



Reinforcement Of Maxillary Complete Denture Opposing A Natural Dentition Using Metal Mesh-A Case Report

¹Dr. Josephine Flora A, ²Dr. Prabhu K.

¹Senior Lecturer, ²Prof and HOD.

^{1,2}Department of Prosthodontics,

¹Indira Gandhi Institute of Dental Sciences, Puducherry-607402.

²Adhiparasakthi Dental College and Hospital, Melmaruvathur-603319.

***Corresponding Author:**

Dr. Josephine Flora A

Senior Lecturer, Department of Prosthodontics,

Indira Gandhi Institute of Dental Sciences, Puducherry-607402.

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Abstract

Fractures of complete dentures can be frustrating and disappointing to both the patients and dentists as it greatly influences a patient's day-to-day life. These fractures may be attributed to various reasons, including Single maxillary complete dentures opposing a natural dentition, deep palatal vault, prominent mid-palatal raphae, thin denture bases, and high frenal attachments. Complete denture fractures result from conventional heat-cure acrylic resins' inability to withstand occlusal loads. Incorporating metal reinforcements into the denture is a simple and affordable way to strengthen acrylic denture bases. This case report shows the prosthetic rehabilitation of an edentulous patient with a reinforced single maxillary complete denture using prefabricated metal mesh to oppose a natural dentition.

Keywords: Reinforced denture, Prefabricated metal mesh, Sandwich technique

Introduction

Denture bases, artificial teeth, and impression trays have all been effectively made from polymethylmethacrylate (PMMA).^[1] They are the material of choice in the fabrication of denture bases due to the following advantages: advantageous working qualities, simplicity of processing and maintenance, the accuracy of fit, stability in the oral environment, outstanding aesthetics, and cost efficiency.^[2] However, it has the main disadvantage of low mechanical strength which makes it vulnerable to deformation during the mastication process and to impact failures.^[3] To overcome this issue, a denture base material with increased flexural strength is preferred. Tensile, compressive, and shear strength are all combined to form flexural strength. The main issue with PMMA is that it has weak physical properties, such as low flexural strength,

impact strength, and fatigue resistance. Under its glass transition temperature (T_g), which is roughly 110°C, this material exhibits brittle behaviour and is vulnerable to cyclic loading.^[4] When PMMA is subjected to stresses, it repeatedly flexes. This causes microcracks to form in stress-concentrated locations.^[5]

The most frequent fractures in removable complete dentures, according to literature reviews, are midline fractures. It is roughly 46.87% for maxillary CD and 61% for mandibular CD.^[6] Many different methods have already been put forth to enhance acrylic denture base materials.^[7] They include:

1. Metal-reinforced PMMA complete dentures
2. Chemical modification of PMMA

3. Strengthening of PMMA by incorporating fibres namely carbon fibres, glass fibers.
4. Using visible light polymerized (VLC) resins
5. Strengthening by incorporating metal inserts in the form of wires, bars, mesh or plates into the dentures.
6. Using polymers -PEEK or PEKK. [8]

This case report shows the method of reinforcing a maxillary single complete denture with a metal mesh to oppose a natural dentition.

Case Report:

A 45-year-old patient reported to the department of Prosthodontics and crown and bridge, Adhiparasakthi Dental College and Hospital with a chief complaint of a fractured single maxillary complete denture during mastication which was fabricated two years back, and wanted to replace them. His past history revealed that he had lost all his teeth due to periodontal involvement 3 years back. The patient had no contributory past medical history. The patient's personal history revealed that he was a chronic smoker and alcoholic. His major concern was to improve his masticatory function with a new denture.

FIGURE1: INTRAORAL IMAGES OF MAXILLARY AND MANDIBULAR ARCH



Intraoral examination revealed a completely edentulous U-shaped maxillary arch and a completely dentulous mandibular arch. The patient was explained the various treatment options which include, Implant supported fixed prosthesis, implant retained overdentures, metal base complete dentures, and reinforcement of conventional dentures with metal mesh or fibers. The patient opted for metal mesh reinforced complete dentures due to financial reasons and was not willing to encounter surgical procedures like implant placement.

