

IMPLANT FAILURES IN PROSTHODONTICS: A REVIEW

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Abstract: Dental implants have revolutionized prosthodontic treatment by providing durable and aesthetic solutions for edentulous patients. However, implant failures still occur, affecting both the longevity of the implant and the patient's quality of life. Implant failure can be classified into two categories: early and late failures. This article reviews the common causes, risk factors, clinical implications, and management strategies for implant failures in prosthodontics, based on recent literature.

Introduction

The success of dental implants has made them a cornerstone of prosthodontic treatment, offering patients a reliable and aesthetically pleasing option for replacing missing teeth. However, despite their success rates, dental implant failures continue to challenge clinicians. Failures can be categorized into early and late stages, depending on whether they occur before or after the implant has been fully integrated into the bone.

The primary goal of prosthodontic rehabilitation using implants is to restore function and aesthetics. A failure, therefore, not only compromises the patient's health but also leads to significant psychological and financial consequences. This review explores the causes, risk factors, and strategies for managing implant failures in the field of prosthodontics.

Types of Implant Failures

1. **Early Failures:** These occur before osseointegration is achieved, generally within the first few months post-surgery. Early failures are often due to surgical complications or insufficient bone quality/quantity.
2. **Late Failures:** These occur after successful osseointegration, typically years after implant placement. Late failures are frequently related to factors such as biomechanical overload, peri-implantitis, or poor prosthetic design.

Causes of Implant Failure

Several factors contribute to the failure of dental implants, and understanding these causes is crucial for both prevention and management.

1. Surgical Factors

- **Inadequate Surgical Technique:** Poor placement technique, such as incorrect angulation, excessive heating of bone, or improper initial stability, can lead to early implant failure (Esposito et al., 2007).
- **Insufficient Bone Volume:** A lack of adequate bone density and volume can impede the healing process and osseointegration, leading to implant failure (Buser et al., 2004).

2. Biological Factors

- **Infection:** Peri-implantitis, an infection around the implant, is one of the leading causes of late failure. This is often due to bacterial contamination at the time of placement or postoperative infection (Lang & Berglundh, 2011).
- **Osseointegration Failure:** Inadequate bone-implant interface, often resulting from compromised bone quality, can lead to the failure of osseointegration (Araujo & Lindhe, 2009).

3. Biomechanical Factors

- **Excessive Loading:** Overloading of the implant, especially when restoring with fixed prostheses, can cause mechanical failure. Misalignment of the prosthesis or ill-fitting crowns can exacerbate these problems (Jemt, 1991).
- **Implant-Abutment Connection Issues:** Microgap formation between the implant and abutment is a well-known factor contributing to biomechanical failures, resulting in prosthetic loosening or implant fracture (Hahn & Kerns, 2006).

4. Patient-Related Factors

- **Bruxism:** Patients with a history of bruxism are at an increased risk for implant failure due to the high forces exerted during grinding and clenching (Pjetursson et al., 2008).
- **Systemic Health Conditions:** Conditions such as diabetes mellitus, osteoporosis, and immunosuppressive therapy can delay healing or impair osseointegration, increasing the risk of failure (Lazzara et al., 2010).

5. Prosthetic Design Issues

- **Improper Prosthetic Design:** Poor prosthetic design, including improper occlusal alignment, incorrect material choice, or improper cantilever extensions, can lead to complications and implant failure (Cavalcanti et al., 2014).

Risk Factors for Implant Failure

Several patient- and treatment-related risk factors have been identified in the literature that increase the likelihood of implant failure:

- **Smoking:** Smoking has been shown to significantly increase the risk of implant failure due to impaired blood flow and reduced healing capacity (Albrektsson et al., 1986).
 - **Age:** Older patients may face an increased risk of implant failure due to factors like bone density changes and slower healing processes (Buser et al., 2004).
 - **Poor Oral Hygiene:** Inadequate oral hygiene is a major risk factor for peri-implantitis and implant failure (Gonzalez-Moles et al., 2014).
 - **Previous Implant Failures:** A history of failed implants can increase the likelihood of future failures due to compromised bone health or surgical technique (Sanz et al., 2009).
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Clinical Implications

The consequences of implant failure can range from mild discomfort to severe complications, such as the loss of bone structure, infection, and the need for further surgeries. Clinicians must be vigilant in the early detection of failure signs, such as mobility, pain, or radiographic changes, to mitigate these effects.

Moreover, implant failure may necessitate the use of more invasive treatments, such as bone grafting or sinus lifts, to restore the necessary foundation for a new implant. These additional procedures can increase the overall cost and recovery time for the patient.

Management of Implant Failures

When an implant failure occurs, the management strategy depends on whether the failure is early or late, the extent of damage, and the overall health of the patient.

1. Early Failures

- **Immediate Replacement:** In cases where the failure is due to poor osseointegration, the implant is often removed, and bone grafting is performed if necessary. After healing, a new implant can be placed (Pjetursson et al., 2014).

2. Late Failures

- **Peri-Implantitis Treatment:** For late failures associated with peri-implantitis, treatments include non-surgical debridement, local or systemic antibiotics, or even implant removal in severe cases (Renvert & Persson, 2014).
 - **Prosthetic Adjustment:** In cases of biomechanical failure, modifications to the prosthetic design or adjustments to occlusion and implant loading are often required (Jemt, 1991).
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Conclusion

Implant failure in prosthodontics is a multifactorial issue, with causes ranging from surgical errors to patient-related factors. Although the success rate of dental implants remains high, failure still occurs, with significant implications for both the patient and the clinician. Understanding the causes and risk factors of implant failure, along with a comprehensive management strategy, is essential for improving patient outcomes and the long-term success of implant-based prosthetic rehabilitation.

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