



IMPLANT FAILURE AND COMPLICATIONS

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ABSTRACT

Implant failures and complications are frequent occurrences in dental practice and knowledge in the management of these cases is essential. For proper management, etiologies and factors associated with implant failures need to be given eye for development of adequate treatment and prevention strategies. This review is intended to provide an insight regarding various aspects of failures that affect dental implants.

Keywords:

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INTRODUCTION

In 1969, Branemark *et al* published a landmark research documenting the successful osseointegration of endosseous titanium implants.¹ High survival rates reported for single and multiple missing tooth replacements have validated the use of implant supported restorations as a predictable method for oral rehabilitation.³⁻⁵ However, implants are not without potential problems.⁶

A tangible number of implants do not integrate or do not survive for long-term function.⁷ Complications and loss of implants can be costly, both in terms of time and financial resources. The placement of implants should not be undertaken without careful consideration of many variables, including systemic and local host factors and the design of a prosthesis. Risk factors, such as smoking, diabetes, and periodontal disease, may contribute to implant failures and complications. Several studies with numerous implants and years of follow-up have concluded that smoking is a definite risk factor for implant survival.⁸

Success, in general terms, can be defined as the gaining of what is aimed at. Therefore, to be successful, an osseointegrated oral implant has to meet certain criteria in terms of function (ability to chew), tissue physiology (presence and maintenance of osseointegration, absence of pain and other pathological processes) and satisfaction (aesthetics and absence of discomfort). Thus, success in implant dentistry should ideally evaluate a long-term primary outcome of an

implant prosthetic complex as a whole.⁹ Hence, a thorough knowledge regarding the various aspects of implant failure is deemed necessary.

Various success criteria have been proposed by authors previously

Schnitman and Schulman¹⁰ (1979)

1. Mobility less than 1mm in any direction.
2. Radiographically observed radiolucency was graded but no success criterion defined.
3. Bone loss no greater than one third of the vertical height of the bone.
4. Gingival inflammation amenable to treatment.
5. Functional service for 5 years in 75% of patients.

Crainin, Silverbrand, Sher and Salter¹¹ (1982)

1. In place for 60 months or more.
2. Lack of significant evidence of cervical saucerization on radiographs.
3. Freedom from hemorrhage according to Muhelman's index.
4. Lack of mobility.
5. Absence of pain and tenderness.
6. No pericervical granulomatosis or gingival hyperplasia.
7. No evidence of a widening peri-implant space on radiograph.

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Mckinney, Koth and Steflik¹² (1984)

Subjective Criteria

1. Adequate function
2. Absence of discomfort
3. Patient belief that esthetics, emotional and psychological attitude are improved.

Objective Criteria

1. Good occlusal balance and vertical dimension.
2. Bone loss no greater than 1/3rd of the vertical height of the implant, absence of symptoms and functionally stable after 5 years.
3. Gingival inflammation vulnerable to treatment.
4. Mobility of less than 1 mm buccolingually, mesiodistally and vertically.
5. Absence of symptoms and infection associated with the dental implant.
6. Absence of damage to adjacent tooth or teeth and their supporting structures.
7. Absence of paresthesia or violation of mandibular canal, maxillary sinus, or floor of nasal passage.
8. Healthy collagenous tissue without polymorphonuclear infiltration.

Alberkton, Zarb Washington and Erickson¹³ (1986)

1. Individual unattached implant that is immobile when tested clinically.
2. Radiograph that does not demonstrate evidence of peri-implant radiolucency.
3. Bone loss that is less than 0.2 mm annually after the implant's first year of service.
4. Individual implant performance that is characterized by an absence of persistent or irreversible signs and symptoms of pain, infections, neuropathies, paresthesia or violation of the mandibular canal.
5. In content of the foregoing, a success rate of 85% at the end of a 5-year observation period and 80% at the end of 10-year observation are minimum criterion for success.

Further, in 1998 M. Esposito, J.M. Hirsch and U. Lekholm⁷ listed out the various criteria for success which were agreed upon at the 1st European workshop on periodontology.

According to them - absence of mobility and an average radiographic marginal bone loss of less than 1.5mm during the first year of function and less than 0.2 mm annually thereafter, absence of pain/paresthesia were to be considered success criteria for osseointegrated implants. It was also suggested that probing depths related to a fixed reference point and bleeding on probing should be measured.

Types of Complications¹⁴

1. Surgical
2. Biologic
3. Mechanical/ technical
4. Esthetic
5. Related to augmentation procedure
6. Related to loading protocols

Surgical Complications

1. Haemorrhage and hematoma
2. Neurosensory disturbances

3. Implant malposition

Haemorrhage and Hematoma

1. Life threatening may happen with surgical procedure related to anterior mandible or with perforation lingual mandibular cortex. In this emergency - primary airway management and surgical management to isolate and stop bleeding. *Neurosensory Disturbance*
2. Caused by drilling or implant compression of the nerve.
3. Hypoesthesia or hyperesthesia.
4. Most common with "Lateral nerve repositioning". It is associated with 100% neurosensory dysfunction and 50% remains permanent.

Implant Malposition

Common reasons for implant malpositioning are:

1. Poor treatment planning
2. Lack of surgical skill
3. Poor communication between surgeon and restorative dentist
 - Ideal position of implant
 - To avoid injury to adjacent tooth root, guide pin location radiograph is necessary.

