

Telescopic overdenture as an alternative rehabilitation for the loss of several anterior teeth due to traffic accidents

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ABSTRACT

Background: Telescopic overdenture is a prosthesis consisting of a primary coping, or an inner crown, that is attached to a supporting tooth in the oral cavity, and a secondary coping, or an outer crown, attached to a denture, which must be compatible with the primary coping. **Purpose:** The purpose of this study was to restore function and aesthetics and uplift the psychological status of the patient by fabrication of a fixed removable prosthesis using the existing abutment teeth as a telescopic overdenture. **Case:** A 36-year-old female came to the Prosthodontic RSGM UNAIR speciality clinic on her own volition to make front dentures for her upper and lower jaws after a traffic accident one and a half years ago. The patient had an arch bar installed two months after the accident, which was removed after two months. The patient wanted new dentures to improve both her ability to eat and her appearance. **Case Management:** Preliminary treatments performed were; maxillary and mandibular scaling and root planing; crown lengthening of tooth 15; extraction of teeth 16, 41, 42, and 43; and alveolectomy of the mandibular anterior region. Before the definitive treatment to improve the aesthetic appearance could be carried out, the first step was to make maxillary and mandibular transitional dentures. These were to be used while waiting for healing to occur, following the socket preservation in the mandibular area. Then, for the definitive restoration, we used telescopic overdenture for the maxilla and a removable partial denture for the mandible. **Conclusion:** Telescopic overdenture is recommended for patients who need good aesthetics for anterior tooth loss. Telescopic overdenture uses double crowns as the retentive elements, which give better aesthetic results compared to clasps, thereby improving the psychological status of the patient. In addition, they have better retention and stability compared to conventional complete dentures.

Keywords: telescopic denture; overdenture; double crown; inner and outer coping; aesthetic

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INTRODUCTION

Telescopic dentures are prostheses consisting of primary coping cemented into the abutment in the patient's mouth, and secondary coping attached to the prosthesis, suitable for primary coping. This increases retention and enlarges the prosthesis. According to the glossary of prosthodontic terms,¹ telescopic dentures are also referred to as overdentures, which are defined as removable tooth prostheses that are connected to and rest on one or more teeth that grow, on natural teeth, and/or on implanted teeth. This is also referred to as denture overlay, prosthetic overlay, and superimposed prosthesis.

The double crown systems are typically distinguished from each other by their differing retention mechanisms. There are four different types of double crown systems: cylindrical crowns, conical crowns, resilient designs, and modified designs. Cylindrical crowns, or telescopic crowns, achieve retention by using friction between the inner and the outer crowns. Conical crowns, or tapered telescope crowns, exhibit friction only when they are completely seated by using a "wedging effect". The magnitude of the wedging effect is mainly determined by the convergence angle of the inner crown: the smaller the convergence angle, the greater the retentive force. Resilient designs are non-rigid designs, as they allow some freedom in the vertical and rotational

movements between the inner and the outer crowns. This may be achieved by some modifications in the inner crown, the outer crown, or both. These modifications result in reduction of the intimate contact and creation of a space between the inner and the outer crowns. Modified designs were developed by considerable modifications in the double crown concept. They mostly depend on the merging of a telescopic system with another type of attachment. In this case, we used conical crown designs as a guidance for manufacturing a double crown system.

One of the advantages of using telescopic overdenture is aesthetic; using double crowns as retentive elements allows better aesthetics than clasps. Good aesthetics can be provided by using ceramite on the labial surface and a suitable colour selection. Telescopic overdenture also has good retention and stabilization properties due to the double crown system, secondary splinting action, transference of occlusal forces through the long axes of abutments, creation of a common path of insertion, and improved hygienic properties.²

CASE

A 36-year-old female came to the prosthodontic specialty clinic at the Dental and Oral Hospital of Universitas Airlangga on her own volition to make front dentures missing in her upper and lower jaw after a traffic accident one and a half years ago. The patient reported having been involved in a traffic accident, which caused several avulsions of the anterior maxillary teeth and increased mobility on several lower-jaw teeth. The first treatment was an arch bar placed on the lower jaw by an oral surgery specialist in Gresik, Indonesia. This was removed after two months, when an evaluation revealed no mobility. The patient had no systemic disease, and wanted new dentures to be made to improve her eating and appearance (Figure 1).

