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### Original Research

#### An Incidence Based Assessment of Etiology and Position of Fracture of Acrylic Resin Dentures: A Survey Based Original Study

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#### ABSTRACT

**Aim:** Fracture of acrylic resin removable dentures occurs frequently during service through heavy occlusal force or accidental damage. The primary goal of this study is to analyze and determines the prevalence of type of denture fracture. **Materials and Methods:** Appropriate data were gathered logically from patients visiting prosthodontic centers for denture repairs at dental hospitals. For each and every patient requiring repairing of a fractured complete and partial denture, the factors were recorded; reasons for denture crack, the kind of crack and the historical backdrop of past repetitive fractures. **Result:** All the collected data were arranged systematically and subjected to fundamental statistical analysis using SPSS statistical package for the Social Sciences version 21 for Windows. Of 320 repaired dentures 180 were complete dentures, 70 were removable partial dentures, and 70 included replacement of the teeth that had debonded from the denture bases. The proportion of upper to lower total denture breaks was roughly 2:1, the majority of the cracked dentures (59%) were those of males. **Conclusion:** Upper dentures were repaired more than lower denture. Within the limitations of the study, authors have also concluded that midline fracture was the commonest sort of crack and greater part of repaired dentures had previously been repaired. Furthermore, our study outcomes could be treated as suggestive for predicting clinical inferences of such situations.

**Keywords:** Midline fracture; Single denture; Complete denture fractures, Acrylic resins

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#### INTRODUCTION

Artificial replacement of human teeth had occupied an important role in the history of human civilization. From time immemorial, it has been observed that various types of materials like wood, bone, ivory, precious and semi-precious metal and alloys have been used as denture material. Also porcelain and vulcanite

rubber were used for artificial teeth and denture base at different times. The material most commonly used for the fabrication of dentures is the acrylic resin, poly methyl methacrylate (PMMA). This material is not ideal in every respect and it is the combination of properties rather than one single desirable property that accounts for its popularity and usage. Despite its

popularity in satisfying aesthetic demands whereby, with an appropriate degree of clinical expertise and with the careful selection and arrangement of artificial acrylic teeth, it is possible to produce a prosthesis which defies detection, it is still far from ideal in fulfilling the mechanical requirements of a prosthesis.<sup>1</sup> Agreeable repairs must have sufficient quality, be effectively and quickly finished, match the first shade of the material, hold its dimensional precision and reestablish the first quality of the denture in order to evade additionally break, however this is not generally conceivable.<sup>2</sup> Fractures in dentures result from two different types of forces, namely, flexural fatigue and impact. Flexural fatigue occurs after repeated flexing of a material and is a mode of fracture whereby a structure eventually fails after being repeatedly subjected to loads that are so small that one application apparently does nothing detrimental to the component. This type of failure can be explained by the development of microscopic cracks in areas of stress concentration. With continued loading, these cracks fuse to an ever growing fissure that insidiously weakens the material. Catastrophic failure results from a final loading cycle that exceeds the mechanical capacity of the remaining sound portion of the material.<sup>3-5</sup> Factors rather than the denture base material itself and these factors have been discussed in detail. For example, any factor which increases the deformation of a denture base; additional factors which form areas of stress concentration such as a large frenal notch; dentures with thin or under-extended flanges; poorly fitting dentures or a lack of adequate relief; dentures with a wedged or locked occlusion; poor clinical design and dentures which have been previously repaired. Fractures in dentures result from two unique sorts of powers, to be specific, flexural fatigue and impact.<sup>6</sup> Mechanical causes are identified with broken outline, defective manufacture or potentially poor materials choice. Any factor that compounds disfigurement of the base or modifies its anxiety circulation will incline the denture to fracture.<sup>7</sup> Fracture might be because of an assortment of elements instead of the denture base material itself and these variables have been examined in detail. For instance, any figure which wrinkles the distortion of a denture base; extra factors which frame ranges of stress fixation, for example, a huge frenal notch, dentures with poor clinical plan thin or under-broadened flanges; inadequately fitting dentures or an absence of satisfactory alleviation; dentures with a wedged or locked occlusion; and dentures which have been beforehand repaired.<sup>8,9</sup> Tremendous developments in the science of biomaterials over the last few decades largely contributed to the increase in the life expectancy of human beings. Dental materials are classified into four major groups such as metals, ceramics, polymers and composites. Polymeric based compositions are

