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Three-year Clinical Performance of Two Giomer Restorative Materials in Restorations

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Clinical Relevance

The clinical performance of both conventional and flowable giomer restorative materials was particularly good in Class I restorations after three years of service.

SUMMARY

This study evaluated and compared the clinical performance of a flowable and a conventional giomer restorative material after three years. Forty-four pairs of restorations (total n=88) were placed in Class I cavities with either a flowable giomer (Beautifil Flow Plus F00; Shofu Inc, Kyoto, Japan) or a conventional giomer restorative material (Beautifil II; Shofu Inc) after the application of a dentin adhesive (FL-Bond II; Shofu Inc) and a flowable liner (Beautifil Flow Plus F03; Shofu Inc). After 3 years, 39 pairs of restorations were evaluated with the modified United States Public Health Service criteria, and digital color photographs of restorations were taken at each patient visit. The evaluation parameters were as follows: color match, marginal integrity, marginal discoloration, retention, secondary caries formation, anatomic form, surface texture, and postoperative sensitivity. Evaluations were recorded as a clinically ideal situation (Alpha), a clinically acceptable situation (Bravo), or a clinically unacceptable situation (Charlie). Data were analyzed with Fisher's exact and McNemar tests (α=0.05).

None of the restorations showed retention loss, postoperative sensitivity, secondary caries, or color change. The performance of Beautifil II in terms of marginal integrity, marginal discoloration, and surface anatomic form was significantly lower at the 36-month follow-up than at baseline (p=0.007). There were no significant differences between the baseline and 36-month follow-up scores for

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the other criteria for Beautifil II (p>0.05). No differences were found between the baseline and the 36-month follow-up scores for any of the criteria for Beautifil Flow Plus F00 (p>0.05). No statistically significant difference in overall clinical performance was found between the 2 materials after 36 months (p>0.05).

The three-year clinical performance of both restorative materials (Beautifil Flow Plus F00 and Beautifil II) was very good and not significantly different for any of the parameters evaluated.

INTRODUCTION

Resin composites have been used in dentistry for more than five decades. In recent years, their formulations were significantly improved to expand the range of clinical indications.[1] Different manufacturing techniques, compositions, filler types, and filler sizes affected the overall properties of these materials. Improvements in filler technology and formulations made composite resin materials suitable even for the stress-bearing areas of posterior teeth.[2] Nanocomposites are among the most recent developments, offering reduced polymerization shrinkage, increased mechanical properties such as tensile and compressive strength to fracture, improved optical characteristics, and better retention.[2,3]

Flowable resin composites are lower viscosity resins that typically have a lower filler content than universal composites. Their flow characteristics make them useful for restoring small cavities or as a cavity liner for improved adaptation to the cavity walls of larger cavities.[4] They effectively seal the microstructural irregularities of cavity preparations prior to conventional resin composite placement. Therefore, it has been confirmed that using flowable resin composites as a liner improves marginal integrity and reduces the microleakage of resin composite restoration.[5] Filler content and monomer composition vary among different brands of flowable resin composites, offering various properties.

Giomer (**g**lass **io**nomer + poly**mer**) restorative materials were introduced more than 15 years ago, and they contain prereacted glass ionomer (PRG) filler particles embedded in a resin matrix.[6] Giomers are manufactured by reacting acid-reactive fluoride-containing glass with polyacids in the presence of water.[7] PRG fillers are divided into two categories: full reaction type PRG (F-PRG) fillers and surface reaction type PRG (S-PRG) fillers. In F-PRG fillers, the entire filler particle reacts with polyacrylic acid and releases a large amount of fluoride as the core of the particle is completely reacted. Therefore, unlike S-PRG fillers, F-PRG fillers degrade faster. In S-PRG fillers, only the surface of the filler reacts with polyacrylic acid, and the glass core remains intact.[8] Giomers offer improved clinical handling and physical characteristics compared with conventional and resin-modified glass ionomers while providing the esthetic properties of resin composites.[8] S-PRG fillers in giomer materials also allow for the release and recharge of fluoride that is comparable to glass ionomer materials but is more than that of fluoride-containing resin composites.[9]

