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Rehabilitation of patient with double crown system: A Marburg denture

Rakhi Shinde[1*], Anjali Bhoyar[2], Seema Sathe[3], Poorvi Jain[4]

[1]Department of Prosthodontics and crown & Bridge, Sharad Pawar Dental College and Hospital, Datta Meghe institute of Higher Education &Research, India.

[2]Professor Department of Prosthodontics and Crown & Bridge, Sharad Pawar Dental College and Hospital, Datta Meghe institute of Higher Education &Research, India.

[3]Professor & Head - Department of Prosthodontics and Crown & Bridge, Sharad Pawar Dental College and Hospital, Datta Meghe institute of Higher Education &Research, India

[4]Post Graduate Student - Department of Prosthodontics and Crown & Bridge, Sharad Pawar Dental College and Hospital , Datta Meghe institute of Higher Education &Research, India.

***Corresponding author:** Rakhi Shinde, Department of Prosthodontics and Crown & Bridge, Sharad Pawar Dental College and Hospital, Datta Meghe institute of Higher Education &Research, India, Email: dr.rakhishinde@gmail.com

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ABSTRACT

Telescopic crowns were initially created as retainers for detachable partial dentures at the turn of the 20th century (RPDs). Along with these names, they are frequently referred to as a double crown, crown and sleeve coping (CSC), or Konuskrone, a German term for a design in the form of a cone (Wentz HJ & Lehmann KM, 1998). These crowns are constructed of an inner, main telescopic coping that is permanently bonded to an abutment and a corresponding secondary telescoping crown that is directly attached to a detachable prosthesis. Copings were developed to hold and stabilise the secondary crown and protect the abutment from thermal irritants and tooth decay. The secondary crown fits into the primary coping to create a telescoping unit that serves as an anchor for the remaining dentition (Langer Y & Langer A, 2000).

Keywords: *double, frequently, telescoping, century*

INTRODUCTION

Telescopic crowns were initially created as retainers for detachable partial dentures at the turn of the 20th century (RPDs). Along with these names, they are frequently referred to as a double crown, crown and sleeve coping (CSC), or Konuskrone, a German term for a design in the form of a cone (Wentz HJ & Lehmann KM, 1998). These crowns are constructed of an inner, main telescopic coping that is permanently bonded to an abutment and a corresponding secondary telescoping crown that is directly attached to a detachable prosthesis.

Copings were developed to hold and stabilise the secondary crown and protect the abutment from thermal irritants and tooth decay. The secondary crown fits into the primary coping to create a telescoping unit that serves as an anchor for the remaining dentition (Langer Y & Langer A, 2000).

According to the theory behind telescopic dentures, occlusal forces are transmitted to the alveolar bone through the preserved root's periodontal ligament. By preventing occlusal overload and the subsequent residual ridge resorption that would have resulted from high

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stresses, the periodontal ligament's proprioceptive feedback protects against these problems. In addition, they perform better than traditional dentures in terms of biting force, chewing effectiveness, and even phonetics. It is evident from the impairment of these functional characteristics caused by edentulism that the periodontal receptors play an important role in sensory input and the capacity to distinguish between the retained roots. The proprioception mechanism, which has been a component of the sensory programme for the rest of life, is lost with tooth loss (Langer Y & Langer A, 2000).

According to the various retention methods, there are generally three main types of double crown systems (Wentz HJ & Lehmann KM, 1998; Wenz HJ et al., 2001; Langer A, 1980; Yalisove IL,1966).

1. Double crowns having parallel milled surfaces that are retained with friction.
2. Conical inner crowns in double crowns with "wedging effect" retention. The inner crown's convergence angle plays a major role in determining the extent of wedging; the lower the convergence angle, the higher the retention.
3. Double crown with clearance fit, often known as a hybrid telescope or hybrid double crown, with functional moulded borders or extra attachments for retention. A clearance fit device that aids in complete arch reconstruction is the Marburg double crown system. The outer crown and the apical portion of the inner crown are parallel in this configuration. The outer crown, which is a component of the cast framework of removable partial denture, fits perfectly and without any wedging or friction onto the inner crown.

Case Report

This clinical report demonstrates how to create a fixed-removable kind of prosthesis using a hybrid double crown system with cast framework.

A 61-years old male patient reported to the Department of Prosthodontics with a history of fracture of previous denture and needed replacement of dentures for the purpose of mastication. After thorough intraoral examination and recording the case history, the presence of distal most molar on either side of mandibular arch was seen. Therefore, to evaluate prognosis of teeth a radiographic and periodontal examination was suggested. It was found that the present molar had fair prognosis and to be included in order to gain retention and support of denture. After considering all the factor involved in the planning process the treatment option decided for the present condition was the Marburg Denture.

