

THE FIVE YEAR EVALUATION OF AESTHETIC COMPOSITE RESTORATIONS ON POSTERIOR TEETH

EVALUACIJA KOMPOZITNIH ESTETSKIH ISPUNA NA BOČNIM ZUBIMA U PERIODU OD PET GODINA

Smajkić N¹, Korač S², Berisalić A², Džanković A², Jakupović S², Mucić F²

¹ Qatar Prime Dental Center; Al Waab St. Doha; State of Qatar

² Faculty of Dentistry with Clinics, the Sarajevo University, Department of Dental Pathology and Endodontics, Bolnicka 4, 71000 Sarajevo, Bosnia and Herzegovina

Corresponding author:

Smajkić Nedim
Qatar Prime Dental Center
Al Waab St. Doha
State of Qatar
PO Box: 93597,
e-mail: nedim@drsmajkic.ba
Phone: +97433907980

ABSTRACT

Modern understanding of dentistry involves high aesthetic criteria thus placing huge demands before dentists.

The aim of this study is the replacement of old amalgam fillings with composite material on the molars and bicuspid teeth along with aesthetic restoration of the tooth anatomic and morphologic surfaces. All restorations were evaluated during the five year period.

54 teeth were divided in two groups of 27 teeth restored with Herculite XRV and Tetric Ceram composite materials.

Fracture of fillings, secondary caries, marginal discoloration, texture resistance, color stability, postoperative sensitivity and vitality test were checked at control examinations.

During the five year evaluation period, no statistically significant differences between used materials on the inplaced composite fillings were found.

Modern composite materials provide complete restorations on the molars and bicuspid teeth while the restauration done by modeled anatomical and morphological details provide natural relation between teeth while chewing and aesthetic look for longer period.

Key words: aesthetic restorations, composite materials, secondary caries

SAŽETAK

Moderno poimanje stomatologije podrazumijeva visoke estetske kriterije, a to pred stomatologa postavlja sve veće zadatke.

Cilj: Cilj ovog rada je zamjena starih amalgamskih ispuna sa kompozitnim materijalom na molarima i premolarima, uz estetsku restauraciju anatomskih i morfoloških struktura zuba. Sve restauracije su evaluirane u periodu od pet godina.

Ukupno 54 zuba podijeljena su u dvije grupe, po 27 zuba, i restaurirana sa Herculite XRV i Tetric Ceram kompozitnim materijalom. Frakture ispuna, sekundarni karijes, postojanost teksture ispuna, stabilnost boje, postoperativna osjetljivost i vitalnost zuba pregledani su prilikom kontrolnih pregleda.

U evaluacijskom periodu, u trajanju pet godina, na postavljenim kompozitnim ispunima nije pronađena statistička signifikantnost između korištenih materijala.

Savremeni kompozitni materijali omogućavaju potpunu nadoknadu izgubljenih dijelova krunice zuba, a restauracijom anatomo-morfoloških detalja omogućen je prirodan odnos zuba, prilikom žvakanja, i estetski izgled zubnog niza na duži period.

Gljučne riječi: estetske restauracije, kompozitni materijali, sekundarni karijes

Introduction

Modern understanding of dentistry involves high aesthetic criteria thus placing higher demands before dentist. Aesthetic component has become an important factor in the psychology of good appearance and thus one of the main tasks of restorative dentistry. The importance of beautiful teeth and mouth lies in the fact that they are an integral part of the face being the most striking aesthetic fact characterized by each person [1]. A clinical study has shown that painful vital teeth with incomplete fractures can be treated successfully by replacing the amalgam fillings with bonded composite restorations [2]. On the other hand, posterior composite restorations have been shown to produce higher failure rates due to secondary caries [3,4]. However, although used in many practices around the world, amalgam is facing its demise, leaving a resin composite as the most likely material for posterior restorations for widespread use in the near future.

Contemporary dental practices have embraced the process of bonding to natural tooth structure to combine function and esthetics. Direct composite resin restorations have replaced amalgam and gold in many clinical situations where esthetics is of primary concern and an adequate amount of natural tooth structure remains.

Modern composite materials allow full compensation for the lost parts of the crowns of teeth, and restoration of anatomical and morphological details provide natural relationship between the teeth while chewing and aesthetic look of the dental arch.

Bonded composite resin materials can deliver desired results while providing longevity that is acceptable to most patients. Still, it is very likely that the restoration which a patient receives today will need replacement in the future.

