Fixed removable prosthesis employing Marburg double crown system

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The ultimate objective of the fabrication of a partial prosthetic appliance is the preservation of the remaining teeth while lost function is being restored. Double crown is an effective type of retainer that provides retention, support and a splinting action between multiple abutment teeth. Double crowns with clearance fit are used to retain tooth-mucosa and implant-supported removable partial dentures (RPDs). Retention is achieved by either functional molded borders or additional attachment. The double crown system retains dentures more effectively than do conventional clasp-retained RPDs, and also shows more favorable transmission of occlusal loading to the long axis of the abutment teeth. This case report will highlight the use of Marburg double crown system in the treatment of partially edentulous patients.

Key words: Fixed removable prosthesis, Marburg double crown, telescopic crowns

INTRODUCTION

The concept of connecting removable partial denture (RPD) with the remaining teeth has long been applied to influence the clinical longevity of prosthesis. The factors that influence such a concept are number, alignment and periodontal status of the remaining teeth, and esthetic demands and financial limitation of the patient. It is essential to optimize the distribution of functional load between the abutment and the edentulous ridge. This helps in the protection and preservation of the supporting tissues.[1,2]

Telescopic or double crown system is an effective means of retaining RPDs. It transfers the force along the long axis of the abutment teeth and provides guidance, support, stability and protection from movements that might dislodge the denture.[3-6] The double crown system retains denture more effectively than the conventional clasp-retained RPDs and shows more favorable transmission of occlusal loading to the long axis of the abutment teeth. The double crown retainer is composed of inner sleeve coping and an outer telescope or secondary crown. The force transmitted from the soft-tissue-supported portion of the prosthesis to the abutment tooth is generally through the long axis of the root, because the secondary crown has a circumferential relationship to its abutment tooth. This has the most favorable effect on the attachment apparatus, creating maximum area of tension with minimum amount of compression in the periodontal space.

In general, there are three types of double crown system based on their different retention mechanisms.[1,2,6,7]

1. Double crowns with parallel milled surfaces - retention by friction.
2. Double crowns with conical inner crown - retention by 'wedging effect'. The magnitude of wedging is mainly determined by the convergence angle of the inner crown; smaller the convergence angle, greater the retention.
3. Double crown with clearance fit (also called hybrid telescope or hybrid double crown) - retention by using additional attachment or functional molded borders. Marburg double crown system is a clearance fit system that helps in full arch reconstruction. In this system, the apical one-third of the inner crown is parallel to the outer crown. The outer crown is part of the cast framework of the RPD and fits precisely onto the inner crown without any friction or wedging.

This clinical report illustrates the use of double crown system with clearance fit for fabricating a fixed-removable type of prosthesis.

CASE REPORT

A moderately built, 68-year-old male patient came to the Department of Prosthodontics for the rehabilitation

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of his teeth. The patient gave a history of cervical spondylitis since 20 years. He suffered from partial paralysis due to stroke 6 years back. He is a known hypertensive, under medication since 10 years and was on anticoagulant therapy. He gave a history of smoking 5-6 cigarettes a day for the past 40 years. He is allergic to sulpha drugs. There was clicking in the right TMJ on lateral movement and a loss of vertical dimension of approximately 6 mm. On intra-oral examination, the patient was partially edentulous with lower left first molar; lower left canine, lower right first molar missing. The teeth were severely attrited to the level of the CEJ [Figure 1]. On clinical and radiographic examination, most of the remaining teeth had periodontal involvement. There was periapical pathology in relation to lower right incisors, lower left canine and upper left lateral and second premolar [Figure 2].

On assessment of the clinical situation and patient desire, it was decided to prosthodontically rehabilitate both upper and lower dentition and restore the lost vertical dimension. The patient was given occlusal splint for 6 weeks and was directed to wear it for the entire day except when eating. This was done to restore the lost vertical dimension and assess the comfort level of the patient. Based on clinical, radiographic and medical history of the patient, only first and second molars in the upper arch and second molars in the lower arch were preserved bilaterally, and the rest all teeth were extracted. After healing, partially edentulous arches were evaluated. Both upper and lower arches were U-shaped, well-rounded with good bone support. The remaining posterior teeth were endodontically treated [Figure 3]. After the preliminary impression, diagnostic casts were made and surveyed. It was decided to give a double crown system with clearance fit to the patient. Mouth preparation of the abutment teeth was carried out so that they can receive the telescopic crowns.

Telescopic or inner crowns were made as thin cast coping that were luted to the abutment teeth [Figure 4]. Only apical third of the coping was made parallel to the outer crown. This was done to provide the clearance fit. After conventional procedure of border molding and final impression, master casts of the upper and lower arches were fabricated. Adequate space was provided to accommodate both inner and outer crowns. Master casts were surveyed and outer crowns were designed as part of the framework. The outer crowns and the framework of the denture were precisely cast in full Co-Cr-Mo alloy. The framework, including the outer crowns, was cast as one piece without any soldering or welding. The cast framework was inserted in the patient mouth to verify the fit. The outer crowns fit precisely onto the inner crown without any friction or wedging. This clearance fit permitted minimal, invisible lateral movement and effortless gliding along the long axis of the path of insertion [Figures 5 and 6].

