



## Failures In Periodontics: A Review

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### Abstract

Periodontal treatment failures seem to arise relatively frequently, possibly because, among other reasons, the periodontist works in a field characterized by the presence of plaque, and the marginal periodontium remains more or less exposed to microorganisms, depending on the intensity and quality of oral hygiene, even after successful primary care. Often many factors come together to cause the ultimate failure of periodontal therapy.<sup>1</sup> Not only does the amount of plaque play a role, but the pathogenicity of the microorganisms and the immune status of the patient, his or her "resistance," are also factors.<sup>2</sup> One needs to identify the cause not just to treat the present condition but also as a learning experience for the future treatments. Proper data collection, patient feedback, and accurate diagnostic tool will help point out the reason for failure. An early intervention is always possible if regular check-up is undertaken.<sup>1</sup>

### Keywords:

### Introduction

All patients should receive a comprehensive periodontal examination. The purpose of the comprehensive periodontal examination is to determine the periodontal diagnosis, prognosis and treatment plan. This process includes an evaluation of periodontal tissues to determine the suitability of the patient for treatments including non-surgical, surgical, regenerative and reconstructive therapy.<sup>3</sup> The clinical findings together with a diagnosis and prognosis should be used to develop a logical plan of treatment in order to eliminate or alleviate the signs and symptoms of periodontal diseases and thereby arrest or slow further disease progression.<sup>4</sup> A high percentage of population, develop new pockets in treated areas, regardless of the techniques used in pocket elimination. As a result, periodontal disease has a tendency to recur and periodontists must be alert in detecting the first sign of deterioration among their treated patients.<sup>5</sup> All patients treated for periodontal disease require professional

maintenance.<sup>6</sup> A typical preventive treatment consists of checking plaque control, careful subgingival curettage, and charting of the mouth by the hygienist. The role of the dentist includes examining the occlusion and the curettage of any deepened crevice.<sup>7</sup> Nonsurgical and surgical periodontal therapies have, for several decades, been and remain the basis of periodontal treatment concepts.<sup>8</sup> The causes of failure are manifold. In addition to the fact that periodontal therapy always takes place in regions exposed to plaque formation, failures may be ascribed to the factors such as incorrect patient selection, incomplete diagnostic procedures, improper diagnosis, and incorrect prognosis, difficult (or inappropriate) treatment, unsupervised healing and absence of maintenance therapy.<sup>2</sup>

### Classification Of Failures In Periodontics:

Failures in periodontal therapy can be basically due to certain dentist and patient related factors.

### Dentist Related Factors Leading To Failure:<sup>9,10</sup>

- Gathering and recording data
- Improper diagnosis
- Improper investigations
- Inadequate motivation
- Improper treatment sequencing
- Incomplete treatment
- Iatrogenic factors
- Lack of adequate post-operative instructions
- Irregular follow-ups

#### **Patient Related Factors Leading To Failure:**<sup>11</sup>

- Age
- Systemic Diseases/ conditions
- Local Factors (plaque retentive factors)
- Poor patient compliance/ maintenance
- Stress/Psychological component
- Smoking
- Socio-economic factors
- Poor healing potential
- Religious factors

#### **Failures In Periodontical Therapy Are Mainly Classified Into:**<sup>12,2,13,14,15</sup>

##### **Pre-Therapeutic Failures**

Pre-Therapeutic failures, are nothing but the dentist-related failures. In addition to that, it also includes the following: -

- **Incorrect patient selection:** A patient is inappropriately selected for comprehensive periodontal therapy if, despite repeated efforts, he or she cannot be motivated to maintain proper oral hygiene. Incorrectly selected patients also include those patients who have a serious systemic disease that could promote periodontitis, including metabolic diseases, such as insulin-dependent juvenile diabetes; blood dyscrasias, such as pan myelopathy, the various leukaemias, cyclic neutropenia, drug induced agranulocytosis and erythroblastic anaemia; Smokers are always worst candidates for comprehensive periodontal therapy.<sup>2</sup>

- **Misdiagnosis/ lack of diagnosis:** Correct diagnosis is achieved by careful history taking, examination and the use of special tests. History taking includes past disease, trauma and pain. Diagnosis of primary endodontic disease and primary periodontal disease usually presents no clinical difficulty.<sup>16</sup> If primary endodontic lesions persist despite extensive endodontic treatment, it should arouse suspicions of an incorrect diagnosis. Hence, missing the diagnosis of an endo-perio lesion or improper diagnosis, might lead to a therapeutic failure.