After years of *in vitro* and *in vivo* investigations, it is currently possible for the clinician to develop a durable, long-lasting restoration that is esthetically indistinguishable from natural tooth structure. Exact shade matching and localized characterization are entirely possible. However, achieving the ultimate in esthetics can take a considerable amount of time and experience. An alternative approach that is

simpler yet based on sound scientific principles can be used to achieve predictable long-term success with direct placement of composite resin restorations for anterior and posterior teeth in more time-efficient manner. In order to estimate duration of posterior composite restorations, long-term studies are needed to identify modes of failure and possible reasons for these failures.

The aim of this study is the replacement of amalgam fillings with the composite material on the molars and bicuspid teeth with esthetic restoration of the tooth surface producing anatomical and morphological details of the natural tooth.

Material and Methods

Patients for this study were middle aged male and female selected randomly. All patients selected for the research are of similar personal habits, proper oral hygiene and non-smokers. Chosen patients had amalgam fillings needing replacement. The fillings were sized class II; mesio-occlusal, disto-occlusal and mesio-occlusal-distal surface restorations. All research restorations were done on vital teeth. Teeth with root canal treatments are not included in the research. The total number of teeth included in research was 54.

After removing the old amalgam fillings the secondary caries of dentine and enamel was removed. After determining the color with Vita-pan shade guide (Vita Zahnfabrik, Bad Sackingen, Germany), the calcium hydroxide based liner was applied on pulpal cavity walls (Kerr Life, Keer Italia Srl, Salerno Italia) and glass ionomer cement (Ketac Cem, 3M ESPE, Dental-Medizin GmbH + Co., KG, Seefeld, Germany). The cavity is treated with 37% orthophosphoric acid (Gel Etchant, Keer Italia Srl, Salerno Italia) by total etch technique with applied adhesive system (Optobond Solo Plus, Keer Italia Srl, Salerno Italia). 27 teeth were restored using Herculite XRV with dentine and enamel composite material.

After polymerization of dentin composite, modeling with enamel composite was achieved in producing cusps and fissure morphology (Herculite XRV, Keer Italia Srl, Salerno Italia). Other 27 teeth were restored in the same way with Tetric Ceram (Ivoclar

Vivadent AG, Schaan, Liechtenstein). After checking the articulation and occlusion of the restorations, polishing was done with silicone rubbers in the presence of water, and high-gloss polishing was performed with paste Dura-Polish Dia (SHOFU DENTAL GmbH, Germany) and brush of goat hair at a low level rotation up to 900 RPM. After polishing, the surface was applied by OptiGuard (Herculite XRV, Keer Italia Srl, Salerno Italia) composite surface sealant, thus preventing premature wear and staining of composite material.

Recalls were done six months and twelve months after treatment in the first year and later one time of year for a four year period. Recalls checked: fracture of filling, secondary caries, marginal discoloration, texture resistance, color stability, postoperative sensitivity and vitality test of teeth. Vitality test was performed with electric tester. (Parkell, USA) Checking of patients was performed by six practitioners. The restorations were evaluated using the modified USPHS parameters to check their stability, and the scores were A (good), B (acceptable), and C (unacceptable).

Results

During the five years of evaluation of placed composite restoration, no it statistical differences between composite materials were found. Also, there were no differences in behavior of used materials regarding the size of the restoration. With both materials, postoperative sensitivity was recorded in four patients with Herculite XRV and six patients with Tetic Ceram during one day after treatment.

Vitality test was positive and without change during evaluation period. The fracture of materials was not recorded. Marginal discoloration after evaluation period was shown at 21% cases with Herculite XRV and 30% restorations with Tetric Ceram. This marginal discoloration was described like acceptable because it was found only on certain parts of occlusal surface and did not jeopardize overall aesthetic and functionality of restorations (**Figure 1 and 2**).

Secondary caries were found at 9% in Herculite XRV group and 14% an Tetric Ceram group during the



Figure 1.
Herculite XRV restoration after five years of tooth 26



Figure 2.
Tetric Ceram restoration after five years of tooth 18
and Herculite XRV immediately after placing on tooth 17

Clinical Results Based on USPHS Criteria for Herculite XRV restoration

	6 month			12 month			2 year			3 year			4 year			5 year			%					
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C			
Restoration (n=27)																								
Vitality test	27			27			27			27			27			27			27			100		
Marginal discoloration	27			27			22	5		22	5		21	6		21	6		79	21				
Secondary caries	27			27			27			27			27			25	2		91	9				
Color stability	27			27			24	3		21	6		16	11		12	15		45	55				
Postoperative sensitivity	27			27			27			27			27			27			100					
Wear resistance	27			27			25	2		25	2		23	4		23	4		85	15				

A - good; B - acceptable; C - non acceptable

Table 1.
USPHS Criteria for Herculite XRV

fifth year checkup. Surface texture was not changed to be described like non acceptable, during the evaluation period for both used materials, and occlusal anatomy of teeth was preserved.

