

Journal section: Oral Surgery
 Publication Types: Review

doi:10.4317/medoral.16.e42
<http://dx.doi.org/doi:10.4317/medoral.16.e42>

Implant failure: Etiology and complications

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Sakka S, Coulthard P. Implant failure: Etiology and complications. Med Oral Patol Oral Cir Bucal. 2011 Jan 1;16 (1):e42-4.
<http://www.medicinaoral.com/medoralfree01/v16i1/medoralv16i1p42.pdf>

Received: 25/02/2010
 Accepted: 02/04/2010

Article Number: 16870 <http://www.medicinaoral.com/>
 © Medicina Oral S. L. C.I.F. B 96689336 - pISSN 1698-4447 - eISSN: 1698-6946
 eMail: medicina@medicinaoral.com
Indexed in:
 Science Citation Index Expanded
 Journal Citation Reports
 Index Medicus, MEDLINE, PubMed
 Scopus, Embase and Emcare
 Índice Médico Español

Abstract

The possible occurrence of implant failure is a major concern for implantologists and knowledge in such unavoidable fact is clinically essential. Periimplantitis is an inflammatory response in which there is a loss of the bony support of the implant. Diagnosis is based on the clinical signs of infection such as hyperplastic soft tissues, supuration, colour changes of the marginal peri-implant tissues and gradual bone loss. This site-specific infection may have many features in common with chronic adult periodontitis. Surgical trauma, micromotion and overload are also considered to be associated with implant failures. The lack of osseointegration is generally distinguished by implant mobility and radiological radiolucency. Here, the implant is considered to be failed. Progressive marginal bone loss without marked mobility is referring to a failing implant. The purpose of this concise review was to discuss the implant complications and failure by highlighting the major etiologic factors as well as the parameters used for evaluating such failure.

Key words: *Implant failure, peri-implantitis, marginal bone loss, implant mobility.*

Introduction

Implantology is continually developing as new research results provide a better understanding of the biologic principles that direct the development of a dynamic interface between the living tissue and an artificial structure. However, in spite of high success rate, occurrence of implants failure has been reported (1).

Implant failure may be referred to as the status of the implant performance that when using some quantitative measurements, falls below an acceptable level. This definition encompasses clinical situations, ranging from all symptomatic mobile implants to implants show

more than 0.2mm of peri-implant bone loss after the first year of loading (2) or bleeding depth exceeding 5mm of probing depth (3). The distinction between failed implant and failing implant is clinically important. The lack of osseointegration is generally characterized by implant mobility and peri- fixtural radiolucency. In this situation, the implant is considered to be “failed” (4). On the other hand, the failure process might be slow and continuing (5). Therefore, an implant characterized by progressive marginal bone loss without marked mobility is considered to be “failing” (4).

Implant complications and failure

A multifactorial background for implant complications and failure has been extensively reviewed (6). Three major etiologic factors have been suggested:

1- Infection: Bacterial infection that leads to implant failures can occur at any time during implant treatment (7). Several terms are currently used indicating failing implants or complications. These are: peri-implant disease, peri-implant mucositis, and peri-implantitis. Peri-implant disease is a collective term for inflammatory reactions in the soft tissues surrounding implants. Peri-implant mucositis is a term describing reversible inflammatory reactions in the soft tissue surrounding implants. Other soft tissue complications (hyperplastic mucositis, fistulations and mucosal abscess) seem mainly to have an infectious etiology (8). Fistulations and hyperplastic mucositis are often found in relation to loose prosthetic components (9). Abscesses can occasionally be seen in relation to food particles trapped in the peri-implant crevice (10). Peri-implantitis is referred to as inflammatory reaction with loss of supporting bone in the soft tissues surrounding implants (8,11). Plaque-induced infection as a result of plaque accumulating on the exposed surfaces of the biomaterial (12) could be included in the definition of peri-implantitis. The latter authors regarded peri-implantitis as site-specific infection having many features in common with chronic adult periodontitis.

2- Impaired Healing: It is believed that the magnitude of the surgical trauma (lack of irrigation and overheating), micromotion and some local and systemic characteristics of the host play a major role in implant failures related to impaired healing (10).

3- Overload: Implant failures related to overload include those situations in which the functional load applied to the implants exceeds the capacity of the bone to withstand it. Failures that happen between abutment connection and delivery of the prosthesis, probably caused by unfavourable loading conditions or induced by the prosthetic procedure, considered to have an overload etiology (5). Other attributes to implant failures are poor surgical technique, poor bone quality and poor prosthesis design in addition to the traumatic loading conditions (13).

Parameters used for evaluating implant failure

Several variations in the evaluation methodology have to be in mind, since implants are branded by different designs and subjected to different surgical techniques and loading conditions. The most common diagnostic criteria used for the assessment of implant failures are:

1- Clinical signs of infection

Infection is the most common explanation for complications that might occur during the healing period. These complications may include swelling, fistulas, suppura-

tion and early/late mucosal dehiscence can occur and may point to implant failure. Nevertheless, early wound dehiscence can also be present in relation to retained sutures, inadequate flap designs, or premature wearing of a denture (14).

Early signs may be a mark of a much more critical result than if the same complications occur later, because of disturbance of the bone healing process that leads to the integration of the implant. Late signs of progressive marginal infection can lead to implant failure (15). However, clinical signs of infection such as hyperplastic soft tissues, suppuration, colour changes of the marginal peri-implant tissues, etc., are signs, which need an intervention. Therefore, signs of infection either early or late can not be used alone to determine the fate of an implant, but should be evaluated in relation to other parameters such as radiographic changes and mobility. In the absence of the latter parameters, clinical signs of infection that if left untreated, might lead to an implant failure. In other words, signs of infection point to more a complication than a failure.

2- Clinically marked mobility

Mobility of implants is the key sign of their failure. This clinically noticeable situation can, occasionally, be present without distinct radiographic signs of bone changes (16).

Several different kinds of mobility: horizontal, vertical and rotation mobility have been recognized (17). The reverse-torque test was proposed to discover mobile implants (18) and the periotest device can be used for a better evaluation of horizontal mobility (19).

While rotational mobility may reflect an immature bone/implant interface, horizontal and vertical mobility on the other hand, may be associated with bone loss and the presence of soft tissue capsule (8).

3- Radiographic signs of failure

The radiographic examination remains one of the main tools for recognition of failed implants in clinical practice. The most important factors for making an appropriate radiographic assessment of the implant conditions are the quality of the radiographs together with the examiner experience (16). Standardized periapical radiographs should be taken at regular follow-up intervals to detect peri-implant radiolucency and/or progressive marginal bone loss (20). At this point, the picture of peri-implant radiolucency suggests the absence of direct bone-implant contact and possibly a loss of stability, whereas in the case of increased marginal bone loss, the implant can be stable.

Conclusion

Despite high success rate with endosseous titanium implants, failures unavoidably occur. At an early stage, lack of primary stability, surgical trauma, peri-operative contamination and occlusal overload seem to be the most important causes of implant failure.

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