Introduction

Although an all-ceramic restoration is increasingly in use in dentistry, a conventional metal ceramic restoration is still considered to be a gold standard. However, with increasing demand in esthetics and advances in ceramic technology, future of metal ceramic restoration has been less certain, necessitating additional qualities in terms of superior esthetics and easy fabrication.

A ceramic-pressed-to-metal restoration (PTM) combines the merits of the casting and the press techniques. Fabrication of a PTM starts with wax-up and casting for the metal framework. Following the opaque porcelain application to the metal framework, a complete contour wax pattern is made and burnt out. The ceramic is then pressed into the room created by burnout of the full contour wax pattern. Therefore, a PTM exhibits better marginal adaptation than a conventional metal ceramic restoration.
A 52-year-old female presented with the chief complaint of a fractured metal ceramic restoration on the maxillary right lateral incisor. After clinical and radiographic examination, no endodontic pathosis was found. Treatment plan, including a conventional metal ceramic restoration, all-ceramic restoration, and a PTM, was discussed with the patient. A PTM was chosen because of esthetics and better marginal adaptation than a conventional metal ceramic restoration.

Following the local anesthesia (Septanest; Septodont, Saint-Maur-des-Fossés, France) injection, the defective restoration was removed and the abutment was prepared for a PTM by placing a shoulder finish line, which is 1.2 to 1.5 mm wide. After the gingival retraction cord (No. 000 Ultrapak retraction cord; Ultradent Products Inc., South Jordan, UT, USA) was placed into the gingival sulcus, an elastomeric definitive impression was made with polyvinyl siloxane material (Aquasil; Dentsply Caulk, Milford, CA, USA) and a temporary restoration was fabricated with an autopolymerizing acrylic resin material (ALIKE; GC America Inc., Alsip, IL, USA).

After pouring with an improved dental stone (Fuji-Rock; GC Co., Tokyo, Japan), the definitive cast was made (Fig. 1). The definitive cast was scanned with...
a digital scanner (D800; 3Shape Inc., Copenhagen K, Denmark) (Fig. 2). According to the manufacturer’s recommendations, a minimum ceramic layer thickness (0.8 mm) needed to be followed. Thus, the framework with correct shape and thickness that supported the veneering ceramic was designed with the CAD software (3Shape’s Dental System; 3Shape Inc.) (Fig. 3). In other words, the framework was designed from the mirror image of the maxillary left lateral incisor with digital wax cutback\(^{19,20}\). A retention pin was then attached to the palatal area of framework to improve fixation in the investment material during the press-on procedure and aid as a handling for further processing.

The morphological data of finished framework design data was transferred to a rapid manufacturing machine (EOSINT M 270 system; EOS GmbH Electro Optical Systems, München, Germany). The SLS Co-Cr framework was fabricated with SLS of Co-Cr power (EOS CobaltChrome SP2 power; EOS GmbH Electro Optical Systems) (Fig. 4). Marginal accuracy was evaluated on the die and the framework’s margin was reduced up to the inner edge of the shoulder preparation. Following the alloy surface treatment, opaque material (IPS InLine POM Opaquer; IvoclarVivadent, Schaan, Liechtenstein) was applied on the framework and fired.

The fired metal framework on the definitive cast was scanned by using the digital scanner. The complete-contour definitive restoration was designed from the virtual mirror image of the contralateral tooth in the previously described manner (Fig. 5). The finished design information of the definitive restoration was transferred to a
5-axis simultaneous milling machine (Zenotec; Wieland Dental, Pforzheim, Germany). The wax blank (Zenotec Wax; Wieland Dental) was milled into the complete-contour design of the definitive restoration. The milled wax pattern was placed on the framework and the entire margin was reflowed and refinished to create a well-adapted, 1-mm zone to prevent cement dissolution (Fig. 6).21

A sprue to the wax-metal complex and investing with fast setting investment material (IPS PressVEST Speed; IvoclarVivadent) was fabricated. After the burning-out at 850°C for an hour in a furnace (Burnout Furnace; JM-Tech Co., Seoul, Korea), the leucite-based ceramic ingot (IPS InLine POM Ingot; IvoclarVivadent) was heat pressed onto the framework in a pressing furnace (EP 600; IvoclarVivadent). Once the press program was completed, the hot investment ring was placed on the cooling grid and allowed to be cooled to room temperature. Divesting, sprue separating, and finishing were carried out. To enhance the individual characterization, stain material (IPS InLine System Stains; IvoclarVivadent) and glaze material (IPS e.max Ceram Glaze Paste; IvoclarVivadent) were applied and fired.

The occlusion was finally adjusted, and the definitive restoration was cemented with resin modified glass ionomer cement (Fuji-Cem; GC Co.) (Fig. 7). After 11-months follow-up, no complication was reported.

Discussion

As an integration of computer techniques
and production processes, CAD/CAM/SLS technologies save significant production time in the manufacture of precision-made products. Major changes also take place in dental laboratories as a result of new digital technologies.

With CAD/CAM technology, as Cho and Chang reported, efficient and precise reproduction of a maxillary incisor from the virtual mirror image of a contralateral tooth was possible. Recently, Bae et al. described the reconstruction of anterior guidance using duplication technique of CAD/CAM technology. In this case, the precise information of contour and dimension was transferred to the milling machine in the same manner. Thus, facilitation of patient’s adaptation to the new restoration was possible. Moreover, a complete-contour digital waxing and digital cutback reduced the fabrication time. In other words, manual waxing and cutback were not necessary and the optimal contour of the framework was achieved with less human error.

SLS technology is an additive manufacturing technique in rapid prototyping. SLS technology was also applied to simplify the laboratory procedure in this case because investing, casting, and divesting procedure for the framework were not required. Many authors reported that SLS Co-Cr alloy restoration exhibited a marginal and internal fit that was comparable to traditional casting way. The increased surface roughness of SLS Co-Cr alloy restoration resulted in more retentive restoration. SLS Co-Cr alloy also possessed improved mechanical properties and similar porcelain bond strength. In other words, no significant adhesion differences were observed between cast and SLS Co-Cr alloys. Moreover, the corrosion properties of SLS Co-Cr alloy met the needs of clinical applications and exceeded those of traditional cast Co-Cr alloy.

This technique overcame the limitations of the conventional fabrication method of the PTM with easiness, usability, expeditiousness, and less human error. However, the development of various ingots and layering technique is still necessary to achieve the superb esthetics outcome.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

References

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