Wear resistance change in luster appeared in 15% Herculite restorations and 31% Tetric Ceram restorations being registered like acceptable.

Color stability of both materials was described like clinically acceptable. No non acceptable color change for all restoration was found regarding this investigation circumstances. (Table 1, Figure 3, Table 2, Figure 4)

Discussion

Due to their aesthetic properties and good clinical service, composites have become the preferred material for direct posterior restorations. The main reasons for the failure of posterior composite restorations are secondary caries, fracture and color change. The failure of restorations related to the wear of these materials in the posterior region seems, nowadays, almost absent and may be restricted to bruxing and clenching patients. A review of the literature on long-term clinical trials of posterior composite restora-

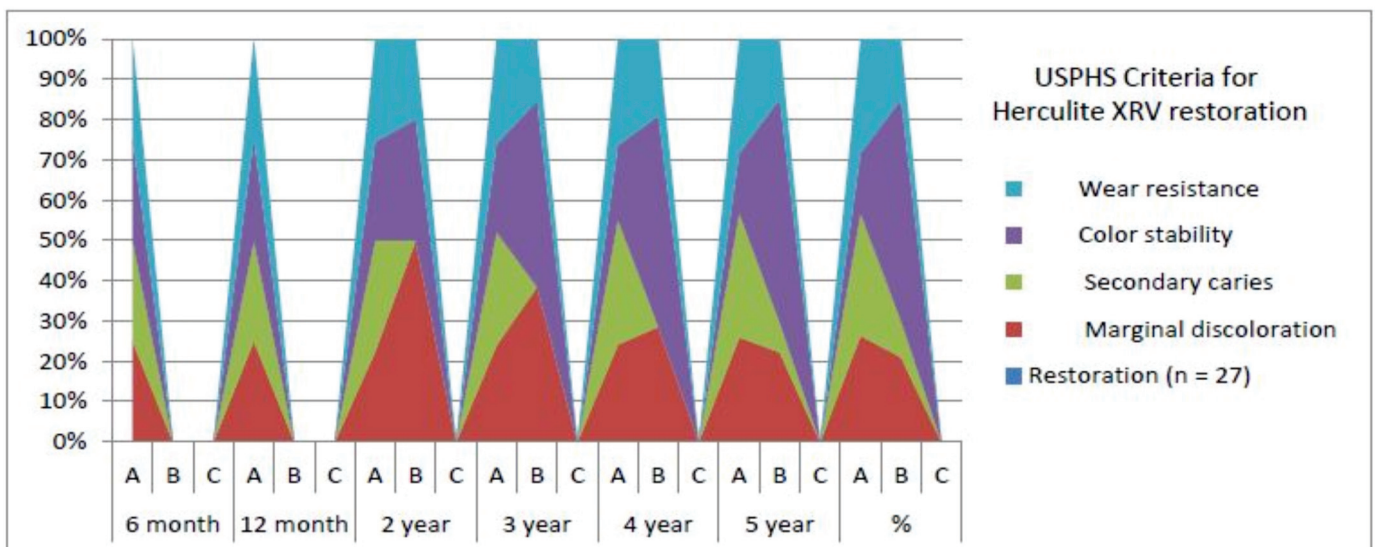


Figure 3.
USPHS Criteria for Herculite XRV

Clinical Results Based on USPHS Criteria for Tetric Ceram restoration

	6 month			12 month			2 year			3 year			4 year			5 year			%					
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C			
Restoration (n=27)																								
Vitality test	27			27			27			27			27			27						100		
Marginal discoloration	27			27			20	7		20	7		19	8		19	8		70	30				
Secondary caries	27			27			27			27			27			23	4		86	14				
Color stability	27			27			22	5		18	9		17	10		15	12		55	45				
Postoperative sensitivity	27			27			27			27			27			27			100					
Wear resistance	27			27			23	4		21	6		20	7		18	9		69	31				

