnjih zubi, proksimalni kontakt, polimerizacijsko skupljanje.*

Authors´ data: Cornelia **Biclesanu**, Full Prof., Faculty of Dentistry, Bucharest, corneliabicle@yahoo.com.; Gabriela **Despa**, Assoc. Prof., Faculty of Dentistry, Bucharest, gabidespa@gmail.com.; Liana **Stanciu**, Assoc. Prof., Faculty of Dentistry, Bucharest, stanciu_liana@yahoo.com.; Ana Maria **Florescu**, Assistant, Faculty of Dentistry, Bucharest; Andreea **Tudose**, Assistant, Faculty of Dentistry, Bucharest

1. Introduction

Composite restoration requires proper treatment planning and an appreciation of restorative principles. Scientific knowledge incurs proper tooth preparation, composite selection and techniques to produce long-lasting restorations. However, studies have shown that many posterior composite restorations require replacement as soon as five years, which is about half the longevity of silver amalgam restorations.
Factors that contribute to premature replacement of composite restorations are: secondary caries either as a result of microleakage or open interproximal contacts, open interproximal contacts causing food stagnation, poor control of polymerization shrinkage, excessive tooth wear, poor moisture control results in a compromised tooth-composite bond and increased microleakage at their interface, inappropriate case selection. Polymerization shrinkage is responsible for the formation of a gap between resin-based composite and the cavity wall. This gap may vary from 1.67 to 5.68 percent of the total volume of the restoration and it may be filled with oral fluids. [1]
Oral fluids contain bacteria, which may be responsible for postoperative sensitivity and recurrent caries. [2]
Polymerization shrinkage is one of dental clinicians' main concerns when placing direct, posterior, resin-based composite restorations. Evolving improvements associated with resin-based composite materials, dental adhesives, filling techniques and light curing have improved their predictability, but shrinkage problems remain. Below we present 2 ways to reduce polymerization shrinkage.

2. Alternatives methods to reduce polymerization shrinkage in direct posterior composite restorations

Stress from polymerization shrinkage is influenced by the restorative technique, modulus of resin elasticity, polymerization rate, and cavity configuration or "C-factor." The C-factor is the ratio between bonded and unbonded surfaces [3]; an increase in this ratio results in increased polymerization stress. Three-dimensional cavity preparations (Class I) have the highest (most unfavorable) C-factor because only outer unbonded surfaces absorb stress. In order to minimize the stress from polymerization shrinkage, efforts have been directed towards improving placement techniques, material and composite formulation and curing methods.
Following a thorough clinical and radiological exam, the portion that needs restoration is isolated in order to prevent saliva infiltration and consequent bonding problems. (figure 1a,b)
Retentions and impression adhesives are applied on a spatula. Then, a high-viscosity putty stent is injected (Extrude™, Kerr, Romulus, MI, SUA).
The spatula is placed gently upon the occlusal surface, in the area that needs restoration, until the material bonds. All remaining from the impression are removed. The matrix is placed again to make sure it resents the necessary degree of stability.

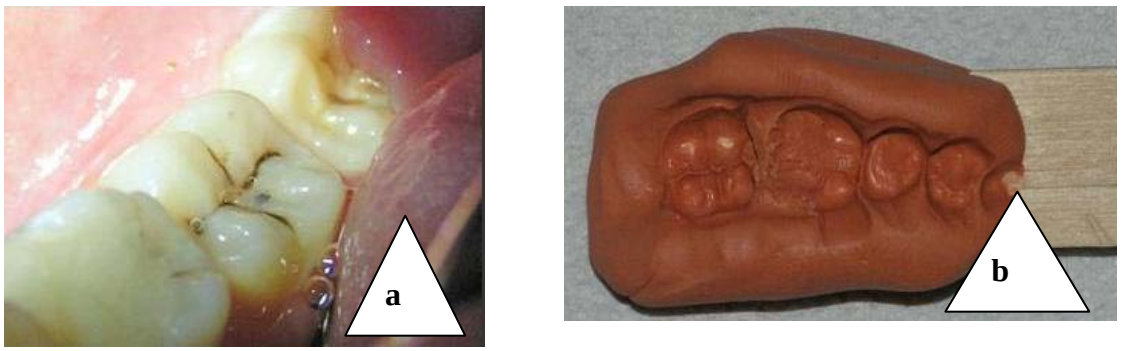

Figure 1a,b. Cavity diagnosis, A high-viscosity putty stent

Tooth was minimally prepared using using high-speed small rounded bur such as a 329 or 2 or diamond bur (Brasseler USA, Savannah, GA). No extension of the treatment in the pits or fissure in the non-cavity areas will be done and without sharp internal angles. Within the deep cavities, where dentin is less than 0,5 mm thick, a thin layer of CaOH is recommended. [4] On the remaining dentin, a glass-ionomer cured cement layer (Vitrebond, Irvine) is placed, in order to release fluoride and to reduce percolation.

