

Case Report

Masking a Metal Cast Post and Core Using High Opacity e.max Ceramic Coping: A Case Report

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ABSTRACT

Rationale: Advancements in dental biomaterials have led to the introduction and application of ceramic-based restorations in dental practice. Currently, ceramic restorations are used in crowns and fixed partial dentures. The optical properties of ceramic restorations are comparable to natural teeth in terms of light scattering and transmission. However, the translucency of ceramic restorations could be a limitation if cemented over metal posts or severely discolored dentin. Therefore, accomplishing the maximum esthetic outcome mandates adequate management of severely discolored foundation. **Patient concerns:** The patient wanted to improve the esthetic of his anterior teeth. **Diagnosis:** This case report describes a clinical case in which the patient had defective restoration in his upper anterior teeth and base-metal cast post and core in his left lateral incisor (tooth #22). **Interventions:** Metal-free full crowns were used in the anterior zone of the maxilla with the help of e.max HO (high opacity) coping to mask the dark core buildup of the base-metal post and core on tooth #22. **Outcomes:** The color of the substrate was masked completely. The esthetic of the anterior teeth was improved and the patient was highly satisfied with the outcome. **Lessons:** e.max HO coping offers clinically acceptable masking ability.

KEYWORDS: All-ceramic restorations, lithium disilicate, masking, metal cast post

INTRODUCTION

In the recent years, esthetic restorative dentistry has become the center of attraction for both dentists and patients. The demand for nonmetallic, biocompatible, and highly esthetic restorations has increased notably.^[1] For this reason, the ultimate objective of esthetic restorative dentistry is to restore missing or mutilated teeth structures with highly compatible, esthetic, and functional restorations.^[1] Advancements in dental biomaterials have led to the introduction and application of ceramic-based restorations in dental practice.^[2] Smile makeover using indirect ceramic restorations is widely accepted because of its biocompatibility, high wear resistance, tooth-matching optical properties, tooth-simulated surface texture, and high translucency with excellent esthetic and mechanical properties.^[3]

Dentists frequently encounter mutilated dentations that require a post and core.^[4] Some cases require custom-made posts and cores particularly when gross tooth structure is lost as well as in teeth with wide canals or when a change in angulation is required for enhancing the esthetics by repositioning the restoration in the arch.^[5] Although metal-ceramic restorations can be used in these clinical cases, the metal substructure of these restorations prevents light transmission and achieving natural translucency with metal-ceramic restorations is difficult.^[6] Consequently, it is not recommended to use metal-ceramic restorations on anterior teeth.

A metal post and core is routinely used in dental practice. The translucency of ceramic restorations will

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1 affect the perceived color when these restorations are
 2 cemented over metallic core.^[7] Therefore, accomplishing
 3 the maximum esthetic outcome mandates adequate
 4 management of severely discolored foundations. This
 5 management could range from simple bleaching of
 6 discolored dentin to prosthetic alterations of the tooth
 7 and the indirect ceramic restorations.^[8]

8 There is considerable interest in glass-ceramic
 9 lithium disilicate-reinforced structures as IPS e.max
 10 restorations. This type is widely used because of its
 11 excellent esthetics and biocompatibility.^[9] It enhances
 12 biometric qualities such as enamel structure, longevity,
 13 mechanical strength, and chemical stability.^[9] It is
 14 available in a five degrees of both translucency and
 15 opacity. There are three levels of e.max translucency
 16 blocks including high, medium, and low translucency
 17 (HT, MT, and LT).^[10] By the same token, there are two
 18 levels of e.max opacity blocks known as medium opacity
 19 (MO) and high opacity (HO).^[10] The highest level of
 20 shade masking is associated with the HO ingot, which
 21 is available in three shades (HO 0–HO 2).^[10] These can
 22 be used as a framework on severely discolored teeth.^[10]
 23 Therefore, the objective of this study was to present a
 24 clinical case in which metal-free full crowns were used
 25 to reestablish the esthetic of the upper anterior teeth
 26 with the help of e.max HO coping on a base-metal cast
 27 post and core that offered clinically excellent masking
 28 ability.