On extraoral examination, the temporomandibular joint (TMJ) had no issues: the face was oval in shape; eyes, nose and lips were symmetrical; and there were no abnormalities. Intraoral examination revealed multiple missing teeth at 18, 14, 12, 11, 21, 22, 28, 31, 44, and 48; tooth mobility 3° at 31, 41, 42; and gangrene radix at 16 (Figure 2). On radiographic examination, there was a visible decrease in alveolar bone at the apical third of teeth 41, 42, and 43. Radiopaque appearance was seen around teeth 23, 24, and 25 (susp: ligature wire). Radiopaque features extended from region 36 to region 46 (susp: arch bar) (Figure 1).

CASE MANAGEMENT

Preliminary impressions of the maxillary and mandibular residual ridges by the alginate were taken on the first visit. Preliminary casts were made by pouring the gypsum into a preliminary impression; then, diagnosis, survey and block-out were conducted. Preliminary treatments performed were: maxillary and mandibular scaling and root planing; crown lengthening of tooth 15; extraction of teeth 16, 41, 42, 43; and alveolectomy of the mandibular anterior region (Figure 3). Then, the first treatment was to make maxillary and mandibular transitional dentures before the definitive aesthetic treatment while waiting for healing after socket preservation in the mandibular area (Figure 4).

The next treatment, which is the definitive denture manufacturing, was the telescopic partial overdenture of the maxilla and removable partial denture of the mandible. Abutment preparation was carried out for 15, 13, 23, and rest seat preparation at 17. Gingival retraction of teeth 15, 13, and 23 using Ultrapack® retraction thread size 000 (Ultradent, South Jordan, Utah) (Figure 5) was done next, followed by maxillary functional impressions using the double-step technique with polyvinylsiloxane putty and light body elastomer (3M Espe, Minnesota, United States), and mounting of the cast.



Figure 1. Panoramic radiographic examination.

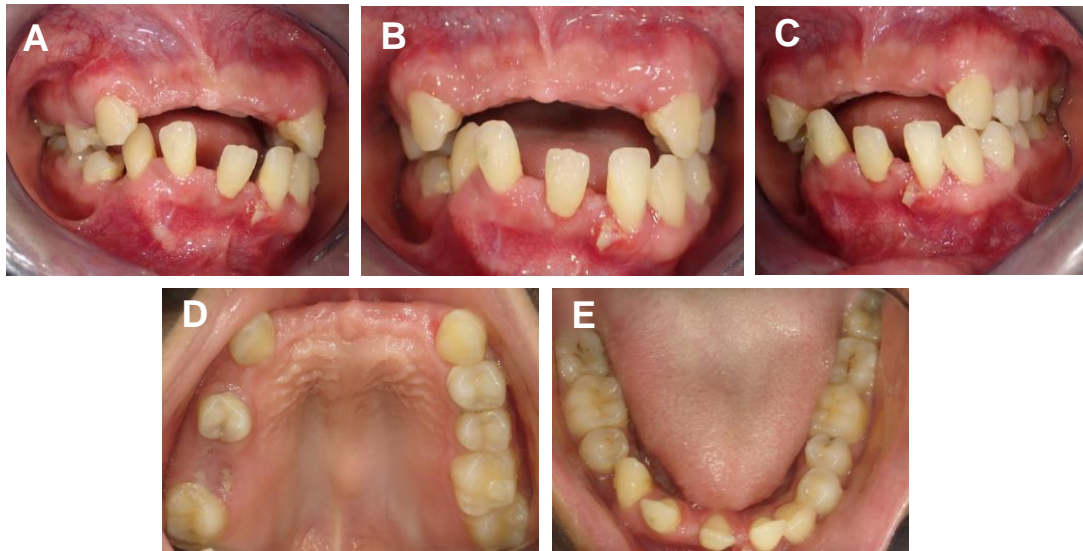


Figure 2. Intraoral condition: (A) right side view, (B) labial view, (C) left side view, (D) occlusal maxillary appearance, (E) occlusal mandibular appearance.



