

REHABILITATION OF AN EDENTULOUS PATIENT WITH REINFORCED MAXILLARY COMPLETE DENTURE: A CASE REPORT

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ABSTRACT:

Fracture of acrylic resin denture base has long been a cause of concern in prosthodontics. Several patients present with repeated fracture of complete denture bases, the cause of which can be certain anatomical limitations, material properties, improper construction, accidental damage and/or the dynamic biomechanical forces acting in the oral environment. Although most of these fractures are observed in patients wearing single complete denture opposing natural dentition, finding edentulous patients with similar problem is not uncommon. A variety of treatment modifications have been devised to tackle this complex situation such as use of high impact strength resins, flexible denture materials and reinforcement with metal wire, metal mesh and others. This case report discusses the rehabilitation of a patient with repeated fracture of maxillary complete denture opposing an edentulous ridge.

Key words: Complete denture, Midline fracture, Metal base denture, Reinforced



INTRODUCTION:

Acrylic resins are the most widely used materials for the construction of removable dentures. However, fracture of acrylic denture bases is a commonly encountered complication. This is primarily because of their mechanical properties which may fail to withstand the masticatory forces acting in the oral cavity. Any factor that exacerbates

deformation of the base or alters its stress distribution will predispose the denture to fracture.^[1,2] The magnitude and direction of forces determined by the opposing dentition leading to flexural fatigue, and anatomical limitations are the two primary factors which may result in denture fracture. Inadequate thickness, inadequate or no relief or poor design may also be significant contributing

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factors. Impact failure usually occurs out of the mouth due to accidental fall. Midline fracture is more frequently observed and is more common in males.^[3,4] Denture repair is often carried out as a temporary measure in this situation. However, a denture repaired with heat-cured resin or autopolymerizing resin has less strength compared to the original prosthesis.^[1,5] It can be understood that a repaired denture would not be able to sustain the same oral environment as effectively as the original one. Hence, it is best to employ appropriate measures so as to avoid fracture rather than repair.

CASE DETAIL:

A 62 year male patient reported with the chief complaint of repeated breakage of upper complete denture. The patient gave a history of denture wear for the past one year. The maxillary complete denture was repaired and relined repeatedly within the first year due to fracture in the midline (Fig 1). Intraoral examination revealed moderately formed but constricted maxillary edentulous ridge with deep palatal vault (Fig 2). The mandibular ridge was edentulous, broad and well formed (Fig 3). The interridge distance was adequate and ridges were in Class I relationship anteriorly. The ridge condition was good despite the loss of teeth due to periodontal reasons. The patient was a strict vegetarian without any deleterious habits and no relevant medical condition, indicating that the masticatory forces would not have been too high to cause repeated fracture. A

prominent finding was the presence of bilateral posterior crossbite. The mucosa was firm and resilient and the patient's neuromuscular coordination was good. He was co-operative and philosophical according to House classification. The main objective in this case was to enhance the fracture resistance of the denture to prevent subsequent fracture which was primarily occurring due to the bilateral posterior crossbite. Hence, fabrication of metal-based maxillary denture opposing a conventional mandibular complete denture was planned for the patient.

Treatment Procedure:

Preliminary impressions were made in impression compound (Y-Dents, MDM Corporation, India) and primary casts were poured in dental plaster (Kalabhai Dental Private Limited). Tissue molding was done using sectional technique using DPI Pinnacle tracing stick and final impressions were made using polyvinylsiloxane (Elite HD+; Zhermack, Italy). Master casts (Fig 4) were poured in dental stone type III (Kalstone, Kalabhai Dental Private limited). The maxillary cast was duplicated using reversible hydrocolloid and refractory cast was poured with ethyl silicate bonded investment material. The denture base pattern wax was adapted on the refractory cast. Sprues were attached followed by investing. The denture base was casted with cobalt chromium alloy. The metal base was finished and placed on the master cast (Fig 5). It was checked for intimate fit and retention in the mouth. Facebow transfer and

maxillomandibular relation were recorded. Teeth arrangement was done in balanced occlusion on a semiadjustable articulator. Try-in was done to patient and operator's satisfaction (Fig 6). This was followed by acrylization of dentures using heat polymerizing acrylic resin (DPI, India). Laboratory remount was done to remove the interferences. Minor adjustments were done intraorally to obtain optimum occlusion. Dentures were given to the patient followed by post-denture insertion instructions, particularly emphasizing on maintenance and hygiene (Fig 7). The patient was satisfied with the aesthetic outcome and could particularly experience the difference in the fit of denture. Most noticeably, the patient's attitude and disposition had changed due to the psychological advantage of an "unbreakable denture" (Fig 8).

DISCUSSION:

Despite several advancements in dental material science, no single material has been able to fulfill the requirements of an ideal denture base material in oral conditions. Acrylic resin, though popular fails on the mechanical front, particularly the fatigue and impact strength. Though it has been stated that the fracture of complete dentures is common when it is opposed by natural dentition, it has also been shown that incidence of such fracture is equal or sometimes greater when the denture is opposed by a complete denture.^[6] This can be attributed to improper construction of prosthesis or to the excessive forces and their uncontrolled direction due to