Steps in fabricating a Marburg Denture:

1. To begin with treatment plan intentional root canal and followed by metal coping was advised to the patient.
2. A tapered round end diamond rotary bur with a chamfer finish line was used to prepare the abutments for the primary coping after they had intentionally undergone root canal therapy. The finish line needed to be subgingivally prepared. Tapered walls (2–5°) must be constructed for the long abutments.
3. After the abutments' preparation, the impression was made using a polyvinyl siloxane elastomeric impression material (putty and light body) utilising the putty wash method in two steps. The impression was poured into a die material to form the cast, which served as the foundation for the fabrication of the primary copings. Glass ionomer cement was used to bond the primary coping to the abutments after they had been fitted for comfort in the patient's mouth (Fig.1 A, B).
4. Maxillary and mandibular arch preliminary impressions were made using medium-fusing impression compound and irreversible hydrocolloid impression material, respectively, and casts were then poured into dental plaster (Fig.2 A, B).
5. Using polyvinyl siloxane elastomeric impression material, a wash impression was made after the conventional border moulding process, and the master cast was then obtained (Fig.2 C, D).
6. For the purpose of creating the metal framework with the secondary crowns that would precisely fit onto the primary or inner copings without friction or wedging, the mandibular master cast was surveyed. In the patient's mouth, the cast framework's fit was confirmed (Fig.3 A, B). For the fit of the framework, only minimal lateral and

smooth gliding motions were allowed along the long axis of the path of insertion.

7. Over the trial denture base, occlusion rims were also made. Utilizing the record bases and occlusion rims, horizontal and vertical maxillomandibular recordings were created. These records were then transmitted via a face bow to a semi-adjustable articulator.
8. For a trial denture arrangement, the artificial teeth were selected, placed in their proper positions on the record base, and assessed intraorally for phonetics, aesthetics, occlusal vertical dimension, and centric relation with an anterior overjet and overbite of 2 mm.
9. During dewaxing, lead foil was placed on distal abutments to assist provide enough room for secondary coping (Fig.4 A, B). The final denture base required to be made using heat-cured acrylic resins after spreading separating media over the master cast, dewaxing the secondary copings, and placing metal framework over the master cast.
10. Instructions for post-insertion processing, finishing, and polishing were provided for dentures (Fig.5 A-D). The recall timetable and after-denture cleanliness instructions were provided to the patient. Cleaning the tissue surface and the coping surface is necessary because the detachable prosthesis leads to plaque build-up on the metallic surface and in the area surrounding the coping edges. Maintaining hygiene is crucial with this prosthesis. When checked again after a week, the patient had become accustomed to using and caring for the dentures. The patient had follow-up appointments every two months, and throughout the course of the next year, he had no issues.

DISCUSSION

Mouth and teeth are the main components in restoring face aesthetics (Pisulkar SK,2019). A detailed assessment and medical history must be taken since systemic problems significantly influence the success of any therapy technique (Wray L, 2011). The proprioception system is preserved by maintaining the remaining natural teeth. When all of the patient's natural teeth are removed, the patient loses all of the tooth proprioception that has helped to programme the masticatory system for the majority of their life (Crum RJ & Loiselle RJ, 1972).

There are several different treatment options for missing teeth, including conventional overdentures, implant- or tooth-supported dentures, and full mouth extraction followed by a complete denture. For the current case scenario, a conventional over-denture was used. The patient's clinical status, including the denture-bearing region, the periodontal health of the remaining natural teeth, the compliance factor, and durability, are taken into consideration while choosing a treatment choice (Crum RJ & Loiselle RJ, 1972).

In this case, the patient's clinical, radiological, and medical conditions were taken into consideration while selecting the rehabilitation strategy. The restoration of distal abutment teeth by planned endodontic therapy and crown prosthesis was chosen because it will give the denture a strong anchor and additional stability and support. A tooth-mucosa-supported prosthesis was chosen as the rehabilitation method as a result. The Marburg double crown system was the best option since it satisfied the majority of patient compliance.

Lehmann and Gente were the first to describe the Marburg double crown system, which allows for the use of either natural teeth or dental implants as abutments. The main goal of using a double crown in removable partial denture situations is to reduce the deleterious axial occlusal forces. For stabilisation, this system offers cross-arch and numerous abutments splinting. These designs are beneficial in situations when there are few or weak abutments (Ohkawa S et al., 1990)

A patient with similar results of few abutment teeth and the presence of systemic diseases was previously recorded in other case studies by Prakash V et al. and was treated with a Marburg denture for the maxillary arch (Prakash V et al., 2008). The level of patient compliance is crucial. The patient has periodic follow-ups to assess the abutment, the state of the denture, and hygiene (Kalucha S et al., 2017). Non-adherent patients are those who do not stick to the treatment plan that has been provided to them. Both developed and developing nations struggle with non-adherence (Kalucha S et al., 2017). Rapid prototyping or direct metal laser sintering can be used to create the metal framework prosthesis that is typically created using casting techniques.