widely used for the fabrications of complete and partial dentures. In addition, denture soft liners, resin cements, pit and fissures sealants also consist of polymers. Although, dental implants have received large attention with a high success rate for the treatment of complete and partially edentulous conditions, dentures remain the most popular choice of prosthetic devices. A definitive objective of denture repair is to accomplish the first shape and quality of the denture with least cost and time. Sadly, the repaired units may lose some of their unique transverse quality. Besides, break of repaired dentures regularly happens at the intersection of old and new materials as opposed to through the focal point of repair. This study aimed to distinguish the reasons for the most common types of denture fractures, which could be identified with patients, clinicians and technique.

## MATERIALS AND METHODS

Inclusion criteria of the study include patients with satisfactorily controlled common anomalies like diabetes and osteoporosis or disease free status of patients and acknowledgment of the denture by the chose patients. Exclusion criteria include patients with poor control of foundational sicknesses like hematological, cardiovascular and renal disorders, immune system dilemmas, patients with propensities like bruxism, habitual eccentric movements and so on which would compromise the outcomes and patients who have experienced chemo/radiotherapy. Mandibular arch dilemmas were corrected by selective grinding / restorations / flexible partial dentures. Standard clinical systems with respect to impression making and maxilla-mandibular jaw connection records were taken after. Information was collected for one year from 320 denture patients who revealed for the repair of their dentures because of crack of the denture. To decide the reason and kind of fracture, dentures were subjected to watchful examination outside and inside the mouth for maintenance and steadiness of the denture, type and area of break, occlusal contact blunders and nature of opposing teeth (natural or artificial, partial or complete denture). Retention of repaired denture was evaluated by examining the resistance of denture to displacement on removing the denture from the mouth. Broken dentures were repaired with conventional procedure by using auto polymerizing acrylic resin. Examination and evaluation of repaired dentures were carried out by the same operator in all hospitals. A detailed history of the fracture was taken from the patient and the denture was assessed for retention, stability, occlusal errors, etc by the clinician.