30 **CASE HISTORY**

31 A 34-year-old male patient presented to the restorative
 32 department with a chief complaint of unpleasant
 33 esthetics and multiple defective composite restorations
 34 in the upper anterior teeth [Figure 1A and B]. The
 35 past dental history included recent trauma to the
 36 upper anterior teeth, defective anterior and posterior
 37 restorations, chipped central incisor, multiple root canal
 38 treatment, and base-metal cast post and core in his lateral
 39 incisor (tooth #22) covered by a temporary crown. The
 40 findings of the extra-oral examination were all within
 41 normal limits. Periodontal examination revealed good
 42 oral hygiene with no gingival inflammation or bleeding
 43 during probing. The patient’s medical, family, social,
 44 drug, and other related history were insignificant.

46 Preliminary impressions were made with an irreversible
 47 hydrocolloid (Jeltrate Plus, Dentsply, York, PA) from
 48 which diagnostic casts were obtained. The upper cast
 49 was used for a diagnostic wax-up [Figure 2]. Both
 50 casts were presented to the patient. The patient wanted
 51 a time efficient and most conservative treatment
 52 approach, and therefore a treatment plan of prosthetic
 53 rehabilitation of upper anterior teeth was discussed.
 54



30 **Figure 1:** (A) anterior view with unpleasant esthetics in the anterior
 31 zone of the maxilla and (B) intra oral view of maxillary dentition



46 **Figure 2:** Diagnostic wax-up—frontal view

48 The treatment consisted of crown preparation of the
 49 upper six anterior teeth followed with a fiber post and
 50 core fabrication when indicated. Finally, e.max (lithium
 51 disilicate) ceramic crowns for all upper anterior teeth
 52 (canine to canine). After the patient accepted the
 53 discussed treatment, a written informed consent was
 54

1 taken from him, and ethical approval for this study
 2 was obtained from the institute. After that, preparation
 3 and temporization of the upper six anterior teeth were
 4 carried out. The structure of the remaining teeth was
 5 assessed. Fiber posts and cores were done for teeth
 6 #13, 11, 21, and 23. All of these teeth received size 1
 7 tapered fiber post (RelyX Fiber Post, 3M ESPE, St.
 8 Paul, MN) and cemented with dual-cure self-adhesive
 9 resin cement (RelyX-unicem, 3M ESPE, St. Paul, MN).
 10 Tooth #22 previously had base-metal cast post and
 11 core over adequate root canal treatment. A putty index
 12 was prepared over the wax-up. The index was used to
 13 prepare the temporary crowns. Full crown preparation
 14 was carried out for all anterior teeth [Figure 3].
 15 Double retraction cords size 00 (Ultrapac, Ultradent,
 16 South Jordan, UT) impregnated in 25% aluminum
 17 chloride hemostatic agent were used to achieve blood-
 18 free atraumatic gingival retraction (Viscostat Clear
 19 Ultradent, South Jordan, UT). The stump shade for
 20 the natural teeth was determined to be ND2 [Figure 4].
 21 The final shade selection for the e.max crowns was
 22 conducted manually using Ivoclar Vivadent shade
 23 guide (Ivoclar Vivadent, Schaan, Liechtenstein) and
 24 selected to be A2 cervically and A1 incisally [Figure 5].
 25 After that, final impression was taken for the prepared
 26 upper teeth using multiple mix impression technique

1 with light and regular viscosity elastomeric impression
 2 materials (Hydrorise Light body and regular body,
 3 Zhermach SpA, Badia Polesine, Italy). The provisional
 4 restorations were formed using bis-acrylic-based
 5 composite resin material (shade A2; Protemp 4, 3M
 6 #SPE, St. Paul, MN) and cemented temporarily using
 7 eugenol-free temporary cement (Temp-Bond NE, Kerr
 8 S.R.I, Scafati, Italy) [Figure 6].