Tooth was then etched with 37% phosphoric acid (Scothbond Etchant, 3M-ESPE) for 20 seconds, rinsed for 15 seconds with an air-water spray, and lightly air-dried. [5][6] A single-component adhesive bonding agent (PQ1®, Ultradent Products, Inc.) was placed on the preparation for 10-15 seconds, lightly air-dried for 5 seconds and light-cured for 20 seconds with an LED curing light (Ultra-Lume™ LED 2, Ultradent Products, Inc.). For this case a cured nano-filled composite (Filtek Supreme, 3M-ESPE) was used because it has high wear resistance, it is radio-opaque and filters the fluoride. [7]

The composite is applied in layers - no more than 2 mm. Once the last layer of composite is applied, the silicon putty matrix is placed on top of the surface in the right position and the excess of composite is removed. This procedure is reiterated until all excess is removed and composite is cured for 20 seconds. A face-penetrating sealant (Fortify, Bisco) is used in order to reduce marginal leakage and percolation. Minimal occlusal adjustment are still necessary, yet they are needed in very few cases. Restoration image is shown in (figure 2).

Figure 2. Final image

3. Split-increment Technique: An Alternative Approach for Large Occlusal Composite Resin Restorations

This technique offers a number of advantages, such as controlled depth of cure and reduction of adverse effects from polymerization shrinkage.
This method is demonstrated on 46 teeth with occlusal caries (figure 3)
The ability of a composite resin restoration to relieve the stresses generated from the polymerization shrinkage is related to the C factor (the ratio of the bonded surfaces of the restoration to its unbonded surfaces) of such restoration. In the proposed technique, relief of such stresses was achieved through the use of two diagonal cuts to split each flat increment into four triangular-shaped portions before light curing (figure 4). This would reduce the C factor from the ratio of 5, obtained when one increment connects the cavity floor with the four surrounding walls, to an approximate ratio of 0.5 when each triangular-shaped portion of the split increment was bonded to only one surrounding cavity wall and one fourth of the floor. The second increment of enamel composite resin was used to complete the restoration. (figure 5)

Figure 3. Initial image

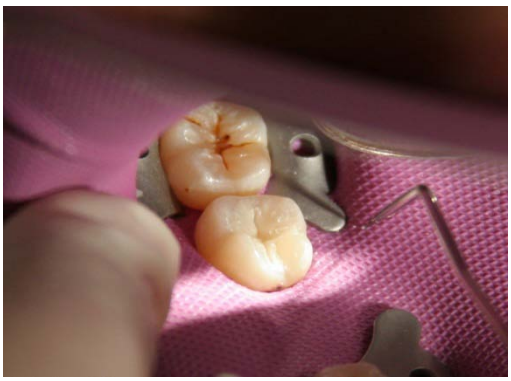

Figure 4. Diagonal cuts

Figure 5. Final image

4. Conclusions

Higher patient demands concerning aesthetics led to a more frequent use of composites on posterior teeth. Research is under way to develop resin-based

composite materials with novel monomers, new photo initiators and improved particle systems to reduce polymerization stresses. In this study, we outlined principles for the judicious selection and use of modern dental materials, careful control of polymerization shrinkage and effective placement techniques that can be used to create more predictable and esthetic posterior resin-based composite restorations.

5. References

[1.] Davidson, C.L.; Gee, A.J. & Feilzer, A. (1984). The competition between the composite-dentin bond strength and the polymerization contraction stress. *J Dent Res*; 63:1396–9.

[2.] Cox, C.F. (1992). Microleakage related to restorative procedures. *Proc Finn Dent Soc*;88 (supplement 1):83–93.

[3.] Feilzer, A.J.; De Gee, A.J. & Davidson C.L. (1987). Setting stress in composite resin in relation to configuration of the restoration. *J Dent Res*; 66:1636–9.

[4.] Windley, W.M. et all, (2003). The effect of short term calcium hydroxid treatment on dentin bond streaghts to composite resin, *Dent traumatol*; 19: 79-84.

[5.] Kanca, J. (1992). Improving bond strength through acid etching of dentin and bonding to wet dentin surfaces. *J Am Dent Assoc*.; 123 (9): 35-43.

[6.] Kanca, J (1992). Resin bonding to wet substrate. Bonding to enamel. *Quintessence Int*.; 23(9):623-627.

[7.] Derek, W. & Jones, (1998). FIM, Dental Composites Biomaterials, *J Can Dent Assoc*.; 64:732-4.

Photo 012. Loundry / Rublje