

## Communal causes of denture fractures in edentulous patients – An overview

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### Abstract

Denture wearing is a routine and very commonly adopted treatment modality used in edentulous patients enabling them to have better quality of life but it has potential constraints like pre-disposition to fractures owing to multiple reasons that limits its utility.

**Material and Methods:** This study was aimed to analyze the causes of denture fractures among edentulous patients reporting to Armed Forces Institute of Dentistry, Rawalpindi. A total of 93-patients were included in this cross sectional study over a period of 15-months. Pre-structured questionnaire augmented with clinical evaluation was used to collect the data about the causes and types of denture fractures. 68-patients were male and 25 were female.

**Results:** Study discovered that fractures commonly occurred in upper dentures having a proportional relationship with increasing age of the denture. Impact failure (74%) was found to be the most frequent cause of fractures and natural denture as antagonist dentition was found to share major fracture liability (48%). It was also observed that use of strengthener has been a preventive factor since 83% fractures occurred in patients where strengthener was not used.

**Conclusion:** It is concluded in the study that appropriate patient education and application of judicious prosthodontic principles for denture construction can be effectually utilized for better results and longterm denture stability.

**Keywords:** Denture fracture, edentulism, acrylic resin, prosthodontic principles.

### Introduction

Ageing is a natural process that can have its toll on teeth as well. Total loss of natural teeth has functional and psycho-social implications that in many cases can be rectified with prosthodontic intervention.<sup>1</sup> Complete denture is so far the commonest treatment modality employed for rehabilitation of edentulous patients. Although acceptance and wearing of complete dentures are related to adaptive behavior of patients, but one reason that can have significant interference with the denture wearing is their potential to fracture which is still a common complication in denture rehabilitation practice.<sup>2,3</sup>

PMMA (Polymethylmethacrylate) which is an acrylic resin is the most common material used for complete dentures. Though this material has

its limitations but aesthetic aspects combined with a multitude of properties makes it a preferred material. During its lifetime a denture is exposed primarily to impact failure outside the mouth and flexure fatigue failure in the mouth. These are the two most important causes of fracture of denture base.<sup>4</sup> Material aging also has dramatic effect on physical and mechanical properties of material.<sup>5,6</sup> Other factors that cause deformation of a denture base or areas of stress concentration are large frenal notches, denture-swath thin or under-extended flanges; poorly fitting dentures, dentures with a wedged or locked occlusion, poor clinical design and dentures which have been previously repaired. Any of these factors can invariably result in fracture of dentures.<sup>7-11</sup>

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Table 1: Frequency distribution of variables

Variables		Total	Percentage
Gender	Male	68	73.1%
	Female	25	26.9%
Age of Denture	< 1 Yr	10	10.8%
	1 – 3 Yrs	35	37.6%
	> 3 Yrs	48	51.6%
Age of Wearer	< 59 Yrs	64	68.8%
	> 60 Yrs	29	31.2%
Cause of Fracture	Accident	4	4.3%
	Impact	74	79.6%
	Mastication	15	16.1%
Antagonist Type	Natural	48	51.6%
	Complete	30	32.3%
	Partial	15	16.1%
Strengtheners	Yes	10	10.8%
	No	83	89.2%

Table 2: Denture fractures / Variables Correlation

Variables		Fractured Denture				Total	P-Value
		LCD	LPD	UCD	UPD		
Gender	Male	10	36	15	7	68	0.921
	Female	5	12	5	3	25	
Age of Denture	< 1 Yr	2	0	5	3	10	0.004
	1 – 3 Yrs	3	25	5	2	35	
	> 3 Yrs	10	23	10	5	48	
Age of Wearer	< 59 Yrs	9	39	11	5	64	0.059
	> 60 Yrs	6	9	9	5	29	
Cause of Fracture	Accident	0	0	2	2	4	0.019
	Impact	10	43	15	6	74	
	Mastication	5	5	3	2	15	
Antagonist Type	Natural	6	34	4	4	48	0.00
	Complete	6	11	13	0	30	
	Partial	3	3	3	6	15	
Strengtheners	Yes	3	0	2	5	10	0.00
	No	12	48	18	5	83	

Consequent to above gradual denture wear and tear can culminate in sudden precipitation of a dental fracture that has paralytic implications for routine life of a denture wearer adversely affecting his/her quality of life.<sup>12</sup> So this study is aimed to evaluate various factors associated with denture fractures and carry out a statistical analysis in Armed Forces Institute of Dentistry and suggest measures so as to improve quality of life for denture wearers and provide better health-

care measures.

### Material and Methods:

This study was conducted over a period of 15-months (October 2015 - January 2017) in the department of Prosthodontics, Armed Forces Institute of Dentistry (AFID), Rawalpindi after taking Ethical committee clearance. Sampling technique used was non probability consecutive sampling. During the study period, total number of 93-acrylic complete denture patients were recruited. Patients included in the study were completely edentulous having either upper or lower dentures with a minimum denture wearing age of 06-months. Patients having repaired dentures or any dental implants were excluded from this study.

Patients selected for this study, basically reported for fracture of upper or lower complete dentures for the first time. They were subjected to detailed history taking followed by oral examination and later a questionnaire was given to each recruit that consisted of six variables. The study hypothesis was that the damaged dentures were related to number of factors like type of denture, denture age, gender, denture fracture causes, antagonist dentition and presence of strengthener.

Data analysis: Data analysis was done using SPSS version 16. The analysis involved frequency calculations and cross tabulations for categorical data. Chi-square test was applied to establish statistical correlation between the selected variables and damaged dentures. A p-value of < 0.05% was taken as statistically significant.

