

Eleven-year clinical performance of a premolar restoration made of an indirect microfilled composite material: a case report

Mitsuo Nakamura, DDS, PhD,^{a,b} Hideo Matsumura, DDS, PhD,^{b,c} and Osamu Saiki, DDS^d

^aPrivate Practice, Ichikawa, ^bDepartment of Fixed Prosthodontics, ^cDivision of Advanced Dental Treatment, Dental Research Center, Nihon University School of Dentistry, and ^dNihon University Graduate School of Dentistry, Tokyo, Japan

This report describes a clinical course of a premolar restoration made of a microfilled composite material. A single restoration made of the Gradia indirect composite material was seated to mandibular second premolar of a 57-year-old female patient. During the course of regular check-up, both second and adjacent first molar were extracted. Although the premolar restoration is functioning for more than 11 years, loss of anatomic form at the occlusal table is apparent. Care must be taken in application of a microfilled indirect composite material to posterior occlusal planes.

(Asian Pac J Dent 2014; 14: 19-21.)

Key Words: indirect restoration, microfilled composite, wear

Introduction

A growing number of indirect composite materials is being introduced in the fabrication of both anterior and posterior restorations. Gradia indirect material (GC Corp., Tokyo Japan) is a typical microfilled composite material containing prepolymerized silica (less than 0.05 μm) composite and splintered glass (average, 1.0 μm).¹ It is reported that a microfilled composite material shows a smoother surface after grinding, abrasion, or acid-attack compared to a macrofilled material.¹⁻³ However, microfilled composite material is less resistant to occlusal contact wear than a macrofilled material.⁴ Although clinical performance of Gradia direct material has been reported,⁵⁻⁷ only limited information is available on evaluation of Gradia indirect composite material in vivo. This report describes the clinical course of a mandibular premolar restoration made with Gradia indirect composite material.

Clinical Report

A 57-year-old female patient presented with a chief complaint of masticatory disturbance associated with gingival recession and decay of her right mandibular second premolar. The second premolar had undergone treatment with a metallic restoration made of silver-palladium-copper-gold alloy, which was functioning for more than 5 years. The adjacent first molar was treated with a metallic restoration veneered with a hybrid composite material. Further, a porcelain-fused-to-metal (PFM) restoration had been placed on the first premolar. Examination revealed that the second premolar was not vital, and secondary dental caries along the cervical margin of the tooth was detected. Several treatment options were proposed; 1) metallic restoration, 2) composite restoration, 3) ceramic restoration, and 4) PFM restoration. The patient chose the tooth-colored composite restoration. The restorative procedure was then explained in detail and consent from the patient was obtained. A summary of the restorative procedure for this case was previously reported.⁸

After the root canal treatment of the second premolar, an indirect core build-up structure was made with a fiber-post (ParaPost Fiber White, Coltène/Whaledent AG, Altstätten, Switzerland) and a composite core material (Clearfil DC Core, Kuraray-Noritake Co., Ltd., Tokyo, Japan) (Fig. 2). The dowel-core structure was seated with a tri-*n*-butylborane initiated adhesive resin (Super-Bond C&B, Sun-Medical Co., Ltd., Moriyama, Japan).



1



2



3



4



5

Fig. 1. Pre-operative view of the second premolar and adjacent teeth
Fig. 2. Dowel core made with a fiber-post and a composite material
Fig. 3. Fiber sheet placed on the abutment cast
Fig. 4. Composite restoration made with Gradia material
Fig. 5. Worn composite restoration (11 y and 4 m after seating) and fractured first premolar (PFM restoration)

After the abutment preparation, an impression was made with a silicone elastomer, and a working cast was prepared. A piece of fiber sheet (FiberStick Net, Stick Tech Ltd., Turku, Finland) was placed surrounding the entire abutment (Fig. 3). The restoration was fabricated with an indirect composite material (Gradia, GC Corp., Tokyo, Japan). Prior to seating the restoration, the inner surface was treated with a silane primer (Porcelain Liner M, Sun-Medical Co., Ltd.). The restoration was then seated with Super-Bond C&B adhesive resin (Fig. 4). The patient entered into a maintenance program. During the check-up period, the first and second molars were extracted after five and 11 years respectively, following the seating of the composite premolar restoration due to chronic marginal periodontitis. Unfortunately, the patient suffered from systemic disease, and it was difficult for her to maintain regular visits to the clinic especially in the 6 years after the first molar was extracted. Figure 5 shows the occlusal view of the restoration 11 years and four months after seating. Although the restoration is still functioning, severe abrasion is detected and posterior occlusion is collapsing. A fracture can also be detected along the distal marginal ridge of the ceramic veneer of the first premolar. Replacement of the premolar restorations and fabrication of a removable partial denture was recommended to the patient.