Giomers have a successful short- to long-term clinical history in Class I, II, and V lesions.[7,8,10-12] Beautifil II (Shofu Inc) is one of the universal second-generation giomer restorative resin materials, which combines the characteristics of both composite resins and glass ionomers. This giomer-based resin actually represents a special class of composites that offers both protection against caries and provides functional and esthetic results. Based on S-PRG technology, it is comprised of aluminofluoro-borosilicate glass and multifunctional glass fillers, with particle sizes ranging from 0.01–4.0 μm. Additionally, it contains discrete nanofillers (10–20 nm) and has a total filler content of 83.3 wt% (68.6 vol%),[13] which means that a glass-ionomer-like structure surrounds multifunctional glass fillers, with an external hard glass layer. Therefore, the fillers gain great physical strength and release fluoride (F) and 5 other ions (Na, sodium; B, borate; Al, aluminum; Si, silicate; and Sr, strontium) without causing deterioration of the properties of the material.[14] More recently, a flowable giomer restorative material, Beautifil Flow Plus F00 (Shofu Inc), was introduced. It is indicated as a flowable base, liner, and final restorative material. Similar to Beautifil II, Beautifil Flow Plus F00 is also based on S-PRG technology. It has a filler content of 67.3 wt% (47.0 vol%).[15,16] Both materials are indicated for Class I–V lesions.

The longevity of resin composite restorations has been previously reviewed;[17] they exhibit lower clinical success than other materials.[18,19] The main reasons for the failure of composite resin restorations are secondary caries and fracture.[17] The properties of resin restorative materials utilizing PRG technology include increased wear resistance and a high level of radiopacity, due to the presence of multifunctional glass fillers and shade conformity, owing to the improved light diffusion and fluorescence of the material.[8] One of the very specific advantages of giomer restoratives is their release of fluoride[20] and, therefore, their possible ability to prevent secondary caries.[21] Giomers with S-PRG fillers could release a greater amount of fluoride than that of other fluoride releasing resin composites.[22,23] Additionally, it was speculated that the amount of released fluoride

was possibly related to the flow level of the restorative material: the higher the flow, the greater the amount of fluoride release.[22]

This prospective study investigated and compared the three-year clinical performance of a flowable and a conventional fluoride-releasing giomer restorative material containing S-PRG fillers, bonded with a two-step, self-etch adhesive to restore posterior Class I lesions. The null hypothesis tested was that there would be no difference in the clinical performance of the two giomer materials.

METHODS AND MATERIALS

In this prospective, open clinical study, 44 pairs of Class I cavities were restored with either a flowable giomer restorative material (Beautifil Flow Plus F00; Shofu Inc) or a conventional giomer restorative material (Beautifil II; Shofu Inc) after the application of a two-step, self-etch adhesive system (FL-Bond II; Shofu Inc) and a flowable giomer liner (Beautifil Flow Plus F03; Shofu Inc) (Table 1).

Patient Selection

The study was approved by the Institutional Review Board of the University of Pennsylvania (Protocol #815836). Written, informed consent was obtained from all participants before the initiation of treatment. Participants of this study had molar-supported permanent dentition with normal occlusion. The patient inclusion criteria were as follows: primary shallow/moderate caries not reaching the inner one-third of dentin, with no risk of pulpal exposure in the occlusal surface; occlusal contact with the antagonist tooth; with at least two similar sized occlusal lesions; and in good state of general health. The exclusion criteria were as follows: intense bruxism or severe periodontal problems, molars with a carious lesion on a surface other than the occlusal surface and in continuity with the occlusal cavity, pulp exposure during caries removal, cavities with imminent risk of pulp exposure, and spontaneous pain or sensitivity to percussion. All patients received oral prophylaxis treatment and oral hygiene instructions 2 weeks before the placement of restorations.

Table 1. *Restorative Materials and Adhesive System Used in the Study*

Material Description	Material Name	Composition	Manufacturer
Giomer restorative	Beautifil II	Base resin: Bis-GMA (7.5 wt%)/TEGDMA (5 wt%); resin filler: multifunctional glass filler and S-PRG (surface prereacted glass-ionomer) filler based on aluminofluoro-borosilicate glass Filler loading: 83.3 wt% (68.6 vol%); particle size range: 0.01–4.0 μm; mean particle size: 0.8 μm DL-Camphorquinone	Shofu, Kyoto, Japan
Flowable giomer restorative	Beautifil Flow Plus F00	Base resin: Bis-GMA (15 wt%)/TEGDMA (13wt%); resin filler: multifunctional glass filler and S-PRG filler based on aluminofluoro-borosilicate glass Filler loading: 67.3 wt% (47.0 vol%); particle size range: 0.01–4.0 μm; mean particle size: 0.8 μm DL-Camphorquinone	Shofu, Kyoto, Japan
Two-step, self-etch adhesive	FL-Bond II	Primer: carboxylic acid monomer, phosphonic acid monomer, 6-MHPA, water, solvent, photoinitiator Adhesive: HEMA, UDMA, TEGDMA, 40% fluoride releasing and recharging S-PRG filler, photoinitiator	Shofu, Kyoto, Japan