### Results:

A total of 93-cases of dental fractures were recruited in the study and results showed that fractures occurred mostly in lower partial dentures 51.6% (table 1) and the fracture percentage was in direct proportion with the age of dentures i.e. more than 50% fractures occurred in dentures older than 3 years (table 2). Chi-square test showed a statistical dependence between denture fracture and age of denture ( $p < 0.004$ ). Males were found to be more prone to denture

fractures (73.1%) as compared to their female counterparts (26.9%) as shown in table-1. Fractures were more commonly observed in younger age group 68.8% as compared to patients aged more than 60 yrs. Impact failure was the most common cause (74%) of denture fracture followed by mastication (15%) and trauma (4%) as shown in table-1. There was statistical dependence between damaged dentures and their cause having a p-value of 0.019. Natural denture as antagonist dentition was found to be responsible for 51.6% of the cases followed by complete dentures (32.3%) and partial dentures (16.1%) and this correlation was found to be highly significant (p-value 0.00). Not using strengtheners predisposed the patients to significant risk as 89.2% patients not using strengthener suffered denture fractures.

#### Discussion:

Prevalence of edentulism in our country has been estimated around 4.1% of the total population in people aged 65-years and above and it is expected to a projected percentage of 9.3% by 2030. Due to an increase in the life expectancy of elderly individuals, prosthetic treatment for edentulous patients is going to have an overgrowing importance in coming years.<sup>13</sup>

But denture fracture is one of the debilitating complication that has the potential to adversely affect the daily routine and quality of life of edentulous patients.

In this study statistical analysis of 93-cases over a period of 15-months found that fractures most frequently occurred in lower partial denturesthat is in agreement with other studies showing it to occur mostly in lower dentures.<sup>14,21</sup> Farmer found that many maxillary denture fractures are a result of deep labial notch, resulting from a high frenal attachment.<sup>15</sup> Frenectomy in cases with high labial frenum can be advised with provision of immediate denture to prevent recurrence of union of the frenum after surgery. Lambrecht suggested that relief in the median palatal suture area should be given to prevent midline fractures because it acts as fulcrum while flexion of denture during mastication.<sup>8</sup>

Our results indicated that most of fractures occur in dentures when subjected to wear and tear over a long period of time and the incidence increased with increasing age of the denture i.e. 37.6% at 3-years and 51.6% after that. Similar result was shown by El Sheikh (53.1%) in their study who suggested that chemical degradation of acrylic polymer occurs in oral cavity overtime and this predisposes to resultant damage.<sup>11</sup> It may be due to breakdown of the material with age representing fatigue phenomenon. Fracture of the denture base in situ often occurs by a fatigue mechanism in which relatively small flexural stresses, over a period of time, eventually lead to the formation of a small crack which propagates through the denture, resulting in fracture.<sup>16</sup>

Our data analysis established that male patients (73.1%) had a pre-ponderance for dental fractures as compared to female contemporaries which is in accordance with Smith et al according to whom higher masticatory or gliding movement forces in males are contributory factors and this is particularly true in short term failure (less than 1.5 years).<sup>17</sup> Broz et al also found male predominance (71.5%) in complete denture fracture patients.<sup>18</sup>

Impact failure (79.6%) and mastication (16.1%) were found to be the major contributors for denture fracture in our study. Impact fractures necessitate careful handling during cleaning of dentures to avoid accidental breakage. Setting the posterior teeth on the ridge and in balanced occlusion may reduce the frequency of fracture of upper complete denture. Similar results were documented by El Sheikh et al (80.4%).<sup>7,8,11</sup> However, these results were not in accordance with Shakir S et al. who conferred 56% liability of denture fractures to accidents and 35% to poor denture fit.<sup>20</sup>

We observed in our analysis that incidence of denture fractures was higher when antagonist dentition was natural (51.6%) and comparatively lower in scenarios of opposing complete denture (32.3%) and least in cases of partial antagonist dentition (16.1%). Hargreaves also pre-

sented natural occlusion as a major offender. It can be postulated that natural teeth might need re-contouring or opposing complete denture occlusion should be set to be more accurate.<sup>19</sup> Lambrecht and Kydd in their studies found that in most maxillary dentures, the posterior teeth were set over buccal slope of the residual alveolar ridge that is in accordance with our study results.<sup>7,8</sup> Artificial teeth should be precisely set on the crest of the residual alveolar ridge or slightly lingual to it and a balanced occlusion should be established to reduce the frequency of denture failure.

It was also observed that use of strengtheners in denture assembly has a preventive effect as far as fractures are concerned and inability to use these has quite significantly been associated with increased load of denture fractures which leads to lesser denture affecting patient's quality of life. Fracture percentage was noted to be 10.8% with use of strengtheners in our data and it was recorded to be 4.5% by El Sheikh and Al Zahrani. It is suggestive of the fact that acrylic resin might shrink away from strengthener creating spaces in the denture that can weaken its structure and generate new points of stress concentrations.<sup>11</sup> Moreover, factors that additionally contribute to stress concentrations can further support the initiation and propagation of cracks thereby enhancing the failure rates.

### Conclusion:

Although this study had quite an extensive scope to be elaborated conclusively however it could be established with certainty that denture fractures are a significant debilitating factor and one of the important factors in discontinuation of denture usage. It can be reduced by following the proper prosthodontics principles of denture construction, eliminating occlusal interferences and using high impact polymers. Furthermore adaptation of processing techniques that decrease chances of voids and preventing stress concentration can yield better outcomes. Factors associated with denture fractures are communal and well established and importance of patient education regarding care of prosthesis can never be underrated.

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### Role and contribution of authors:

Dr Zehra Iqtidar, collected the data, referecnes and did the initial writeup

Dr Ghazala Suleman, collected the data, referenes and critically review the article.

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