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MIDLINE FRACTURES IN SINGLE COMPLETE DENTURES AND ITS VARIOUS TREATMENT MODALITIES – A REVIEW

Dental Science

Dr.B.Sivasaranya M.D.S, Reader, Csi College Of Dental Sciences And Research, Madurai
Dr.R. Lambodharan M.D.S, Professor, Csi College Of Dental Sciences And Research, Madurai
Dr. V. S.Vigneshwar M.D.S, Reader, Csi College Of Dental Sciences And Research, Madurai
Dr. S. Sankarakrishnan M.D.S, Senior Lecturer, Sathyabama College Of Dental Sciences

ABSTRACT

Patient using single complete denture opposing the natural dentition facing the problem of midline fracture in their routine use. Various techniques have failed over the years to address the problem for midline fractures. This paper reports the causes of the midline fracture and techniques to reduce the incidence of fracture.

KEYWORDS

Midline Fracture, Teeth Arrangement & Prosthodontics.

Introduction:

In removable prosthodontics, complete dentures are commonly fabricated with acrylic resin. Polymers are the dominant material for the fabrication of denture bases. Materials such as polymethylmethacrylate may be molded and polymerized by use of variety of techniques. These acrylic resin has many advantages include its similarity in appearance and ease of manipulation[18]. Despite acrylic resin has many advantages, the fracture of acrylic resin is still a significant problem[5].

Denture fracture is usually divided into mechanical and accidental. Fracture in dentures results from two forces namely, flexural fatique and impact fatique[11].

Mechanical causes are related to faulty design, fabrication of material and poor material of choice. Accidental cause are related to accidental dropping of denture, sudden blow,trauma[15].

Flexural fatique occurs after repeated flexing of a material and its mode of fracture whereby a structure eventually falls after being subjected to loads that are so small that one application apparently does nothing detrimental to the component.

Catastrophic failure results from a final loading cycle that exceeds the mechanical capacity of the remaining sound portion of the material. The midline fracture in a denture is often a result of flexural fatique. Impact failures occur due to sudden blow to the denture, accidental dropping while cleaning, coughing and sneezing[11].

Our ultimate goal is to prevent denture fracture than repairing the denture is to attain the original shape and contour of the fracture.
This paper represents the causes of the midline fracture and various treatment modalities for midline fracture.

Causes:

Midline fracture of the denture was the most common type of fracture in single complete denture especially in maxillary denture opposing natural dentition. Midline fracture of a denture base occurs due to a flexural fatique and impact fatique failure. Midline fracture due to flexural fatique failure results from cyclic deformation of the denture base during function. Any factor that alters the stress distribution of the denture base can predispose the denture to fracture.

Presence of high frenum leads to deep incisal notches represents a point of weakness in that it act might as a stress raiser and it contribute to fracture. The labial frenal notch was found to exhibit the higher compressive strain. Usually the tensile stresses accumulated in the posterior region but especially in the anterior midline over the incisisve papilla. In an early survey, it was observed that a deep labial frenal notch was the cause of the midline fracture. Due to deep frenal notch, once a crack has initiated on the polished surface at the anterior midline, the tensile forces tend to open the crack and cause a fracture. Hargreaves findings demonstrate that notch geometry has an important role in determing the nature of the strain. A shallow and smooth labial frenal notch was reported to be located at the compressive area, which is on intaglio surface whereas a deep and sharp labial frenal notch is in the tensile region. The location of the tip of the frenal notch may result in different types of strain[2,13].

Poor fit was the another cause of denture fracture. Poor fit of denture is flexed in the mouth during function, movement of the denture during mastication will cause fracture due to a series of repeated small loadings leads to flexural fatique failure. If the notch is sufficiently sharp, the local stress concentration may exceed the breaking strength of the acrylic resin and the crack will form which will run right throughout the complete denture. Beyli & Vonfraunhofer (1981) found that poor fit was the main cause of denture fracture[1,3,6].

