

A Novel Method of Reinforcing Acrylic Denture – A Case Report

Prof Dr Kurien Varghese¹, Dr Arun K Joy², Dr Nitha Sankar, Dr Sony Vaidyan

(¹ Professor and Head of department prosthodontics Azeezia College of Dental Sciences and research Kerala, India)

(² Post graduate students department of prosthodontics Azeezia College of Dental Sciences and research Kerala, India)

Abstract:Metals have been using for reinforcing acrylic denture since long times. Metal due to high malleability and higher strength can scaffold the acrylic materials withstanding flexural fatigue and stress concentration there by reinforcing the denture. Metal can be added in form of wires, bars, mesh or plates. Metal strengthener had a beneficial effect on the fracture resistance of the polymethylmethacrylate.

Keywords: Metal Reinforcement, Metal Inserts, Single complete denture

I. Introduction

There has been so much debate regarding the Masticatory loads and forces transferring in the case of a single complete denture opposing a natural dentition. Occlusal forces produced by a conventional complete denture are found to be 14lbs while that of natural dentition is 44lb¹. In most of the times flexural fatigue and stress concentration is found to be major cause of denture fractures³. So a single complete denture opposing natural dentition should be reinforced to that extent that it should withstand the huge occlusal forces acting on it. Metal can be added in form of wires, bars, mesh or plates. Metal strengthener had a beneficial effect on the fracture resistance of the polymethylmethacrylate ($P < 0.001-0.01$)²

II. Case Report

65 year aged male patient reported to the OP in Azeezia College of Dental Sciences and Research with chief complaint of repeated fracture of the maxillary Denture. The patient had been a denture wearer for the past 5 years and already had 3 dentures which got repaired for fracture. On examination the patient is found to be a single complete denture wearer with Maxillary complete denture opposing mandibular natural teeth. The previous denture were also inspected and detailed history were taken about the Para functional habits, dietary habits, denture cleansing and the fracture pattern of denture. The patient has not reported any Para functional habits and he is under normal mixed diet too.

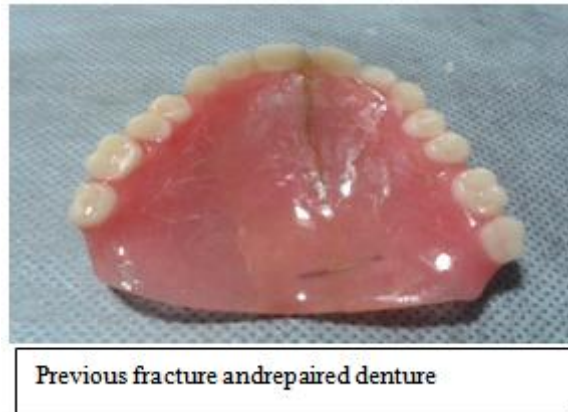


Completely edentulous maxillary arch opposing remaining mandibular natural dentition

¹ Professor and Head of department prosthodontics Azeezia College Of Dental Sciences and research Kerala, India

² Post graduate student department of prosthodontics Azeezia College Of Dental Sciences and research Kerala, India

The previous dentures were found to be cured according to the manufactures instructions and henceforth the technical failure is rejected. Following further investigations and literature referral it is concluded that the opposing natural teeth with heavy occlusal loads as well as maligned and supra erupted opposing teeth were the root cause for recurrent fracture. So the ideal treatment option for the current scenario is, endodontic treatment and crown on severely attrited and supra erupted teeth, fixed partial denture in relation to lower anterior and metal reinforced maxillary denture. Since patient economical background was not sound only metal reinforced maxillary denture was planned.



1. Clinical Procedures

1.1 For maxillary arch two edentulous alginate trays are selected by accurately measuring the inter hamular notch⁵. A preliminary impression of the maxillary arch is made using alginate with one of the trays and study model is prepared. A customized tray is fabricated, border molding done and secondary impression is made and master cast is prepared.



1.2 For Mandibular arch teeth with carious lesion are restored, impinging cusps are reduced. An alginate impression of mandibular arch is made after preprosthetic mouth preparation. The impression is poured in dental stone to have the mandibular diagnostic cast.

1.1.2 A temporary denture base is fabricated on to the Maxillary master cast and maxillo-mandibular relations are recorded. Teeth selection is done. The record is then transferred and articulated in a mean value articulator using the mandibular cast. Teeth arrangement is done according to the opposing remaining natural dentition. The patient is then sent for try in appointment. On the try-in appointment the maxillo-mandibular relation is re-evaluated and verified.

2. Laboratory Procedures

2.1 The Maxillary Master Cast is then duplicated with self-cure acrylic material. The other alginate tray selected previously, is now placed over the duplicated cast and the palatal vault is marked approximately and transferred to the tray using indelible pencil. The tray is then cut and trimmed using metal trimming disks in the conventional high speed lathe till the desired markings. The thickness of the finally trimmed and prepared tray according to the marking is measured using Willis gauge and is found to be 0.5mm.