anatomical constraints such as posterior crossbite. Several alternatives have been used in the past to tackle this dilemma such as use of high strength polymers, metal wire, metal mesh and flexible dentures. However, some fractures have still been reported in high strength resins as well as in flexible dentures.^[7] The incorporation of metal mesh, though economical and less time consuming, is itself flexible by nature. It has also been proposed that the acrylic resin during polymerization shrinks away from the 'strengthening' material such as metal mesh or wire leaving a material with a network of voids which weakens the structure by creating new points of stress concentration.^[6] Modified designs for metal base dentures in case of decreased interridge distance have been suggested in the past.^[8] However, the present case exhibited good ridge condition with adequate interridge distance. The presence of bilateral posterior crossbite was the decisive factor in this case where conventional design of metal base covering the palate and ridge was used. This was also determined by the fact that the denture was repaired multiple times within the first year of fabrication whereas several studies state that majority of midline fractures occur after 2-3 years of service.^[6,9,10] Hence, repeated fracture could not be attributed to fatigue failure alone in the present case. Besides rigidity and fracture resistance the metal base would also offer several other advantages like excellent strength to volume ratio, better retention due to intimate adaptation, high thermal

conductivity, little dimensional changes due to fluid absorption, enhanced plaque control and psychological advantage to the patient. A cast cobalt-chromium reinforcement has been shown to reduce strain and thereby contribute to fracture avoidance deformation in maxillary complete dentures.^[11] The design however did not cover the posterior palatal seal area. Instead the posterior most area was perforated to allow bonding of denture base resin. This was a provision for relining in future, if need arises. Reinforcement with metal base also permitted us to arrange the teeth in maximum intercuspation rather than in crossbite. The maxillary teeth were positioned slightly buccal to the ridge so as to obtain balanced occlusion with anatomic teeth.

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CONCLUSION:

Majority of midline fractures can be prevented by following sound prosthodontic principles such as adequate relief in areas of incompressible tissue, correct design and extensions, intimate contact, adequate bulk and optimum occlusion. However, in circumstances where anatomic limitations lead to repeated fracture, the use of metal bases is a viable treatment alternative as presented in this case report. However, it is of immense importance to identify the cause of failure prior to re-treatment. Also, there is a need for a more suitable and cost effective method of reinforcement of denture bases.

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FIGURES:

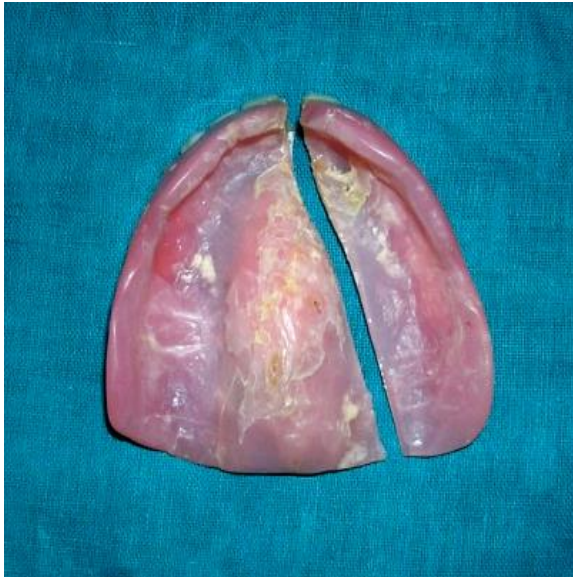


Fig 1. Fractured previous denture.

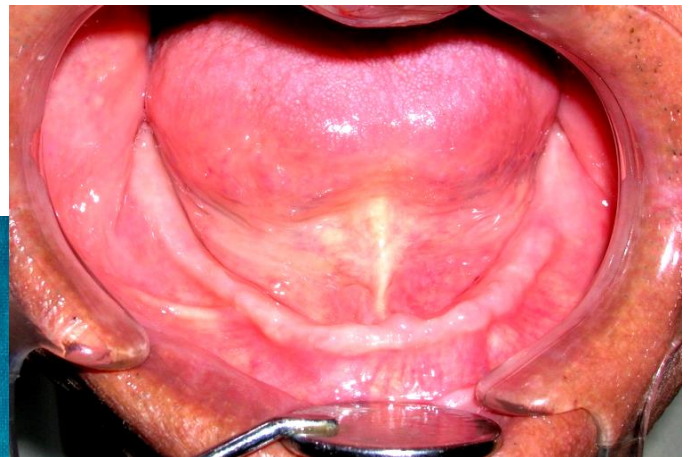


Fig 3. Broad, well-formed mandibular edentulous ridge.



Fig 4. Master casts showing marked difference in posterior width.



Fig 2. Constricted maxillary edentulous ridge.



Fig 5. Metal base positioned on the maxillary master cast.

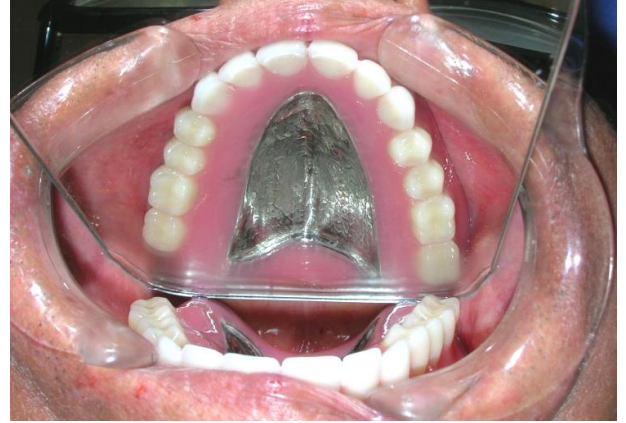


Fig 7. Maxillary denture with metal base in situ.



Fig 6. Try-in.



Fig 8. Post denture insertion smile of the patient.