##### **Therapeutic Failures:**

##### **Failures associated with non-surgical periodontal therapy-**

##### **• Scaling & root planing:**

Primary objective of scaling and root planing (SRP) is to completely remove elements that provoke inflammation such as plaque, calculus, necrotic cementum and endotoxin embedded on the root surface and to restore gingival health. Failures associated with SRP include:

- 1) Persistence of inflammation due to residual embedded calculus.
- 2) Condition of the instruments: Dull instruments frequently cause burnishing of the calculus instead of removing it completely.
- 3) Faulty techniques of instrumentation: Decreased angulation (<45° to the long axis of the root surface) can lead to burnishing of the calculus & prevent it from being removed in total. Increased angulation (>90° to the long axis of the root surface) can lead to laceration and trauma to the gingival tissues.<sup>4</sup>
- 4) The failures of root planing: can be, presence of a rough root surface or persistence of inflammation. Over instrumentation of root surface removes the unaltered cementum and may result in exposure of dentin especially in the cervical regions where the cementum is the thinnest. This may result in sensitivity and the area may also be prone for root caries.
- 5) Conventional mechanical non-surgical root debridement does not usually eradicate *A. actinomycetem comitans*, *P. gingivalis*, *P. intermedia*, *B. forsythus*, *P. micros*, enteric rods and probably additional microbial taxa,

from the subgingival ecosystem. Periodontal debridement may not eradicate these species due to their invasive potential into gingival epithelial cells and subepithelial connective tissues, and their high affinity for crevicular epithelium and dentinal tubules.<sup>12</sup>

**Supragingival and subgingival irrigation:** are associated with

- i) Persistence of inflammation: as the irrigant solution cannot be penetrated into deeper pockets.
- ii) The drug present in the irrigant brought out of the gingival sulcus/periodontal pocket by the constantly oozing crevicular fluid (which is known as “wash-out effect”).
- iii) So, apart from the fact that, irrigation cannot be employed as a solo therapy, it is weakly effective even as adjunctive therapy.<sup>13</sup>

**Splinting:** failures are associated with:

- Difficulty in oral hygiene maintenance
- Increased plaque accumulation.
- Inflammation in the area
- Higher bite force application
- Breaking of splint

**Local drug delivery:** failures are associated due to

- 1) difficulty in placing the LDD in inaccessible, deep pockets and in furcation areas
- 2) development of resistance among bacteria
- 3) time consuming and expensive if many sites are involved with periodontal disease.<sup>12</sup>

**Laser therapy:** some studies have found that lasers can also inflict a negative effect on the periodontium, including thermal damage, attachment inhibition and delayed wound healing. This is especially when the lasers are not properly used on the root surface **Frank Schwarz et al (2003). Cobb et al (1992) and Jorg Eberhard et al (2003), found the lasers to be not effective in calculus removal.**<sup>17</sup>

**Photodynamic Therapy:**

**Polansky et al (2009)** concluded that application of a single cycle of PDT was not effective as an adjunct to ultrasonic periodontal treatment.

**De Angelis et al. (2012)** reported that the use of adjuvant PDT with mechanical cleaning did not improve any clinical outcomes up to 4 months.<sup>18</sup>

**Failures Associated With Surgical Therapy-**

**Failures Associated With Flap Surgery:**

- i) Improper incision
- ii) Reflection of the flap: Over reflection will result in bone resorption, whereas under reflection will result in limited access to the underlying root/bone surface.
- iii) Incomplete debridement: leads to the recurrence of the disease.
- iv) Failure of proper placement of the sutures will lead to gaping of the wound and thereby results in disease recurrence. In case of grafting procedures, a space between the graft and the underlying tissue (i.e., **dead space**) impairs vascularization and jeopardizes the graft.<sup>19</sup>
- v) Flap perforation and necrosis: may be caused due to excessive tension from the sutures, use of chemical irrigant, injury to nearby artery/nerves and tissue emphysema.

