

Complete denture fractures: A clinical study

Original Article

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ABSTRACT

The main purpose of the study was to determine the causes for the fracture of complete dentures of patients reporting to the Department of Prosthodontics, Teerthanker Mahaveer Dental College, Moradabad, Uttar Pradesh, India. Data collected from 200 patients reported for repair of their complete dentures. Data was collected from patients, aged between 30 to 80 years (mean 55 plus/minus 25 years), from both the genders. Investigations were done on factors causing the fracture. After the analysis it was observed that the ratio of fracture of upper to lower denture was 1:3. Most fractures were common among males (55%). The most common reason being accidental dropping of the denture in case of the lower and improper fit and stability of the denture, improper arrangement and occlusion of the teeth for the upper one. Midline fracture was the most common site of fracture (60%). After analysis, the causes for the fracture were divided into material factors and clinical/ technical factors. It was concluded that the after denture delivery, instructions of denture care were required to reduce mishaps, proper principles of denture construction were required for mechanical advantage of the denture – balanced occlusion, removal of interferences, reduction of stress concentration areas, etc has to be followed. The use of high impact acrylics and strengthened acrylic along with methods increasing fracture toughness of the conventional acrylic dentures are to be used.

KEY WORDS: Acrylic, complete denture fracture, prosthodontics

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INTRODUCTION

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. This study was undertaken to investigate the causes of denture fracture and devise ways of reducing these problems in the future.

MATERIALS AND METHODS

This study was conducted in the Dept of Prosthodontics, Teerthanker Mahaveer Dental College and Research Center, Moradabad, India. Data was collected for one

year from 200 complete denture patients who reported for the repair of their dentures due to fracture of the denture. The data was categorized with the following parameters separately for upper and lower dentures:

1. Age and gender of the patient
2. Age of the denture
3. Reason for the fracture, according to history, given by the patient and clinical analysis of the clinician.
4. Site of the fracture

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. The data collected was analyzed using chi square test and the result was considered statistically significant when probability was less than 0.05.

RESULTS

In this study, 200 complete dentures were examined,

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Table 1: Number of fractures in relation to age of denture

Age of the denture (years)	No. of dentures
0-2	42
2-4	56
4-6	32
6-8	24
8-10	31
>10	15
Total	200

Table 2: Causes for fracture in relation to upper and lower denture

Proposed cause of fracture	Upper	Lower
Accidental dropping	13 (25)	79 (53)
Poor fit, retention stability	22 (43)	33 (22)
Poor occlusion and interferences	08 (16)	18 (12)
Acrylic base defects	02 (04)	03 (02)
Material breakdown	01 (02)	12 (08)
Faulty teeth arrangement	05 (10)	04 (03)
Total	51 (100)	149 (100)

$\chi^2 = 20.89, P = 0.034$, Figures in parentheses are in percentage

Table 3: Upper and lower denture fractures in relation to site of fracture

Site of fracture	Upper denture	Lower denture
Midline fracture	32 (62)	89 (60)
Incisor area	13 (26)	15 (10)
Canine area	02 (04)	21 (14)
Premolar area	00 (00)	06 (04)
Molar, maxillary tuberosity and retromolar pad area	02 (04)	12 (08)
Any other area	02 (04)	06 (04)
Total	51 (100)	149 (100)

$\chi^2 = 14.90, P = 0.186$, Figures in parentheses are in percentage

excluding removable partial dentures and debonded teeth. [Table 1 and 2]

It was observed that the ratio of fracture of upper denture to lower denture was 1:3 [Table 3].

Maximum fracture was seen in the denture age group of two to four years post-delivery followed by zero to two years.

Accidental dropping of the denture while cleaning, insertion and removal (53%) was the most common cause for lower denture fracture followed by poor retention and fit (22%) whereas poor fit was the most significant factor for upper denture fracture (43%) followed by accidental dropping of the denture (25%).

Midline fracture was most common in both the upper and lower dentures (more than 60%).

DISCUSSION

In this study, midline fracture was the most common

site of fracture (more than 60%). Midline fracture results from cyclic deformation of the base during function. Since lower dentures fractured it was postulated that the less surface area and thinness in the middle part of the denture are responsible for the fracture. Also, patient negligence during insertion, removal and cleaning of the denture are the major causative factors. Accidental dropping of the denture was the prime cause in these cases, the lower being the delicate of the two was fractured in the ratio of 3:1 to the upper. Presence of deep incisal notches, diastema and thin labial flanges for esthetics and comfort factors of the patient act as stress raisers and contribute to midline fracture of the maxillary denture. Poor fit was the prime cause in upper denture fracture, such dentures flex in the mouth during function around the midline and due to repeated small loadings during mastication lead to the fatigue fracture. This study also holds good with the study of Beyli and von Fraunhofer^[1] who suggest the poor fit is the main culprit. Mathews and Wain^[2] show that tensile stresses are on the palatal aspect of the denture.

The other causes of fracture are poor occlusion (16% in upper, 12% lower). Many of the dentures in the study opposed natural dentition and most of the sets were not balanced occlusally leading to unwanted stresses in the weaker parts of the denture. Heavy occlusal contacts from the natural teeth and over-erupted natural teeth lead to strong forces and caused constant interferences in the masticatory movements. Faulty teeth setting outside the ridge may concentrate stresses on non-stress bearing areas of the denture.

From studies of Beyli and Smith,^[3] it is clear that internal defects in the acrylic denture base like voids, porosities, notches, scratches, residual stresses are predominant factors in the fracture of the denture. These areas of stress concentration lead to crack formation and propagation.

Inherent properties of the denture base material also play a very important role in impact strength of the denture. Fractures from accidental dropplings can be prevented to a large extent by using high impact resins, metal reinforcement (in the form of plates, wires and fillers) and, glass fibers in the form of woven mat. Reinforcement with glass fibers enhances the mechanical strength characteristics of denture bases such as the transverse strength, ultimate tensile strength, and impact strength. The technical work of fabricating acrylic dentures using modern techniques which reduce voids and porosities releasing residual stress is a must.

Material breakdown with age and water sorption will

reduce the fatigue resistance of the material. Hence selection of the material for denture requires more emphasis.

The study showed that maximum denture fractures are in the group of two to four years post-delivery followed by zero to two years. According to Hargreaves,^[4] physical properties of acrylic do not deteriorate with age, but the clinical function may induce stress which after a period of usage may bring deterioration of the material and hasten fracture.

CONCLUSION

From this study, the following conclusions can be drawn:

- Proper patient education and motivation of patients using dentures to reduce accidental mishaps.
- Following definite prosthodontic principles in denture construction – analyzing proper fit and retention of the denture. Eliminating occlusal interferences and establishing balanced occlusion
- Using high impact polymers, metal reinforcements, glass fibers
- Using processing techniques which reduce chances of voids and porosities.
- Maintaining proper thickness in flanges and incisal notch areas to prevent stress concentration.

Inducing methods of research for manufacture of high strength material which can reduce the denture fractures.

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