



“CARBON FIBER REINFORCED TOOTH SUPPORTED OVERDENTURE WITH UNIQUE IDENTIFICATION SYSTEM: A CLINICAL REPORT”

Prosthodontics

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ABSTRACT

Overdentures retained by 2 teeth significantly improve the stability and retention of prosthesis. This clinical report presents a new approach of denture fabrication for dementia patient with increased strength and unique identification system. A tooth supported over denture was fabricated with carbon fibers as structural component and labeled by quick response (QR) code. Carbon fibers exhibit increased resistance to applied stress, increased flexural fatigue resistance, improved impact strength and elastic modulus. The QR code, helps in denture identification process. These include prevention of losing or misplacing dentures, medico-legal purposes, accidents or natural disaster.

KEYWORDS

Telescopic Denture, Tooth supported over- denture, Carbon fibers, QR code, Metal copings

INTRODUCTION

Any treatment that can postpone or remove possible prosthodontic issues is referred to as preventive prosthodontics.⁽¹⁾ DeVan golden statement: "Perpetual preservation of what is left is more necessary than the meticulous replacement of what is lost" is still valid. According to different studies the rate of resorption of the edentulous mandible is four times that of the edentulous maxilla.² Teeth loss, especially mandibular teeth, often results in a rapid reduction in alveolar process height.³ Natural teeth/tooth supported overdentures is definitely a better option as compared to a removable complete denture prosthesis.⁴

Overdentures have advantages of preservation of alveolar bone, proprioception, maintenance of vertical dimension of occlusion and enhanced stability and retention of prosthesis. However, overdentures are contraindicated in patients with reduced periodontal support of remaining tooth, questionable oral prophylaxis and insufficient distance between arches.⁵ The purpose of this clinical report was to document the use of carbon fibers and QR code in the prosthesis.

CLINICAL REPORT

A 58-year old female patient presented with a broken ill-fitting denture. Her chief complaint included replacement dentures with increased strength and retention. The patient gave a relevant medical history of memory loss or dementia. Extraoral examination reported no dental abnormality. Intraoral examination revealed a well-rounded completely edentulous maxillary arch and partially edentulous mandibular arch with 34, 44 and 48 present (fig.1). The various treatment options available for this patient were denture (implant supported overdenture or tooth supported overdenture) with unique identification elements which could prevent loss of removable prosthesis. After discussions, the patient decided to proceed with a new mandibular overdenture retained by custom attachments against maxillary complete denture with the patient specific QR code. Implant supported overdenture was rejected because of cost factor.



Fig.1. Preoperative mandibular arch with 34, 44 and 48 present

Intentional root canal treatment and tooth preparation was carried out on 34 and 44. Coronal height of the remaining teeth were reduced 3 mm short of marginal gingiva and shaped like a dome to obtain adequate clearance for overdenture prosthesis.

Primary impressions were made with impression compound in the maxillary arch and putty relined technique in the mandibular arch. Two inlay wax pattern coping were fabricated and casting was done in Ni-Cr alloy on mandibular die stone cast. These obtained primary copings were tried and checked for the passive fit, after which were luted on the tooth preparations with glass ionomer cement (fig.2). The whole assembly was duplicated with the rubber base impression material and cast was poured again to fabricate special tray.



Fig. 2 Primary Coping cemented over 34 and 44.

Border molding for both the arches was done using a green stick compound. Final impression for the maxillary cast was made using zinc oxide eugenol (ZOE) impression paste and mandibular by using light body polyvinyl siloxane. Beading and boxing was carried out and master cast was obtained. This master cast in die stone was used to fabricate secondary copings for telescopic denture (fig. 3).



Fig.3. Secondary coping to be picked up in final denture.

The secondary coping was kept aside for pick up impression during denture insertion. The remainder of the procedures up to try in was carried out in conventional manner.

Carbon fibers were used during packing of acrylic resin. Carbon fibers exhibit increased resistance to applied stress, increased flexural fatigue resistance, improved impact strength and elastic modulus. The reinforced carbon fibers were placed at the canine region in mandibular denture as they are more prone for fracture. Similarly, for maxilla they were placed in the palatal region. Processing of denture with carbon

fibers was done in conventional manner.

For pick up impression two holes were made in the lower denture where secondary coping would be located. Secondary copings were placed on to the primary copings over which fabricated denture was placed and verified for proper occlusion on both the sides. Auto-polymerizing resin was injected into the prepared holes after the occlusion was determined. After polymerization, secondary coping was picked up in the denture. Excess flash, if any was trimmed off and the denture was checked for uniform contact over the ridge. This chair side pickup of secondary coping reduced the patient appointment and overall cost.

QR Code containing patient's information was generated using QR generator applications available free online. The printed QR code of size 20mm was secured on the palatal side of denture with thermoplastic sheet and clear auto polymerizing acrylic resin.

Finishing and polishing of the denture was done in the usual manner. Denture insertion was done (fig. 4). Post insertion instructions were given and recall visits were done at 24 hour, 1-week and 1 month intervals.



Fig. 4: Final denture placed and QR code data encrypted

DISCUSSION

The patient in this report presented with a satisfactory solution to problem of strength and retention over conventional mandibular denture. However, functional and esthetic results were also appreciable. The denture base can be reinforced by carbon fibers in two ways: the entire denture base can be reinforced with a fiber weave, or a fiber reinforcement can be accurately placed at the weak region of the denture.⁷ Carbon fibers undoubtedly increase the strength of denture base but more clinical studies are needed to be done on its maintenance requirement.

Denture labeling by most inexpensive accurate method of QR code also helped to recognize the unknown in case of memory loss or dementia patients. This two dimensional barcode can be scanned easily using (smartphone) Android operating system and iOS devices (iPhone/iPad).

SUMMARY

Over denture is an excellent viable treatment alternative. A design modification done in present report makes its excellent for elderly compromised patients. Carbon fibers increased strength and QR code gave unique identification to prosthesis to prevent its loss.

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