

Glass Fibre Mesh Reinforced Denture - A Case Report

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Abstract: PMMA resin commonly used for the fabrication of various prostheses and appliances has low impact strength and low fatigue resistance. This problem becomes even more magnified in case of single complete denture where the horizontal forces are of much higher magnitude. Midline fracture is the most common problem, seen among patient with heavy masticatory loads and those with Para functional habits. A glass fibre reinforced denture aids benefit in response to fracture of denture. This article discusses in detail a case report of successful prosthetic rehabilitation of a patient with glass reinforced single complete denture in relation to maxillary arch opposing natural dentition.

Keywords: denture reinforcement, glass fibre mesh, denture

1. Introduction

The fracture of acrylic resin dentures is a common clinical occurrence. Fracture observed in denture is usually related to faulty planning, faulty fabrication, and/or poor choice of materials. It can also happen when a denture accidentally falls out of mouth while coughing or sneezing, or due to dropping of the dentures¹. Excessive biting forces may also cause fracture of the denture. Fractures are more common in the midline of maxillary complete dentures. Furthermore, fracture of repaired dentures often occurs at the junction of an old and new material rather than through the center of the repair².

To avoid such fractures, advancement in materials and techniques have been continuously taking place. Use of metal reinforced denture base, acrylic resin base reinforced with wire netting, carbon fibre, E glass fibre reinforced PMMA lucitone 199, Trevalon high, Paladon ultra and visible light polymerized resin⁸ have been tried in the past to increase fracture resistance of the denture and thereby decreasing chances of failure³

Many attempts have been made to enhance the strength of acrylic denture bases including the addition of metal wire. The primary problem of using metal wire reinforcement is poor adhesion between wire and acrylic resin. Alternatively, Vallittu et al found no difference in impact strength between acrylic resin reinforced with metal wires⁴.

To overcome the problem of poor esthetic appearance of reinforced dentures, E-glass fibers were developed. Since these fibers were transparent or colorless they provided very good esthetics.

Glass fibers were tested in some studies to improve mechanical properties of denture base polymers, especially improved fatigue resistance and good esthetic properties of glass fibers were noted⁵. The denture when reinforced with Glass fiber has shown significantly increase in the flexural strength, impact strength, toughness, and Vickers hardness of acrylic resin.

Indications of Reinforced Denture:

- 1) Patient with atrophied ridges.

- 2) Patient with compromised neuromuscular coordination who drop their denture for e.g.: Parkinson's disease
- 3) Patient with higher rate of residual ridge resorption like postmenopausal women b) Diabetic Patient.
- 4) Patient who are have frequent history of denture fractures.

Advantage of reinforced denture

- 1) Improved mechanical property: high fracture resistance.
- 2) Less deformation during lateral mandibular movement.
- 3) High thermal significant conductors.
- 4) Light pink colour of glass fibre mesh gets camouflaged with pink colour of heat cure resin which gives it higher esthetics when compared to metal mesh supported denture

Disadvantages of reinforced denture

- 1) Slightly higher cost, difficult to rebase.
- 2) Slightly Time consuming
- 3) Additional step care needed.

2. Case Report

A 35 year old male patient completely edentulous in relation to maxillary arch reported to the department of prosthodontics, Rajarajeshwari dental college, Bengaluru, with the chief complaint of repeated fracture of upper denture and needs replacement. Detailed case history was recorded and treatment plan was formulated. History revealed that patient was partially edentulous for the past 3 years and was using removable complete denture which had to be repaired several times with autopolymerizing acrylic resin. On intra oral examination, well rounded maxillary ridge and periodontally sound retained teeth were found in relation to mandibular arch. Due consideration was given to the frequent history of fracture of removable single complete denture while formulating the treatment plan. Our intention was to enhance the fracture resistance of the denture without compromising esthetics of the denture

Patient was explained about various other treatment options-

- a) Implant supported hybrid prosthesis.
- b) Implant supported over denture.

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- c) Metal mesh reinforced denture.
- d) Glass fibre reinforced denture

With due consent of the patient, it was decided that the patient be rehabilitated with glass fibre reinforced denture.

