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Rejuvenating aesthetics by mixing different ceramic stains

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Abstract
The replacement of natural teeth, especially with single- tooth porcelain bonded to metal restorations of truly satisfactory esthetics, represents a challenge. Insertion of porcelain bonded to metal restoration that not only possesses superior adaptation and compatible occlusion but also excels esthetically, is the most satisfying events in prosthetic dentistry. Replication of natural tooth color and shade using stains is a creative approach that helps concealing the color and opacity that result from metal framework. The use of stains is a method that expands the potential of fabricating a restoration with more natural color and shade, which blends with natural dentition.

Keywords: color, esthetics, restoration, shade

Introduction
Esthetics 'the theory and philosophy that deal with beauty and the beautiful, especially with respect to the dental restoration, as achieved through its form and colour'. - GPT9 [1]. But Achieving symmetry of shape, colour, value, texture and translucency can be a challenging task [2]. The metal ceramic crown is one of the most popular restorations since it combines good esthetics with adequate strength, accurate fit, and long-term survival [3]. Esthetic problems with this type of restoration are related to the opaque porcelain layer used to mask the dark colour and opacity of the underlying metal framework [4]. Proper soft tissue control, tooth preparation, good understanding of materials and their application and clear communication with a skilled ceramist are necessary to achieve a predictable esthetic outcome. Yet with meticulous design, and exacting fabrication procedures with use of different stains, optimal aesthetics can be achieved with a PFM crown.

Case Report
A 21-year old male reported to the Department of Prosthodontics with complaint of protruded central incisors and discolouration (Fig 1). On further inception no major systemic diseases or drug allergies were reported. The dental history revealed that the patient got his maxillary right and left central incisor fractured ten years back which were endodontically treated. An IOPA x-ray of maxillary central incisors reveals no periapical radiolucency in relation to any of the teeth. Clinical examination showed the deposition of plaque and staining of teeth. During the treatment planning session, the patient was given the option of either orthodontic treatment, as to correct the spacing between his maxillary anterior teeth, or endodontic treatment of anterior teeth followed by metal-ceramic restorations. Since the patient did not have any objection about the spacing between his anterior and wanted to maintain the natural spaces, he opted for metal-ceramic restorations. The occlusion was analysed preoperatively, both clinically and with the aid of mounted models on a semi-adjustable articulator. A diagnostic wax-up was completed and then modified at the chair side. This was presented to the patient to assist in determining the course of treatment. The teeth were prepared by using modified shoulder diamond burs (coarse and superfine). Gingival retraction was done by placing a small impregnated retraction cord (Ultrapack#00, Ultra dent) which was impregnated with a haemostatic solution (Hemodent, Ultradent). The final maxillary arch impression was made with a combination of heavy and light viscosity polyvinyl siloxane. An impression of the opposing arch was also made with irreversible hydrocolloid (Jeltrate, Dentsply/Caulk).The Shade was determined with a shade guide (Vitapan 3D Master Vita Bad Sacking, Germany).The patient was given provisional restorations which were made from polymethyl methacrylate material and was cemented with non-eugenol temporary cement.

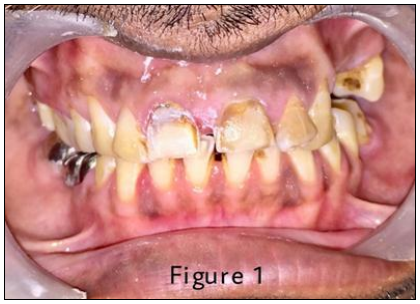

Fig 1: Protruded central incisors with discolouration

Laboratory Procedure
A detailed prescription was sent to the laboratory with maxillary and mandibular full-arch polyvinyl siloxane impressions, centric bite registration record, tooth shade

selection and a detailed diagram of the teeth to be matched included dental characteristics such as enamel translucency patterns, locations of high Chroma, stains, hypo calcification patterns, craze lines, or stained cracks that were to be reproduced in the restoration (Fig 2). Different shades and combinations of shades which were used are given in Table 1. The body colour or general colour of the tooth itself is the main guide.