9 The presence of the base-metal core on tooth #22 was a
 10 challenging clinical situation to reestablish harmonious
 11 and esthetically pleasing e.max crowns on the upper
 12 six anterior teeth. Therefore, an HO coping was prescribed
 13 with a thickness of 1.2mm to mask the metallic shade of
 14 the underlying metal core. This HO coping was fabricated
 15 using the traditional “wax and press” technique. All of
 16 the upper anterior glass-ceramic crowns were then
 17 pressed using MT blocks (IPS e.max Lithium Disilicate;
 18 Ivoclar Vivadent, Schaan, Liechtenstein) with cutback
 19 to facilitate porcelain layering technique to maximize
 20 the esthetic outcome (IPS e.max Ceram; Ivoclar Vivadent,
 21 Schaan, Liechtenstein) [Figure 7A-C].

22 Try-in of the HO coping was done on tooth #22 to
 23 verify the coping seating on the prepped finish-line



Figure 3: Anterior view—teeth preparation



Figure 4: Anterior view—stump shade selection



Figure 5: Anterior view—shade selection



Figure 6: Anterior view with provisional crowns

and complete obscuring of the metal shade of the metal core. The e.max crown of tooth #22 was fitted over the HO coping to verify the complete seating of the e.max crown on the coping substructure. Then, all e.max crowns were fitted to verify proper seating and esthetic outcome. After patient approval of the esthetic outcome, all the surfaces of the HO coping and fitting surfaces of the e.max crowns were etched for 90s using hydrofluoric acid (Porcelain Etch, Ultradent, South Jordan, UT) then salinated for 60s (Monobond Plus,

Ivoclar Vivadent, Schaan, Liechtenstein). The HO coping was cemented on the tooth #22 using resin cement (Variolink Esthetic DC, Ivoclar Vivadent, Schaan, Liechtenstein). Light curing was done based on the manufacturer's instructions, and excess cement was removed [Figure 8]. As per the manufacturer's instructions, all-ceramic crowns were cemented with resin cement, light cured, and excess cement was removed [Figure 9]. Upon examination at two-week-follow-up, there was no evidence of metallic hue effect on the final e-max crown on tooth # 22. This confirmed that full masking had been achieved, and the patient was highly satisfied with the results [Figure 10].

DISCUSSION

The excellent properties of all-ceramic restorations have led dentists to shift from metal-ceramic to metal-free restorations. However, such restorations are difficult in cases with an underlying metallic core because of the unacceptable grayish hue seen under these restorations. Previous studies have found that the underlying tooth structure has a primary influence on the appearance of the ceramic restoration.^[11-13] Accordingly, a clinician should consider this issue when treating such cases. The final color of a ceramic restoration depends on a combination of different variables such as ceramic opacity degree, ceramic thickness, color of the underlying substrate, and the color of the cement.^[14] The color of the substrate has a primary influence on the final appearance of the ceramic restoration.^[11] On the contrary, the color of the cement has the least effect on the final shade of the definitive ceramic restoration.^[7]

The dental literature suggests different approaches to mask the color of the substrate including but not limited to increased thickness of the ceramic material,^[12] using opaque luting cement,^[14] using HO zirconia material, or using ceramic systems containing a ceramic substructure with shade-masking properties.^[13] Clinical situations of discolored teeth or dark-colored abutments can be masked with a ceramic layer that will enhance the outcome of the final restoration and give

