



RESEARCH ARTICLE

SCALPEL DEPIGMENTATION AND CROWN LENGTHENING TO IMPROVE ANTERIOR ESTHETICS WITH ZIRCONIA CROWN: A CASE REPORT

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ABSTRACT

Smile is the first contact in human relationship. With the trend of “media smile” in our society today, esthetic concerns of patients are increasing. To achieve excellence in the delivery of dental care, dentists rely on the vast array of modern advances in dental materials and restoration fabrication technologies. Recent advances in technology and dental materials have prompted the use of all-ceramic crowns which offers the potential for improved aesthetic results compared to conventional ceramo-metal crowns. However, they are mechanically weaker, therefore, to overcome such shortcomings, newer ceramic materials like Zirconia have been established during past few years which have better mechanical and optical properties. This case report summarizes the scalpel depigmentation and crown lengthening followed by Zirconia crown for achieving the best possible esthetics.

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INTRODUCTION

The rehabilitation of an unaesthetic smile in the anterior maxilla is always a clinical challenge (Anissa *et al.*, 2016). Over the past two decades, dentistry has seen the development of many new tooth colored restorative systems. The drive for such materials and restorative techniques has been precipitated by increased patient expectations for esthetics and also by concerns about the biocompatibility of metals intraorally (Divia, 2016).

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Badly mutilated teeth or the grossly decayed teeth often pose problems to the restorative dentists during their treatment due to unavailability of sufficient clinical crowns. Hence, a crown lengthening procedure prior to restorative treatment is mandatory during management of such teeth. Clinical crown lengthening refers to procedures designed to increase the extent of supragingival tooth structure for restorative or esthetic purposes (Gupta *et al.*, 2015). The concept of crown lengthening was first introduced by D.W. Cohen in 1962 which states that the remaining tooth structure must be enough with a stable dentogingival complex and biological width to permit proper tooth preparation and account for an adequate

marginal placement, thus ensuring a good marginal seal with retention for both provisional and final restorations (Ingber, 1977). The color of healthy gingiva is variable ranging from a pale pink to a deep bluish purple hue (Chatterjee *et al.*, 2015). Between these limits of normalcy are a large number of pigmentation mosaics which depend primarily upon the intensity of melanogenesis, depth of epithelial cornification and arrangement of gingival vascularity. Moreover, color variation may not be uniform and may exist as unilateral, bilateral mottled, macular or blotched and may involve gingival papillae alone or extend throughout the gingiva on to other soft tissues (Dummet, 1971). Zirconia, the crystalline dioxide of zirconium was identified by German chemist 'Martin Heinrich Klaproth' in 1789. It has properties same as that of metals and has near comparable color as that of the tooth. By virtue of its superior mechanical properties, zirconia has been called as 'ceramic steel' as its mechanical properties are same as that of stainless steel (Somaraj, 2016). Zirconia is a wonderful conservative modality for creating and restoring esthetics in the human dentition. The beauty of the zirconia is unsurpassed because of the natural light transmission that occurs through the coping and ultimately through the tooth. It is color stable, strong and has the capacity to last for many years. Thus, this case report presents improvement in esthetics by scalpel depigmentation and crown lengthening procedure followed by zirconia crown.

MATERIALS AND METHODS

A 36 year old male came to the Department of Conservative Dentistry and Endodontics, Genesis Institute of Dental Sciences and Research, Ferozepur, India for an esthetic consultation. The patient was not pleased with his smile and did not feel comfortable while attending social gatherings. He was dissatisfied with the color of his right maxillary central incisor. Patient gave past dental history of root canal treatment and surgical procedure of the same tooth. After clinical examination, it was found that tooth 11 had gingival discoloration (Fig No. 1). However, tooth 11 was asymptomatic and radiographic examination of tooth 11 showed well condensed obturation with no significant periapical radiolucency (Fig No. 2).



Fig No. 1 Pre-op picture showing gingival discoloration and PFM crown in relation to 11



Fig No. 2. Pre-op picture showing complete root canal treatment in relation to 11

Another observation was the discrepancy in the gingival zenith level of 11, mismatched color of PFM crown along with gingival discoloration at the cervical margins in relation to 11. After removal of PFM crown, depigmentation of gingiva and a crown-lengthening procedure was carried out in the Department of Periodontology and Implantology of our institute using the tissue recontouring system to expose 4 mm of the tooth structure and to have the crown ferrule effect for better retention (Fig No. 3 & 4 a and b).



Fig No. 3 Depigmentation in relation to 11

At the end of 1 month, when complete healing was observed, tooth preparation was modified (Fig No.5) and shade selection was done using 3-D Shade Guide (Lava™ Plus High) (Fig No.6). Impression was made using putty wash technique with condensation silicone (3M ESPE) material (Fig No. 7). Temporary crown was given to the patient (Fig No. 8). After 1 week, temporary crown was removed and zirconia crown was cemented in relation to 11 using dual cure resin (Bifix SE) cement (Fig No. 9). Final results were satisfactory and the patient was quite satisfied with the appearance.