After metal try-in, acrylic shade selection was done. Acrylic teeth were arranged on the metal framework after the jaw relations were recorded. One advantage of using acrylic teeth was to make easy occlusal adjustments. During the wax try-in, the occlusion, esthetics and phonetics were satisfactorily evaluated. Post-palatal seal was again recorded and denture extension was marked by indelible pencil on the cast. The marginal periodontium of the abutment teeth was not covered by the denture base. The dentures were inserted and evaluated after possessing, finishing and polishing [Figures 7 and 8]. Fit occlusion, esthetics and phonetics were again evaluated. Post-insertion instructions were given. The patient was kept on periodic recall. Proper hygiene maintenance was emphasized. Initially, the patient complained of loose upper denture and difficulty in mastication, but over a period of time he was satisfied with the treatment outcome.

DISCUSSION

The type of retention mechanism of the double crown system determines the long-term success of RPD.[1,2,8-10] The principle objective of double crowns used in RPD is to reduce the destructive horizontal and rotational occlusal forces and directing them more axially.[11] Telescopic or double crown provides cross-arch and multiple abutment splinting. The superstructure acts as rigid splint when, in position, interlocking the primary and secondary parts to act as a functional unit. The tooth-mucosa-supported RPDs are better retained by the double crown system with clearance fit. This type of system is also called resilient double crown or resilient telescope, which was first described by Hoffmann and Graber (1966). Retention is achieved by functional border retention.[1,2]

Lehmann and Gente first described the Marburg double crown system. It is a versatile method of restoring partially edentulous arches where natural teeth or implants can be used as abutments. Its application does not depend on number and alignment of the abutments. The marginal periodontium of the abutment teeth is not covered by the denture base. Adjacent to the abutment teeth, the denture is perioprotective. Distal extension base is functionally extended to provide maximum support. Complete contact between the denture base and the denture-bearing mucosa is fabricated in denture base resin to enable relining. The retention achieved is through additional attachment or functional border seal.

In the present case, this method of rehabilitation was chosen on the basis of clinical, radiographic

Figure 1: Preoperative photograph of the patient

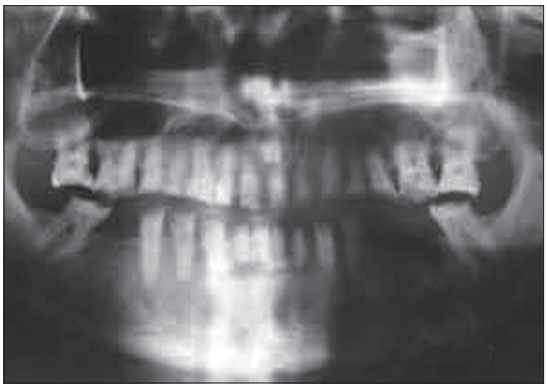

Figure 2: Preoperative Orthopantograph of the patient

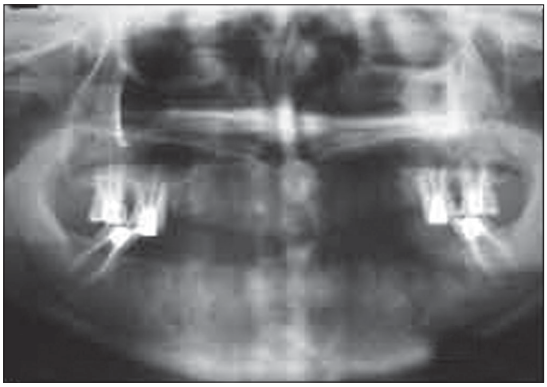

Figure 3: Ortho Pantograph after endodontic treatment of molars and extraction of remaining teeth

Figure 4: Intraoral view of telescopic crowns in place

Figure 5: Metal try-in of Maxillary Cast metal framework

Figure 6: Metal try-in of Mandibular Cast metal framework

Figure 7: Finished Maxillary and Mandibular Fixed Removable Cast Partial Dentures

Figure 8: Post operative view of Maxillary and Mandibular dentures in place

and medical condition of the patient. The extensive complete mouth rehabilitation of fixed prosthesis and crowns with endodontic treatment was not preferred because of more appointments and extensive cost of the treatment. Therefore, it was decided to rehabilitate with tooth-mucosa-supported RPD. Since Marburg double crown system met most of the patient compliance, it was the ultimate choice.

The Marburg double crown system provides with definite terminal stop that transmits functional forces to the abutment teeth. This concept of rigid support is applied to tooth-supported RPDs and tooth-mucosa-supported RPDs. On cementation of the inner copings and placement of the RPDs, the denture base is in contact with the denture-bearing mucosa, while there is a gap between the inner and the outer crowns as it is a clearance fit system. When an occlusal load is applied, the denture moves downwards; the amount of movement depends on the resiliency of denture-bearing mucosa. Moreover, the perioprotective feature plays a key role in ensuring periodontally healthy abutment teeth. These are some features that make this treatment option preferable to the conventional overdentures.[1,2,8]

The concept of oral rehabilitation for older patients or other patients with reduced dexterity should present simple and adaptable solutions. Attachments that demand a great deal of manual dexterity should be avoided. Marburg double crown system provides a comprehensive treatment concept for these patients. Insertion, removal and hygiene care of denture can be carried out by patients with compromised dexterity.

CONCLUSION

Marburg double crown is one of the treatment options in cases of severely mutilated dentition where the patient is medically compromised. Low cost, limited appointments, easy modification and easy maintenance make this line of treatment more desirable. The ultimate objective in rehabilitating a partially edentulous patient is to provide a prosthesis that can function over a long period of time successfully.

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