

Failures in Tooth Supported Fixed Partial Dentures: A Review of Classification Systems

Dr. L. Keerthi Sasanka^{1*}, Dr. V. Vamsi Krishna Reddy², Dr. Dileep Nag Vinnakota³, Dr. Srinivasa Rao Pottem⁴, Dr. Y. Poojitha⁵

¹Post graduate student, Department of Prosthodontics, Narayana Dental College and Hospital, Nellore, Andhra Pradesh, India

²Reader, Department of Prosthodontics, Narayana Dental College and Hospital, Nellore, Andhra Pradesh, India

³Professor, Department of Prosthodontics, Narayana Dental College and Hospital, Nellore, Andhra Pradesh, India

⁴Professor and Head, Department of Prosthodontics, Narayana Dental College and Hospital, Nellore, Andhra Pradesh, India

⁵Post Graduate student, Department of Prosthodontics, Narayana Dental College and Hospital, Nellore, Andhra Pradesh, India

Review Article

*Corresponding author

Dr. L. Keerthi Sasanka

Article History

Received: 14.03.2018

Accepted: 23.03.2018

Published: 30.03.2018

DOI:

10.21276/sjds.2018.5.3.8



Abstract: The most common procedures employed by majority of dental practitioners for a missing tooth or teeth were by replacement through crowns and bridges. With accurate planning and implementation, the tooth supported fixed prostheses will provide anticipated function, aesthetics and value for money. Although, an imperfectly fabricated prosthesis were more likely to fail and leading to the damage to the teeth which cannot be altered and to the supporting structures. When dealing with failed or failing fixed restorations, proper knowledge of diagnosis, assessment of the clinical condition and technical skills are absolutely necessary. It is of great significance or value to evaluate the types of fixed partial denture failures. The practical advantages of classifying these failures were to educate the general dentists and laboratory technicians. The following information of this review is a pub med search, the articles regarding fixed partial denture failures from the year 1920 to 2018. The objective of this review article is to classify the types of failures associated with tooth supported fixed partial denture and classification systems proposed by various authors.

Keywords: Classification, Failure, Fixed Partial Denture, Prosthesis failure, Prosthodontics.

INTRODUCTION

A classification system is required to be universally acceptable, visualize the dental arch and the prosthesis design, which helps facilitate discussion and helps in teaching. In prosthodontics, 'the inability of prosthesis to produce the expected desired outcome' is defined as failure [1].

A Fixed dental prosthesis is considered as one of the best methods to restore missing or endodontic ally treated teeth, the prevalence of failures of such prosthesis were increased with its increased demand [2]. Inspire of careful planning, scrupulous attention to the details and the application of a great deal of time and effort, the most annoying and undermining side of dental practice face up to and deal with the non-fulfilment of the work.

The intent of this article is to deal with different classification systems for tooth supported fixed partial denture failures in an attempt to determine the types, incidence and reasons of the failure [3]. The causes of FPD failures were summarized as early as in

1920 when Tinker [3] wrote - "*Chief among the causes for such disappointing results*" has been:

First: Faulty, and in some cases, no attempt at diagnosis and prognosis

Second: Failure to remove foci of infection in attention to treatment and care of the investing tissues and mouth sanitation

Third: Disregard for tooth form

Fourth: Absence of proper embrasures

Fifth: Inter proximal spaces

Sixth: Faulty occlusion and articulation

Classification of fpd failures

Bennard G. N. Smith [4]

Loss of retention

Mechanical failure of crowns or bridge components

- Porcelain fracture
- Failure of solder joints
- Distortion
- Occlusal wear and perforation
- Lost facings

Changes in the abutment tooth

- Periodontal disease
- Problems with the pulp
- Caries
- Fracture of the prepared natural crown or root
- Movement of the tooth

Design failures

- Under-prescribed FPDs
- Over-prescribed FPDs

Inadequate clinical or laboratory technique

- Positive ledge
- Negative ledge
- Defect
- Poor shape and color

Occlusal problems

Barreto M. T.[5]

Biologic - caries, fractures, generalized periodontal disturbances

Esthetics - shapes, contours, surface characteristics

Biophysical - physical properties and chemical composition of porcelain and metal

Biomechanical - faulty designs, misplaced finish lines, rough or sharp surfaces, undercuts on the bonding surface cause porcelain to be dislodged

John F. Johnston [6]

• BIOLOGIC FAILURES

- Caries
- Root caries
- Periodontal disease
- Occlusal problems
- Gingival irritation
- Gingival recession
- Pulp and periapical health
- Tooth perforation

• MECHANICAL FAILURES

- Loss of retention
- Cementation failure
- Acrylic veneer wear or loss
- Porcelain fracture
- Metal-ceramic porcelain failures
- Porcelain jacket crown failures

