

A case report on esthetic rehabilitation of anterior teeth using computer aided design-computer aided manufacturing – A modified approach

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Abstract

This clinical report describes planning, designing and fabrication of a crown and bridge prosthesis in esthetic zone using computer-aided design/computer-aided manufacturing system. Complete procedure involves preparation of study cast, treatment planning according to patient need followed by preparation of teeth and fabrication of prosthesis. Functional and esthetic requirement of patient was accomplished.

Key words: CAD- Computer aided design, CAM- Computer aided manufacturing, PVS- Poly vinyl siloxane impression material.

Introduction

Due to increase in patient's expectation of cosmetic has led to evolution of aesthetic dentistry. In recent and modern society, dental health considered not only as functional; but also, as an important factor in terms of aesthetics. Major factors that are required for the longevity of aesthetic dental restoration is selection of durable material, tooth preparation, cementation, and techniques involved in the fabrication of prosthesis. Patient's knowledge of oral hygiene and maintenance is equally important for the success of the treatment.

Metal-supported ceramic systems have proven their success in crown and bridge restorations¹. However, insufficiency in biocompatibility and optical properties of metal-supported ceramics^{2,3} lead to the emergence of dental ceramics, while increase in aesthetic expectations has made all ceramics a highly preferred material in dentistry. CAD (Computer Aided Design) and CAM (Computer Aided Manufacturing) technology is used for fabrication of restorations from ceramic blocks. In dentistry CAD/CAM system can be chairside or laboratory comprises of a scanner, software to process the scanned data and a manufacturing system that converts the data into actual restorations, dentures, or appliances. Inlay, onlays, porcelain laminate and veneer, fixed prosthesis is also been fabricated using CAD- CAM. This article presents anterior aesthetic rehabilitation using all ceramic restoration fabricated by CAD-CAM technology.

Case report

A 23 year old male patient reported to Department of Prosthodontics and crown and bridge with the chief complaint of missing anterior teeth because of orthodontic extraction. Patient gave a dental history of impacted teeth which were extruded using orthodontic treatment but due to infection, teeth were extracted. Patient had an expectation of replacement of missing teeth and correction of smile.

On Intraoral Examination, missing 11, 12, 13 and reduced ridge height and width related to 11,12, 13 (*fig.1*). During the first appointment diagnostic impression was made using irreversible hydrocolloid and dental stone cast was prepared and was used for different treatment options like Implant supported prosthesis, All ceramic and Porcelain fused to ceramic restoration. Patient did not choose Implant supported restoration because of economic condition and was not willing to undergo any surgical procedure. So, with patient consent All Ceramic restoration using CAD-CAM treatment was planned.



fig.1 – Pretreatment.

In the second appointment tooth preparation and gingival retraction of 000 gingival retraction cord was done based on gingival biotype with respect to 21,22,14 and 15 (fig.2) followed by impression using Polyvinyl siloxane impression material (Aquasil, Dentsply) (fig.3) and was poured in Type IV dental stone (Kalabhai Kalroch diestone) and cast was obtained.



fig.2 – Tooth preparation and gingival retraction.



fig.3 – Impression of maxillary arch using PVS impression material.

Temporization was done using (Luxatemp) temporary material which was luted with zinc phosphate cement (fig.4).



fig.4 – Temporization.

Final cast was sent to the laboratory for the fabrication of zirconia prosthesis using CAD-CAM (fig.5).



fig.5 – Prosthesis fabricated using CAD-CAM.

In the next appointment final CAD- CAM prosthesis was luted using resin cement (3m EspeRelyx luting) (fig.6).



fig.6 - Cementation of final prosthesis.

Discussion

Digitization has captured the world with its wide ranging applications. In present scenario no field remains aloof anything and everything is just a click away⁵.

Before advances in physical properties of dental ceramics and resin adhesion to enamel and dentin, metal-ceramic crowns were the best option to aesthetic restorations⁴.

Use of all-ceramic crowns obtained by CAD/CAM systems been increased⁴. The future of dental practice is closely linked to the utilization of computer-based technology and virtual reality, which allows the dental surgeon to simulate true life situations in patients. CAD/CAM systems have three functional components: data capture unit or scanner, CAD to design the restoration and CAM to fabricate the restoration. Hence, resulting in high quality metal free dental prosthesis. Advances in digital imaging, computer aided design, internet communication, digital manufacturing and new materials have undoubtedly simplified the diagnostic process and improved treatment outcomes⁵.

On contrary to metal ceramic restoration, non-metallic restorative materials are widely used because of optimal aesthetics, biocompatibility, color stability, high wear resistance, and low thermal conductivity⁶. Elaborating the complete biocompatibility of this material is non allergic as patients with porcelain fused to ceramic prosthesis suffer from allergic reaction because of high content of nickel in metal copings. All ceramic material with respect to firmness is 4 times higher than the metal used for metal-ceramic works. Even after prolonged use of the former material does not show any physical and chemical changes in their properties. In addition to excellent biocompatibility, all ceramic restoration possess unique esthetic properties with beneficial effects on the gums when in close approximation with the restoration. All ceramic restoration mask dark discoloration of the "gingiva" at the junction of crown and gums which is evident in metal ceramic restorations. To add, treatment completed in a short time, less materials being used, and the ease of production make CAD/CAM system the preferred modality of all-ceramic restorations⁷.

Conclusion

This case report illustrate multiple challenges of compromised width and height of maxillary anterior teeth and successfully restoring with all ceramic prosthesis; the prosthesis consisted of Yttrium-stabilized zirconium dioxide coping^{8,9} fabricated using CAD-CAM technology.

During every stage of treatment dentist should choose or eliminate and consider the most appropriate material and technology to increase the success rate and patient satisfaction.

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