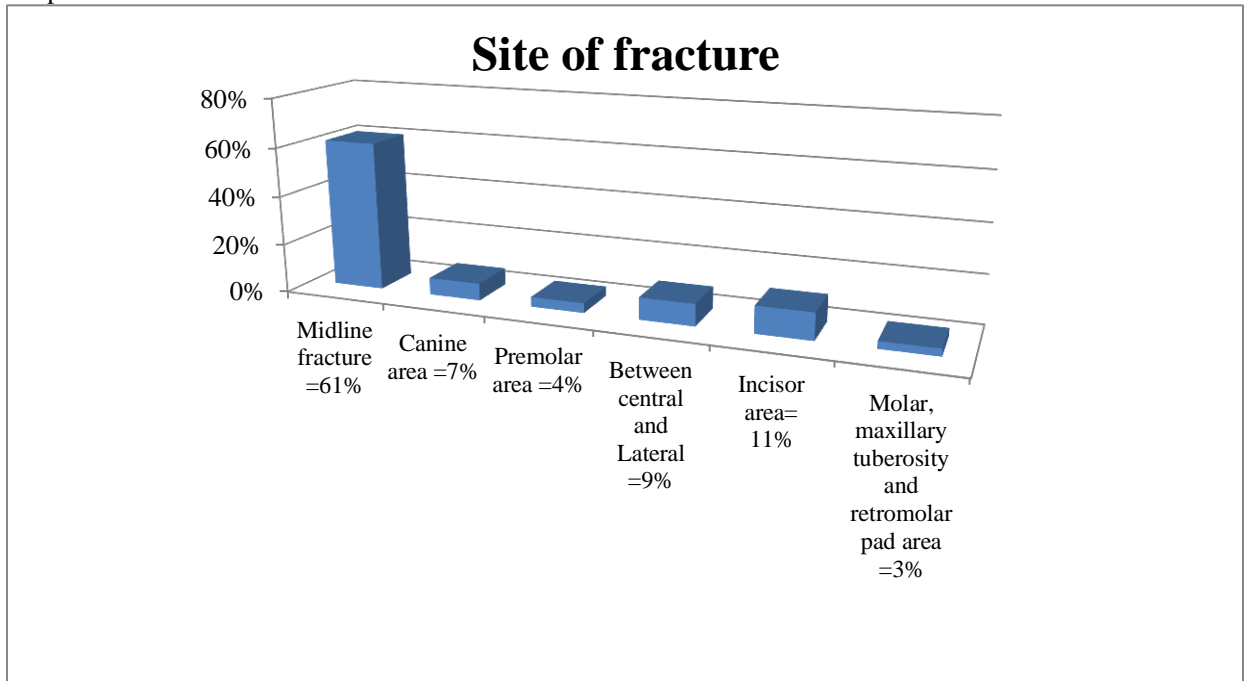
## STATISTICAL ANALYSIS AND RESULTS

All the collected data were arranged systematically and subjected to fundamental statistical analysis using SPSS

statistical package for the Social Sciences version 21 for Windows. Of 320 repaired dentures 180 were complete dentures, 70 were removable partial dentures, and 70 included replacement of the teeth that had debonded from the denture bases. The proportion of upper to lower total denture breaks was roughly 2:1, the majority

of the cracked dentures (59%) were those of males. The fundamental driver of denture fracture was poor fitting (42%), trailed by poor occlusal connection. Midline fracture was the commonest kind of crack (61%). From the examination most of the dentures had already been repaired once or more [Table 1, Graph 1 & 2].

Graph 1: Assessment of site of fracture of dentures



Graph 2: Assessment of cause of fracture of dentures

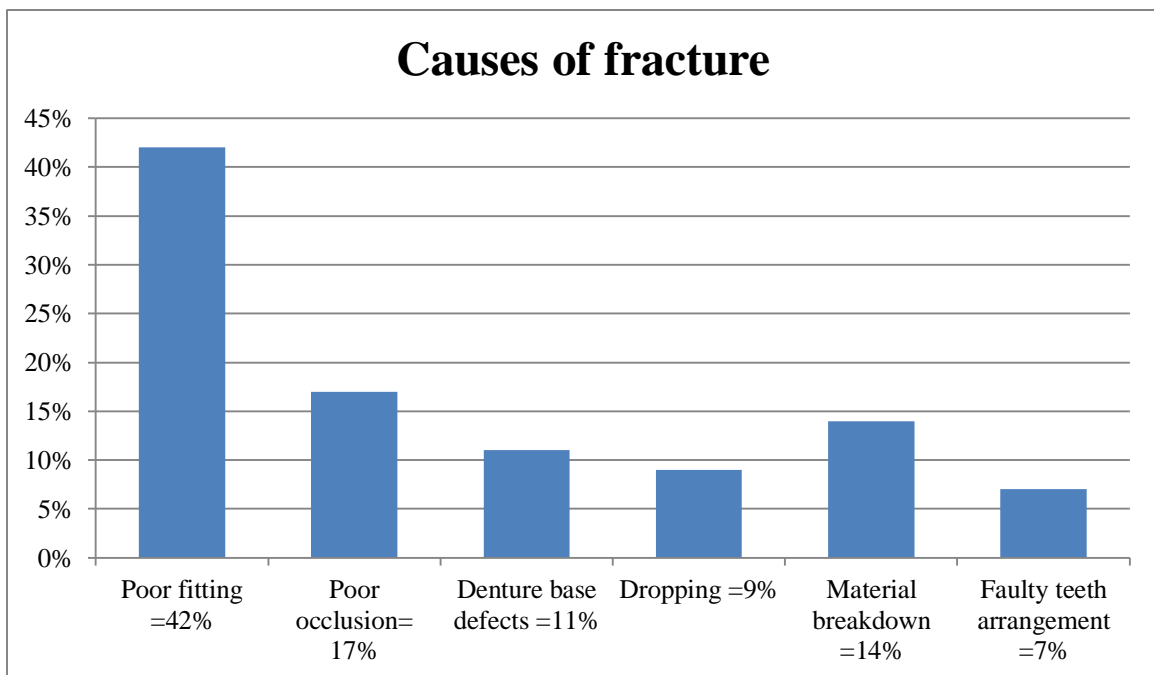


Table 1: Repetition of fractures

<b>Repetition of fractures</b>	<b>Upper denture</b>	<b>Lower denture</b>
Denture repaired for first time	113	81
Denture repaired once previously	53	18
Denture repaired twice	23	10
Denture repaired three or more times	16	6

