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Review Article

Strategies to Manage Failures in Periodontal Therapy- A Review

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Abstract

Modern periodontal therapies are effective in maintaining a healthy natural dentition as well as controlling periodontal disease. Numerous treatment strategies and various techniques have been designed and described to treat periodontal disease. Most of these procedures had drawbacks which were identified, leading to the modifications of the original techniques which lead to better treatment options, but still very less emphasis has been laid on failures. Without a regular program of clinical reevaluation, plaque control, oral hygiene instructions, and reassessment of biomechanical factors the benefits of treatment are often lost and inflammatory disease in the form of recurrent periodontitis may result. So this review describes the most common failures noticed in periodontal therapies and also discusses the possible solutions to reduce the incidence of failures in periodontal therapy.

Keywords: Periodontal therapy, risk factors, failures.

Introduction

The main objective of periodontal therapy in the large sense is the preservation of the natural dentition. Its more immediate goals are the elimination of pockets and where possible reconstruction of gingiva and bone destroyed by the disease process.

The objective of this article is to present some of the numerous and complex factors which may contribute to or be responsible for failures in periodontal therapy.

The oxford dictionary describes "failure as lack of success, declare to be unsuccessful." In periodontal terms, "the set goals when not achieved is a failure".

Periodontal therapies ranging from scaling and root planing (SRP) to various flap surgeries have their own advantages and limitations. Various concepts have been introduced for the treatment of periodontal disease, but very less emphasis has been laid on failures.[1] So, this review describes most common failures noticed in various periodontal therapies and also discusses the possible solutions to reduce the incidence of failures in periodontal therapies. After completion of comprehensive periodontal therapy, persistence of residual periodontal pockets, presence of bleeding and/or pus on probing, increase in loss of attachment or persistence of tooth mobility would be criteria to categorize a periodontal case as failure [1].

Failures can be broadly classified as

1. Dentist related failures
2. Patient related failures

1. Dentist related failures [2]

The dentist related failures include ones which the dentist fails in any of the following steps.

a. Gathering data

Recording of case history is of prime importance and listening to the patient's chief complaint and eliciting the different signs and symptoms might reduce the risks of failure. Medical evaluation and

assessing patient's emotional, physical and intellectual quotient goes a long way in planning the treatment of the patient.

b. Improper diagnosis

Periodontitis is recognized as a group of diseases with similar signs and symptoms. Arriving at a diagnosis is important in predicting either the prognosis or alteration in the treatment protocol. Improper diagnosis could lead to higher rates of recurrence and failures, probably due to failure to eliminate all the etiological aspects.

c. Improper investigations

Radiological examinations are important to assess the amount of hard tissue destruction. Some diseases can be identified based on their radiological distribution. Others like microbiological investigations and antibiotic culture and routine blood investigations must be performed to understand the patient's immune quotient and this assessment help in deciding the need for either altering or adjusting with the patient's medical condition/disease.

d. Inadequate motivation

The motivation of the patient is an important parameter as this leads to the improved co-acceptance and co-operation of the patient which is recognized as a critical factor in the long term success of therapy.

e. Irregular follow-ups

The follow ups need to be done at a regular basis and the patients have to be classified according to the maintenance care that they need.

II. Patient related factors

The patient related factors can be summarized into the following factors

a. Maintenance
b. Smoking
c. Systemic Diseases.
d. Poor healing potential.
e. Psychological component.

Classification of failures [3]

I. Pre-therapeutic,
II. Therapeutic and
III. Post-therapeutic.

I. Pre-therapeutic

a. Incorrect patient selection

- Age
- Socio-economic status and nutritional deficiencies
- Systemic disease: Diabetes Mellitus; Blood Dyscrasias (leukemia, Cyclic neutropenia); Immune deficiencies (neutrophil-monocytic chemotactic defects, AIDS); Genetic disorders (Down's syndrome, Papillion Lefevre syndrome, hypophosphatasia, Chediak Higashi Syndrome) ; Vitamin deficiencies.