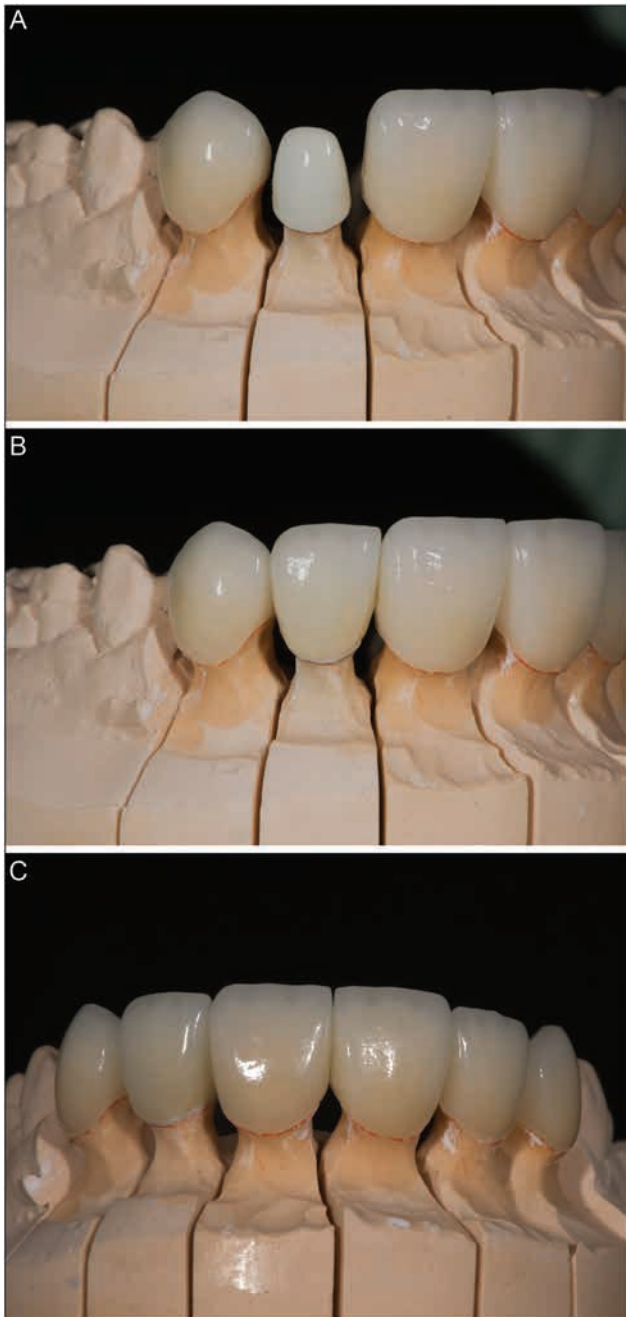


Figure 7: (A) e.max ceramic crowns and HO e.max coping, (B) and (C) all upper anterior e.max crowns



Figure 8: Anterior view with cemented coping on tooth #22



Figure 9: Anterior view with cemented e.max crowns



Figure 10: Anterior view, two-week post-operative photo

an excellent esthetic result.^[15] This can be achieved with either zirconia or e.max copings.

A recent study compared the masking ability between e.max HO and Lavaä Zirconia white coping in different thicknesses under a light dentin colored stump and a dark colored wax stump and found that opacity of e.max HO ingots is superior to that of Lava Zirconia in masking dark stump shade.^[16] The study suggested that 0.5–0.6 mm thickness of e.max HO coping is sufficient to effectively mask the underlying structure.^[16] This observation was confirmed by Zhou *et al.*,^[17] study, which evaluated the masking ability of IPS e.max all-ceramics system of HO series and found that ceramic disks of HO 1 e.max with a thickness of 0.4 mm were negatively affected by the dark background. Thus, this thickness could not produce a pleasing restoration outcome. The study results suggested a thickness of 0.6–1 mm to mask the dark color of metal substrate.

The stump shade is one of the most essential pieces of information that a clinician needs to pass on to the ceramist when working on any metal-free restoration. The ceramist will use this information to make a model die that is the same shade as the preparation and will confirm that there is no shade change or show-through the ceramic from the underlying tooth structure. These

can have a significant impact on the final outcome of the restoration.^[16]

Esthetic rehabilitation of upper anterior teeth is always considered to be a major challenge.^[1] The difficulty of each esthetic case is proportionally increased because multiple dental disciplines are involved in the management of a deteriorated smile.^[1] The treatment of the upper anterior teeth could be complicated by many factors. These factors include, but are not limited to, teeth shape and size discrepancy, old faulty restorations, teeth malalignment, and unaesthetic gingival contour.^[1] Therefore, a comprehensive and detailed treatment plan is crucial to identifying both esthetic and functional treatment needs. The use of a diagnostic wax-up, detailed facial and dental esthetic analyses, and proficient communication with the lab technician are required to achieve the most predictable esthetic outcomes.^[18]

CONCLUSION

The final esthetic outcome of all-ceramic restorations is influenced by the underlying shade of the abutment. Hence, managing cases with a metallic core using all-ceramic restorations represents a major challenge. This case report shows the clinical procedures of using HO e.max coping to mask the metallic core material to improve the final esthetic outcome and to achieve a pleasant smile for the patient.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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