Seven-year clinical evaluation of indirect restorations made of the Estenia composite

Hideaki Shiono, DDS, PhD,[a] Hiroyasu Koizumi, DDS, PhD,[a,b] Masakazu Hirata, DDS,[a] Michiya Ayano, DDS,[a] Daisuke Nakayama, DDS,[a] and Hideo Matsumura, DDS, PhD,[a,b]

[a]Department of Fixed Prosthodontics, and [b]Division of Advanced Dental Treatment, Dental Research Center, Nihon University School of Dentistry, Tokyo, Japan

Purpose: The aim of this study was to evaluate the clinical performance of tooth-colored crown restorations made of a highly loaded indirect composite material.
Materials and Methods: A total of 17 restorations made of the Estenia indirect composite were clinically evaluated on the basis of the modified USPHS criteria. Color match, marginal integrity, surface texture, wear of restoration as well as antagonist, recurrent dental caries, fracture/detachment, and gingivitis around the abutments were examined. The observation period varied from 50 to 125 months with an average of 87.5 months.
Results: All restorations were judged as Alfa for all categories at baseline. After an average observation period of 87.5 months, the following cases were judged as Bravo; eight for surface texture, one for wear, five for wear of the metallic antagonists, and one for gingival inflammation. Fracture of the restoration was detected in one case. Problems associated with color match, marginal integrity, wear of enamel antagonists, and recurrent dental caries were not observed in any patients.
Conclusion: Within the limitation of current evaluation, it can be concluded that the expected service period of the indirect restorations made of the Estenia composite is five years or more. **(Int Chin J Dent 2009; 9: 39-43.)**
Key Words: clinical evaluation, composite, indirect restoration.

Introduction

Over the last decade, the application of composite materials for indirect restorations has increased substantially. This trend is probably due to improvement in both mechanical and handling properties of materials. The Estenia material (Kuraray Medical Inc., Tokyo, Japan) is one of such composites applicable for indirect tooth-colored restorations. Laboratory evaluation demonstrated that the Estenia composite is superior in color stability,[1] wear resistance,[2-5] and strengths,[6,7] to other composites. The Estenia material is therefore currently used for single restorations,[8-10] fixed partial dentures (FPDs),[6,11-13] as well as the super-structure of implant-supported prostheses.[14,15]

Although in vitro assessment of the Estenia material has been reported extensively, only limited information is available concerning the clinical performance of restorations made of the Estenia composite.[9,10] This report evaluated clinically 17 single indirect restorations fabricated with the Estenia composite on the basis of modified United States Public Health Service (USPHS) criteria, after an average observation period of seven years and 3.5 months.

Materials and Methods

The Estenia composite material, which consists of 8% hydrophobic multifunctional methacrylates and urethane tetramethacrylate (UTMA), 16% submicron filler (0.02 μm), and 76% glass filler (1.5-2.0 μm), was used in fabrication of restorations.

Sixteen adult female patients participated in the evaluation. Seventeen teeth (one maxillary incisor, one maxillary canine, 11 maxillary premolars, and four mandibular premolars) were restored. The abutment was prepared according to a typical design for a tooth-colored restoration with approximately 1.2 mm rounded shoulder preparation and 1.5-2.0 mm occlusal surface or incisal edge reduction.

Table 1. Modified USPHS criteria for direct clinical evaluations.[10,16-18]

Category/Rating	Characteristics
Color match	
A	The restoration appears to match the shade and translucency of adjacent tooth tissues.
B	The restoration does not match the shade and translucency of adjacent tooth tissues, but the mismatch is within the normal range of tooth shades.
C	The restoration does not match the shade and translucency of adjacent teeth, and the mismatch is outside the normal range of tooth shades and translucency.
Marginal integrity	
A	The explorer does not catch when drawn across the surface of the restoration toward the tooth, or, if the explorer does catch, there is no visible crevice along the periphery of the restoration.
B	The explorer catches and there is visible evidence of a crevice, into which the explorer penetrates, indicating that the edge of the restoration does not adapt closely to the tooth structure.
C	The explorer penetrates a crevice defect.
Surface texture	
A	Surface texture is similar to polished enamel as determined by means of a sharp explorer.
B	Surface texture is gritty similar to a surface subject to a white stone or similar to a composite containing supramicron sizes particles.
C	Surface pitting is sufficiently coarse to inhibit the continuous movement of an explorer across the surface.
Wear	
A	The restoration is a continuation of existing anatomic form or is slightly flattened.
B	A surface concavity is evident.
C	There is a loss of restorative substance such that a surface concavity is evident. Replacement is required.
Wear of antagonist	
A	The antagonist is a continuation of existing anatomic form or is slightly flattened.
B	A surface concavity is evident.
C	There is a loss of antagonist substance such that a surface concavity is evident. Replacement or restorative treatment is required.
Recurrent dental caries	
A	The restoration is a continuation of existing anatomic form adjacent to the restoration.
C	There is visual evidence of dark deep discoloration adjacent to the restoration.
Fracture/Detachment	
A	No bulk fracture/detachment is present.
C	Bulk fracture/detachment is evident.
Gingiva	
A	No clinical inflammation is present.
B	Clinical inflammation is present.