A - good; B - acceptable; C - non acceptable

Table 2.
USPHS Criteria for Tetric Ceram

tions showed that the duration of these restorations is influenced mainly by clinical variables (type, size, and location of the restoration), the quality and technique of the operator, socioeconomic factors such as income and type of dental service, demographic factors (age of patients) and behavioral aspects (caries prevalence) [5]. At the research done 12 years later, large composite restoration showed a higher survival in the combined population and in the low-risk group. For three-surface restorations in high-risk patients, amalgam showed better survival [6]. There is no much evidence that the material properties of the used composite are a relevant factor in restora-

tion longevity. Da Rosa et al reported that there is superior longevity for the higher filler loaded composite [7]. Choosing the right material can also be the reason for success of aesthetic composite restoration. Today, dental market offers a wide range of composite materials with different prices and properties. One of the characteristic of composite materials is polymerization shrinkage and choosing the material with lowest polymerization shrinkage rate can improve longevity of the restoration. For this research, two types of material were chosen. Herculite XRV, microhybride composite is one of the first products which offers dentin and enamel material for producing high

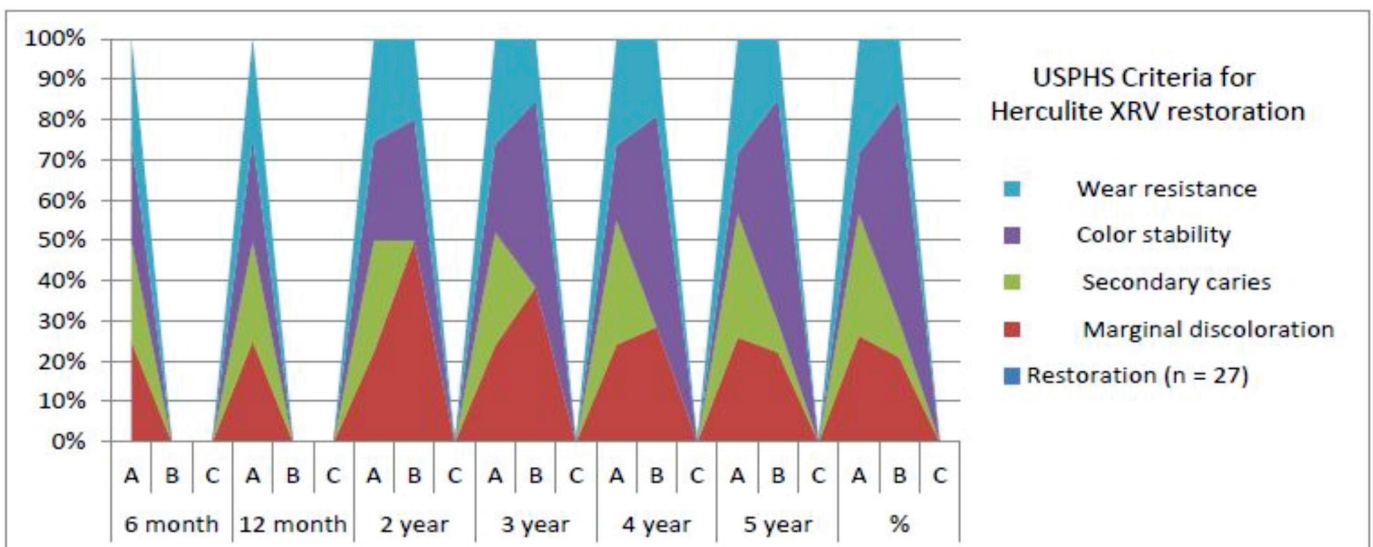


Figure 4.
USPHS Criteria for Tetric Ceram

aesthetic direct restorations. Tetric Ceram is also microhybride composite which has been used for long time in dentistry. The both products showed acceptable physical properties, good handling characteristic and longevity aesthetic [8, 9, 10].

Under the circumstances of this research, used restoration materials did not show statistical differences in five year evaluation period. All patients selected for this research were low risk patients being the possible reason for good fractural resistance and low rate of secondary caries which is mostly found in the gingival region of restoration. All those secondary caries were found in the last year of research. Risk for secondary caries can be reduced firstly by removing all pathologically changed dentin and enamel by the initial preparation with disinfection of prepared cavities. Use of the proven quality of adhesive materials, and adequate technique of placing and polymerizing composite material for reducing polymerization shrinkage can also be the fact for reducing secondary caries risk. The patients may have benefit by proper information and education about oral hygiene in order to reduce secondary caries reducing.