The prosthesis may be digitally designed using haptic interface software and produced using 3-D printing (Eggbeer D et al.,2005; Purohit HS et al.,2020)

Key Points for Success of Marburg denture (Langer A, 1980; Singh K, 2012; Preiskel HW,1996):

1. Analyzing the inter-arch space with care (the spacing between the arches should be less than 10 mm).
2. There must be enough space for the primary and secondary copings,
3. a thick enough denture base to prevent fracture
4. appropriate closest speaking space, and space for the arrangement of the teeth to satisfy the aesthetic requirements.
5. The devitalization of the abutments is typically necessary due to the space considerations.
6. The selected abutments should have good periodontal health, sufficient bone support, and little to no mobility.
7. Each quadrant should have at least one sound abutment.
8. For improved stress distribution, greater retention, and higher stability of the prosthesis, an equitable distribution of the abutment is preferred in each quadrant of the arch.
9. The telescopic prosthesis must have sufficient vertical wall height (at least 4mm), coping thickness (never less than 0.7mm for each casting), and a taper of about 6 degrees in order to function for a longer period of time.
10. The path of insertion and the level of retention of the prosthesis are determined by the contours and degree of taper of the outer part of the primary coping. The retention changes in a reverse way to the coping's taper. Even copings with minor taper (about 5 degrees) need a height of 4mm or more to provide a significant retention.

ADVANTAGES (Langer A, 1980; Singh K, 2012; Laufer BZ & Gross M, 1998; Besimo C & Graber G, 1994):

1. In RPDs, telescoping crowns connect the dentures to the natural teeth.
2. Obtain support from the underlying remaining tissues as well as the abutments.
3. Telescopic crowns have also been utilised effectively in RPDs and FPDs, supported by endosseous implants, in conjunction with the natural teeth, including the overdentures.
4. Telescopic crowns can be utilised as efficient direct retainers for RPD.
5. Telescopic crowns can also be employed as indirect retainers to prevent the distal extension base from moving away from the edentulous ridge.
6. Because they are pericoronal devices, they distribute occlusal stresses toward the long axis of the abutment teeth. This has shown out to be the least harmful application force.
7. Teeth supported dentures provide better predictable prosthetic results due to greater support, stability, and retention as well as a reduced rate of residual ridge resorption.
8. Patients with natural teeth are able to masticate more efficiently than those who lack teeth. This is because of their functional jaw movements, which are more accurate because to a better compared neuromuscular feedback pathway from the periodontal ligaments.

CONCLUSION

This article outlines the reasons why Marburg dentures should be used instead of conventional complete dentures when there have been a few distal abutment teeth present. Marburg dentures offer better retention, stability, support, and chewing efficiency than conventional complete dentures, and they also reduce the rate of residual ridge resorption due to proprioception, better stress distribution, and the periodontal ligament's ability to convert compressive forces into tensile forces. This line of treatment is more appealing due to its low cost, simplicity of customization, and ease of maintenance. The provision of a prosthesis that can perform well over a lengthy period of time is the ultimate goal in the rehabilitation of a patient with partial dentition.

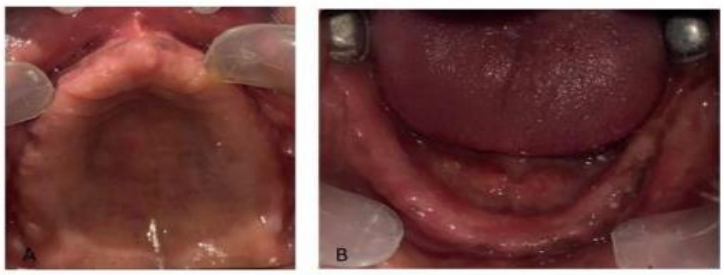

FIGURE 1: Maxillary and Mandibular edentulous arches
A: Maxillary edentulous arch; B: Mandibular edentulous arch with primary metal coping cemented on distal abutment tooth.

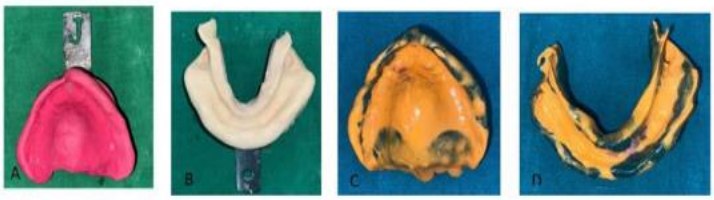

FIGURE 2: Maxillary and mandibular preliminary impressions and final impressions A: Maxillary preliminary impressions; B: Mandibular preliminary impressions; C: Maxillary final impressions; D: Mandibular final impressions.

FIGURE 3: A: Metal framework with secondary coping; B: Metal framework fit was verified on cast.

FIGURE 4: A: lead foil was placed on distal abutments
B: Sealing done with wax

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Figure:5 A: Pre-operative photograph; B: Extraoral photograph of Mandibular Marburg denture; C: Intraoral view of dentures; D: Post-operative Extra oral photograph with prosthesis in place.

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