b. Incomplete diagnostic procedure or misdiagnosis

- Improper clinical diagnosis
- Radiological interpretations
- Microbiological interpretation
- Biochemical interpretation
- Immunological interpretation

c. Inappropriate or improper dental restorations or prosthesis

Overhanging Class II, overextended (jacket crowns and bridges) will lead to plaque accumulation and there by attachment loss.

d. Failure to carry out associated prosthetic-restorative procedure

Failure to replace the missing teeth will lead to excessive stresses over the remaining natural teeth; secondly there will be selective intake of diet leading to nutritional deficiencies thereby hampering the post-therapeutic healing.

e. Morphology of tooth surfaces

Morphological aberrations like resorption lacunae lateral accessory canals, enamel pearl and grooves act as a "Guide Plan" for bacterial penetration into deeper periodontal tissues.

f. Habits

Habits like mouth breathing, bruxism, thumb sucking and smoking [2] are associated etiological factors.

g. Occlusal corrections or teeth preparation

Occlusal discrepancies may lead to trauma from occlusion. Failure to eliminate or correct these discrepancies will prevent the proper adaptive remodeling of the periodontium.

II. Therapeutic

1) Non-Surgical

a. Scaling

Failure of scaling is recognized by remnants of calculus. It may be caused by

- Incorrect instrumentation.
- Poor condition of instruments.
- "Burnishing Calculus"- improper adaptation or angulation re-

sults in smoothening of the calculus rather than removing it.

- Improper instrumentation leads to excessive tissue trauma resulting in more bleeding thus obscuring the vision to remove the deposits.
- Usage of gum paints before the completion of therapy could lead to precipitation of the proteins leading to masking of the inflammation which is actually an indicator underlying disease process.

b. Root planing

Failure to remove the entire deposits from the root surface may lead to failure in detection of root caries. Over instrumentation of root surface removes the unaltered cementum and exposure of dentin especially in the cervical regions where the cementum is the thinnest, resulting in sensitivity and the area may also be prone for root caries.

Mechanical therapy which follows the principles of periodontal instrumentation will result in reduction in failures in periodontal therapy [4].

c. Splinting [5]

Failures could be inflammation in the area, breaking of splint, increased plaque accumulation

Prevention

- Diagnose whether a temporary or permanent splint is required.
- Contouring the splint
- Proximal cleaning aids to be prescribed.
- Should be clear of occlusal interferences.
- Margins of splint should be flush with tooth surface.

d. Occlusal therapy [6]

The diagnosis of occlusal abnormalities must be made taking into the consideration the occlusal scheme of the patient, the presence of tooth wear, plunger cusps or other occlusal interferences. The severity of occlusal disturbance must be analyzed and treated; accordingly, either orthodontically or prosthodontically.

Assessment of tooth wear and judgment whether it can be corrected by selective grinding or a full fledged occlusal rehabilitation procedure is needed.

The loss of vertical dimension may lead to excessive forces on the periodontium. Correction of worn out teeth must be done prior to invasive periodontal surgery.

Patients with other oral habits like tongue thrust, occupational habits must be either advised to quit or forced to quit before attempting any periodontal therapy. Gross malocclusion must be corrected following basic therapy.

e. Failures associated with local drug delivery (LDD) of antimicrobial agents

Local drug delivery is defined as the placement of the drug directly to the periodontal pocket. Failures with LLD is associated due to

- Difficulty in placing the LDD in inaccessible, deep pockets and in furcation,
- Development of resistance among bacteria,
- Time consuming and expensive if multiple sites involved [1].

f. Failures associated with supragingival and subgingival irrigation [7]

Oral irrigation cleans the non-adherent bacteria and debris from the oral cavity.

Failures associated with these procedures are due to

- Persistence of inflammation as the irrigant solution cannot be penetrated into deeper pockets.
- The drug present in the irrigant gets thrown out of the gingival sulcus/periodontal pocket by the constantly oozing crevicular fluid ("wash-out effect").
- Irrigation cannot be employed as a solo therapy; it is weakly effective even as adjunctive therapy.

