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Case Report

Telescopic Retention in Prosthodontics: A Digital Approach for Enhanced Patient Outcomes

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ABSTRACT

Because they offer improved retention, stability, support, and stable occlusion, as well as reduced forward sliding of the prosthesis and improved control over mandibular movements due to proprioception feedback that improves chewing efficiency, telescopic dentures are thought to be a good alternative to traditional removable dentures. A well-made prosthesis that is maintained with great care and has good clinical and laboratory knowledge can be successful. The use of sophisticated digital software in the construction process eliminates human errors and allows for the rapid creation of a digital prosthesis. Unlike the traditional prosthesis, this article aimed to explain the importance of preserving the natural remaining teeth and the creation of digital telescopic dentures utilizing additive 3D printing (DMLS) and subtractive milling technology, as well as the use of dissimilar materials for a friction fit.

Keywords: Telescopic denture, Digital dentistry, Overdenture, CAD CAM, Digital denture, Innovation

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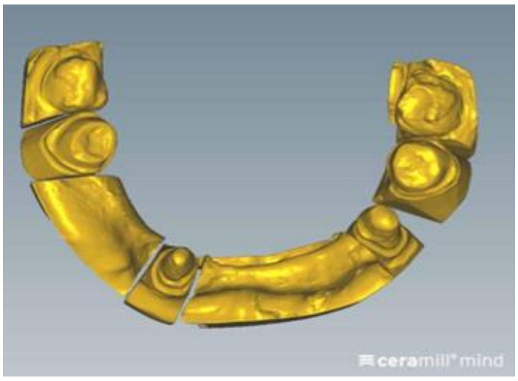
Introduction

Since the telescopic overdenture is crucial to the maintenance of alveolar bone and the periodontal sensory systems that direct and oversee gnathic dynamic activities, it makes sense to employ it in preventive prosthodontics [1]. The prosthesis had great hopes because of the special friction concept that only fits when they are fully placed through the use of a "wedging effect" [2]. By reorienting them more axially, this kind of restoration can lessen harmful rotational and horizontal occlusal stresses in individuals with terminal dentition. We live in the age of digital dentistry, where prosthesis quality is improving and fabrication time is reducing daily. It is possible to decrease manual error, the need for highly skilled specialists, and material waste by using 3D design software and production technologies (such as 3D printing, DMLS, and milling) properly. In contrast to the traditional prosthesis, this article aimed to explain the significance of preserving the natural remaining teeth and the creation of digital telescopic dentures utilizing additive 3D printing (DMLS) and subtractive milling technology, as well as the use of dissimilar material for a friction fit.

