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Core Build Up and Layered Zirconia Restoration on Fractured Central Incisor – A Case Report

[1]Dr Babita Yeshwante, [2]Dr Preeti Patni, [3]Dr Nazish Baig, [4]Dr Vivek Jadhav, [5]Dr Ruchi Kasat

CSMSS Dental College & Hospital, Kanchanwadi,Paithan Road, Aurangabad, Maharashtra-431011

Corresponding Author: Dr Preeti Patni, CSMSS Dental College & Hospital, Kanchanwadi,Paithan Road, Aurangabad, Maharashtra-431011

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Abstract

Objective: Esthetics is of prime importance in today's world. Having a perfect smile makes your face look more pleasing. The objective of this case report is to restore the discoloured fractured anterior teeth with tooth coloured all ceramic crown to enhance the beauty of the individual. clinical consideration – The fractured discoloured crown with insufficient height for all ceramic restoration, can be restored with core build-up and then all ceramic crown.

Conclusion: This case report summarises the use of composite material as a core build-up material and zirconia crown for achieving best possible esthetic rehabilitation of fractured left central incisor.

Key words: Core Build-Up, Zirconia Crown, Fractured Central Incisor, Esthetics, composite

Introduction

In modern era esthetics has become the prime importance. The pleasing smile improves the personality of the individuals. People have become more conscious about their looks. Earlier porcelain fused to metal crowns (PFMC) were popular in esthetic region. Recently all ceramic crowns have become more popular. Amongst clinicians, zirconia crowns have become more popular. They are a good choice for gingiva and do not produce black lines at gingival margin like in PFMC. They are more esthetic, good functional qualities, esthetically pleasing and long lasting. Zirconia are basically of two types; one is monolithic zirconia and the other one is layered zirconia. Monolithic zirconia has more flexural strength (380 – 1,000 MPA) than layered zirconia. Therefore, they are used in posterior region, where function is more important than esthetics. The flexural strength of layered zirconia is 90 – 140 MPA. The layering porcelain is the weakest link in layered zirconia. Porcelain contains colour and optical properties closely resembling dentin and enamel of the teeth. The only disadvantage of monolithic zirconia is esthetic outcomes.

The fractured crown with insufficient crown height for retention of the all ceramic restoration (zirconia crown),

does not need to be extracted or need post. They can be restored by core build-up and then restoration with all ceramic crown. The core build-up material can be composite resin.

Case report

A 28-year-old female patient reported to the department of Prosthodontics and Crown and Bridge. Her chief complaint was broken front teeth. Intraoral examination revelled Ellis class III fracture and discoloured left central incisor (21). Fractured tooth was non vital and rest all teeth were vital. No medical history was present. History of trauma, due to accident 10 years ago. Dental history revealed RCT (root canal treatment) done 10 years ago and no prosthesis since then. Figure 1 represents preoperative view.

Figure 1: preoperative view

Figure 2: intraoral view

After the clinical examination (figure 2), diagnostic impression was taken and poured in class IV stone to fabricate study casts. Facebow was recorded (figure 3) and maxillary and mandibular casts were mounted on semi adjustable articulator. (figure 4) Mock-up was done to evaluate the final treatment outcome and was showed to the patient. (figure 5) On approval of the patient, we proceeded with further steps. As the height of the teeth was compromised due to extent of the fracture till middle third of the tooth, the crown structure left was insufficient for retention of the crown. Therefore, composite core build-up of the tooth was done. (figure 6).

Figure 3: facebow record

Figure 4: Ready for mounting

Figure 5: Mock-up

Figure 6: composite core build-up

The tooth was cleaned with water. Then it was dried with cotton. 37 percent phosphoric acid was applied for 20 seconds. Then the tooth was thoroughly washed with water for 10 seconds and air dried. Then the bonding agent was applied and it was light cured for 20 seconds. Then the composite was applied in small layers and light cured. Application of composite in small increments reduces polymerization shrinkage. It also helps in complete polymerization in deeper areas, and to produce a void-free restoration through better adaptation between the composite layers and the cavity walls. Like this the composite core build up of the tooth was done.

The tooth was then prepared with 1.2 – 1.5 mm axial reduction and 1.5 – 2 mm incisal reduction and 6 – 15-degree taper. Occlusal reduction was checked with fleximeter strip. All the line and point angles were rounded off. A chamfer finish line was prepared circumferentially. Retraction cord of size # 00 was placed in the gingiva to record finish line properly in the final impression. (figure 7) Final impression was made using C-silicon impression material with double stage impression technique. (figure 8) Shade matching was done with VITA shade guide. (figure 9) The cast was poured in type IV stone. Provisional crown was fabricated using autopolymerising acrylic resin. Cementation of provisional crown was done with templute (temporary luting cement). (figure 10) The stone cast was scanned in CAD CAM Scanner (Amann Girrbach Ceramill Map Scanner). The restoration was designed in CAD software (Amann Girrbach CAD Ceramill mind software) and milled in CAM unit (Amann Girrbach CAD Ceramill Matrix unit). (figure 11)