2) Surgical [8].

a. Improper treatment sequencing

The role of interdisciplinary dentistry is today unquestionable and this helps in sequencing the treatment to help in achieving optimal results.

b. Improper selection of technique

The design of surgery or procedure, right from types of incisions to the required modification must be done in detail. Improper selection of technique might be the primary cause for failure of the case.

c. Incomplete treatment

Once active treatment has started, the entire treatment planned has to be completed. Maintenance program has to be considered a part of active therapy. If the patient fails to turn up for the procedure, it has to be considered a failure of motivation.

d. Improper asepsis

Improper asepsis of the surgical field and patient, improper sterilization of instruments, use of unsterile medicaments etc. will lead to infection and failure in periodontal treatment.

e. Improper primary closure

Improper suturing technique will lead to improper approximation of tissues and will delay post-operative healing.

f. Curettage [9]

The failure is determined by the persistence of inflammation after procedure

Causes

- Curettage is indicated in patients with either shallow pockets or who are not medically fit for invasive surgical procedures. In such situations, in deep pockets the excision of the soft tissue lining of the pocket may not be feasible on a clinical basis. This often leads to failures of therapy.
- Instrumentation plays a vital role in performing the procedure. When curetting an area with a curette, the working side of the instrument must face the tissue.
- Curetted area must always be forcefully irrigated and failing to do so, may leave behind tags of granulation tissue which may either be resorbed or may increase the tissue volume preventing the formation of a knife-edged gingival margin.
- Suture if during curettage procedure inadvertently a papilla is opened up to aid in better instrumentation.

g. Gingivectomy [10]

Failures in gingivectomy could be defined by recurrence of lesion.

Wade (1954) outlined 15 reasons for gingivectomy failure

Unsuitable case selection. Cases - underlying osseous or intrabony defects.

- Incorrect pocket markings
- Incomplete pocket elimination
- Insufficient beveling of the incision.
- Failure to remove tissue tags, resulting in excessive tissue.
- Failure to remove etiologic factors-calculus and plaque.
- Beginning or terminating the incision in a papilla
- Failure to eliminate or control the predisposing factors.
- Inaccessible interdental spaces
- Loose dressings
- Lost dressings
- Insufficient use of dressings
- Failure to prescribe stimulators or rubber tip for interproximal use.
- Failure to use stimulators or rubber tip.
- Failure to complete treatment.

h. Abscess drainage [11]

Failures of abscess drainage are defined by the recurrence of abscess resultant increase in periodontal destruction.

Causes and Prevention

- The tortousity of the pocket and the complexity of the tooth anatomy require a precise identification and source of the abscess prior to the drainage.
- Removal of entire abscess wall is mandatory as remnant tags could act as a nidus surrounding which recurrent abscesses can occur
- Chronic abscesses tend to show more recurrence.
- Systemic/Local drug delivery is mandatory; if it's a periodontal abscess. A gingival abscess is usually exogenous in origin either by the incorporation of a foreign body into the gingiva or as a result of trauma and drainage and removal usually does not recur or need antibiotics.

i. Failures associated with frenectomy [12]

Frenectomy procedures may fail due to

- 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 fibre attachment and
- If sutures are not placed properly gaping of the wound may occur leading to hindrance in healing.

j. Failures associated with crown lengthening [13]

Failures associated with this procedure are primarily due to

- Inflammation of the gingiva caused due to the violation of the biological width So, the minimum distance from the bone crest to the gingival margin should be 3 mm or greater to prevent impingement of the restoration on to the biologic width.
- In cases of surgical crown lengthening, excessive removal of the bone can lead to poor tooth support leading to poor prognosis. Hence, optimum bone removal should be planned to maintain the biologic width as well as bone support of the tooth.

k. Failures associated with depigmentation [14]

Failures associated with this procedure are primarily caused due to lack of patient co-operation in smokers. An increase in melanin pigmentation is associated with increase in smoking. If the procedure of depigmentation is carried out with electrocautery, care should be exercised to prevent necrosis of bone. So, contact of the cautery instruments with underlying bone should be avoided. If chemicals are used for depigmentation there may be damage to the bone and underlying tissue because the depth of action of these chemicals is not controlled.

l. Failures associated with periodontal flap surgery [14]

Failures should be identified by recurrence of pockets, flabby tissue, abscess formation, gingival recession, cleft formation, loss of interdental papilla. In most situations, some amount of gingival tissue recession and loss of papilla occurs which is clinically accepted.