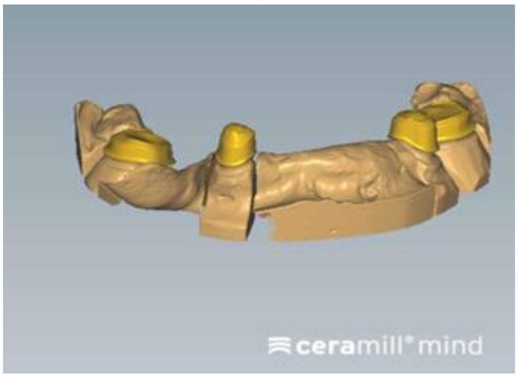
Case report

The main complaints of a 45-year-old female patient who was brought to the hospital in Bangalore were bad appearance, speech difficulties, and trouble chewing. Upon first inspection, it was determined that the mandibular arch was missing teeth number 31, 32, 35, 36, 41, 42, 43, 45, and 46, while the maxillary arch was dentulous and had previously had metal-ceramic crowns. The ridge of the edentulous span was small and sharp. After the bite was registered, a diagnostic cast was made and articulated after radiographic analysis and intraoral inspection. The patient's treatment choice of an implant-supported prosthesis was ruled out when CBCT (cone beam computed tomography) revealed the breadth and density of the accessible bone. A telescopic denture was selected as the preferred therapy because the patient was also hesitant to have any surgery. A class II malocclusion with unilateral crossbite and decreased vertical dimension was discovered during diagnostic mounting. Additional measurements of extraoral anatomical landmarks (outer canthus to modulus and base of the nose to base of chin) and facial expressions during rest and occlusion were required to develop a telescopic denture prosthesis vertical dimension of about 3 mm. Following oral prophylaxis of the abutment teeth, the patient received an acrylic partial denture as an interim therapy to restore the vertical dimension at a weekly increment of 1 mm, using the natural opposing dentition as a reference point. The patient felt at ease after six weeks as her entire stomatognathic system had adjusted to the 3 mm vertical dimension.

On 33, 37, 44, and 47, teeth were prepared for digitally designed milled zirconia main copings. The first master model was created for laboratory scanning utilizing a single-phase putty relining procedure with extra silicon (3M ESPE). The principal coping was then virtually acquired in 3D CAD software by digital wax-up and designing **(Figure 1)**. To produce a single route of insertion, primary zirconia copings that were designed in CAD software were manufactured on the four abutment teeth. They were made parallel to one another with a two-degree taper. A fit checker (GC) and radiograph (RVG) were used to test the coping mechanisms and their connection to one another. Following confirmation of correctness, non-eugenol cement (GC) was used to temporarily solidify the primary zirconia copings. A second master model was then created by making an over-imprint (monophase DENTSPLY) in a specific tray. To fabricate the cast partial superstructure, this model was utilized for scanning. The model and main coping were scanned to create the master cast for the framework and secondary coping. **Figure 2** shows the secondary coping and extension (for the attachment with the framework) that were created in the 3D design program. The framework was designed virtually in the software and fabricated digitally using CAD-CAM (computer-aided design and computer-aided machining); DMLS (Direct Metal Laser sintering) technology for the framework and the 3D milling technology for secondary coping to achieve satisfactory friction lock retention. After the framework and secondary coping fit well, they were welded together. Scrutinizing the patient's mouth. A metal framework was used to reestablish the vertical dimension of the jaw relationship, choose teeth, and apply indirect composite resin on top of secondary metal copings that were fastened to the framework. To confirm prosthetic fit, aesthetics, phonetics, and occlusal interferences, a try-in was conducted during the next session. For the prosthesis to preserve a pink-and-white aesthetic score, acrylization was performed, and an indirect gingival composite was applied on the labial surface **(Figure 3)**. The patient's mouth was filled with the final prosthesis and the principal coping, which was cemented using glass ionomer cement (GC). After a day of implantation, the patient was brought back, extra cement was taken out, and appropriate instructions and follow-up were addressed. A questionnaire-based quality-of-life scale was used to measure the significant improvement in patient quality of life, which was the clinician's true accomplishment.



a)