Biologic Complications

Types are:

1. Inflammation and proliferation of peri-implant soft tissue
2. Dehiscence and recession
3. Peri-implantitis ad progressive bone loss
4. Implant loss or failure

Inflammation and Proliferation

- Similar to plaque induced gingival lesions.
- Also common with loose implant- abutment or abutment crown connection and excessive cement retained after restoration.
- Correction of precipitating factors effectively resolves the problem.

Dehiscence and Recession

- Common when the supporting hard and soft tissues are thin, lacking or lost.

Peri-Implantitis

Bacterial invasion of the peri-implant tissues results in soft tissue inflammatory changes and rapid bone loss. This condition was termed peri-implantitis and was defined by Meffert¹⁵ as the progressive loss of peri-implant bone as well as soft tissue inflammatory changes.

Risk indicators for peri-implantitis included:-

1. Poor oral hygiene,
2. A history of periodontitis,
3. Diabetes,
4. Cigarette smoking,
5. Alcohol consumption, and
6. Implant surface

Clinical and radiographic symptoms of peri-implantitis:

- Probing depth <6mm
- Bleeding on probing/suppuration

- Attachment loss/bone loss of 2.5mm
- Vertical destruction of crestal bone on radiographs
- Possible swelling and hyperplasia of the peri-implant tissues
- Pain if present, depicts acute infection

Implant Loss or Failure

Two types

1. Early implant failure
 - Occurs before osseointegration.
 - Osseointegration is jeopardized by infection, movement or impaired wound healing.
2. Late implant failure
 - Occurs after prosthesis installation probably due to peri-implantitis, progressive bone loss or overload.

Mechanical or Prosthetic Complications

Screw Loosening and Fracture.

Frequent in screw-retained FPDs.

- In the patient with a prosthesis retained by multiple implants, the ability to detect a loose screw is greatly diminished
- Biomechanical support (and resistance) for the restoration must be evaluated.

Implant fracture

- Fatigue of implant materials and weakness in prosthetic design or dimension are the usual causes of implant fractures

Esthetic or Phonetic Complications

If the amount of available bone is not ideal, it appears like unesthetic emergence profile.

Benefits of Gingiva coloured materials:

- Improved lip support
- Masking interproximal spaces
- Restoration of gingival symmetry.

Phonetic problems

- More common with full arch implant supported prosthesis.
- Unusual palatal contours.
- Space between implant and superstructures.

Related To Augmentation Procedures

1. Complication associated with autogenous bone harvesting/grafting
 - At donor site, high incidence of neurosensory disturbance to mandibular anterior teeth and chin region.
 - Inferior alveolar nerve injury or trismus.
 - Recipient site complication, wound dehiscence, flap necrosis, graft exposure, graft contamination, problem with graft incorporation and resorption.
2. Complications of GBR
 - Exposure of the barrier membrane and necrosis of the overlying flap.
 - Other, bone graft infection, failure to regenerate adequate bone volume, decrease in the depth of vestibule.

3. Complications Associated With Sinus Augmentation Procedure

- Lateral window sinus lift:
- Schneiderian membrane perforation or bleeding from nasal cavity.
- Crestal (osteotome) sinus augmentation
- BPPV- benign paroxysmal positional vertigo- trauma induced by percussion with surgical hammer, along with hyperextension of neck during operation can displace otoliths in the inner ear.
- In suspected cases, patient is informed about the condition and referred to the otoneurologist to carry out otolithic reinstatement maneuver.

Prevention using:

- Manual force instead of hammer percussion
- Surgical fraise/ bur in combination with osteotome
- Piezoelectric surgical instruments.

Related To Placement and Loading Protocols

1. Immediate implant placement
 - Poor implant position,
 - Marginal bone loss,
 - Periimplant soft tissue recession,
 - compromised esthetics,
 - Failure to attain primary stability and implant failure.
2. Immediate loading
 - Failure to achieve primary stability
 - To avoid complication, requisites are
 - Long and wide implants
 - Thread design
 - For full edentulous arches, minimum 4-6 implants
 - Cross-arch stabilization
 - Minimizing cantilever.
3. Flapless approach
 - Complications due to:
 - Lack of operator visualization
 - Improper positioning- It is technique sensitive that requires surgical experience, proper case selection, an accurate surgical guide and knowledge of the anatomy surrounding the implant site.

Failures of Implants

Signs of failure according to Esposito et al⁷-

Signs of infection during healing (6-9 months)

- Swelling, fistulas, suppuration, early/late mucosal dehiscences, and osteomyelitis.
- Pain.
- Mobility.
- Dull sound at percussion.

Radiographic signs of failure

- Two well-distinct radiographic pictures:
 1. A thin peri-fixtural radiolucency surrounding the entire implant, suggesting the absence of a direct bone- implant contact and possibly a loss of stability.
 2. An increased marginal bone loss.

Indications for Implant Removal

1. Severe peri-implant bone loss (> 50% of implant length).
2. Bone loss involving implant vents or holes.
3. Unfavourable advanced bone defect.
4. Rapid, severe bone destruction (within 1 year of loading).
5. Nonsurgical or surgical therapy ineffective.
6. Esthetic area providing implant surface exposure.

CONCLUSION

Dental implants have high predictability and long term success but its not “fail free or complication free”. Surgical complications can be avoided by proper pre- surgical work ups. As someone well said, it is not how much success we obtain, but how best we tackle complex situations and failures, that determines the skill of a clinician. No doubt, failures are stepping stones to success but not until their etiologies are established and their occurrences is prevented.

Hence, it is mandatory for every clinician to know, how and why the failures occur and how best we can prevent them in order to give the upcoming branch of dentistry a new horizon.

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