Figure 3. Intraoral condition after extraction and alveolectomy in regions 31 to 44.



Figure 4. Transitional denture for maxilla and mandible.



Figure 5. Results of abutment teeth preparation 15, 13, 23, and after being given gingival retraction thread before functional impression.



Figure 6. Try-in of inner coping of abutment teeth on 15, 13, and 23.

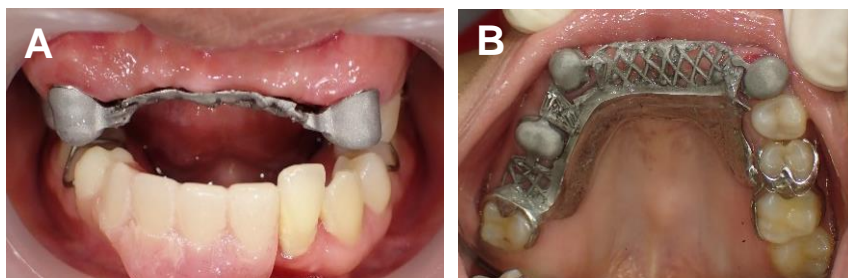


Figure 7. Try-in of outer crown to the patient along with the inner crown attachment to the teeth, viewed from the front (A) and occlusal (B).



Figure 8. Denture teeth setup view from the right side (A), labial (B), and left side (C).



Figure 9. Telescopic partial overdenture in patient, viewed from the right side (A), labial (B), and occlusal maxillary (C).



Figure 10. Try-in of metal frame mandibular on the patient, view from the right side (A), labial (B), and left side (C).



Figure 11. Denture teeth setup on 31,41,42,43,44.



Figure 12. Intraoral condition after insertion of removable partial mandibular denture, view from the right side (A), labial (B), and left side (C).

Inner copings of 15, 13, 23 were customized in the dental laboratory. We did a try-in of the inner coping of 15, 13, and 23 in the patient with attention to the cervical so as to close the cervical teeth (Figure 6). Then, we made a final functional impression of the maxilla with a one-step technique using polyvinylsiloxane putty elastomer and light body with inner coping attached to the teeth. Meanwhile, the inner crown settings took part inside the impression.

Manufacture of outer coping and metal frames took place in dental laboratories. Then, we did a try-in of the outer crown and metal frame while the inner crown was attached to the abutment tooth (Figure 7). The wax occlusal rim was made and placed on the metal frame. Then, a bite registration was done with polyvinylsiloxane medium body O-bite® (DMG, Hamburg, Germany). A denture tooth setup was performed on the articulator (Shofu, Kyoto, Japan) and fitted to the patient (Figure 8) with acrylic denture processing. Fixed cementing inner coping, fitting and delivering the denture on patient (Figure 9).

We next continued treatment for the lower jaw, performing rest seat preparation in the distal areas 35 and 45, and in the mesial areas 36 and 46. Functional impressions for making metal frames were done using a stock tray with polyvinylsiloxane putty elastomer and light body. The cast was poured from the final functional impression and mounted. Try-in of the metal frame and making the occlusion rim wax occurred next (Figure 10), followed by denture tooth setup for 31, 41, 42, 43, and 44 (Figure 11). Next steps included acrylic denture processing, then fitting and delivering the removable partial mandibular denture on the patient (Figure 12). Next visit for control was done 24 hours after insertion of the denture.