Failures of periodontal flap surgery can be due to

- Improper incision: the rationale of any periodontal flap surgery is to gain access to underlying root and bone surfaces. If incisions are not made upto the bone/root surface a mucosal flap is elevated which may lead to inaccessibility the underlying root surfaces. Therefore when incisions are made the blade should hit the bone in order to elevate a full thickness flap.
- Reflection of the flap: elevation of the periodontal flap should be such that only around 1 mm of marginal bone is exposed. Over reflection will result in bone resorption, whereas under reflection will result in limited access to the underlying root/bone surface.
- Debridement of the root surfaces and the bone: complete debridement with removal of plaque and calculus from the root surface is essential for success of any periodontal flap surgery.
- Separated flaps should be closely adapted and sutured. Failure to properly place the sutures will lead to gaping of the wound and hence recurrence of the disease [12].

Regenerative Techniques

m. Bone grafting Procedures [12]

The factors one needs to consider before, during and after the use of bone grafts include

- Pre-surgical considerations. The decision to place a bone graft must be taken prior to the procedure and the graft material of choice and the instruments must be sterilized and kept ready for use.
- Assessment of defect morphology. The use of bone grafts remains restricted in periodontal defects only to interproximal well supported 3 or 2 walled defects and furcation involvements of a moderate degree.
- Technique of placement. The bone graft is always placed in increments and is compacted into the defect and not compressed or tightly condensed. Distance between the particles has also assumed clinical significance as this is the area that new blood vessels are going to migrate bringing along with them, osteoblasts that ultimately lay down new bone.
- Maintenance of vascular continuity. The graft materials mostly used have only an osteoconductive property. Establishment of vascular continuity throughout the graft is vital in the success of therapy. The clot that forms as a result of therapy should preferably arise from the bone. To ensure this, some penetrations of the cortical plate are deemed required, to enhance the blood flow from the marrow (trephination) and must be routinely performed to aid in neovascularization.
- Root surface treatment: Following the root planing of teeth, the root surface if treated with any of the available and indicated agents, will, apart from the other advantages; result in exposure of collagen fibrils from the dentine which prevents the epithelial down growth thus preventing a long junctional epithelium between the grafted bone and the root surface.
- Overfilling the defect impairs the healing and may lead to fibrous encapsulation of the graft.
- “Flap margin bleed.” Before the placement of the graft, one

must assess the condition of the flap surface. The bleeding if persistent on the surface of the flap will result in the clot forming from the flap surface involving the graft resulting in the fibrous encapsulation of the grafted material.

- Postoperative infection control. Postoperative antibiotics must be prescribed following any bone grafting procedure. Patients with systemic compromise need to be pre- medicated with antibiotics. An antibacterial mouth rinse in the form of chlorhexidine or Povidone iodine twice daily must be prescribed to compensate for abstinence from mechanical plaque control.
- Graft sterilization. Most bone graft vials comes as disposable units which cannot be used more than once. However, some graft materials can be autoclaved. Thus attempts must be made to either to sterilize the graft materials prior to use or check the expiry date before placing it into the defect.
- Primary closure with no intervening graft particles. After the placement of sutures it is necessary to evaluate the presence of intervening graft particles between the flap margin and the tooth surface. This is accomplished by passing a probe along the gingival margins before the placement of a pack. The intervening graft particles could interfere with the healing of graft post-operatively.

n. GTR procedures [15]

While doing these procedures one must take into account the following factors

- Adaptation of membrane; the membrane of choice, whether resorbable or non- resorbable, must be adapted to the root surface to provide adequate space for the periodontal ligament cells to migrate and result in periodontal regeneration.
- Prevention of collapse. Resorbable membranes are weaker and have lesser space maintaining ability, hence when using a resorbable membrane it must always be used in conjunction with a bone graft.
- Trimmed membrane. The membrane should be trimmed in such a way that it covers atleast two millimeters of adjacent alveolar bone. Also the trimmed membrane must not have any sharp corners to avoid complications of flap perforations.
- Membrane exposure. Overlying flap should be adapted easily, without tension to adequately cover the membrane. Exposure of the membrane post-operatively leads to bacterial accumulation interfering with the formation of the healing callus or resulting in infection.
- Membrane suture; the membrane may be sutured using a sling suture.
- Primary closure is desirable and suturing techniques may be modified to achieve as much primary closure as possible. This holds true while using resorbable, absorbable or e-PTFE membranes. When primary closure cannot be achieved, it is preferable to use a full- bodied, dense PTFE membrane.