Abbreviations: 6-MHPA, 6-methacryloxyhexyl 3- phosphonoacetate; Bis-GMA, bisphenol-A-diglycidyl methacrylate; HEMA, 2-hydroxylethyl methacrylate; S-PRG filler, surface prereacted glass-ionomer filler; TEGDMA, triethyleneglycol dimethacrylate; UDMA: urethane dimethacrylate.

Thirty-four patients (14 men, 20 women; age range, 20–45 years) were included in this study. A total of 88 molar teeth (44 pairs) with Class I primary carious lesions were restored. Each patient received at least 1 pair of restorations with both materials placed in either tooth. A "pair" means that the 2 materials were used in the same patient in at least 2 molar teeth, based on the patient's needs.

Clinical Procedures

The teeth were randomly assigned to the restorative materials. All lesions were restored by 2 calibrated operators using local anesthesia and rubber dam isolation. The initial access to the carious dentin was accomplished using a diamond bur attached to a high-speed handpiece under water cooling. Cavity preparations were limited to the removal of carious tissue. The average faciolingual width of the cavities was approximately one-third of the intercuspal width. No bevel was prepared on the enamel margins. Only loose enamel prisms were removed with finishing diamond burs. Each preparation was performed with new burs.

The self-etch adhesive (FL-Bond II; Shofu Inc) was used according to the manufacturer's instruction. The primer was thoroughly applied to the cavity and left undisturbed for 10 seconds, after which it was air-dried for 5 seconds. Subsequently, the bonding agent was applied to the cavity and light-cured for 10 seconds. A thin layer of flowable material (Beautifil Flow Plus F03; Shofu Inc) was applied to the cavity base and light-cured for 10 seconds with a light-emitting diode (LED) curing unit (Elipar S 10; 3M Espe, St. Paul, MN, USA). The cavities were then restored incrementally with either Beautifil Flow Plus F00 or Beautifil II giomer resin restorative material. Each 2-mm increment was light-cured with the same curing unit. After polymerization, occlusal adjustment, contouring, and finishing were performed with diamond finishing burs (Brasseler, Savannah, GA, USA) and the restorations were polished thoroughly with composite polishing kits (Enhance and PoGo Polishing System; Dentsply Caulk, Milford, DE, USA).

Clinical Evaluation of the Restorations

The restorations were evaluated according to the modified United States Public Health Service criteria[24] at baseline, 6-month, 18-month, and 36-month follow-up visits (Table 2). Two calibrated examiners who were

Table 2. *Evaluation Criteria of the Restorations According to Modified United States Public Health Service Criteria*

No.	Category	Rating and Characteristics
1	Retention	Alfa (A): no loss of restoration Bravo (B): any loss of restorative material
2	Marginal integrity	Alfa (A): explorer doesn't catch or slight catch with no visible crevice Bravo (B): explorer catches and crevice is visible, but there is no exposure of dentin or base Charlie (C): explorer penetrates crevice and defect extended to dentin–enamel junction
3	Secondary caries	Alfa (A): no caries present Bravo (B): caries present associated with the restoration
4	Surface anatomic form conditions	Alfa (A): restoration is continuous with existing anatomic form Bravo (B): restoration isn't continuous with existing anatomic form, but missing material is not sufficient to expose dentin or lining Charlie (C): sufficient material is lost to expose dentin
5	Postoperative sensitivity	Alfa (A): no sensitivity Bravo (B): sensitivity, but diminishing in intensity Charlie (C): constant sensitivity, not diminishing in intensity
6	Surface texture	Alfa (A): enamel-like surface Bravo (B): surface rougher than enamel, clinically acceptable Charlie (C): surface unacceptably rough
7	Color match	Alfa (A): restoration matches adjacent tooth structure in shade and/or translucency Bravo (B): mismatch in shade and/or translucency is within normal range of tooth shades Charlie (C): match in shade and/or translucency is outside normal range of tooth shade
8	Marginal discoloration	Alfa (A): no visible evidence of marginal discoloration Bravo (B): marginal discoloration present but has not penetrated in pulpal direction

not involved in the operative process evaluated the restorations with a mirror, explorer, and air stream. In case of a disagreement, examiners re-evaluated the restorations until a consensus was reached. Digital color photographs of the lesions and the restorations were taken at baseline and at each follow-up visit for documentation purposes.