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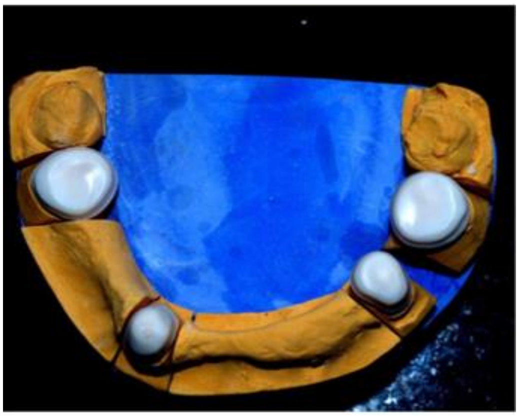
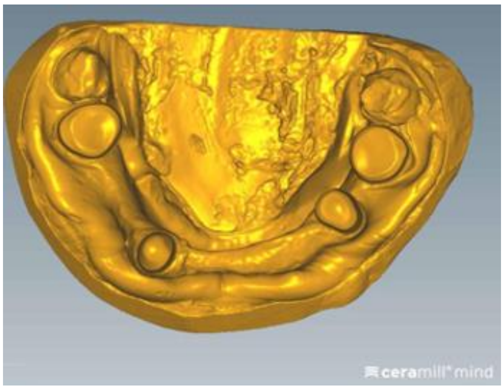
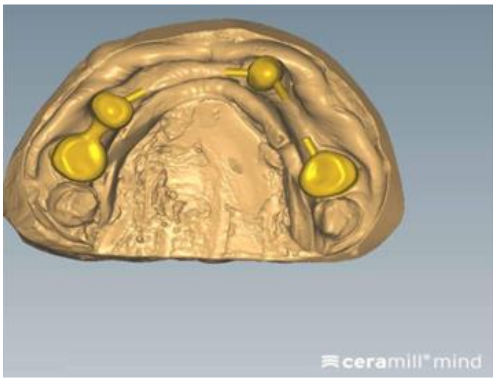


c)



d)

Figure 1. a) virtual model after laboratory scanning, b) design of primary coping in 3D design software, c) zirconia primary coping, and d) scanned cast after over impression along with zirconia coping a virtual cast for secondary coping and framework.



a)

b)

c)

d)

Figure 2. a) secondary coping design with extension, b) cross-section view of secondary coping on primary coping, c) DMLS metal framework and secondary coping (outer surface), and d) metal framework and secondary coping (inner surface).

a)

b)

c)

d)

Figure 3. Final prosthesis after layering with indirect composite, a) frontal view, b) lateral view, c) intaglio surface, and d) polished surface (occlusal view).

Results and Discussion

Due to the knife-edge ridge and poor bone density in this instance, considerable bone grafting was required for an implant-supported prosthesis; therefore, given the time and surgical morbidity, this was not the recommended course of therapy. Telescopic dentures were avoided because of their superior stress distribution, robust splinting action, and high-quality retentive and stabilizing qualities. They also have the benefit of stimulating alveolar bone and periodontal tissues, which reduces axial strain on the tooth [3].

When employed as a primary coping, Çelik Güven *et al*. [4] examined the wear of CrCo more than zirconia. In a randomized clinical trial, Schwindling *et al*. [5] examined the clinical results of zirconia as a major coping mechanism and discovered that it had excellent results and a positive survival rate. Additionally, the impact of this kind of zirconia primary coping on Oral Health-Related Quality of Life (OHRQoL) was assessed by Schwindling *et al*. [6]. They discovered that zirconia failed to carry out better than CoCr (cobalt chrome) alloy crowns in terms of patient satisfaction or tooth-like color. In this instance, the indirect composite was layered because it meets nearly all of the requirements for an anterior restorative material on metal, particularly for implant Malo bridges, telescopic dentures, etc., in terms of shear bond strength, color stability, and longevity. It also avoids firing temperature, which can change the prosthesis's precise fit [7-9].

With the aid of digital surveying, virtual undercut block out, and the precision of digital parallelism in CAD software, the digitalization of the telescopic denture made this instance extremely accurate. Digital surveying and the path of insertion were a significant benefit in this instance since they removed the need for a surveyor with a milling machine. Single main crowns, which were evaluated for parallelism by the program, made it simple to control the tooth's inclination. A robotic main crown design with a clear finish line and anatomical morphology was chosen. The master cast was scanned after the principal copings were over-impressed, and a minimal digital blockout was completed to create the virtual copy cast.

Conclusion

By eliminating human mistakes through digitization, the prosthesis's final product has reached a remarkable degree of improvement. The combination of zirconia milling and metal 3D printing produces high-quality, well-fitting prosthetic reconstructions that satisfy patients. The treatment result was quite successful due to the mix of cutting-edge materials and contemporary technologies.

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Conflict of Interest: None

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Ethics Statement: None

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