Discussion

One of the problems associated with indirect composite material is lack of wear resistance. This characteristic has been apparent especially for microfilled composite material. Gradia composite is categorized as a microfilled indirect composite material. A microfilled composite material shows smoother surface than a macrofilled material. This feature is derived from both the particle size of the inorganic filler and the difference in wear resistance between inorganic filler and matrix polymer. As shown in Fig. 5, Gradia material exhibited severe wear in vivo over 11 years. However, the worn surface of the Gradia restoration appears to be smooth. These findings correlate with the results of in vitro studies.¹⁻⁴

Figure 5 also shows marginal fracture of sintered porcelain material adjacent to the Gradia restoration. Porcelain material is brittle and resistant to contact wear. The authors consider that composite material was gradually worn, whereas porcelain material fractured suddenly due to the collapse of occlusal contact of molar dentition. Shiono et al.⁹ reported on the clinical performance of restorations made of a highly filled indirect composite material. The material included more than 90% of micro and macro inorganic filler. Although the restorations made with the highly filled composite material showed loss of gloss in many cases, the restorations did not exhibit apparent wear or fracture at the occlusal contact areas.

Considering the change of the surface texture of composite materials in vivo, great care must be taken in fabrication of molar restorations with microfilled composite material. Moreover, application of microfilled composite material is recommended for use as anterior small restorations, especially in facial areas due to its surface smoothness.

Acknowledgments

This clinical report is supported in part by Grant-in-Aid for Scientific Research C 24592934 (2012-2014) from the Japan Society for the Promotion of Science (JSPS).

References

1. Soeno K, Matsumura H, Atsuta M, Kawasaki K. Influence of acidulated phosphate fluoride agent and effectiveness of subsequent polishing on composite material surfaces. *Oper Dent* 2002; 27: 305-10.
2. Ohara N, Koizumi H, Matsumoto Y, Nakayama D, Ogino T, Matsumura H. Surface roughness and gloss of indirect composites etched with acidulated phosphate fluoride solution. *Acta Odontol Scand* 2009; 67: 313-20.
3. Jain V, Platt JA, Moore K, Spohr AM, Borges GA. Color stability, gloss, and surface roughness of indirect composite resins. *J Oral Sci* 2013; 55: 9-15.
4. Jain V, Platt JA, Moore BK, Borges GA. In vitro wear of new indirect resin composites. *Oper Dent* 2009; 34: 423-8.
5. Grandini S, Goracci C, Tay FR, Grandini R, Ferrari M. Clinical evaluation of the use of fiber posts and direct resin restorations for endodontically treated teeth. *Int J Prosthodont* 2005; 18: 399-404.
6. Burrow MF, Tyas MJ. Comparison of two all-in-one adhesives bonded to non-carious cervical lesions--results at 3 years. *Clin Oral Investig* 2012; 16: 1089-94.
7. Palaniappan S, Elsen L, Lijnen I, Peumans M, Van Meerbeek B, Lambrechts P. Nanohybrid and microfilled hybrid versus conventional hybrid composite restorations: 5-year clinical wear performance. *Clin Oral Investig* 2012; 16: 181-90.
8. Nakamura N. Esthetic recovery of molars. In the Quintessence Year Book 2003, Quintessence Publishing, Tokyo, 222-3, 2003, ISBN 4-87417-790-5.
9. Shiono H, Koizumi H, Hirata M, Ayano M, Nakayama D, Matsumura H. Seven-year clinical evaluation of indirect restorations made of the Estenia composite. *Int Chin J Dent* 2009; 9: 39-43.

Correspondence to:

Dr. Mitsuo Nakamura
 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: ndent@sea.plala.or.jp

Accepted July 20, 2014.

Copyright ©2014 by the *Asian Pacific Journal of Dentistry*. Online ISSN 2185-3487, Print ISSN 2185-3479