Poor occlusion was another main cause of midline fracture. Dentures were fractured due to heavy or uneven masticatory loads. Especially in single complete denture opposing natural dentition, which is mesially/distally inclined, supraerupted natural teeth. Teeth arrangement plays a major role in denture fracture. Because the presence of mesially/distally inclined tooth, supraerupted tooth causes unbalanced occlusion as well as teeth arrangement according to this opposing natural dentition leads to encroachment of buccal corridor space and this causes excess flexing of the denture leads to flexural fatique failure. Also unfavourable occlusal relationship exists that tends to displace the denture causing soreness, mucosal changes and ultimately ridge resorption. The fixed positions of the mandibular teeth make the esthetic and phonetic placement of maxillary teeth difficult without introducing occlusal interference in eccentric functional movements. Although these circumstances make treatment difficult and many times compromised, perhaps the greatest error is to make no attempt to modify the occlusal arrangement of the natural teeth. Failure to diagnose and properly modify the mandibular teeth to achieve ooclusal harmony with the denture will result in forces that may exceed the physiologic tolerance of the maxillary residual ridge tissue[14,16].

Denture fracture occurs outside the mouth from impact such as accidental drop of denture and also sudden drop of denture by coughing and sneezing. This type of fracture is due to impact fatique failure. Denture fracture was also found to be related with poor denture base design, inadequate thickness of the flange area, defects such as porosities, voids inside the material, deep scratches present in the denture, material fatique resistance to the long term saliva and water sorption[11].

Once the denture is fractured, denture repair need to be done. The denture repair is to attain the original shape and strength of the denture with minimum cost and time. Broken acrylic dentures are repaired with autopolymerising acrylic resin, heat cure resin sometimes visible light cure resin also used[15].

Treatment modalities:

Midline fracture denture initially need to be analysed, etiology of the fracture need to be identified.

I. High frenum attachments results in a subsequent weak point and potential fracture line in the denture base. Maxillary labial and buccal frenal attachments that closely approximate or attach to the edentulous ridge crest also interfere with the satisfactory retentive seal of the denture. A labial frenectomy is recommended for all such patients. Beyli and von fraunhover advised strengthening the notch by placement of a thin bead of acrylic resin around the heavy labial frenum, although this thickening method may not be as effective as the frenectomy because the strain concentration at the deep notch has not been reduced[2].

II. There are so many techniques have been described to achieve harmonious occlusion such as 1. Dynamically equilibrate the occlusion by use of functionally generated technique, 2. Statically equilibrate the occlusion by an articulator method to simulate the jaw movement[14].

III. There are so many materials now introduced as an alternative to polymethyl methacrylate(PMMA).

1. According to YUNUS(2005), nylon denture base material could be an alternative to PMMA in special circumstances as the patient allergy to the monomer[20].

2. According to YURDANUR(2012), Polyamide denture base material produced good fracture resistance and its modulus is not yet sufficiently high to be equal to be standard PMMA material[19].

3. Injection moulded denture base flexible material is superior, stronger and flexible than acrylic denture base material[4].

4.Metal reinforced dentures may not be so esthetic to be used in daily life.

5. In recent years, fiber reinforced for strengthening the denture base was introduced and proven to be valuable method. Especially glass fibers were reported to be useful in reinforcing the denture base heat cure denture base. The reinforcement can be carried out in two ways, the entire denture base can be reinforced with a fibre weave or the fiber reinforcement can be accurately placed in the weak region[12].

IV. Metal denture base material was more resistant to deformation while undergoing the forces of mastication than acrylic denture base. Advantages of metal denture base include 1. Very biocompatible & hypoallergenic with healthy approaching supporting tissues, 2. Provide added strength for easily broken denture,3. Perceive more a natural feeling, 4.dimensionally very stable.

Disadvantages include 1. Difficult to reline, 2.cost effective, 3. Technique sensitive[18].

Summary:

Factors that contribute to the midline fracture of single complete denture and various treatment options have been discussed. Recognition of these factors and their prevention or correction will result in a denture that is physiologically and functionally acceptable for the patient for an extended period without chronic denture failure.

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