**Gingivectomy:** failure reasons can be <**Wade (1954)**>:

1. Incorrect pocket markings
2. Incomplete pocket elimination
3. Insufficient bevelling of the incision
4. Failure to remove tissue tags
5. Inaccessible interdental spaces

**Frenectomy:** may fail due to

- i) Improper incision design
- ii) If sutures are not placed properly, it would result in the gaping of the wound, which affects the healing.<sup>20</sup>

**Depigmentation:** The recurrence of pigmentation is the major problem that can be encountered after depigmentation. **Ginwalla et al** suggested that, it can be attributed to residual melanocytes left during the operation, which can start to synthesize melanin once they are activated.<sup>21</sup> An increase in melanin pigmentation is also associated with increase in smoking.<sup>19</sup>

### Failures Noticed With The Treatment Of Furcation Involvement:

Failures associated with furcation involved teeth are usually due to inability to maintain the furcal area free of plaque either by the patient or by the lack of access to the clinician.<sup>22</sup> **Hamp et al. (1975)** reported that four out of the 7 (57.1%) molars with furcation treated with tunnelling developed carious lesions over the 5-year follow-up time. In three out of these four cases, the tooth had to be extracted. Treatment of maxillary Degree II furcation with guided tissue regeneration (GTR) revealed little or no improvement. Indeed, the addition of GTR to open flap debridement resulted in probing attachment and bone gain in buccal furcation of maxillary molars, while this was not the case for the corresponding interproximal furcation, as observed by **Pontoriero & Lindhe 1995**.<sup>23</sup>

### Failures Associated With Soft Tissue Augmentation:

Failures associated with soft tissue autografts are:

1. Mismatch between graft size and defect
2. Improper graft adaptation to the underlying periosteum
3. Graft movement: Loosened sutures could lead to displacement of grafts or contamination
4. Improper root preparation for graft may lead to failure of graft.
5. "Patch like appearance"

### Gtr And Gbr Procedures: Factors considered for failure are:

- a) Overlying gingival tissue
- b) Surgical technique
- c) Post-surgical factors
- d) Non sterile technique
- e) Instability (movement) of barrier against root
- f) Premature exposure of barrier to oral environment and microbes
- g) Premature loss or degradation of barrier.

### Implant:

### Classification Of Implant Failure:<sup>1,24</sup>

### I. According to aetiology:

1. Host factors:

- Osteoporosis
- Diabetes
- Smoking
- Para functional habits
- Poor home care
- Irradiation therapy
- Pregnancy

2. Surgical placement:

- Off axis placement
  - Lack of initial stabilization
  - Impaired healing and infection because of improper flap design.
  - Overheating the bone and exerting too much pressure.
  - Placing the implant in immature bone grafted sites/infected socket/pathologic lesion.
  - Contamination of the implant body before insertion.
3. Implant selection:
- Improper implant type in improper bone type.
  - Too short implants/unfavourable crown–implant ratio
  - Diameter of the implant.

4. **Restorative problems:** Excessive cantilever, pier abutments, no passive fit, improper fit of the abutment, improper prosthetic design, improper occlusal scheme, bending moments, connecting implants to natural dentition, premature loading, excessive torquing.<sup>25</sup>

### II. According to timing of implant failure:

Before stage II surgery:

1. It usually occurs as a result of Implant misplacement, that is, placement of the implant in an infected socket, pathological lesion, or immature bone previously augmented or placement of a contaminated implant in the osteotomy, infection or soft tissue complications.