A, Alfa; B, Bravo; C, Charlie.

An impression was made with elastomeric material, and a working cast was prepared. A composite restoration was fabricated with the Estenia system according to the manufacturer's specifications. The restoration was tried-in and seated with the Panavia F dual activated luting composite (Kuraray Medical Inc.) or with other resin-based luting agents. The patients entered a regular check-up program with oral examination once or twice per year.

The restorations were evaluated immediately after seating (baseline) and periodically evaluated up to 10 years. On the basis of the modified USPHS criteria, the following characteristics of the restorations were evaluated; color match, marginal integrity, surface texture, wear of both restoration and antagonist, recurrent dental caries, fracture or detachment, and gingivitis around the abutments. The modified USPHS criteria used in the current study are shown in Table 1.[10,16-18] This study was performed in compliance with permission for use of human subjects from the Medical Ethics Committee, Nihon University School of Dentistry (No. 2007-3).

Results

Table 2 summarizes the results of clinical evaluation of the restorations at baseline and after an average observation period of seven years and 3.5 months. All restorations were judged as Alfa for all categories at the baseline evaluation. The numbers of restorations judged as Bravo rating at the recall visit were eight for surface texture, one for wear of restoration, five for wear of antagonist, and one for gingivitis. It was notable that a total of five antagonists showed moderate wear judged as Bravo, all of which were cast restorations made of gold or silver-palladium-copper-gold alloy. Fracture of the restoration occurred in one case, in which a hair-line crack generated at the lingual surface of a maxillary second premolar. The remaining restorations were judged as Alfa for all categories.

Table 2. Clinical evaluation of crown restorations made of the Estenia composite material.

Category	Baseline			After ave. of 87.5 months			Note
Rating	A	B	C	A	B	C	
Color match	17	0	0	17	0	0	
Marginal integrity	17	0	0	17	0	0	
Surface texture	17	0	0	9	8	0	
Wear of restoration	17	0	0	16	1	0	Incisal edge
Wear of antagonist	17	0	0	12	5	0	Five metallic antagonists
Recurrent caries	17		0	17		0	
Fracture/Detachment	17		0	16		1	
Gingiva	17	0		16	1		

A, Alfa; B, Bravo; C, Charlie. N=17.

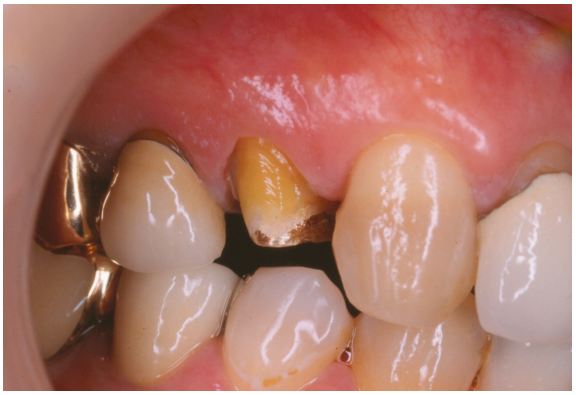


Fig. 1. Buccal view of the abutment.

