

A Serviceable Treatment Option for Partially Edentulous Cases- From Traditional to Technological

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ABSTRACT

Rehabilitating patients with partial edentulism always pose countless challenges to the clinicians. Despite of the popularity of fixed options, many individuals opt for removable prosthesis as an alternative due to monetary constraints, local anatomic factors and several medical conditions contradicting the use of fixed prosthesis. This case report describes the oral rehabilitation of two patients exhibiting Kennedy's class 1 and class 2 conditions, respectively. In the first case, the patient was already a cast partial denture wearer and reported to the Department of Prosthodontics for the replacement of the same due to broken mandibular partial denture. However, in the second case, the patient sought replacement of the missing mandibular teeth in the form of a removable partial denture. In both the cases, the cast partial dentures were fabricated using Computer Aided Designing and Computer Aided Manufacturing (CAD-CAM). The patients have shown enhancement in the fit of the prosthesis and at the same time shrieved the human handling faults, indistinctness, and surplus time period as well as the cost.

Keywords: Cast partial denture, Partially edentulous mandibular arch, Removable partial denture, Telescopic crown

CASE REPORT

Case 1

A 73-year-old female patient reported to the Department of Prosthodontics with the chief complaint of difficulty in mastication owing to broken mandibular cast partial denture since five months [Table/Fig-1]. The medical history of the patient was not significant. Meanwhile, the past dental history disclosed that the patient was a partial denture wearer with both upper and lower arches since five years.



[Table/Fig-1]: Broken mandibular cast partial denture.

A thorough intraoral examination was carried out which revealed multiple missing teeth number-15, 16, 17, 25, 26, 27, 33, 35, 36, 37, 43, 45, 46, 47 in both maxillary and mandibular arches. Radiographic investigation included orthopantomogram which confirmed generalised horizontal bone loss and the endodontically treated mandibular right first premolar [Table/Fig-2]. After explaining all the findings and discussing the possible management options with the patient, such as acrylic partial dentures, cast partial dentures and implant supported prosthesis, a comprehensive treatment plan was formulated, which included the root canal therapy with the mandibular left bicuspid followed by the telescopic crown on

the former and the already endodontically treated mandibular right first premolar.



[Table/Fig-2]: Radiographic investigation (orthopantomogram).

After finishing the endodontic phase of the mandibular left premolar, diagnostic impressions were made and the surveying of the cast was accomplished followed by designing of the partial denture. Considering that the patient manifested with the broken prosthesis and Kennedy's class 1 condition (bilateral distal extension), it was decided to place telescopic crowns on the mandibular right and left bicuspid and a linguoplate major connector which also performed the function of an indirect retainer. After surveying, mouth preparation was carried out which included tooth preparation with 34 and 44 followed by the cementation of the copings and making of a fresh impression [Table/Fig-3].



[Table/Fig-3]: Cementation of copings.

The cast thus obtained from this impression was scanned and the cobalt chromium framework was fabricated using the CAD-CAM technology [Table/Fig-4].



[Table/Fig-4]: Virtual designing of the partial denture (exocad software).

Next, the framework was tried on in the patient [Table/Fig-5] and after considering its fit to be appropriate a compact self-cured acrylic resin tray was added at its free saddle end. The flanges of the tray were made to extend adequately to an all inclusive functional depth of the sulcus and the retromolar area [Table/Fig-6].



[Table/Fig-5]: Trial placement of the metal framework.



[Table/Fig-6]: Self-cured acrylic resin tray.

Border molding was carried out using low fusing impression material followed by the final impression which was made with the rubber based impression material [Table/Fig-7]. Subsequently, modification of the cast was carried out in a laboratory.



[Table/Fig-7]: Final impression.

Two saw cuts were made distal to the both the bicuspid on each side followed by an additional nick which was made parallel along the medial area of the edentulous ridge, outspreading from the utmost posterior part of the cast to the most medial position of the principal cut [Table/Fig-8].

