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CASE REPORT

MASKING COMPLETE DENTURE REINFORCEMENTS OF METAL MESH- A TECHNICAL REPORT

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ABSTRACT

Complete denture with an acrylic denture base is a successful treatment modality for many edentulous cases, but there are repeated episodes of fracture due to reasons of occlusal disharmony, flexure and fatigue as a result of alveolar resorption and impact as a result of dropping the denture. Denture reinforcements in form of metal mesh though a suitable alternative for alleviating fracture episodes; it exposes the metallic component in certain areas and hence affects the overall patient compliance. In situations where extensive resorption of the residual ridge has occurred, it is not uncommon to have a buccolingual width of 5 mm or less. The potential for denture fracture is therefore inherent commonly in anterior region. This case report aims at using an economical and less time consuming procedure for reinforcement by use of metal mesh and technique to avoid metallic display in mandibular complete denture.

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INTRODUCTION

Polymethylmethacrylate (PMMA) popular as a denture base material, fulfills the aesthetic demands, but it is not an ideal material as it does not fulfill the mechanical requirements of the complete denture prosthesis. A common site of fracture is along antero-posterior mid line that coincides with labial notch provided for the relief of the labial frenum in maxillary and mandibular complete dentures. (Rodrigues, 2000) However, with increased consciousness and highly risen standards of esthetics, the metallic display of mesh used to reinforce the prosthesis is many a times unacceptable by the denture wearers. This case report presents a technique of masking the metal reinforcement.

Case report

A completely edentulous 59 year old female patient, having good general health, reported to the Department of Prosthodontics, Crown and Bridge, School of Dental sciences, KIMS-DU, with a history of repeated fracture of Mandibular Denture. History revealed that she was completely edentulous for last 7 years and was wearing the present dentures for last 6 years. Since last 1 year the lower denture had been repaired thrice with routine Laboratory procedures.

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Her primary concern for fabrication of new dentures was dentures with increased strength. History taking revealed a personality of philosophic type, intraoral examination revealed that ridge form of maxillary arch was Class1 -Square to gently rounded and that of mandibular arch was Class 3 -thin inverted 'V'. Labial frenum of Mandibular arch exhibited a Class 3 type of Frenal attachment according to House classification of frenal attachments (Robert, 1996) that encroached onto crest of the ridge (Figure 1). Appropriate treatment plan was formulated taking into consideration, the repeated episodes of fracture.

Patient was advised for surgical correction for high renal attachment in the lower arch but she did not give consent for the same. Our objective was to enhance the fracture resistance of the denture. So it was planned to fabricate a cast metal denture, which was not cost effective for the patient. Considering the availability of the resources and keeping in mind the patient's concern about the cost and function, it was decided to fabricate a metal reinforced denture. Patient was informed and shown the reinforcement using a metal mesh but was dissatisfied by the esthetics and display of metal mesh, Therefore masking of mesh to eliminate metallic display was planned out. Preliminary impression of upper and lower arches were made in modeling plastic (*Impression compound-Ydents, MDM Corp)* followed by border moulding with green stick (Low fusing compound; *DPI Pinnacle, Mumbai, India*) and wash impression using Zinc oxide eugenol impression paste (*Neogenate- Septodent*).

Figure 1. Class III Frenal Attachment in Edentulous Lower jaw

The master cast was duplicated using alginate (*Alginate-Marieflex, Septodent*). The impression was poured in autopolymerising acrylic resin to obtain a duplicate cast.The size of Golden reinforcement mesh (*MAAC –CE Reinforcement Golden Mesh Shiva Products -Thane*) was marked using a marking pen , later was cut using a separating disk and adapted to the original master cast for customized dimensions according to the residual ridge by using a universal plier. After the intial adaptation was complete, the duplicated cast in acrylic was flasked using dental plaster and counter flasked with dental stone. This procedure resulted in mould for complete adaptation of the mesh on the hard duplicated acrylic cast (Figure 2).

Figure 2. Duplicated Cast in Acrylic Invested in Dental plaster and Counter flasked in dental stone to produce a mould space

Figure 3. The Golden reinforecement mesh cut and adapted onto duplicated master cast

The adapted mesh over the duplicated cast was oriented and stabilized with modeling wax, entire assembly was kept under bench press (3000 psi) for one hour (Figure 3). This procedure allowed complete adaptation of stainless steel mesh on the duplicated master cast. Later the completely adapted mesh was retrieved and coated with autopolymerizing resin using bead brush technique such that only exposed surface was masked and its under surface was left untouched (Figure 4).

Figure 4. Coated Occlusal surface of Adapted mesh using Autopolymersing resin by Bead Brush Technique

The small thickness of 0.4mmof the mesh helped in avoiding over dimensioning of denture base. The Coated mesh was adapted over the master cast and was incorporated during packing after following regular complete denture flasking protocols (Figure 5).