ESTHETIC FAILURES

- Failure to identify patient expectations regarding esthetics
- Improper shade selection
- Failure to transfer the shade to dental laboratory
- Excessive metal thickness at incisal and cervical region
- Thick opaque layer application
- Surface blistering ("chalky" appearance)
- Over glazing or too much smooth surface
- Metal exposure in connector, cervical and incisal regions
- Dark space in cervical third due to improper pontic selection (Anteriors)
- Failure to produce incisal and proximal translucency
- Improper contouring
- Failure to harmonize contra-lateral tooth morphology
 - Contour
 - Color
 - Position
 - Angulations
- Discoloration of facing

John J. Manapallil[7]

He described it based on the increasing severity from class 1 to class 6. Grading of failures based on severity

Class I - Cause of failure is correctable without replacing restoration

Class II - Cause of failure is correctable without replacing restoration; however, supporting tooth structure or foundation requires repair or reconstruction

Class III - Failure requiring restoration replacement only. Supporting tooth structure and/or foundation acceptable

Class IV - Failure requiring restoration replacement in addition to repair or reconstruction of supporting tooth structure and/or foundation

Class V - Severe failure with loss of supporting tooth or inability to reconstruct using original tooth support. Fixed prosthodontic replacement remains possible

through use of other or additional support for redesigned restoration.

Class VI - Severe failure with loss of supporting tooth or inability to reconstruct using original tooth support. Conventional fixed prosthodontic replacement is not possible.

Selby. A [8], reviewed of important aspects of FPD Failure

Reasons for failure of fixed prostheses;

Biological problems

- Caries
- Periodontal disease
- Endodontic or periapical problems

Mechanical problems

- Loss of retention
- Fracture or loss of porcelain
- Wear or loss of acrylic veneer
- Wear or perforation of gold
- Fracture of metal framework
- Fracture of solder joints
- Fracture of abutment tooth or root
- Defective margins
- Poor contour
- Poor aesthetics

The intra oral tolerances are minute and working site is restricted and the restorations must survive in a demanding biological environment over which there is little control, the practice of fixed prosthodontics will always yield a certain percentage of unsatisfactory results. The failure of the tooth supported fixed dental prosthesis can occur due to any of the above said causes and usually divided into biological problems and mechanical problems. The mechanical problems are directly under the effect of clinician and laboratory technician whereas biological problems are less related to the clinician. In some instances the biological problems were due to iatrogenic causes i.e. during treatment procedures and faulty prosthesis design.

Following are the causes for the biological and mechanical problems;

CEMENTATION FAILURE

Can be broadly divided into:

- Cement failure
- Retention failure
- Occlusal problems
- Distortion of FPD

MECHANICAL FAILURES

Classification of mechanical failure

- Retainer failure
- Pontic failure
- Connector failure
- Gingival and periodontal problems

Margins are one of the most important and weakest links in the success of FPD restorations. One of the prime goals of restorative therapy is to establish a physiologic periodontal health. A successful prosthesis depends on a healthy periodontal environment and periodontal health depends on the continued integrity of the prosthodontic restoration.

The margin is one of the components of the cast restoration most susceptible to failure, both biologically and mechanically. Most of the investigative proof shows that supragingival margins are kinder to the gingiva than are subgingival margins. However, practicality dictates that supragingival margins are not always usable

Failure to produce the margin of the preparation in the impression leads to reproducing the marginal integrity of the restoration. Using of gingival retraction technique in case of sub gingival preparation is mandatory.

However, all displacement techniques have the potential damage gingiva, attachment apparatus and bone, especially if anatomic forms are weak or if disease is present. In healthy patients, properly used cord displacement or copper band methods have proved to be atraumatic.

CARIES

Causes

Iatrogenic (dentists' role)

Patient role

- Systemic factors
- Local factors

PULP DEGENERATION

Pulp reactions to various procedures

Each step in full crown preparation presents hazards, which may injure the pulp. In general, heat desiccation and / or chemical injury cause the insult. The result may be pulpitis or even necrosis. Among the many essential procedures that may cause pulp injury are:

- Tooth preparation:
- Impression making:
- Pulp infection:

BIOMECHANICAL FAILURE

Causes

Failure in selection of right abutment

Lack of retention and resistance form

Incorrect design of FPD

Wrong material selection

Esthetic failures

Reasons for esthetic failure

- Failure to identify patient expectations regarding esthetics
- Improper shade selection
- Excessive metal thickness at incisal and cervical regions
- Thick opaque layer application
- Surface blistering (chalky appearance)
- Over glazing or too smooth a surface
- Metal exposure in connector, cervical and incisal regions (anterior)
- Failure to produce incisal and proximal translucency
- Improper contouring
- Failure to harmonize contra lateral tooth morphology
 - Contour
 - Color
 - Position
 - Angulation

K. Dark space in cervical third due to improper pontic selection

L. Discoloration of facing.

CONCLUSION

The efforts in fixed bridge prosthodontics result in restorations which are to serve a useful purpose over a long period of time. The best way to lessen the fixed dental prosthesis failures is to have a sound knowledge of diagnosis and treatment procedures. The ability of the clinician mind should be creative, advanced and original which are the key factors in successful treatments and in handling the repairs when met with a FPD failure. The unique and challenging situation for a dentist is to solve the failure in a most effective and economical way.

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