Review Article

Failures in Dental Implants: A Review

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ABSTRACT

The primary reason to consider dental implants to replace missing teeth is to maintain the level of alveolar bone. The most common type of implant failures is caused either by poor treatment planning or poor surgical execution. To optimize the treatment outcome through dental implants, etiology and factors associated with implant failures should be taken into consideration. Such knowledge is needed for developing adequate treatment and prevention strategies. Hence, this review is intended to provide an insight regarding various aspects of failures that affect dental implants.

Keywords: Ailing and failing implants, Classification of implant failures, Implant failure, Peri-implantitis

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INTRODUCTION

Dental implant survival depends on successful osseointegration following placement. Excessive surgical trauma, infection, or metabolic disorders may adversely affect treatment outcome by altering the biological process. As an implant is restored and placed in function, bone remodeling becomes a critical aspect of implant survival in response to the functional demands placed on the implant restoration and supporting bone.

Failures occasionally do occur, even though the success rate with implant therapy is high. A thorough knowledge regarding the various aspects of failure is deemed necessary for successful management.

PARAMETERS FOR THE EVALUATION OF IMPLANT FAILURE

Although it is probable to differentiate between a successful and a failed implant clearly, it still remains challenging to identify failing implants. Esposito *et al.* discussed the parameters, which have been employed clinically to evaluate implant conditions.[1] The most common diagnostic criteria established for the implant failures (failed implants) are as follows.

Clinical Signs of Early Infection

Signs of infection which occur during the early stage of healing are more critical than if they occur at a later stage. Infection occurring at an early stage will lead to disturbance in the osseointegration of the implant to the surrounding bone. The most common complications seen are swelling, fistulas, suppuration, early/late mucosal dehiscences, and osteomyelitis during the healing period (3–9 months) which indicates implant failure.

Mombelli *et al*.[2] compared clinical and microbiological finding related to healthy and failing dental implants. Futile implant sites were categorized by probing depths of 6 mm or greater in association with suppuration, bone loss, and microbiota consisting primarily of Gram-negative anaerobic rods.[2]

Discomfort or Sensitivity

Pain or discomfort is the first sign which indicates an implant failure and is often associated with mobility.

Clinically Distinct Movement

Several different types of mobility have been recognized as: (1) Rotation mobility, (2) lateral or horizontal mobility, and (3) axial or vertical mobility.[3] Sometimes, clinically apparent movement of the implant can be present minus distinct radiographic bone changes. Therefore, mobility is the cardinal sign of implant failure.[1]

Radiographic Signs of Failure

There can be two well-distinct radiographic pictures in implant failure. First is a thin perifixtural radiolucency

surrounding the entire implant. This suggests the absence of a direct bone-implant contact and possibly a loss of stability. Second being an increased marginal bone loss. When a suspected perifixtural radiolucency or excessive marginal bone loss is observed, it is recommended to remove the prosthetic construction and check the implants for stability. Clinically noticeable mobility after framework removal will endorse the reasonable radiographic identification of implant failure.[4]

Dull Sound at Percussion

A subdued sound on percussion is indicative of soft tissue encapsulation. A clear crystallization sound indicates successful osseointegration.[1]

Bleeding on Probing

Bleeding on probing has been a measure of peri-implant tissue conditions. However, recent findings suggest that it cannot be used to discriminate between a healthy and diseased peri-implant state and it has no scientific evidence to support it.

El Askary *et al.*[5] in 1999 gave eight warning signs of implant failure which are (i) connecting screw loosening (ii) connecting screw fracture (iii) gingival bleeding and enlargement (iv) purulent exudates (v) pain (not very common) (vi) fracture of prosthetic component (vii) angular bone loss and (viii) long-standing infection and soft tissue sloughing.

Table 1 summarizes a description of implant failures, the problems encountered and the solutions to it.[5]

Rosenberg *et al.*[14] classified implant failures as an: (1) infectious failure and (2) traumatic failure.

An implant is determined to have failed from infection if one or more of the below-mentioned criteria are seen. They include clinical signs of infection with classic symptoms of inflammation, high plaque and gingival indices, pocketing, bleeding, suppuration, attachment loss, radiographic peri-implant radiolucency, and presence of glaucomatous tissue on removal. Implants are suspected to fail from traumatic conditions if the following conditions, i.e., radiographic peri-implant radiolucency, mobility, lack of glaucomatous tissue on removal, lack of increased probing depths and low plaque, and gingival indices exist.

Truhlar[11] classified failures as early and late failures. Early failures occur within weeks to few months after placement. They were caused by factors that can interfere with normal healing processes or by an altered healing response. Late failures were those that arose from pathologic processes that involved a previously osseointegrated implant.

Heydenrijik *et al.*[15] classified implant failures are referring to the occurrence in time as early failures, in which osseointegration had never been established, thus representing an interference with healing process.

Late failures are the one in which osseointegration was not maintained implying processes involves loss of osseointegration. Soon late failures referred to implants failing during the 1st year of loading and delayed late failures referred to implants failing in subsequent years.