Figure 5. Coated mesh was adapted over the master cast

DISCUSSION

Midline fracture was the most common problem in a recent denture survey, 71% were seen in maxillary complete dentures and 29% were seen in mandibular dentures. (Darbar *et al.,* 1994) A denture repaired with heat-cured resin exhibits approximately 85% of its original strength, and with auto polymerizing resin repair has only 55% to 65% of the original heat-cure denture strength. (Anderson, 1976) Fracture of a denture is an important problem not only for patients but also for dentists and dental laboratory technicians. (Teraoka *et al*., 2001)

The risk of fracture is great especially when the denture base is thin and masticatory forces are high. An ideal denture base material is the one that possesses biocompatibility with the oral tissues, excellent esthetics, superior mechanical properties especially modulus of elasticity, impact strength, flexural strength and hardness, sufficient bond strength with artificial teeth and lining materials, ability to repair or alter the contours and dimensional accuracy. Fracture of a prosthesis occurs due to crack initiation and propagation from areas of high stress concentration. In order to overcome this problem.

Figure 6. Eliminated Metallic Display of Stainless steel mesh in Lower Denture

In order to overcome this problem, it is important to identify the regions of stress concentration. The failure of a denture base material may often be either an impact failure or fatigue failure. Impact failures involve rapid stressing of the material such as by dropping the denture on a hard surface. Fatigue failures occur after continued flexing of the base during function, this type of failure can be explained by the development of microscopic cracks in areas of stress concentration. Failure of this type in an upper denture commonly results in fracture long the midline. Doubling the thickness of the denture base was one of the early attempts to increase the strength of acrylic dentures. (McCabe, 1985) Reinforcement has been attempted through the incorporation of solid metal forms and various types of fibers in fracture–prone areas. Metals can be added in the form of wires, plates, nets or fillers. (Polyzois, 1995) Glass fibre reinforcements although impart high fracture resistance in terms of flexural and impact strength, they are regarded as expensive alternatives.

Over the years various types of fibers such as carbon, aramid, polyethylene, jute fibres and glass fibres have been added to acrylic resin in an attempt to improve its mechanical properties. Poor wetting of fibres within the acrylic resin and polymerization shrinkage of the PMMA destroys the layer of resin on the surface of the fibres and decreases the bond between the fibres and the polymer. Kassab *et al*. (2009) in their study conducted to evaluate effect of thickness of acrylic denture base resin on the transverse strength, also to evaluate the effect of metal and fiber reinforcements on the fracture resistance of denture base resin concluded that the thickness significantly increased the transverse strength of denture base resin.

All forms of metal and glass fiber reinforcement significantly improved the transverse strength, impact strength and tensile strength of denture base resin. (KassabBashi *et al.,* 2009)

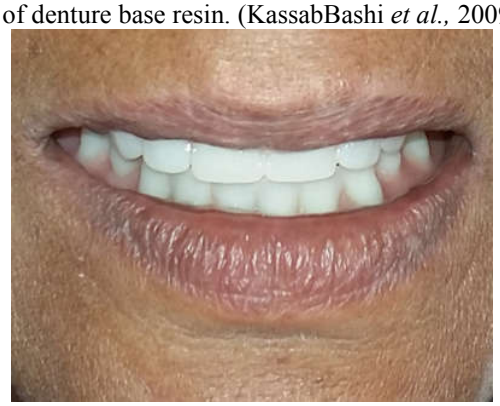

Figure 7. Enhanced Esthetics due to eliminated metallic display

Although it is concluded that significant difference in reinforcing characteristics of different fibres was evident from the literature. Further, processing of fibre reinforced denture bases seems to be technique sensitive and difficult to fabricate in the dental laboratory. (Rama Krishna Alla *et al.,* 2013) Metallic inserts in form mesh, wires or plates, are stronger, have greater resistance to fatigue and are less likely to break under normal conditions.

However, a serious disadvantage of metallic components is they are prone to corrosion, are unesthetic, and exhibit poor adhesion to denture base, but cost effective than glass fibre reinforcements. The technique presented in this article for masking the metal mesh using autopolymersisng resin depends upon the bonding between auto polymerizing and heat polymersing resins. The self-cure material, masked the metallic component show through the translucent heat cure resin enhancing esthetics (Figure 6 & 7) and patient compliance, particularly in areas other than those that lie underlying the artificial dentition i.e palatal vault in mesh reinforced maxillary complete denture and labial flanges of mandibular complete dentures.

Conclusion

Poly methyl methacrylate will continue to be the preferred material of choice for the fabrication of complete and partial denture prostheses. Attempts to improve the strength characteristics of the material would result in prolonging the service life of acrylic dentures. Fibre reinforcements although have significant improvement in flexural strength, impact strength and fatigue resistance of the materials, further research is needed to address assured success. On the other hand, masking the metal reinforcements can be used as a cheaper and a more esthetic alternative to fibre reinforced prosthesis (Figure 7).

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