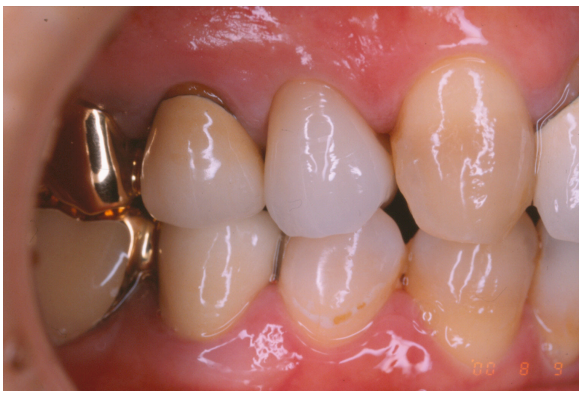
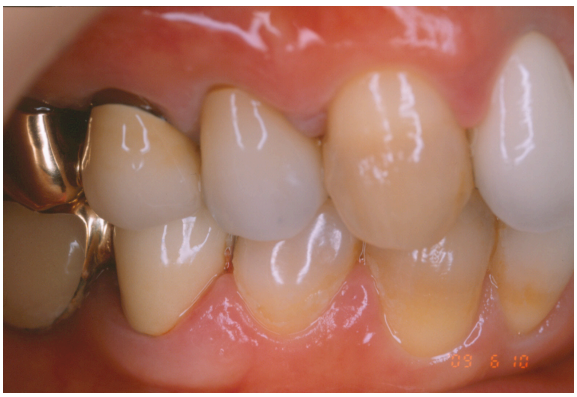
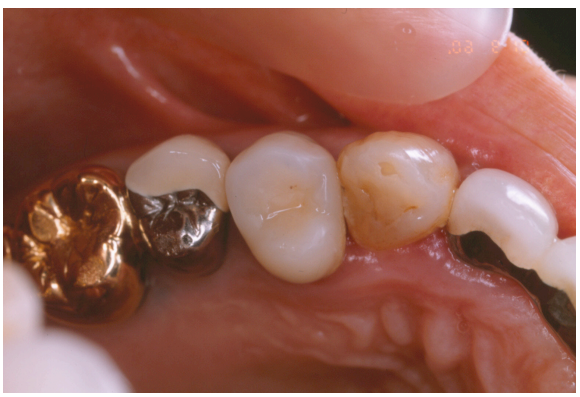


Fig. 2. A restoration made of the Estenia composite.





Figs. 3 and 4. Buccal (left) and occlusal (right) views of the restoration seated after eight years and 10 months.

Figs. 1 through 4 show a typical restoration made of the Estenia composite. This case did not show discoloration, wear, and fracture of the restoration after service period of eight years and 10 months. Recurrent dental caries was not detected, and condition of periodontal tissue appeared to be satisfactory. The patient was satisfied with the clinical course of the treatment.

Discussion

Previous studies[9,10] have demonstrated the effectiveness of the Estenia composite as a tooth-colored restorative material. This study evaluated longevity of the Estenia restorations for up to a maximum of 10 years and five months on the basis of the modified USPHS criteria. The results after an average observation period of 87.5 months were substantially similar to the results of 38.9-month evaluation.[10] Specifically, eight of the 17 restorations exhibited a frosty appearance after their surface was air-dried. Roughening of the restorations, however, was not distinct when the surface was in contact with saliva. This phenomenon is not ideal but clinically acceptable since it is desirable for individual dentition that the wear rate of natural teeth and restorative materials is equivalent. The roughened surface could be polished with a rotary silicone instrument with file diamond particles (Compomaster, Shofu Inc., Kyoto, Japan).

Wear is closely related to surface texture of both tooth and restorative materials. Ogino et al.[5] evaluated wear characteristics of the Estenia composite and gold alloy using a gold alloy antagonist. The results indicated that the Estenia composite was more wear resistant than gold alloy. The results agree with the clinical results of the current and previous[10] studies. Table 2 shows that five worn antagonists were made of either gold or silver-palladium-copper-gold alloy. The remaining antagonists that did not show remarkable wear were enamel of natural dentition. This may be due to insufficient wear resistance and hardness of alloys when opposed to the Estenia composite, especially in the area of the centric holding cusp.

As revealed in this evaluation, restorations made of the Estenia composite demonstrated clinical success in the majority of cases after seven years or more. On the basis of the current clinical results, it can be concluded that the Estenia composite is a clinically reliable material for use in anterior and premolar tooth-colored restorations.

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Correspondence to:

Dr. Hiroyasu Koizumi
Department of Fixed Prosthodontics, Nihon University School of Dentistry
1-8-13 Kanda-Surugadai, Chiyoda-ku, Tokyo 101-8310, Japan
Fax: +81-3-3219-8351 E-mail: koizumi@dent.nihon-u.ac.jp

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