Both tested materials were compared with Fisher's exact test. Each tested criterion for each material was analyzed separately (with respect to different follow-up periods) using Friedman's test.

RESULTS

Of the 44 original pairs of restorations placed, 39 were available for evaluation at the 3-year follow-up visit. The number of patients, score percentages, and statistical significance values for the criterions, which revealed different outcomes at different follow-up periods, are presented in Tables 3, 4, 5, and 6. None of the restorations showed retention loss, postoperative sensitivity, secondary caries, or color change. For the marginal integrity, marginal discoloration, and surface anatomic form, Friedman's test revealed that the quality of Beautifil II restorations was significantly lower at 36 months than at baseline (p=0.007) (Tables 3, 4, 5). However, there was no significant difference between the baseline and 36-month follow-up scores for the surface texture criteria with Beautifil II (p>0.05) (Table 6). For Beautifil Flow Plus F00, no differences were found between the baseline and the 36-month follow-up scores for any of the criteria (p>0.05).

Fisher's exact test revealed no difference between the performance of Beautifil Flow Plus F00 and Beautifil II at 36 months for all the criteria evaluated (p>0.05).

DISCUSSION

Clinical studies can provide important information in respect to material performance and changes over time.[25] This study employed a 36-month observation period with 6- and 18-month intervals. The recall rate of this study was 100% at 6 months and 88.64% at 18 months and 36 months. A similar study reported a recall rate of 80% at 36 months,[16] while another study revealed a recall rate of only 59%,[26] which is far lower than that of this study.

In this study, all restorations of the presented patients (39 patients) remained intact, with no postoperative sensitivity or secondary caries at the 36-month follow-up. The absence of postoperative sensitivity may be attributed to the use of a two-step, self-etch adhesive, which does do not entirely remove the smear layer.[26] Therefore, the outcomes in respect to this parameter

Table 3. *Results of Clinical Evaluation of Marginal Integrity Criterion*

		Baseline (n=44)	6 m (n=44)	18 m (n=44)	36 m (n=39)	Friedman Test *p*-value
Beautifil II	A	40 (90.9%)	40 (90.9%)	40 (90.9%)	35 (89.7%)	0.007
	B	4 (91.0%)	4 (91.0%)	4 (91.0%)	4 (10.3%)	
Beautifil Flow Plus F00	A	43 (97.7%)	42 (95.4%)	42 (95.4%)	37 (94.9%)	0.112
	B	1 (2.3%)	2 (4.6%)	2 (4.6%)	2 (5.1%)	
Fisher's exact *p*-value		1	0.676	0.676	0.675	–

Abbreviations: A, Alpha; B, Bravo; m, months.

Table 4. *Results of Clinical Evaluation of Surface Anatomic Form Criterion*

		Baseline (n=44)	6 m (n=44)	18 m (n=44)	36 m (n=39)	Friedman Test *p*-value
Beautifil II	A	41 (93.2%)	40 (90.9%)	40 (90.9%)	35 (89.7%)	0.007
	B	3 (6.8%)	4 (91.0%)	4 (91.0%)	4 (10.3%)	
Beautifil Flow Plus F00	A	44 (100%)	43 (97.7%)	43 (97.7%)	38 (97.4%)	0.392
	B	0 (0%)	1 (2.3%)	1 (2.3%)	1 (2.6%)	
Fisher's exact *p*-value		0.241	0.36	0.36	0.358	–

Abbreviations: A, Alpha; B, Bravo; m, months.