To assist in retention of the freshly dispensed stone, the grooves were positioned on the medial aspect of the cast stone. Beading

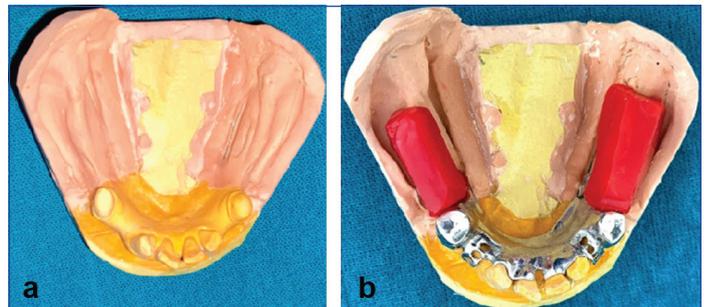


[Table/Fig-8]: Cast modification for obtaining working altered cast.

and boxing of the final impression material was accomplished which was later poured in die stone [Table/Fig-9]. After obtaining the working altered cast the framework was again seated on the altered cast and wax rims were fabricated over it [Table/Fig-10a,b].



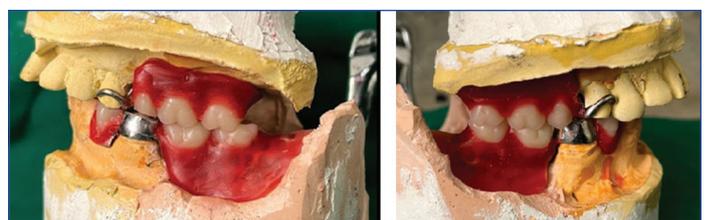
[Table/Fig-9]: Beading and boxing of the final impression.



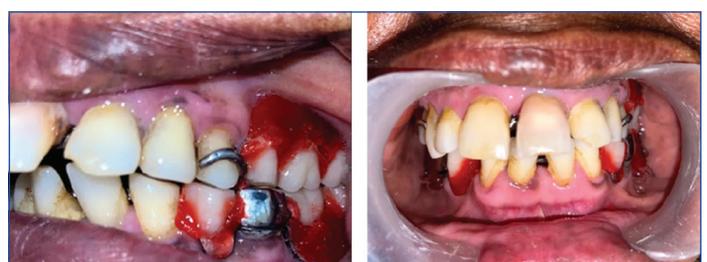
[Table/Fig-10]: a) Altered cast; b) Fabrication of wax rims for interocclusal record.

Since, the left over opposing teeth did not show a distinct intercuspal location, they were trimmed off and the wax rims were made on the upper framework as well. Then interocclusal records were made and were mounted in an appropriate relation.

Consequently, wax try-in was executed followed by processing and finishing of the partial dentures [Table/Fig-11, 12]. Position of the jaw and occlusion were substantiated at the time of delivery. Thorough denture maintenance directives were conveyed to the patient [Table/Fig-13a-c]. The patient was recalled after a period of one week and the necessary adjustments were carried out followed by the recall

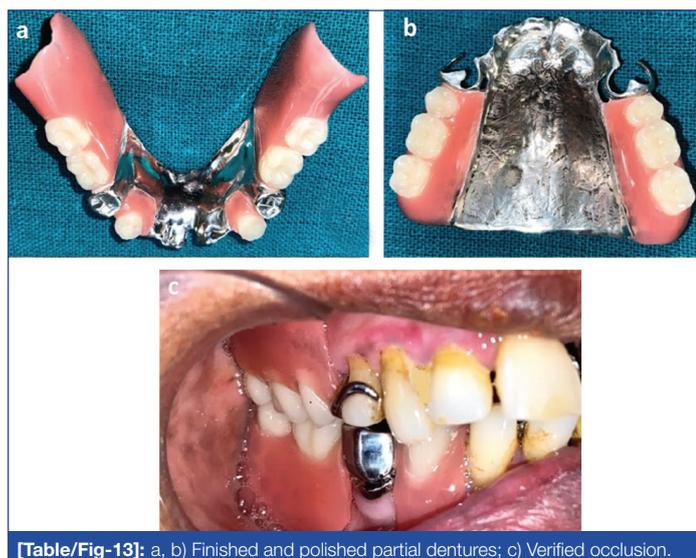


[Table/Fig-11]: Trial dentures.