## DISCUSSION

The life of a complete denture wearer is abruptly paralyzed by the sudden fracture of his/her denture which is of utmost necessity for his/her day to day routine life. As part of the dental education faculty, it is always our goal to make the life of denture-wearers easier and happier by investigating and solving the problems related to complete denture patients. As literature suggests, there are many causes and reasons associated with fractures of complete dentures.<sup>10-15</sup>

Different components which frame zones of stress fixation, for example, a huge frenal notch, dentures with thin or under extended flanges, ineffectively fitting dentures or an absence of satisfactory alleviation, dentures with a wedged or bolted impediment have been embroiled. Every one of the endeavors to strike midline fracture in complete maxillary denture against normal mandibular teeth by enhancing materials did not give the indispensable outcomes.<sup>16-17</sup> Injection moulding technique was created to conquer this issue. Despite the fact that this innovation has been being used since 1954, it has turned out to be prevalent just as of late. Poor fit (42%) was the primary driver of denture fracture in this examination. Poor fit denture is flexed in the mouth amid work about the midline or around which is like study by Beyli and Von Fraunhofer (1981) who found that poor fit was the most widely recognized reason for denture fracture in 12 out of 15 dental laboratories.<sup>14</sup> In the present investigation, poor occlusion was the second reason for denture, (17%) dentures were broken because of overwhelming or uneven masticatory loads. A considerable lot of the dentures in the examination opposed common dentition and the greater part of the sets were not adjusted occlusally prompting undesirable worries in the weaker parts of the denture. Overwhelming occlusal contacts from the normal teeth and overerupted characteristic teeth prompt solid powers and caused consistent impedances in the masticatory developments.

Faulty teeth setting outside the ridge may focus weights on non-push bearing zones of the denture. From investigations of Beyli and Smith, unmistakably interior deformities in the acrylic denture base like voids, porosities, notches, scratches, residual stresses are prevalent factors in the break of the denture.<sup>14,2</sup> These regions of stress fixation prompt split development and

engendering. Different reasons for break was observed to be identified with acrylic denture base material, for example, poor denture base outline, deficient thickness and deformities, for example, porosities, voids inside the material, profound scratches, and also acrylic denture base handling stresses which contributed roughly to 37 (16%) dentures crack. This finding concurs with the consequence of different examinations.<sup>16,18</sup> In spite of the fact that repairing fracture dentures with auto polymerizing resin is a monetary and fast technique however the repaired denture will normally lose around 40%-60% of their transverse quality.<sup>19,20</sup> That is the reason many repaired dentures will be re cracked, so in the present examination the larger part of repaired dentures were beforehand repaired once or more, which had been concur with the aftereffects of different investigations which demonstrated that majority of aggregate breaks had already been repaired, 23% of them had been repaired twice or more.<sup>21,22</sup> Different precautions can be made to decrease the frequency of denture breaks through, maximal denture maintenance and steadiness, uniform occlusal loading and adjusted verbalization. Utilizing higher quality polymers (high-impact resins), a great handling method to kill surface imperfections and incorporations inside the denture base, decreasing the requirement for a profound frenal notch by a frenectomy, sufficient thickness in the foremost area (the most extreme reliable with tongue space) and putting a thin beading around the labial frenum to enhance the seal. Metals can be included the type of wires, plates or fillers to expand the transverse quality of acrylic resin.<sup>24-28</sup> The fortification of acrylic resin with glass fibers as a woven mat has been exhibited to be an attractive method for delivering a resin with enhanced mechanical properties.

## CONCLUSION

Despite of tremendous progresses in dental innovation, it can be noticed that the fracture of acrylic resin dentures remains a remarkable issue. Here in this study the authors have shown potential reason for fracture in 320 repaired dentures. Upper dentures were repaired more than lower denture. Within the limitations of the study, authors have also concluded that midline fracture was the commonest sort of crack and greater part of

repaired dentures had previously been repaired. Furthermore, our study outcomes could be treated as suggestive for predicting clinical inferences of such situations. Nevertheless we expect other genuine studies to be conducted that could further establish certain concrete guidelines in this field.

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