Procedure:

1. Primary impression of the upper and lower arch was made using alginate impression material and the primary cast was poured using dental plaster in the upper arch and dental stone in the lower arch.
2. Special tray for the maxillary arch was done using auto-polymerizing acrylic resin. Border moulding was done using green stick compound

and the secondary impression was made using Zinc oxide eugenol impression paste.

3. Beading of the secondary impression was done using the Pumice and plaster method and Boxing was done using boxing wax. The master cast was poured using dental stone.
4. Base plate and occlusal rims were fabricated in the usual manner and Articulation of the casts was done after the procedure of jaw relation.
5. Teeth setting was done in a conventional manner and wax try-in was done.
6. The master cast was duplicated using agar and this duplicated cast was used for the adaptation of the metal mesh over the cast. This procedure helped in retaining the original master cast without any damage.
7. The waxed denture was flaked and dewaxed in a conventional manner. After dewaxing, a separating medium was painted over the cast and allowed to dry.
8. Before acrylization, a sort of sandwiched technique was carried out. The acrylic resin was

mixed and packed over the cast and a separating sheet was placed between the two halves of the flask and it was subjected to hydraulic pressure to remove the excess resin.

9. Following this process, the separating sheet was taken out and the preadapted metal mesh was pressed into the resin matrix and once again closed.
10. After curing, the denture was retrieved, trimmed, and polished.

11. At the insertion appointment, slight occlusal adjustments were done. Post Insertion instructions were given to the patient. The patient was asked to report back after three days for a follow-up appointment. The patient was happy and satisfied with the masticatory performance and esthetics of the newly fabricated metal mesh-reinforced single maxillary complete denture.

FIGURE 2: PRIMARY IMPRESSION

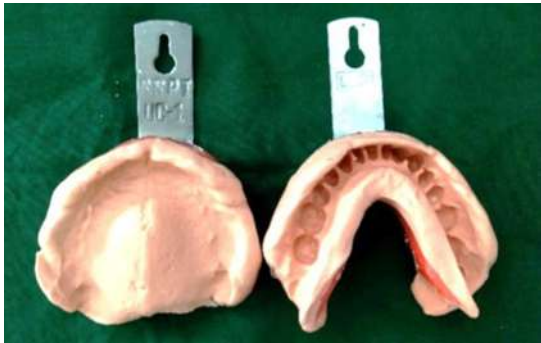


FIGURE 3: PRIMARY CASTS



FIGURE 4: SPECIAL TRAY

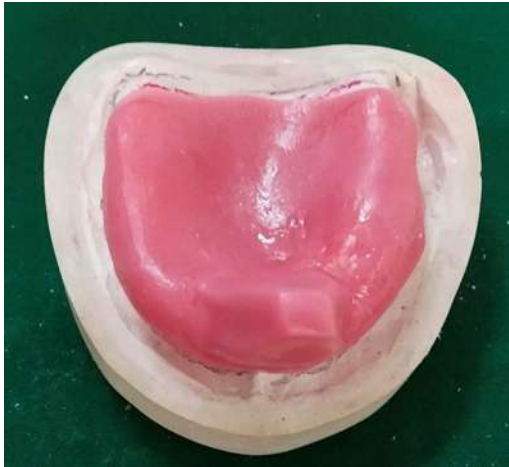


FIGURE 5: SECONDARY IMPRESSION



FIGURE 6: ARTICULATION



FIGURE 7: TEETH SETTING



FIGURE 8: METAL MESH

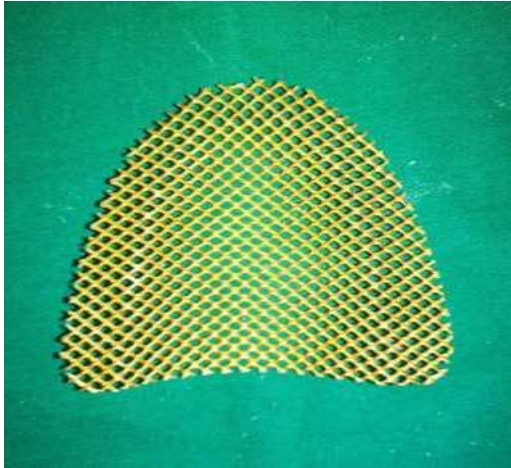


FIGURE 9: CAST DUPLICATION (AGAR)