2. After Stage II surgery: This could be due to excessive torquing during abutment connection when inserted into grafted bone. It probably happens because of an insufficient bone contact surface area with the implant and possibly because of poor surface treatment of the fixture.
3. After restoration: It starts after an integrated implant is loaded and leads up to the point of discovery of the failure. The most common cause is occlusal trauma. It has its own clinical manifestations, known as peri implantitis.<sup>1</sup>

### III. According to origin of infection:

Peri-implantitis: There is strong evidence that there is an increased risk of developing peri-implantitis in patients who have a history of chronic periodontitis, poor plaque control skills, and no regular maintenance care after implant therapy. "Smoking" and "diabetes" identified as potential risk factors/indicators for peri-implantitis have inconclusive evidence. Also, only limited evidence linking peri-implantitis to other factors exists such as: post-restorative presence of submucosal cement, lack of peri-implant keratinized mucosa and positioning of implants that make it difficult to perform oral hygiene and maintenance. Evidence suggests that progressive crestal bone loss around implants in the absence of clinical signs of soft tissue inflammation is a rare event.<sup>26</sup>

Retrograde peri-implantitis: etiologic possibilities are: -

- Residual bacteria in implant site
- Adjacent endodontic lesion
- Overheating
- Implant surface contamination
- Residual root particles or foreign bodies
- Surgical drilling beyond the length of the implant
- Fenestration of vestibular bone
- Bone compression
- Poor bone quality
- Premature loading
- Development of osteomyelitis

### IV. According to supporting tissue type:

- Soft tissue loss
- Bone loss
- Combination

### V. According to condition of failure:<sup>1</sup>

- Ailing implant: Implants exhibiting soft tissue problems exclusively are classified as ailing and have a more favourable prognosis.
- Failing implant: An implant that is progressively losing its bone anchorage, but is still clinically stable, can be defined as failing
- Failed implant: Implant with mobility excessive bone loss (>70%) not amenable to treatment are failed implant.

### VI. According to failure mode:

- Lack of osseointegration
- Unacceptable aesthetics
- Functional problems
- Psychological factors

### VII. According to osseointegration concept:<sup>27</sup>

1. **Biological:** Early or primary (before loading): failure to establish osseointegration. Late and secondary (after loading): failure to maintain the achieved osseointegration.
2. **Mechanical:** Fracture of implants, connecting screws, bridge frameworks, coating etc.,
3. **Iatrogenic:** Nerve damages, wrong alignment of implants, etc.

### Endo-Perio Lesion Management:

Multirouted teeth are often a challenging problem for the periodontist. The furcation area, the roots and their alveolar housing, and the varied pattern and nature of periodontal destruction, creates situations in which routine periodontal procedures have limited role and special procedures are generally required. Failures associated with furcation are usually due to inability to maintain the furcal area free of plaque by the patient or due to lack of access to the clinician.

### Ortho-Periodontic Treatment:

Frenectomy procedures may fail due to

1. Reattachment of the frenum as a result of improper incision design, and failure to sever the underlying periosteal attachment. Therefore, care should be taken to design the incision and to completely remove the muscle fiber attachment and

2. If sutures are not placed properly gaping of the wound may occur leading to hindrance in healing.

### **Prostho-Periodontic Treatment:**

Failures are primarily due to

i) Inflammation of the gingiva due to violation of the biological width (defined as the combined physiologic dimension of the junctional epithelium and the supra-crestal connective tissue attachment which is approximately 2mm. So, the minimum distance between the bone crest and the gingival margin should be 3 mm or more to prevent impingement of the restoration on to the biologic width.

ii) Surgical crown lengthening involves excessive removal of the bone which can lead to down gradation of the prognosis of the tooth. Hence, optimum bone removal should be planned to maintain the biologic width as well as bone support of the tooth.<sup>13</sup>

### **Post-Therapeutic Failures:**

**Inappropriate Treatment:** As simple as scaling sounds, its application in practice may be quite difficult. Inconsistent treatment, however, inevitably leads to failure. Several difficulties can stand in the way of subgingival scaling: an uneven course of the pocket floor, the micromorphology of the root surface, and the macro morphology of the root.<sup>28,29</sup>