DISCUSSION

In this case, the patient came to us to make dentures for the upper and lower jaw. The patient reported that she had been involved in a traffic accident, which had caused several avulsions of anterior maxillary teeth and mobility of several teeth on the mandible. The first treatment was by the oral surgery specialist in Gresik, Indonesia, who placed an arch bar on the mandible. The arch bar was removed after two months, when evaluation revealed there was no mobility.

The first treatment was to make maxillary and mandibular transitional dentures, while waiting for healing after socket preservation in the mandibular area. Transitional dentures were used until definitive dentures could be inserted.³ Transitional dentures are designed to transition a patient from one oral condition to the next. Transitional dentures are temporary appliances that will ultimately be replaced and discarded. The need for this type of treatment arises when a patient is faced with the extraction of some or all of their remaining dentition but does not want to be toothless while they heal and recover post-surgery. One of the options patients can consider is an immediate denture. This is a denture that is fabricated

prior to extractions and placed immediately after the natural dentition has been removed.⁴

Tooth conditions on 15, 13 and 23 had a good prognosis, so they could be used as abutment teeth. This was due to the good condition of the alveolar bone; pocket depth on the mesial, distal, labial and palatal teeth (2mm); no bleeding on probing examination; and no bleeding, inflammation, or tooth mobility. This examination was carried out in accordance with Carranza's opinion that a tooth's supporting tissue is declared healthy if the normal gingival sulcus is ± 2 mm deep, the gingiva is pink, the size of the gingiva is not enlarged, and there is no bleeding. Additionally, the tissue should be supported by healthy bones and the absence of tooth mobility.⁵

The condition of being partially edentulous can be treated with various treatment options, including both fixed and removable prostheses. The periodontal status of abutment teeth present in such cases dictates the prognosis of the treatment option chosen.^{6,7} A limited number of available abutments and decreased crown-to-root ratio of the present teeth pose a great prosthetic challenge.⁸ Removable prosthodontics was the only answer to cases before the advent of fixed removable prosthesis in the form of telescopic overdenture.⁹

In the case of the maxillary tooth loss at 16, 14, 12, 11, 21, 22, teeth 15, 13, and 23 with good periodontal tissue conditions were selected as abutments. The anterior location required a good aesthetic. Based on these considerations, the treatment that was chosen for the maxilla was a telescopic partial denture. Telescopic denture has the advantage of a double crown that can directly transfer occlusal loads to the axial axis of the abutment teeth.² In telescopic partial denture restoration, aesthetics and good retention can be achieved because the attachment is based on mechanical frictional resistance.

Patients who present with multiple periodontally and endodontically compromised abutment teeth pose a great prosthodontic challenge. Opting for a fixed prosthodontic treatment for such patients does not ensure prognosis and longevity.^{6,7} However, apart from the cripples of a removable prosthesis, compromised support and stability are added disadvantages to such a treatment plan.⁷ Fabrication of a fixed removable prosthesis combines advantages of both fixed and removable dental prostheses.⁸ Undue leverage forces due to parafunction are avoided as the superstructure is removable. The rigid splinting action, support, and retention provided by abutment teeth, as well as better distribution of forces, are some of the advantages of such a prosthesis. Furthermore, a better prognosis of abutment teeth can be predicted due to improvement in the crown-to-root ratio, better hygiene maintenance, and reinforcement provided by the primary metal copings. Disadvantages associated with such a prosthesis are the extra time, effort, and cost involved.^{10,11}

Vertical space requirement is another limitation to planning treatment with such a prosthesis. A minimum of 9 mm vertical space is required to accommodate the

metal copings (1.5–2 mm) and ceramide superstructure (3 mm) on abutments prepared to an adequate height (4–5 mm). Furthermore, the procedure is technique-sensitive.¹¹ A satisfactory periodontal and endodontic status of the abutment teeth dictates a fair prognosis with a removable cast partial denture if the design of the components satisfies the mechanical requirements. In the current case, a removable cast partial denture was fabricated to rehabilitate the lower arch due to the favourable prognosis of the abutment teeth. However, a telescopic overdenture prosthesis was fabricated for the upper arch due to the guarded prognosis of abutment teeth present.

