

Original Research

Fixed partial denture failures: A review of classification

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ABSTRACT:

Rehabilitation performed with a fixed partial denture (FPD) is one of the most accepted and desired by patients. However, it is a long procedure and generates high expectations from the patient. Once the professional knows the factors that create dissatisfaction or contribute to failures, the dentist could minimize them and thus meet that all the patient's need and establish the most appropriate planning. The dental literature is lacking in classification of failures in Fixed partial dentures. The cause may be that signs and symptoms of failures are varied and often complex and there is the additional problem of reaching a common interpretation among investigators on the definition of failure. When dealing with failed or failing fixed restorations, proper knowledge of diagnosis, assessment of the clinical condition and technical skills are absolutely necessary. Hence it is important to be aware of obvious and subtle indications of prosthesis failure and have a working knowledge of the procedure that are necessary to remember the situation. This review focusses on classification systems of failures associated with tooth supported fixed partial denture proposed by different authors.

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INTRODUCTION

Replacement of missing teeth in partially edentulous arch involves various treatment options like removable, fixed prosthesis, and implants. Fixed prosthodontic treatment can offer exceptional satisfaction for both patient and dentist. Restoring and replacing of teeth with FPDs represents an important treatment procedure in dental practice, mainly because of the continuing high prevalence of caries and periodontal diseases in the adult and geriatric populations.¹ A fixed partial denture is defined as a fixed restoration which replaces one or more missing teeth and is attached to natural teeth or an implant. In case of improper treatment planning, they are more likely to fail prematurely and lead to irreversible damage to the teeth and supporting structures.²

In prosthodontics, 'the inability of prosthesis to produce the expected desired outcome' is defined as failure.³ Fixed prosthodontic failures can be frustrating and complex in terms of both diagnosis and treatment and may occur at any time.⁴

Before calling any fixed tooth-supported prosthesis as "Failing" or "Failed" implant, there are certain objectives which a fixed prosthesis should fulfill. Failing to fulfill these objectives leads to failures in fixed prosthodontic treatment.⁵

Reasons of failure can be caries, uncemented restoration, over-contoured restoration, poor occlusal plane, periodontal disease, periapical involvement, failed post retained crowns, poor esthetics, crown perforation and defective margins of restorations.^{6,7}

Knowledge regarding the clinical complications that can occur in fixed prosthodontics enhances the clinician's ability to complete a thorough diagnosis and to develop the most appropriate treatment plan.⁸

It provides realistic expectations to patients and to plan the time intervals needed for post-treatment care.⁹ Hence, it is important to be aware of obvious and subtle indications of prosthesis failure and have a working knowledge of the procedure that are necessary to remember the situation.⁴

OBJECTIVES OF FIXED PROSTHODONTIC TREATMENT¹⁰

- Preservation and improvement of related hard and soft tissue structures.
- Preservation or improvement of oral function.
- Improvement or restoration of esthetics.
- Ensuring restoration retention, resistance and stability
- Providing restoration with mechanical or structural integrity.
- Preserving or improving patient comfort.
- Designing restorations for maximum longevity.

CLASSIFICATION SYSTEM FOR FAILURES IN TOOTH-SUPPORTED FIXED PARTIAL DENTURE

“Tinker”¹¹ was the first one to summarize the causes of FPD failures as early as in 1920. Chief among the causes for such disappointing results were:

- First: Faulty or no attempt at diagnosis and prognosis
- Second: Failure to remove foci of infection
- Third: Disregard for tooth form
- Fourth: Absence of proper embrasures
- Fifth: Interproximal spaces
- Sixth: Faulty occlusion and articulation.

Robert’s classification¹²

- Cementation failure
- Mechanical breakdown
 - Flexion, tearing, or fracture of the gold
 - Solder joint failure
 - Pontic fracture
 - Bonded porcelain failure
- Gingival irritation or recession
- Periodontal breakdown
- Caries
- Necrosis of the pulp.

Lombardi classification of esthetic errors¹³

1. Inharmonious dentofacial ratio
 - Shade disharmony
 - Compositional incompatibility
 - Static prosthesis in dynamic mouth
 - Inharmonious strength or weakness of dental composition compared to background features.
 - Weak mouth with strong face
 - Strong mouth with weak face.
2. Intrinsic dental disharmony
 - Space allocation errors
 - Inadequate vertical space allocation
 - Excessive vertical space allocation
 - Excessive horizontal space allocation
 - Structural line errors

- Elevated occlusal plane
- Occlusal plane drops down posteriorly
- Asymmetrical occlusal plane.

3. Unnatural lines

- Reverse smiling line
- Unnatural axial inclination
- Cusp less posterior teeth
- Gradation errors
- Age–sex personality disharmony.

4. Single-line errors

- Vertical deviation
- Horizontal deviation
- Line conflict.

5. Imbalance

- Midline error
- Imbalance of directions
- Artifact error
- Diastema error.

Barreto classification – 1984¹⁴

1. **Biologic** – caries, fractures, and generalized periodontal disturbances
2. **Esthetics** – shapes, contours, and surface characteristics
3. **Biophysical** – physical properties and chemical composition of porcelain and metal
4. **Biomechanical** – faulty designs, misplaced finish lines, rough or sharp surfaces, and undercuts on the bonding surface cause porcelain to be dislodged.

Thayer classification – 1984¹⁵

- Caries
- Cement failures
- Preparation fractures and acrylic veneer wear/loss
- Porcelain fractures
- Solder joint or major connector failure
- Periodontal involvement.

Selby classification – 1984¹⁶

Biologic

- Caries
- Periodontal disease

Mechanical

- 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 esthetics. Endodontic or periapical problems

Wise classification – 1999¹⁷

1. General pathosis
2. Periodontal problems
3. Caries
4. Pulpal changes

5. Erosion
6. Cracked teeth
7. Subpontic inflammation
8. Temporomandibular joint disorders
9. Occlusal problems.

Smith classification – 1985 [Bennard G.N. Smith]¹⁸

1. Loss of retention
2. Mechanical failures of crown and bridge components
3. Changes in abutment tooth
4. Design failures
5. Inadequate clinical or laboratory technique
 - a. Marginal deficiencies
 - b. Defects
 - c. Poor shape and color
6. Occlusal problems.

John. F. Johnston classification – 1986¹⁹

Biological 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

- Improper shade selection
- Excessive metal thickness and exposure
- Thick opaque layer application 7 overglazing
- Dark space in cervical third
- Failure of translucency
- Improper contouring
- Discoloration of facing.

Manappallil classification – 2008 [JOHN J. MANAPPALLIL]¹⁰

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 the 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.

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. The classification systems presented in this review for failures in tooth-supported fixed partial denture identify trends that can be effectively and wisely used to develop treatment plans that optimize success and to communicate appropriate expectations to patients.

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