The materials used in this research showed acceptable aesthetic after five years. Best esthetic is shown one year after placing restoration. Ageing of material is the reason for the changing of color and marginal discoloration. Using the OptiGuard or similar material for final coating after polishing of restoration can slow down aging process of material and prevent pigment accumulation from food or drinks [11].

Fillings that last for five years with acceptable esthetics, even with small surface secondary caries, can be repaired with refurbishing treatments consisting of repolishing and applying the OptiGuard. This can improve the clinical properties of defective or slight color changed resinbased composite restorations by increasing the longevity of the restorations with minimal intervention [12].

This research shows that fillings lasting five years can assume clinically acceptable success. This is proved by the results of Lundin and Koch showing that out of 137 restorations, after the 5 years of evaluation, 114 of the examined restorations were in clinical function and after 10 years 92, meaning 90% and 79 % respectively [13].

Composite restoration achieved a morphological form of teeth with satisfactory aesthetic appearance. Composite restoration allows the correction of the anatomical and morphological shape of teeth to achieve the desired aesthetic solutions. Correct articulation of restoration is achieved through absolute functionality of the restored teeth in the articulatory system.

Conclusion

Composite restorations on the molars and bicuspid teeth with modeled anatomical and morphological details of the natural teeth allow the achievement of proper articulation and occlusal relationships and meet long-term aesthetic effects.

References

1. Vuković. A. Basic principles of visual art in esthetic dentistry. *Stomatološki vjesnik* 02/2012
2. Opdam NJ, Roeters JJ, Loomans BA, Bronkhorst EM. Seven-year clinical evaluation of painful cracked teeth restored with a direct composite restoration. *J Endod.* 2008;34:808–811
3. Bernardo M, Luis H, Martin MD, Leroux BG, Rue T, Leitao J, et al. Survival and reasons for failure of amalgam versus composite posterior restorations placed in a randomized clinical trial. *Am Dent Assoc.* 2007;138:775–783
4. Soncini JA, Maserejian NN, Trachtenberg F, Tavares M, Hayes C. The longevity of amalgam versus compomer/composite restorations in posterior primary and permanent teeth: findings From the New England Children's Amalgam Trial. *J Am*
5. Flávio F.D, Marcos B.C Maximiliano S. C. Rafael R.M. Niek J.M. O. Longevity of posterior composite restorations: Not only a matter of materials Volume 28, Issue 1, Pages 87-101, January 2012
6. Opdam NJ, Bronkhorst EM, Loomans BA, Huysmans MC 12- year survival of composite vs. vs. amalgam restorations. *J Dent Res.* 2010 Oct;89(10):1063-7. Epub 2010 Jul 26.

7. Da Rosa Rodolpho PA, Donassollo TA, Cenci MS, Loguercio AD, Moraes RR, Bronkhorst EM, Opdam NJ, Demarco FF. 22-Year clinical evaluation of the performance of two posterior composites with different filler characteristics. *Dent Mater*. 2011 Oct;27(10):955-63. Epub 2011 Jul 16.
8. Van Dijken JW, Pallesen U. A six-year prospective randomized study of a nano-hybrid and a conventional hybrid resin composite in Class II restorations. *Dent Mater*. 2012 Oct 9. pii: S0109-5641(12)00400-9. doi: 10.1016/j.dental.2012.08.013. [Epub ahead of print]
9. Garcia-Godoy F, Frankenberger R, Lohbauer U, Feilzer AJ, Krämer N. Garcia-Godoy F, Frankenberger R, Lohbauer U, Feilzer AJ, Krämer N. *J Biomed Mater Res B Appl Biomater*. 2012 May;100(4):903-10. doi: 10.1002/jbm.b.32651. Epub 2012 Feb 10.
10. Nazarian A. Simplifying direct composites with new material technology. *Dent Today*. 2010 Jan;29(1):128,130.
11. Alawjali SS, Lui JL. Effect of one-step polishing system on the color stability of nanocomposites. *J Dent*. 2012 Oct 24. pii: S0300-5712(12)00282-5. doi: 10.1016/j.jdent.2012.10.008. [Epub ahead of print]
12. Moncada G, Fernández E, Martín J, Arancibia C, Mjör IA, Gordan VV. Increasing the longevity of restorations by minimal intervention: a two-year clinical trial. *Oper Dent*. 2008 May-Jun;33(3):258-64.
13. Lundin SA, Koch G. Class I and II posterior composite resin restorations after 5 and 10 years. *Swed Dent J*. 1999;23(5-6):165-71.