According to the glossary of prosthodontic terms,¹ telescopic dentures are also referred to as overdentures, in the form of removable dentures that cover and ride on one or more natural teeth, natural tooth roots, or dental implants. The retention and stability of the telescopic denture depends on the number and distribution of the supporting teeth along the dental arch, and the taper wall of the inner crown. The smaller the degree of taper, the greater the friction retention of the retainer.¹² Tooth preparation in all mesial-distal-labial-palatal-incisal sections is around 1.8-2 mm. The inner crown requires a thickness of about 0.3-0.5 mm (the mesial/distal part that uses friction elements requires more thickness), while the outer crown requires a thickness of about 0.3-0.5 mm, and the ceramide requires a thickness of 0.8- 1 mm.¹³

In this case, the double crown system used was the conical crown. Braces were prepared subgingivally, and walls were tapered (2° – 5°) to increase retention. The inner crown was made by a laboratory with a slope of about 2° so that a spring tension arises from the outer crown to the inner crown. The main requirements for durable telescopic dentures were vertical wall height (around 4mm), sufficient thickness of coping (minimum 0.7mm), and degree of inclination of around 6° .¹²

In this case, the patient was also advised to use a removable partial denture (metal frame) design for the mandible. The removable partial denture (metal frame) compared to other materials has many advantages: it is more comfortable to wear because it can be made thinner than acrylic resin; all parts of artificial teeth are one unit and homogeneous; and the occlusal load can be transferred evenly. Additionally, there is better thermal conductivity and better hygiene because porosity on metal surfaces is lower than acrylic resins, thereby reducing food and plaque accumulation, and maintaining healthy tissue.⁴

According to Carr and Brown⁴ in McCracken's removable partial prosthodontics, the type of tooth loss and design of the mandibular denture in this case include the classification of Kennedy class IV, so that the support obtained is from the teeth. After a survey on the work model, retention in lingual teeth 45 and 46, and 35 and 36 was obtained. Therefore, the selected clasp design used a tooth-borne clasp, namely double Akers' clasps at 35 and 36, and 45 and 46, as a direct retainer. There was plate expansion above the cingulum on teeth 32 and

33 as an indirect retainer. The direct retainer was placed on teeth 35 and 36, and 45 and 46, so that the clasp was not too visible from the front. Therefore, it looks good aesthetically.⁴

Patients are advised to remove dentures at night, because according to Watt and Gregor, this is an efficient way to control caries and the development of periodontal disease.¹⁴ Patients are also instructed to always maintain the cleanliness of the oral cavity by brushing teeth and using mouthwash so that there is no accumulation of food debris on the supporting teeth. According to Ai and Shiau, maintenance of periodontal tissue health is a critical success factor in overdenture treatment, which also depends on the effectiveness of plaque control by the patient.¹⁵

Denture treatment can be done using an antibacterial denture cleanser by brushing the denture with a soft bristled toothbrush and liquid soap without strong pressure. Cleaning this way is in accordance with the opinion of Zarb; it is not recommended to use toothpaste when cleaning dentures because most contain abrasive materials that can erode the surface of acrylic resin.¹⁶

Telescopic overdenture has aesthetic advantages; using double crowns as retentive elements allows better aesthetics than clasps. Good aesthetics can be provided by using ceramic faces and a suitable colour selection. Telescopic overdenture also has good retention and stabilization properties due to the double crown system and secondary splinting action. It also transfers occlusal forces through the long axes of abutments, creates a common path of insertion, and offers improved hygiene. It can be concluded that telescopic overdenture is recommended for patients who need good aesthetics for anterior tooth loss; it uses double crowns as the retentive elements, which give a better aesthetic result compared to clasps, thereby increasing the psychological status of the patient. Telescopic overdenture has better retention and stability compared to conventional complete dentures.

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