FIGURE 10: ADAPTATION OF MESH

FIGURE 11: FLASKING AND DEWAXING

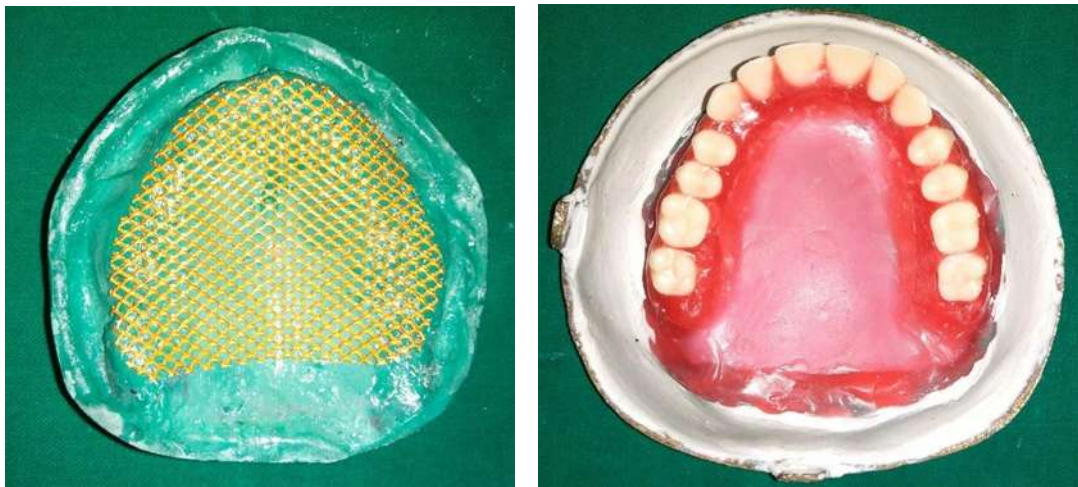


FIGURE 12: SANDWICH TECHNIQUE

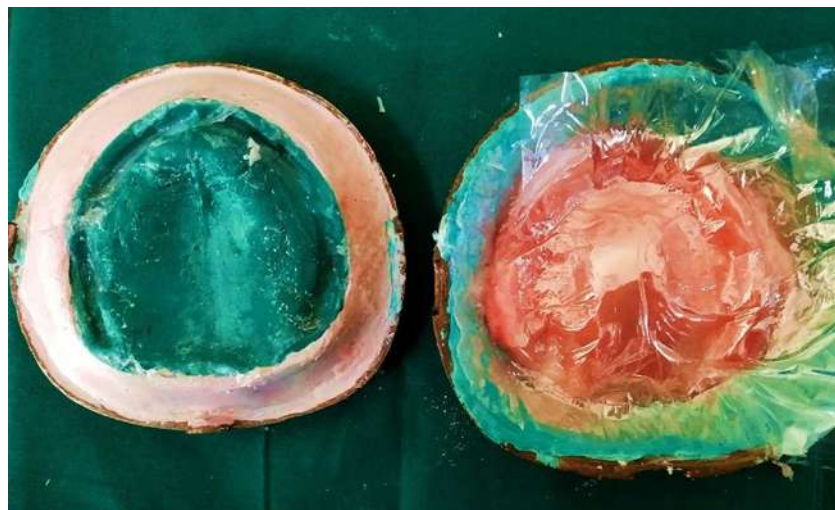


FIGURE 13: INCORPORATION OF MESH INTO ACRYLIC RESIN

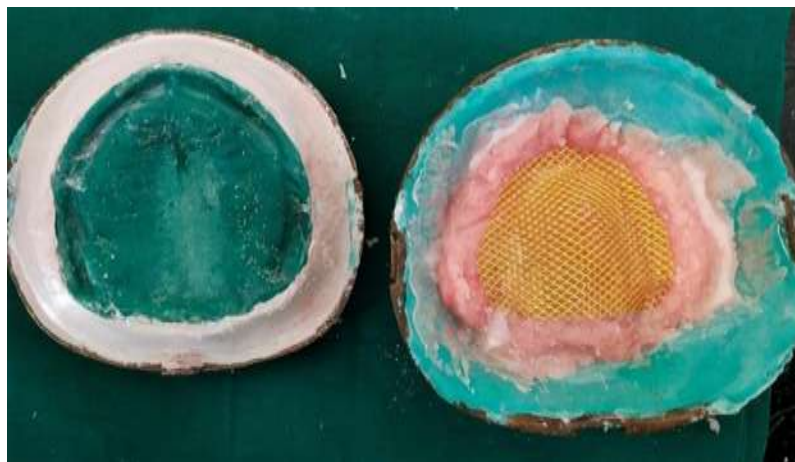


FIGURE 14: FINISHED AND POLISHED DENTURES

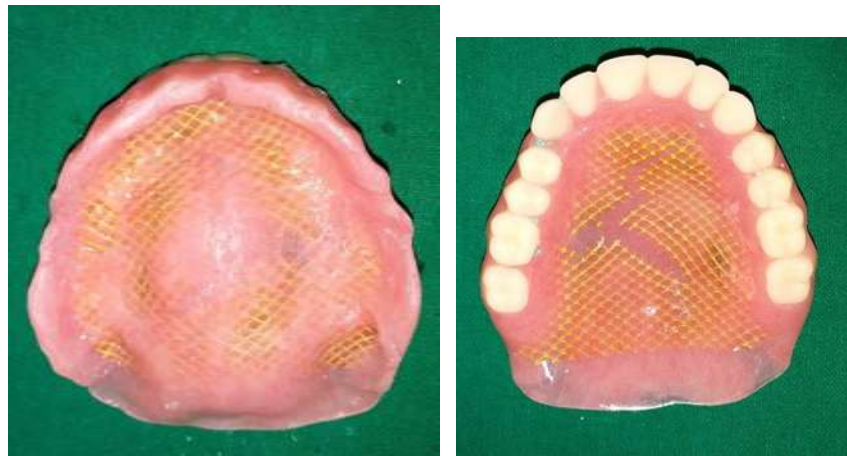


FIGURE 15: PRE-OPERATIVE FIGURE 16: POSTOPERATIVE



Discussion:

Impact and flexural fatigue are two distinct types of forces that lead to denture fracture. Impact fracture happens when the denture receives a violent blow or due to an unintentional fall of a denture from the mouth or hands. Flexural fatigue happens when lower dimensions are repeatedly stressed, which causes the base of the denture to develop microscopic cracks. When subjected to high occlusal loading, the traditional denture base material Poly methyl methacrylate (PMMA) exhibits weak mechanical qualities and is prone to shatter. Denture fracture that occurs frequently is problematic for both patients and doctors.^[9]

The polymethyl methacrylate's fracture resistance is augmented with a metal strengthener. Metal mesh reinforcement increases denture strength and prevents micro-crack propagation.^[10] Prefabricated metal meshes are available commercially as stainless steel and gold-plated metal. The metal meshes have a very minimum thickness of about 0.4mm and they improve the acrylic resin bonding without increasing the bulk and the weight of the denture. They are more economic to the patient and in turn, reduce the chances of recurrent fractures of the dentures due to heavy occlusal loads of the opposing natural dentition.^[11,12,13]

Hence, advancements in various materials, methods, and techniques are needed in this aspect to satisfy the mechanical and esthetic properties of both the patient and the clinician. The above-presented method/technique can stand as an economical and promising choice for patients who can't afford a fixed implant-supported prosthesis.

Conclusion:

Prosthetic rehabilitation of patients with repeated midline fractures of a single maxillary complete denture opposing a completely dentulous natural dentition is a challenging task for both the clinician and the patient. Thus, reinforcements with these prefabricated metal mesh serve to be the most economical and less time-consuming option for those who can't afford fixed Implant prostheses due to economical reasons.

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