Table 1(a): Stains used on 2/3rd of the crown surface –

Company Name	Stain	Quantity
Ceramico 3	Yellow	45%
Ceramico 3	Black	5%
Ceramico 3	Ochre	45%
Ceramico 3	White	2%
Ceramico 3	Opaque modifier tan	3%

Table 1(b): Stains used on 1/3rd of the crown surface

Company Name	Stain	Quantity
Ceramico 3	Yellow	40%
Ceramico 3	Black	10%
Ceramico 3	Opaque modifier ochre	5%
Ceramico 3	Ochre	45%

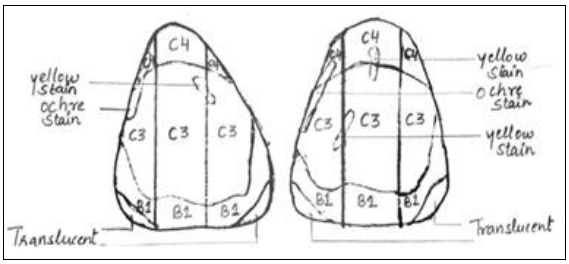

Fig 2: detailed diagram of the teeth

A small portion of each stain is placed on the glass slab along with a drop of the glaze liquid. The colours are blended and painted directly on the crown. When the colour of the stain has been satisfactorily selected, it may be necessary to proceed similarly with stains used in incisal coloring (Fig 3). Finally, individual variations such as mottling, hairline checks, or gingival discolorations is completed and final restoration was cemented (Fig 4).

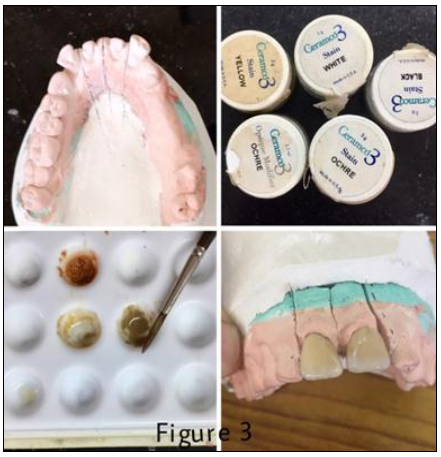

Fig 3: Selection and blending of stains

Fig 4: Final restoration cemented

Discussion

Selecting the proper shade and the colour matching ceramic restoration to natural dentition continues to be one of the most perplexing and frustrating problems in fixed prosthodontics [5]. Rarely will a shade guide tab be found to match the natural teeth without a modification of the ceramic restoration with mineral porcelain color modifiers or stains [6]. While current trends in research and development show a preference for all-ceramic restorations because of their inherent esthetic advantages, metal-ceramic restoration remains the Gold Standard of predictability [7]. Monochromatic restorations machined from ceramic blocks have been scrutinized for their lack of individual characterization. Although customized characterizing of these restorations was shown to compete esthetically with layering techniques [8].

The clinical shortcomings of ceramic materials, however, such as brittleness, crack propagation, low tensile strength, wear resistance, and marginal accuracy, continued to limit their use [9]. Enamel may be subject to accelerated wear when opposed by ceramic [10]. Placement is contraindicated when there is reduced intero occlusal distance, as with short clinical crowns, deep vertical overlap anteriorly without horizontal overlap, or an opposing supraerupted tooth, as well as for cantilevers, periodontally involved abutment teeth, and patients with severe bruxism or parafunctional activity [11].

Metal-ceramic restorations combines the accuracy and strength of cast metal with the esthetics of porcelain [4]. The combination of predictable strength and reasonable esthetics has continued to make traditional metal-ceramic restorations popular [12]. Stains may be used on porcelain to modify a shade which does not exactly blend with the other teeth or to add characteristic details such as mottling, cracks, gingival staining, or other striking details of colour [13]. This approach enhances the dentist-ceramist team's ability to esthetically match metal-ceramic restorations to the natural dentition [14].

Staining is not a solution to all problems involved in attaining natural shading. Knowledge of the potential and limitations of surface staining provides a valuable tool for the dentist and ceramist [15]. The colour of the teeth to be matched must be carefully observed in good light. Diagrams and diagnostic casts must be available at the time the porcelain is baked. One or more trial baking procedures may be necessary to arrive at a satisfactory formula for the required color. When shade or

colour distribution is in question, glazing should be deferred until the crown has been observed in the patient's mouth. Knowledge of the potential and limitations of surface staining provides a valuable tool for the dentist and ceramist.

Conclusion

Metal ceramics are still used extensively, primarily due to their superior physical properties and acceptable esthetics. Esthetic porcelain-fused-to-metal restorations are dependent upon sound tooth preparation, careful colour selection, and proper manipulation of materials. Discrepancies in colour of porcelain fused to metal do occur. However, the use of stains can eliminate many of these deficiencies.

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