CONCLUSION

Clinical trials document a consistently high success rates for endosseous dental implants in partially and

Table 1: Classification of implant failures

Classification of implant failure	Problems seen	Solution
I. According to etiology:		
1. Host factors:		
A. Osteoporosis:	Greater loss of trabecular bone than cortical bone	Hyperbaric oxygen therapy
	Difficult to achieve immediate stability of implant[5]	Dietary calcium, weight-bearing exercise
		Hydroxyapatite-coated implants
		The number of implants is increased to distribute the load
B. Diabetes:	More chances of infection	Diabetes has to be under control
C. Smoking:	Wound healing is impaire	Diabetes has to be under control
	Alveolar vasoconstriction decreased blood flow Wound healing is impaired[7]	Pre-operative antibiotic prophylaxis, aseptic technique is to be followed with regular follow-up
	Bone quality is poor	Smoking cessation 2 weeks before and 3 weeks after surgery[7]
D. Para functional habits:	Connecting screw loosening.	The number of implants should be increased
		Use of occlusal splint, wide diameter implants
E. Poor home care:	Plaque accumulation leads to loss of permucosal seal and ingress of bacteria	Maintenance programs
		Precise methods of plaque and calculus removal
	Susceptibility to infection is more	Space should be provided beneath the superstructure to allow cleansing aids

(Contd...)

Table 1: ***(Continued)***

Classification of implant failure	Problems seen	Solution
F. Irradiation therapy:	Osteoradionecrosis is commonly seen. Endarteritis of vessels causes the decrease in oxygen supply to the tissues[8]	Hyperbaric oxygen therapy Waiting period of 6–12 months
G. Pregnancy:	Implant surgery procedures are contraindicated	Dental prophylactic appointments are suggested in 2nd and 3rd trimester
2. Surgical placement:	Severe angulation	Graft the area to allow proper implant placement and use of angulated abutments
	Lack of initial stability	Proper drill grip, sharp drills should be used
	Impaired healing	Proper flap design, blood supply, visibility, access, and the primary closure
	Overheating the bone	A combination of copious irrigation system and sharp drills should be used to prevent it
	Minimal space between the implants	A space of 3–5 mm is necessary between implants to allow biologic space to avoid necrosis due to blood supply impairment
	Placement in an infected socket	Implant placement in an infected socket should be avoided. The waiting period of 2–6 months can prevent implant failure
3. Implant selection:	Improper implant length	Long-term success of implant depends on bone-implant contact hence short implant will lead to higher stress concentration
	Number of implants	Use of more number of implants decreases the number of pontics and the associated mechanics and strains on the prosthesis. It dissipates stresses more effectively to the bone structure
4. Restorative problems:	Screw loosening	Framework should have greater dimension occluso gingivally
		Occlusal forces should be shared evenly by all implants
		Flathead screw design
	Excessive cantilever	A mesial cantilever is favored
	No passive fit	Laboratory technique should minimize casting shrinkage and inaccuracies. A non-passive framework try-in technique will achieve a stable and passive fit
	Improper fit of the abutment	
	Bending moments	Fit of the components must be checked before taking the impression
	Connecting implants to natural teeth	Avoid connecting the implant and natural tooth to prevent an intrusion of a natural abutment
II. According to timing of implant failure UCLA team (Beumer. Moy)	1. Complications in Stage I surgery:	Medical history, dental history, radiographs, CT, models[9]
	Damage to mental nerve	Nerves (<1 mm from implant), vessels, adjacent teeth (<.5 mm from implant), type IV bone and sinus/nasal floor[9]
	Penetration into a maxillary air sinus, nasal cavity, or through inferior border of the mandible	Drilling torque, proper irrigation, correct armamentarium, surgical guide[9]
	Excess countersink	
	Thread exposure	
	Eccentric drills, taps	
	Stripping of threads	
	Jaw fracture	
	Ecchymosis, more common in older patients	
	Wound dehiscence	
	Facial space abscess, sub-mental, sub-mandibular abscess, Ludwig's angina	
	Suture abscess	
	Loss of cover screw[9]	

(Contd...)