Table 5. *Results of Clinical Evaluation of Marginal Discoloration Criterion*

		Baseline (n=44)	6 m (n=44)	18 m (n=44)	36 m (n=39)	Friedman Test *p*-value
Beautifil II	A	44 (100%)	43 (97.7%)	41 (93.2%)	35 (89.7%)	0.007
	B	0 (0%)	1 (2.3%)	3 (6.8%)	4 (10.3%)	
Beautifil Flow Plus F00	A	44 (100%)	44 (100%)	43 (97.7%)	38 (97.4%)	0.392
	B	0 (0%)	0 (0%)	1 (2.3%)	1 (2.6%)	
Fisher's exact *p*-value		1	1	0.66	0.358	–

Abbreviations: A, Alpha; B, Bravo; m, months.

Table 6. *Results of Clinical Evaluation of Surface Texture Criterion*

		Baseline (n=44)	6 m (n=44)	18 m (n=44)	36 m (n=39)	Friedman Test *p*-value
Beautifil II	A	43 (97.7%)	42 (95.4%)	42 (95.4%)	37 (94.9%)	0.112
	B	1 (2.3%)	2 (4.6%)	2 (4.6%)	2 (5.1%)	
Beautifil Flow Plus F00	A	44 (100%)	43 (97.7%)	43 (97.7%)	38 (97.4%)	0.392
	B	0 (0%)	1 (2.3%)	1 (2.3%)	1 (2.6%)	
Fisher's exact ***p***-value		0.241	1	1	0.308	–

Abbreviations: A, Alpha; B, Bravo; m, months.

may not be solely related to the type of the giomer resin material used. The only deterioration observed was minimal loss of marginal integration and slight marginal discoloration in the teeth restored with Beautifil II after 36 months. Regarding marginal integrity and marginal discoloration, 10.3% of the restorations received Bravo ratings for both of these criteria. Another study found higher Bravo ratings—41.9% for marginal integrity and 16.1% for marginal discoloration—for Beautifil II.[24] The difference between the results could be due to lower recall rates in the previous study. Additionally, in this study, a flowable material, Beautifil Flow Plus F03, was used as a liner underneath both restorative materials. Such a low-modulus material could act as an elastic layer and dissipate the stresses generated by occlusal loads,[27] which may explain the different findings. Additionally, the use of a flowable material as a liner could improve the adaptation of the initial increment of the covering restorative material and may, therefore, influence the outcomes.

Teeth restored with the flowable giomer restorative material, Beautifil Flow Plus F00, did not exhibit any significant changes at the 36-month recall compared with baseline. Its flowable behavior has the ability to provide better adaptation to the cavity walls,[28,29] which may be a contributing factor for the sustained marginal integrity over time.

Previous clinical studies reported an acceptable clinical performance of first-generation giomer restorative materials.[7,8] In this study, a second-generation giomer restorative material, Beautifil II, also showed clinically acceptable results, confirming the results of previous studies with Beautifil II.[16,26,30] A recent observation showed that surface roughness, marginal adaptation, and marginal discoloration were the most frequent changes observed for Beautifil II after 36 months.[26] Forty percent of the restorations showed signs of slight crevices along the margin at occlusal surfaces.[26] This study revealed similar results for Beautifil II.

In a clinical trial,[16] which compared Beautifil II and Beautifil Flow Plus F00 for 3 years, Beautifil Flow Plus F00 showed better performance regarding marginal integrity, marginal discoloration, surface roughness, and surface morphology (anatomic form) at the 36-month recall. Those materials performed similarly in this study.

Among the most prevalent factors for gap formation during long-term clinical service are polymerization shrinkage and differences between the thermal expansion coefficients of the restorative material and the tooth structure.[31] This gap along the restoration–tooth interface potentially leads to leakage, marginal discoloration, secondary caries, and postoperative sensitivity. Cavities with high configuration factors

may produce contraction stresses along the cavity walls,[32] affecting the long-term marginal integrity of the restoration. In this study, Class I cavities, which have the highest configuration factor, were restored with giomer restoratives with different viscosities. The high cavity configuration factor must be viewed as a reason for the Bravo ratings observed for marginal integrity and marginal discoloration with Beautifil II at 36 months. Lower viscosity and higher elasticity may be contributing factors for the finding that Beautifil Flow Plus F00 performed better at the 36-month follow-up in respect to marginal integrity and discoloration. Besides material-dependent properties, finishing/polishing procedures, and chipping of restorative material at the cavosurface margins also influence marginal deterioration.[8]