[Table/Fig-12]: Wax try-in.

periods of one month, three months and one year. At the end of one year follow-up period, the patient reported with the improved masticatory function.



[Table/Fig-13]: a, b) Finished and polished partial dentures; c) Verified occlusion.

Case 2

A 48-year-old female patient reported to the Department with the presenting complaint of difficulty in mastication as a result of missing teeth in lower right and left back region of jaw since one year. The medical history of the patient revealed that she had hypothyroidism since two years and was on the medications for the same. Also, patient was a betel nut chewer for past 10 years but claimed to have stopped the habit. The past dental history disclosed that the patient underwent root canal therapy in the lower right back region of jaw one year back along with the extraction of the carious teeth on the contralateral side of the same arch. A thorough intraoral examination unveiled multiple missing teeth in the mandibular arch, carious mandibular right second molar and silver filling with the mandibular left second premolar and second molar and maxillary right first molar.

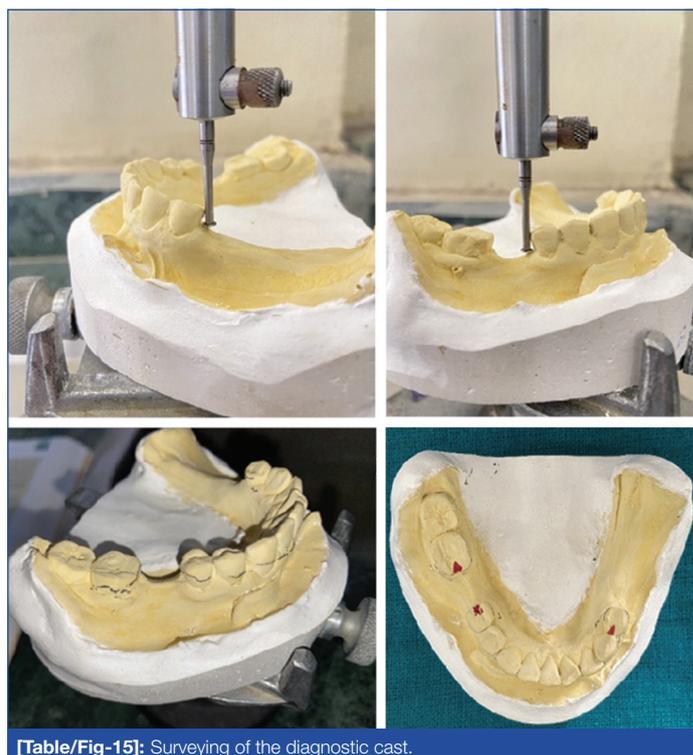
Radiographic investigation in the form of orthopantomogram was carried out, which revealed proximal caries with right mandibular second molar, periapical radiolucency with left mandibular second premolar and fractured endodontically treated second molar. Endodontic therapy along with a dislodged prosthesis was also observed with right maxillary first molar [Table/Fig-14].



[Table/Fig-14]: Radiographic investigation (orthopantomogram).

After elucidating all the outcomes and discussing the promising management alternatives with the patient such as acrylic partial dentures, cast partial dentures, tooth supported fixed dental prosthesis with 45, 46 and 47 region and implant supported prosthesis in the 36, 37 region, an all-inclusive treatment strategy was framed, which comprised of the root canal therapy with the right mandibular first molar followed by extraction with left mandibular second bicuspid and molar and prosthesis placement with right maxillary first molar. Once the root canal therapy of the salvageable tooth and the extraction of the non salvageable teeth

were completed, the healing of the sites was allowed to take place. Subsequently diagnostic impressions were made and surveying of the mandibular cast was carried out [Table/Fig-15].