**Delayed Wound Healing:** The most probable cause of delayed wound healing is infection which results in dead necrotic tissue which promotes bacterial growth. Other causes include wound dehiscence (un-approximated flap margins), hematoma, Stitch abscess (infection of suture track), foreign substances (like calculus, tooth fragments, periodontal pack), allergic reactions to graft material, suture material, periodontal pack, tight closure via suturing.<sup>30</sup>

**Incomplete Maintenance Therapy:** Some periodontists do not carefully check their own maintenance patients, but rely too much on their hygienist. Adequate probing and charting are not done and the recurrence of pathosis is overlooked. If

the general dentist who referred the patient does the maintenance, supervision of the patient may be no better. All patients who underwent a treatment for periodontal disease, require professional maintenance. The degree of professional care depends on the severity of the original involvement, the skill and motivation of the patient in oral hygiene procedures, and above all, the susceptibility of the patient to periodontal disease. Often one or more deep crevices exist immediately after the original treatment, usually because of the impracticability of achieving complete pocket elimination. The decision as to whether or not retreatment is necessary should not be made at the preventive maintenance appointment, but should be postponed for 1 to 2 weeks. In some patients an extra session of curettage with the periodontist himself is also desirable every year or two. Incomplete maintenance may worsen the periodontal health.

**Recurrence After Treatment:** the most common cause of failure is the inability of the patient to keep the bacterial population of the crevicular areas at a permissible level. Failure to smooth the involved roots during the original treatment is often a cause of pocket recurrence. The choice of an improper surgical technique will usually result in a relative failure. The inadequacies of the gingivectomy have been well documented. The failure to properly contour bone in osseous surgery can also result in rapid pocket recurrence. Occasionally a case will fail for reasons which can ascribed only to systemic factors. There seem to be two types of patients that fall in this category. In the first type there is a rapid, general vertical deterioration or loss of bone. The second type of patient is characterized by a slow horizontal bone loss and simultaneous recession of gingiva, with little pocket formation. In neither type is retreatment generally successful.<sup>7</sup>

**Root Hypersensitivity:** During periodontal therapy, scaling and root planing removes the outer layer of hyper mineralized dentine and thus leaves the surface expose to the effect of hydrodynamic phenomenon. Surgical periodontal therapy, usually involves complete root surface debridement. Post-operative recession of the soft tissue further exposes the dentinal tubules. Patient inability to maintain plaque control in the healing phase further complicates the problem.<sup>30</sup>

**Periodontal Pack Related:** Most commonly encountered complications of periodontal pack are allergy associated with eugenol-based packs. **Baer and Wertheimer** in their studies showed that periodontal dressings can cause greater inflammatory infiltration on the bone and the inflammatory reaction is greater when the dressing is directly placed on the bone compared with the time when it is placed on the periosteum.<sup>31</sup>

### Conclusion:

Periodontal health is achieved with a combination of treatment and regular periodontal maintenance care and careful maintenance is as important as skilful original treatment, if periodontal health is to be maintained. Many of the known causes of periodontal therapy failures have been discussed; and it has been suggested that recognition and avoidance of these pitfalls will result in a greater percentage of success.<sup>11</sup> Most failures can be avoided by instituting a regular recall system.<sup>2</sup> The therapist controls rather than cures the condition. At the time of treatment, every patient must be informed that, retreatment of some type is necessary occasionally. Patients with recurrent disease should be treated as conservatively as possible and every effort must be made to find the cause of failure. Surgical retreatment should be done only after a reasonable effort has been made to improve the situation by other means. Successful periodontal therapy is necessary for providing better dental care, for which the selection of the most suitable technique for treatment and evaluation of the complications associated with it, is considered crucial for paving way towards favourable outcomes.<sup>30</sup> Thus, proper diagnosis, selection of correct treatment, prognosis assessment, patient motivation, gentle tissue handling, strict asepsis and appropriate surgical techniques are the key factors for the prevention of the failures in periodontal therapy.

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