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Review

Immediate nonfunctional versus immediate functional loading and dental implant failure rates: A systematic review and meta-analysis

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ABSTRACT

Objectives: The purpose of the present review was to test the null hypothesis of no difference in the implant failure rates, postoperative infection, and marginal bone loss for patients being rehabilitated using dental implants with immediate nonfunctional loading (INFL) compared to immediate functional loading (IFL), against the alternative hypothesis of a difference.

Methods: An electronic search without time or language restrictions was undertaken in March 2014. Eligibility criteria included clinical human studies, either randomized or not. The estimates of relative effect were expressed in risk ratio (RR) and mean difference (MD) in millimeters.

Results: 1059 studies were identified and 11 studies were included, of which 7 were of high risk of bias, whereas four studies were of low risk of bias. The results showed that the procedure used (nonfunctional vs. functional) did not significantly affect the implant failure rates ($P = 0.70$), with a RR of 0.87 (95% CI 0.44–1.75). The wide CI demonstrates uncertainty about the effect size. The analysis of postoperative infection was not possible due to lack of data. No apparent significant effects of non-occlusal loading on the marginal bone loss (MD 0.01 mm, 95% CI -0.04–0.06; $P = 0.74$) were observed.

Conclusions: The results of this study suggest that the differences in occlusal loading between INFL and IFL might not affect the survival of these dental implants and that there is no apparent significant effect on the marginal bone loss.

Clinical Significance: There has been a controversy concerning whether dental implants should be subjected to immediate functional or nonfunctional loading. As the philosophies of treatment may alter over time, a periodic review of the different concepts is necessary to refine techniques and eliminate unnecessary procedures. This would form a basis for optimum treatment.

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1. Introduction

The desire for fewer surgical interventions and shorter implant treatment times has led to the development of revised placement and loading protocols. A healing period of 4–6 months was initially proposed to ensure osseointegration of endosseous dental implants.[1] With the improvements in oral implantology resulting in improved prognosis and outcomes, the traditional protocol for implant dentistry has been constantly reevaluated. Recent steps include reduction of the treatment time through immediate placement of implants into fresh extraction sockets[2] and by loading the implants immediately.[3] Immediate loading protocols have since been extensively discussed in the literature and found to be a viable treatment approach in selected cases.[3]

Two types of immediate loading have been described in the literature. One is the immediate functional loading (IFL), or immediate occlusal loading, which refers to the use of a temporary or definitive prosthesis seated the same day as the surgery in occlusal contact with the opposing arch.[4] An alternative approach consists modifying the immediate temporary restoration to avoid occlusal contacts in centric and lateral excursions, in order to reduce the early risks of mechanical overload caused by functional or parafunctional forces, the immediate nonfunctional loading (INFL), or immediate non-occlusal loading.[5] Thus, the modified restoration would still be involved in the masticatory process, but the mechanical loading stress is reduced.[6]

Theoretically, it has been suggested that IFL could be associated with an increased rate of implant failure. Thus, the aim of this systematic review and meta-analysis was to compare the survival rate of dental implants submitted to IFL and INFL protocols, in order to test the hypothesis that the immediate full occlusal load would compromise or jeopardize the osseointegration process. This study presents a more detailed analysis of the influence of IFL and INFL protocols on the implant failure rates, previously assessed in a systematic review addressing the reasons for failures of oral implants.[7]

2. Materials and methods

This study followed the PRISMA Statement guidelines.[8] A review protocol does not exist.

2.1. Objective

The purpose of the present review was to test the null hypothesis of no difference in the implant failure rates, postoperative infection, and marginal bone loss for patients being rehabilitated by dental implants with INFL compared to IFL, against the alternative hypothesis of a difference.

2.2. Search strategies

An electronic search without time or language restrictions was undertaken in March 2014 in the following databases: PubMed, Web of Science, and the Cochrane Oral Health Group Trials Register. The following terms were used in the search strategy on PubMed:

{Subject AND Adjective}

{*Subject*: (dental implant OR dental implant failure OR dental implant survival OR dental implant success [text words])

AND

Adjective: (immediate occlusal loading OR immediate non-occlusal loading OR immediate functional loading OR immediate nonfunctional loading [text words])}

The following terms were used in the search strategy on Web of Science:

{Subject AND Adjective}

{*Subject*: (dental implant OR dental implant failure OR dental implant survival OR dental implant success [title])

AND

Adjective: (immediate occlusal loading OR immediate non-occlusal loading OR immediate functional loading OR immediate nonfunctional loading [title])}

The following terms were used in the search strategy on the Cochrane Oral Health Group Trials Register:

(dental implant OR dental implant failure OR dental implant survival OR dental implant success AND (immediate occlusal loading OR immediate non-occlusal loading OR immediate functional loading OR immediate nonfunctional loading))

A manual search of dental implant-related journals, including *British Journal of Oral and Maxillofacial Surgery, Clinical Implant Dentistry and Related Research, Clinical Oral Implants Research, European Journal of Oral Implantology, Implant Dentistry, International Journal of Oral and Maxillofacial Implants, International Journal of Oral and Maxillofacial Surgery, International Journal of Periodontics and Restorative Dentistry, International Journal of Prosthodontics, Journal of Clinical Periodontology, Journal of Dental Research, Journal of Dentistry, Journal of Oral Implantology, Journal of Craniofacial Surgery, Journal of Cranio-Maxillofacial Surgery, Journal of Maxillofacial and Oral Surgery, Journal of Oral and Maxillofacial Surgery, Journal of Oral Rehabilitation, Journal of Periodontology, and Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontology*, was also performed.

The reference list of the identified studies and the relevant reviews on the subject were also scanned for possible additional studies. Moreover, online databases providing information about clinical trials in progress were checked (clinicaltrials.gov; www.centerwatch.com/clinicaltrials; www.clinicalconnection.com).

2.3. Inclusion and exclusion criteria

Eligibility criteria included clinical human studies, either randomized or not, comparing implant failure rates in any group of patients receiving dental implants with non-occlusal immediate loading compared to occlusal immediate loading. For this review, implant failure represents the complete loss of the implant. The exclusion criteria were case reports, technical reports, animal studies, *in vitro* studies, and reviews papers.