Flowable restorative materials typically have a lower filler load than conventional composite resins.[33] The flowable giomer restorative material Beautifil Flow Plus F00 has a filler load of 67.3 wt % (47.0 vol %), which is higher than that of conventional flowable composites.[33] The high filler content with S-PRG fillers has shown to provide the flowable giomer material with superior physical properties and increased fluoride release over time.[15] Therefore, it can be assumed that these superior properties can expand the range of indications for this material to the posterior regions. However, further clinical studies would be necessary to test this hypothesis. Although the hardness value of Beautifil Flow Plus F00 was reported to be lower than that of Beautifil II,[15] 36-months follow-up evaluation did not yield any difference between them in respect to anatomic form. It was reported that fluorosilicate glass fillers in giomers are susceptible to degradation by weak acids[34] and that both Beautifil II and Beautifil Flow Plus F00 can be degraded by citric acid,[15] which might influence their anatomic form during clinical service. However, longer-term follow-up trials would be needed to verify this. In addition, the size and the location of the restorations influence occlusal wear of the restorative materials.[35] Wear increases with a larger surface area and length of cavosurface margins. Since it was not possible to standardize cavities in this study, the location and the size of the restorations have possibly impacted the outcomes.

In general, it has been confirmed that giomer restorative materials present promising clinical outcomes.[7,8,10-12,16,26] In this study, second-generation giomer restorative materials, both Beautifil II conventional giomer restorative and Beautifil Flow Plus F00 flowable giomer materials, clinically showed very good results without any significant difference from each other for all parameters evaluated in the study.

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Conflict of Interest

The authors of this manuscript certify that they have no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

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Errata

Operative Dentistry apologizes for the errors in the following manuscripts.

IF Leão, N Araújo, CK Scotti, RFL Mondelli, MM de Amoêdo Campos Velo, JFS Bombonatti; The Potential of a Bioactive, Pre-reacted, Glass-Ionomer Filler Resin Composite to Inhibit the Demineralization of Enamel *in Vitro*. *Oper Dent* 1 January 2021 **46 (1)**: E11-E20. doi: https://doi.org/10.2341/19-151-L

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DM De Paula, AD Loguercio, A Reis, S Sauro, AH Alves, PR Picanço, K Yoshihara, VP Feitosa; Lack of Neutralization of 10-MDP Primers by Zirconia May Affect the Degree of Conversion of Dual-cure Resin Cement. *Oper Dent* 1 January 2021 **46 (1)** 107-115. doi: https://doi.org/10.2341/18-189-L

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F Ozer, O Irmak, O Yakymiv, A Mohammed, R Pande, N Saleh, M Blatz; Three-year Clinical Performance of Two Giomer Restorative Materials in Restorations. *Oper Dent* 1 January 2021 **46 (1)** E60-E67. doi: https://doi.org/10.2341/17-353-C

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IBL Soares-Rusu, CA Villavicencio-Espinoza, NA de Oliveira, L Wang, HM Honório, JH Rubo, PAS Francisconi, AFS Borges; Clinical Evaluation of Lithium Disilicate Veneers Manufactured by CAD/CAM Compared with Heat-pressed Methods: Randomized Controlled Clinical Trial. *Oper Dent* 1 January 2021 **46 (1)** 4-14. doi: https://doi.org/10.2341/19-233-C

There are errors in the corresponding author information and in paragraph 1 under Treatment Planning and Tooth Preparation in the Methods and Materials section (p6), and in the legend for Figure 10 (p11). They should read (corrections are underlined):

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Digital smile design was performed using Apple's Keynote Software to obtain veneer proportions and to enable communication and increase predictability. Standardized extraoral photographs were taken with a Nikon D5300 digital reflex camera using the following parameters: manual mode 1/125, f22, and ISO 125, coupled with Sigma Macro 105mm DX lens; twin manual 1/1 flash (Nikon R1C1 Wireless Close-UP Speedlight System) equipped with Watson CR123A Rechargeable Lithium Battery (3V, 400mAh); and a flash holder (Agnòs, Italy). The analysis of the face thirds was made according to the participant's smile. Initial impressions were taken using a heavy and light condensation silicone (Xantopren/Optosil, Heraeus Kulzer, Germany) onestep technique. The study casts were obtained, and the wax-up was performed according to digital planning.

Figure 10. *Means and standard deviation of the manufacturing process at the study periods (baseline, 6 months, and 12 months of follow-up) for the topics marginal adaptation (MARA), marginal discoloration (MARD), restoration fracture (RESF), and postoperative sensitivity (POSTS).*