3. Clinical Steps

- 1) Preliminary impression for maxillary arch was made using non perforated edentulous metal stock tray no 3 with type 1 impression compound and for mandibular arch using perforated edentulous metal stock tray no 3 with alginate (alginate-DPI dust free) impression material and the impressions were disinfected and poured using type II Gypsum product.
- 2) The preliminary casts were obtained and groomed. Custom tray was fabricated with I-SHAPED SPACER on maxillary cast using dental wax.
- 3) Border molding procedure was carried out conventionally using low fusing impression compound (DPI PINNACLE tracing sticks) and then final impression was recorded with zinc oxide eugenol (DPI) impression paste using selective pressure technique.
- 4) Beading and boxing of the impression was done and it was poured in type III gypsum product.
- 5) Denture base was fabricated and occlusion rim was made on maxillary denture base. Maxillo-mandibular relations were recorded and evaluated for optimum aesthetics and phonetics.
- 6) Articulation was done followed by teeth arrangement. Try in was done in the next appointment.
- 7) After trial was found to be satisfactory, then the flasking and dewaxing procedures were carried out.
- 8) Before packing, the glass fibre mesh (SES mesh) was cut in half of dimension 4*4cm, roughened borders are smoothed using sand paper (fig2).
- 9) The glass fibre mesh was slightly softened by pressing it against heated iron box and was placed and adapted on the maxillary cast using slight finger pressure (fig 3).
- 10) Packing procedure was carried out, bench curing was done and the acrylization procedure was carried out (fig 4).
- 11) The prosthesis was then finished, polished and delivered to the patient (fig 5).

4. Discussion

Fracture of single complete denture are common when opposing natural teeth as the high forces acting on the denture leads to stress propagation which will further lead to crack and finally causing fracture in mid line area. The midline fracture in a denture is often a result of flexural fatigue. Though poly Methyl Metha Acrylate denture bases have good mechanical, biological and esthetic properties, the impact and fatigue strength of PMMA are not entirely satisfactory, thus may fail when there is excessive parafunctional and/or functional force ⁷.

Various studies based on mechanical properties revealed that the glass fibres are efficient in reinforcing acrylic denture base resin. There are some clinical studies regarding the clinical behaviour of removable acrylic reinforced dentures. Narva et al. found that polymer pre-impregnated partial fibre

reinforcement seemed to be useful in eliminating fractures of acrylic removable dentures⁸

The incorporation of glass fibres produced an increase in the strength and a decrease in fatigue weakening of PMMA. However, an excess of methyl methacrylate monomer to ensure better impregnation of fibres with PMMA would increase the polymerization shrinkage and could cause dimensional changes within the denture. Vallittu⁹ demonstrated that the polymerization shrinkage of PMMA caused lower dimensional accuracy of test specimens reinforced with glass fibre.

5. Conclusion

In this case report glass fibre mesh was used as reinforcement to resist fracture if PMMA was to be used as denture base. The fibre mesh have good esthetic properties and less bulky. There would be no propagation of crack from the deep labial notch as well. Glass fibre mesh in the maxillary denture has an added advantage as it increases the strength and durability of the denture with patient satisfaction.

Figures



Figure 1

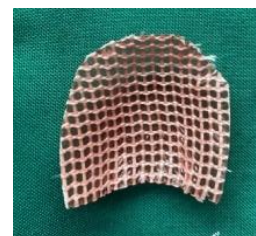


Figure 2

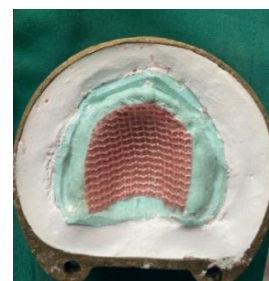


Figure 3

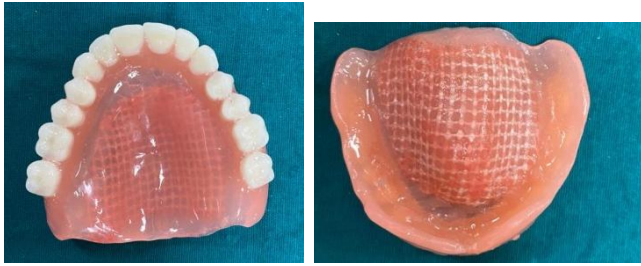


Figure 4: Processed denture reinforced with glass fibre mesh



Figure 5: Postoperative

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