Fig No. 4 a) Crown lengthening procedure with Cautery in relation to 11



Fig No. 7. Impression made using Putty Wash technique



Fig No. 4 b) Crown lengthening done in relation to 11



Fig No. 8 Temporary crown in relation to 11



Fig No. 5 Tooth Preparation done in relation to 11



Fig No. 9 Zirconia Crown cemented in relation to 11



Fig No. 6 Shade selection done using 3-D Shade Guide

DISCUSSION

Oral pigmentation is a relatively common condition that may involve any portion of the oral cavity. Pigmented entities may arise from intrinsic and extrinsic sources. The color may range from light brown to blue-black. There are four different types of oral pigmentation: oral pigmentation due to intrinsic processes, oral pigmentation due to extrinsic processes, oral pigmentation due to hyperplastic or neoplastic processes and iatrogenic oral pigmentation (Najjar *et al.*, 2016). Pathological melanin hyper pigmentation can cause significant esthetic concerns for the patients. In this clinical report, gingival pigmentation adjacent to the Nickel-Chromium (Ni-Cr) based metal ceramic crowns has been observed. It has been reported that metal ions such as Ni^{3+} and Cr^{3+} released from cast alloys can alter gingival fibroblast behavior, including

proliferation and metabolism, and enhance the level of inflammatory mediators such as Interleukin 6 (IL-6), IL-1b, and tumor necrosis factor-alpha (TNF-a) (Tian et al, 2016). Gingival depigmentation with a conventional scalpel technique is a periodontal surgical procedure done with no. 15 surgical blade. In this procedure, the gingival epithelium with a layer of connective tissue beneath it is removed. This procedure is simple, effective and one of the most cost effective treatment (Hosadurga et al., 2017). Crown Lengthening is a surgical procedure that requires exposure of adequate tooth structure for restorative procedures (Gupta et al., 2015). The goal of crown lengthening is to provide the clinician with sufficient tooth structure to permit optimum restoration of a tooth with crown. The indications of surgical crown lengthening are subgingival caries, subgingival fracture, teeth shortened by extensive caries or fracture, naturally short clinical crown due to non exposure of anatomic crown. A minimum of 3 mm distance, should exist between the restorative margin and the alveolar bone, allowing for 2 mm of biologic width space (attachment epithelium and connective tissue above crestal bone) and 1 mm for sulcus depth. Zirconia has become a reality in dental practice that demonstrates improved physical and mechanical properties like high strength, adequate fracture toughness, biocompatibility and esthetics outcome. Various studies have shown promising clinical results in restoring anterior teeth with zirconia crowns. CAD/CAM technology in the manufacture of Zirconia has become a reality in dental practice as it shows the accuracy of marginal fit by scanning systems (Anissa et al., 2016). Edelhoff D and Brix O (2011) reported improved functional and esthetic results with all-ceramic restorations even in severely discolored teeth (Somaraj, 2016). Following a 3 year follow-up prospective clinical trial by Schmitt J et al. (2010) who evaluated 19 single unit zirconia crown restorations in relation to anterior maxillary region among ten patients, reported 100% survival and success rate (Somaraj, 2016). Nam J and Tokutomi H (2015) reported a similar successful full mouth rehabilitation treatment in terms of esthetics, functionality and biomechanics for a worn dentition (Somaraj, 2016).

The zirconia material typically used today by most manufacturers is a tetragonal polycrystalline zirconia, partially stabilized with yttrium oxide (Divia, 2016). Zirconium dioxide appears as a monoclinic, cubic or tetragonal polymorph. At room temperature only the monoclinic ZrO₂ exists. This phase is stable up to 1170°C when it inverts to a tetragonal, metastable phase, whereas above 2370°C it turns into a cubic. It has high flexural strength of more than 1000 MPa, hardness of 1200–1400 VHN (Shori et al., 2015). During the manufacturing process, a stabilising agent, yttrium oxide (Y₂O₃) is added to zirconium oxide and the resultant Y-TZP exhibits excellent material properties for clinical application by, resisting fracture by a process termed ‘transformation toughening’, whereby any stress fractures created within the material cause a transformation of configuration of the zirconia to another one of its three forms, thereby minimising crack propagation (Barnfather, 2007).

Zirconia based ceramic restorations are widely used for anterior teeth. Tooth reduction is less than that for PFM crowns because zirconia is very strong (>1000 MPa) and no opaque layer is required. Even after long clinical service, tooth-colored zirconia margins stay unremarkable. This makes it easy to maintain optimal gingival esthetics (Divia, 2016).

Conclusion

Esthetic demand of patients is widely increasing mainly in case of esthetically compromised anterior maxillary teeth. Completion of this aesthetic dilemma with a quick restorative solution satisfied the patient’s demands of esthetic smile. By performing crown lengthening and depigmentation procedures followed by zirconia crown, a substantial improvement was achieved quickly both from functional and esthetic point of view. Zirconia crowns are reliable suggestive alternatives to metal based restorations due to its superior mechanical and biological properties. Thus, it is recommended as a perfect treatment option for patient seeking esthetic enhancement.

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