[Table/Fig-15]: Surveying of the diagnostic cast.

The surveying procedure revealed the need to carry out the mouth preparation which involved those course of action that will return the mouth to optimum health and would eliminate any condition that can be detrimental to the success of removable partial denture. The mouth preparation here can be divided into:

1. The preparation of the proximal tooth surfaces of the mandibular right and left bicuspid to deliver guiding planes as well as reduction of the unwarranted tooth contours to eradicate the interferences and permit a more satisfactory position of reciprocal and retentive clasp arm.
2. Reduction of the right mandibular first molar for crown placement.
3. Preparation of occlusal rest seat on mandibular abutment teeth. For right mandibular first molar, the tooth was prepared such that sufficient clearance was provided for the rest within the preparation [Table/Fig-16].



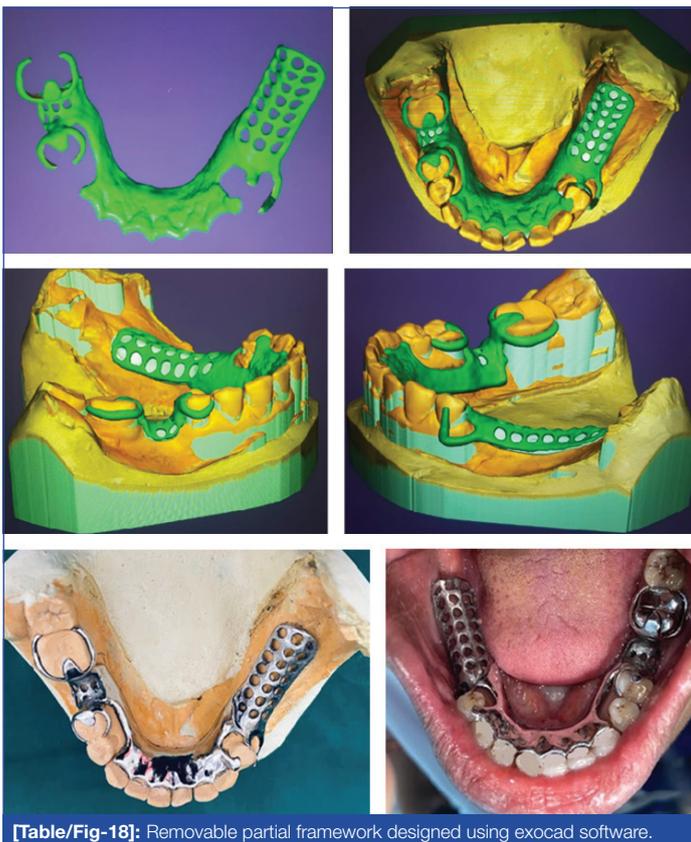
[Table/Fig-16]: Occlusal rest seat on the mandibular first molar.

Next the crown with the provision for rest seat was cemented on the right mandibular first molar followed by impression making using McLeans physiologic method [1, 2], wherein a custom tray was constructed on the diagnostic cast and a functional impression was made. Border moulding was carried out with low fusing impression material followed by the final impression which was made with the rubber based impression material. Then, a hydrocolloid over impression was made while retaining the functional impression in its anticipated position [Table/Fig-17].



[Table/Fig-17]: McLeans physiologic method.

The cast consequently acquired from this impression was scanned and the cobalt chromium framework was fabricated using the CAD-CAM technology. Subsequently, the framework was tried on in the patient and after bearing in mind its fit to be appropriate then at that point a bite was recorded for the arrangement of artificial teeth [Table/Fig-18].



[Table/Fig-18]: Removable partial framework designed using exocad software.