Failures of GTR membranes

Barrier-Independent Factors

- Poor plaque control
- Smoking
- Occlusal trauma
- Sub optimal tissue health (i.e., Inflammation persists)
- Mechanical habits (e.g., Aggressive tooth brushing)
- Overlying gingival tissue
- Inadequate zone of keratinized tissues.
- Inadequate tissue thickness
- Surgical technique
    - Improper incision
    - Traumatic flap elevation and management
    - Excessive surgical time
    - Inadequate closure or suturing
- Post surgical factors
    - Premature tissue challenge
- Plaque recolonization
- Mechanical insult
    - Loss of wound stability (loose sutures, loss of fibrin clot).

Barrier - dependent factors

- Inadequate root adaptation (absence of barrier effect)
- Nonsterile technique
- Instability (movement) of barrier against root.
- Premature exposure of barrier to oral environment and microbes.
- Premature loss or degradation of barrier.

o. Root coverage procedures [16]

Reasons for failure (Langer and Langer 1992)

- Recipient bed too small
- Flap perforation
- Inadequate graft size
- Inadequate coronal positioning of flap
- Too thick a CT graft
- Poor root preparation
- Poor papillary bed preparation

p. Implants

- Inadequate union of bone and implant at the time of surgical insertion.
- Improper biomaterials
    - Use of dissimilar materials.
    - Bio-incompatible materials.
- Contamination of the implant surface and infection.
- Surgical overheating of bone
- Structural design that does not transmit forces evenly to the bone.
- Premature loading with occlusal forces prior to healing phase.
- Increased periodontal pocket activity.

III. Post therapeutic

- Instruction and motivation.
- Unsupervised healing
- Persistent or reintroduction of certain micro organisms.
- New disease.
- Refractory Periodontitis.
- Ability or skill of the operator

a. Instruction and motivation

Preservation of the periodontal health of the treated patient requires a positive programme as does the elimination of periodontal disease. Motivation plus reinforcement of oral hygiene maintenance is of prime importance. Patient failure to continue with the treatment may be a conscious or unconscious decision by the patient or failure on the part of the dentist or staff to emphasize the need for periodic examination.

b. Unsupervised healing

Many failures arising after completion of treatment can be traced to the absence of supervision of healing process which includes professional cleaning of supragingival area periodically. Various systemic diseases and condition affect the healing process.

c. Persistent or reintroduction of microbial pathogen

Failure to eliminate these organisms may lead to recurrence of the disease. Certain strains of the bacteria may be present by their inherent resistant capacities to the antibiotics used. Reintroduction of the microorganisms can be done by overt probing, that is transferring bacteria from a periodontally unhealthy site to a periodontally healthy site.

d. New periodontal diseases

Introduction of diseases like AIDS on already existing chronic destructive periodontitis may further aggravate the already existing condition, leading to poor prognosis. Chances of failure are more likely if the disease is introduced during the healing period of periodontal therapy.

e. Refractory Periodontitis

A subset of patients clearly *exists* who respond poorly to conventional treatment modalities and continue to lose attachment and alveolar bone despite the best effort of the practitioners to control the disease, such patients are grouped under and referred as “intractable” or “refractory”.

f. Ability/skills of therapist

Last but not the least the ability or skills of the professional to correctly execute a good surgical procedure are also equally important for successful periodontal treatment.

Conclusion

Some of the factors which may contribute to periodontal therapy have been presented in this article. Several causes for failures have been discussed and it has been suggested that recognizing and avoiding such pitfalls will result in a greater percentage of success.

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