2.2 Dentures reinforced with metal wire exhibited significantly lower adaptation to the stone cast than the unreinforced ones for each polymerization system⁴. In order to precisely contour the trimmed tray on to the palatal vault, the self-cure duplicated cast is flaked applying a thin coat of cold mold seal. Once the gypsum is set the flask is opened and washed thoroughly to remove the thin coat of separating medium. Now the trimmed and reduced tray is placed on the palatal vault of de-flaked self-cure acrylic resin cast and the flask is closed again and pressed using conventional bench press. The bench pressing is done to get a close adaptation of the trimmed tray 3 dimensionally to the palatal vault contours



Self-cured duplicated cast after de-flasking

2.2.3 The flask is then removed from the bench press and opened to check for the accurate adaptation of the trimmed tray conforming the contours of palate 3 dimensionally. The adaptation is finally evaluated on the master cast too.

2.1.1 The trial denture with the mast cast is then flaked and deflaked for final packing. The trimmed and 3 dimensionally contoured tray is then removed from the duplicated cast and placed on the palatal vault region of the master cast and re-evaluated.

2.2.1 For a smooth functioning of the denture within mouth the impression surface should be free of blebs and any sharp points. In the final denture the reinforcing material should be sandwiched within layers of acrylic and acrylic have to flow both on the cameo as well as the intaglio surface so that a smooth surface finish have to be obtained. This is done by placing 4 wax blocks [size 0.5cm×0.5cm and thickness 0.8mm] 2cm apart on the master cast (palatal vault area) and the prepared and contoured tray is placed over the wax blocks so that the tray now rests on the 4 separately placed wax blocks and 0.8mm space is there between the palatal vault of master cast and trimmed tray for the final heat cure acrylic to flow while packing.

2.2.4 Self-cure acrylic material is then mixed following manufacturers recommendations and it is loaded on to a syringe. The material is then injected through the tray hole immediately adjacent to the position of the wax block for holding the tray in position while packing as well as maintaining the space beneath. The acrylic material is allowed to set and once it is set the wax sheet beneath the tray is removed using fine forceps. Now the tray is resting on self-cured acrylic pillars on 4 separate points with a space of 0.8mm beneath for the heat cure acrylic material to flow while final packing.



Loaded self-cure acrylic is syringed through the tray-hole

2.2.5 The heat cure acrylic resin is then mixed according to manufactures instructions and packed in dough stage. It is then clamped and sent for curing. Once the material is cured the whole thing is deflaked and denture is separated. Final finishing and polishing done and denture are ready for insertion. The denture is weighed using a common balance and compared with that of conventional denture.



Final finished and polished denture

1.1.3 On the next appointment denture insertion is done strictly following the denture insertion protocols as well as post insertion instructions is given to the patient. The patient is reviewed 24 hours post insertion and examined as well as patient opinion is recorded. Recall visit also done after 1 week intervals and the denture is inspected thoroughly for fracture lines. No evidence of craze lines is evident and denture is functioning well under the occlusal loads of opposing natural dentition even after one month recall visits.

III. Discussion

The conventional methods of incorporating metal meshwork and even aramid fibers were cumbersome and costly. The easy availability of the alginate edentulous trays and affordable price as well as the perforations within the tray helps in mechanical interlocking of the heat cure acrylic material and bonding. All forms of metal reinforcement significantly increased the impact strength and tensile strength and the metal wire reinforcement produced the greatest increasing in impact strength and tensile strength⁶. In this article the author has presented an economical way of reinforcing denture using edentulous alginate stock trays and a Novel method to get an accurate adaptation of the reinforcing material 3 dimensionally.

IV. Summary

There are many methods in the literature to improve the strength of heat cure acrylic resin in special cases. Incorporating the perforated Metal impression tray to Heat-cure acrylic Denture for increasing the strength of acrylic to counter the heavy Masticatory Loads is a novel method of reinforcing acrylic denture.

References

- [1]. Prosthodontic treatment of edentulous patient- Boucher 12th edition
- [2]. P. K. VALLITTU V. P. LASSILA Reinforcement of acrylic resin denture base material with metal or fibre strengtheners *Journal of Oral Rehabilitation* Volume 19, Issue 3, pages 225–230, May 1992
- [3]. Robert L. Schneider, Diagnosing functional complete denture fractures. *JPD* Volume 54, Issue 6, December 1985, Pages 809–814
- [4]. F. Teraoka, M. Nakagawa and J. Takahash Adaptation of acrylic dentures reinforced with metal wire *Journal of Oral Rehabilitation* Volume 28, Issue 10, pages 937–942, October 2001
- [5]. J F McCord & A, A Grant *British Dental Journal* 188, 484 - 492 (2000) Published online: 13 May 2000 doi:10.1038/sj.bdj.4800516 Effect of some properties of metal strengtheners on the fracture resistance of acrylic denture base material construction
- [6]. P.K. VALLITTU Effect of some properties of metal strengtheners on the fracture resistance of acrylic denture base material construction; *Journal of Oral Rehabilitation* Volume 20, Issue 3, pages 241–248, May 1993