Afterwards, wax try-in was accomplished followed by the necessary modifications [Table/Fig-19]. The partial dentures were then processed and finished. At the time of delivery, the jaw position and occlusion were substantiated. In depth denture maintenance directives were delivered to the patient which include instructions regarding the hygiene maintenance and insertion and removal directions [Table/Fig-20]. The patient was then recalled after a period of 1 week and all the necessary adjustments were carried followed by consequent recall periods of one month, three months and one year. Patient reported with improved masticatory efficiency at each appointment.



[Table/Fig-19]: Wax try-in.



[Table/Fig-20]: Finished and polished partial dentures.

DISCUSSION

The objective of the current case series is to exemplify a methodology that is a combination of both orthodox as well as digital workflow for construction of the removable partial denture. Since, the suitable design of the cast metal framework plays a crucial protagonist in long-term accomplishment and efficient use of a prosthesis [3].

Telescopic crowns incorporated into the cast partial denture proved to be a better management preference in the first case report which depicted bilateral distal extension scenario. Here, the movement of the bases is restricted by the use of inflexible retainers accompanied by cylinder-shaped or conical primary copings in addition to accurate fit of the former with the subordinate restoration. The tapered conformation of the communicating walls produces a compressive intersurface tension. One of the principal assistance of the telescopic retainers is the conduction of the forces in the favourable direction [4].

It has been very well-documented in the literature that the abutments harbouring telescopic retainers are known to exhibit reduction in the lateral stresses. The additional benefits include:

1. Failure of the abutment tooth- the prosthesis can be effortlessly restored by means of acrylic resin by constructing the secondary crown all over again into a pontic.
2. Effective household maintenance- removal of the overprosthesis subsequently leads to copings that can be certainly cleaned owing to the decent ease of access around their gingival margins once the overprosthesis is detached.
3. Protection of the abutment teeth against carious lesions [5-8].

However, the success of such type of prosthesis is governed by the proficiency of the clinician and the skillfulness of the technician since establishing the occlusion not only enhances the masticatory abilities but is also closely related to the muscles of mastication [9]. Even though a frequently ignored procedure, the practise of telescopic crowns for removable dental prosthesis has not been fully exploited regardless of it being an admirable management alternative as it enables superior hygiene maintenance by the patient and/or dental specialist and aids to preserve debateable teeth for an extended period of time [6].

Also, the altered cast impression technique utilised in the first scenario is most commonly employed in the mandibular distal extension cases. It was first described by Applegate. It aids

fulfilling the necessities of linking the anatomic form of the teeth to the functional form of the residual ridge [2]. Leupold RJ and Kratochvil FJ and Holmes JB in their articles regarding the altered cast impression technique have mentioned that utilising the former technique results in minimum movement of the base at the time of placement and displays the most favourable ridge to denture base relationship [10,11].

The use of Kratochvil's system: mesial rest, proximal plate, and I-bar has been utilised in the Kennedy's class II modification 1 scenario of second case report. The I-bar scheme encounters all of the necessities of a partial denture clasp system: vertical support, horizontal stabilisation, retention, reciprocation, and passivity. Successful use of the I-bar system necessitates cautious exploration and outlining of every component, proficient abutment preparation, and accurate fitting of the partial denture framework [1].

It is possible to design and construct a partial denture using CAD/CAM. CAD software permits uninterrupted control of segments of discrete components of the prosthesis, and hereafter, regulates the execution of strategic mechanical factors, and at the same time designing of marginally noticeable attaching components. Therefore, by means of CAM, it is possible to exactly fabricate the entire prosthesis with a precision of up to 0.1 mm [12].

CONCLUSION(S)

Restoring a partially edentulous mouth has always been a challenge for most of the clinicians. Cast partial dentures are one of the most viable treatment options available for the patients with few missing teeth in whom the fixed or implant supported prosthesis are contraindicated whether due to underlying medical disorders or the local condition of the oral cavity. Therefore, proper treatment

planning is an integral part of rehabilitating such patients, keeping in mind their aesthetic and functional needs.

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