Figure 7: Gingival retraction

Figure 8: Final impression

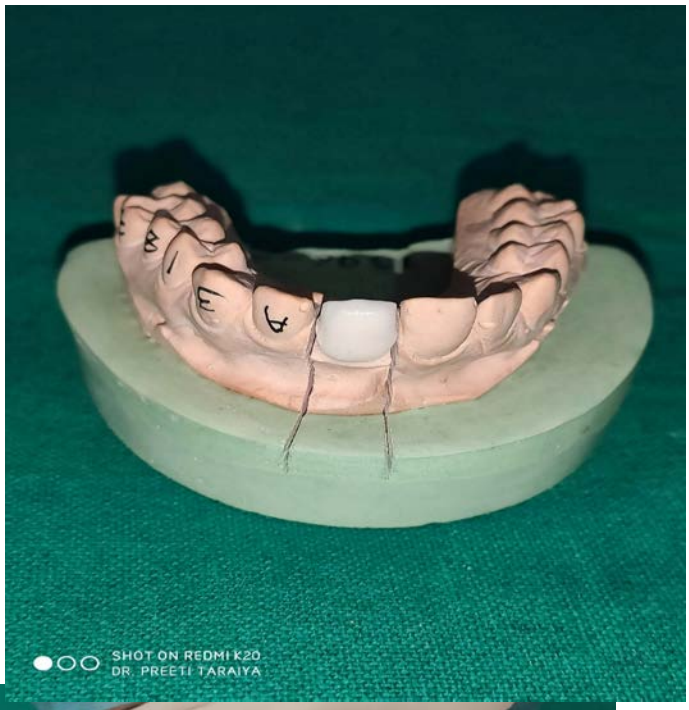

Figure 11: zirconia coping ready for try in

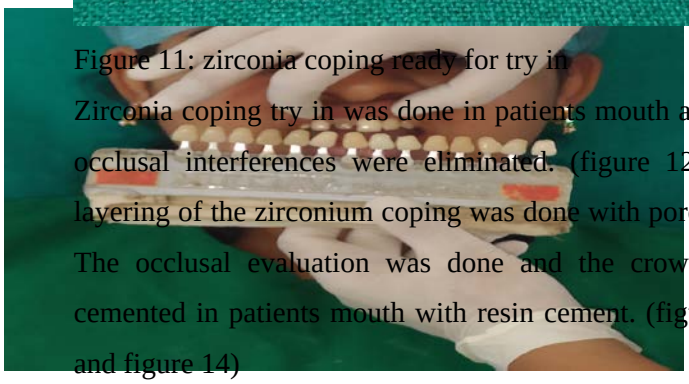

Figure 9: Shade Matching

Zirconia coping try in was done in patients mouth and the occlusal interferences were eliminated. (figure 12) The layering of the zirconium coping was done with porcelain. The occlusal evaluation was done and the crown was cemented in patients mouth with resin cement. (figure 13 and figure 14)

Figure 10: Provitional Restoration

Figure 12: Zirconia Coping Try- in

Figure 13: Final Restoration

Figure 14: Satisfied Patient

Discussion

Dr fahl said that monolithic zirconium can be used in posterior restoration of teeth where occlusion is prime concern and in bruxers in anterior esthetic zone. He said that layered zirconium can be used in anterior esthetic region as porcelain layering can provide good natural looking teeth. He even said that principal difference in layered all-ceramic restorations lies in the ceramic used for the coping, which include zirconia, alumina, and lithium disilicate. [1]

Christel Larsson, Ann Wennerberg in their review article, which is based on relatively small number of studies concluded that the success rate of tooth-supported and implant-supported zirconia-based crowns is adequate, similar, and comparable to that of conventional porcelain-fused-to-metal crowns. [1]

Futoshi komine reviewed the literature on the bond strength between layering materials and zirconia frameworks used in dental restorations. The main problem with layered zirconium crowns is chipping and fracture of layered porcelain from the zirconia based restoration. Various approaches to obtain the stable bond strengths are currently being developed. In addition, the development and testing of new materials and techniques are required to minimize chipping and fracturing of layering porcelain. [1]

Shruti investigate the mechanical behaviour with respect to different designs of zirconia-ceramic veneer interface using three-dimensional finite element analysis. Design I- full ceramic veneer, Design II- ceramic veneer on buccal surface extending upto occlusal surface, Design III ceramic veneer on buccal surface only. The study concluded that Design III has the least chances of chipping of ceramic layer under masticatory loads. Design II is more prone to chipping of ceramic layer under masticatory loads. Design I may show chipping under high occlusal loads. [1]

Aous A. Abdulmajeed in his study concluded that Layered zirconia restorations displayed relatively low fracture rates in the relatively short term of 5 years. Layered zirconia restorations displayed relatively low fracture rates in the relatively short term of 5 years. Layered zirconia restorations displayed relatively low fracture rates in the relatively short term of 5 years.

Aous A. Abdulmajeed concluded that Layered zirconia restorations displayed relatively low fracture rates in the relatively short term of 5 years. [1]

Girish Kumar in his study stated that visible light cured composite showed relatively high compressive strength, diametral tensile strength, and flexural strength compared with the other tested materials. [1]

Conclusion

This case report provides the through knowledge on restoration of anterior fractured discoloured teeth. Conservation of the remaining structure is the most important rule in dentistry. After the root canal treatment and composite build-up of the fractured tooth, it successfully restored. As the patient was more concerned with esthetics, all ceramic restoration (layered zirconia) was given the treatment of choice.

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