Table 1: ***(Continued)***

Classification of implant failure	Problems seen	Solution
	2. Complications in Stage II surgery:	Achieve anchorage, primary stability[10]
	Poor selection of fixture height	Analyze compromised situation dehiscence, fenestration, improper positioning/ angulation[10]
	Incorrect fixture placement, more than 35° cannot be used prosthetically	Accommodate problem by bone grafting, membranes, sutures, back-up implant, shorter implants, root canal therapy[10]
	Damaged hex nut on top of fixture	
	Loss of abutment	
	Fractured abutment screw	
	Early loading by prostheses	
	Poor air-flow pattern with "high water" design	
	Aspiration of instruments	
	Thread exposure	
	Fixture fractures	
	Excess bone resorption	
	Plaque/calculus formation	
	Periodontal problems	
	Poor selection of abutment height[9]	
	3. Prosthetic complications:	Thorough knowledge about type of prosthesis
	Insufficient space beneath the fully bone anchored prosthesis	Post-operative instructions
	Abutments penetrate through alveolar mucosa (unattached tissue)	
	Screw fractures: Gold or abutment screws	
	Acrylic or porcelain fracture	
	Posterior fixture failures in the maxilla[9]	
III. According to origin of infection[4]	1. Peri-implantitis	Maintenance of good oral hygiene by the patient and regular recall appointments
	2. Retrograde peri-implantitis	Careful analysis of occlusal forces
		Increased number of implants
IV. According to condition of failure	1. Ailing implant[11,12]	Maintenance
	2. Failing implant[11,12]	Supra-mucosa/sub-mucosa scaling
		Local antibiotic[13]
		Antiseptic mouthwash
		Regenerative/respective therapy
		Surface decontamination
	3. Failed implant[11,12]	Remove the failed implant[13]
V. According to failure mode[4]	1. Lack of osseointegration	Careful planning is the only solution
	2. Unacceptable aesthetics	Identify patient with significant psychiatric disturbance
	3. Functional problems	
	4. Psychological factors	
VI. According to osseointegration concept[1]	1. Biological:	Avoid implant and osteotomy site contamination
	Early loading-failure to establish osseointegration	Avoid disturbances in biomechanical equilibrium or overload, and alterations of the host-parasite equilibrium
	Delayed loading-failure to maintain the achieved osseointegration	
	2. Mechanical:	If the occlusion or the adaptation of the prosthesis seems right, modify the prosthetic design
	Component fracture, connecting screw fracture, prosthesis fracture, functional speech problems, malpositioned fixtures, etc.	
	3. Iatrogenic:	
	Nerve damage, hemorrhage, etc.	Knowledge of the topography and course of these nerves and x-ray serve to prevent the nerve damage

CT: Computed tomography

completely edentulous patients. Failures occur at a low rate but tend to cluster in those with common profiles or risk factors. In this paper, an attempt has been made to categorize the implant failures as related to implant devices, procedures, anatomy, systemic health or exposures, occlusion, microbial biofilm, host

immunoinflammatory responses, and genetics. In general, factors related to patient appear to be more critical than those related to the implant in determining the likelihood of implant failure.

REFERENCES

1. Esposito M, Hirsch JM, Lekholm U, Thomsen P. Biological factors contributing to failures of Osseo integrated oral implants (I) success criteria and epidemiology. Eur J Oral Sci 1998;106:527-51.
2. Mombelli A, van Oosten MA, Schurch E Jr, Land NP. The microbiota associated with successful or failing Osseo integrated titanium implants. Oral Microbiol Immunol 1987;2:145-51.
3. Ivanoff CJ, Sennerby L, Lekholm U. Influence of initial implant mobility on the integration of titanium implants. An experimental study in rabbits. Clin Oral Implants Res 1996;7:120-7.
4. Prashanti E, Sajjan S, Reddy JM. Failures in implants. Indian J Dent Res 2011;22:446-53.
5. el Askary AS, Meffert RM, Griffin T. Why do dental implants fail? Part I. Implant Dent 1999;8:173-85.
6. Beikler T, Flemmig TF. Implants in the medically compromised patient. Crit Rev Oral Biol Med 2003;14:305-16.
7. Bain CA, Moy PK. The association between the failure of dental implants and cigarette smoking. Int J Oral Maxillofac Implants 1993;8:609-15.
8. Granstorm G, Bergstorm K, Tjellstorm A, Branemark PI. A detailed analysis of titanium implants lost in irradiated tissues. Int J Oral Maxillofac Implants 1994;9:653-62.
9. Verma AK, Ali M, Katiyar P, Gaur A, Ahmad N, Tiwari A K. Success and failure of dental implants. Int J Adv Dent Res 2016;1:1-4.
10. Misch K, Wang HL. Implant surgery complications: Etiology and treatment. Implant Dent 2008;17:159-68.
11. Truhlar RS. Perimplantitis-causes and treatment. Oral Maxillofac Surg Clin N Am 1998;10:299-308.
12. el Askary AS, Meffert RM, Griffin T. Why do dental implants fail? Part II. Implant Dent 1999;8:265-77.
13. Popat RP, Bhavsar NV, Popat PR. Peri-implantitis: Management of ailing, failing and failed dental implants. IOSR J Dent Med Sci 2014;1:43-6.
14. Rosenberg ES, Torosian JP, Slots J. Microbial differences in 2 clinically distinct types of failures of Osseo integrated implants. Clin Oral Implants Res 1991;2:135-44.
15. Heydenrijk K, Meijer HJ, van der Reijden WA, Raghoebar GM, Vissink A, Stegenga B. Microbiota around root-form end osseous implants: A review of the literature. Int J Oral Maxillofac Implants 2002;17:829-38.

How to cite this article: Fathima M, Sinha N, Ali SM. Failures in Dental Implants: A Review. Int J Adv Health Sci 2017;4(2):5-9.

Source of Support: Nil, **Conflict of Interest:** None declared.