

Use of Antibiotics in Dental Implant Surgery: A Decision Based on Evidence from Systematic Review

Uso de Antibióticos en la Cirugía de Implantes Dentales:
una Decisión Basada en la Evidencia desde la Revisión Sistemática

Claudia Asenjo-Lobos^{*}; Jorge Jofre^{**}; Marcela Cortes^{***} & Manterola Carlos^{****,*****}

ASENJO-LOBOS, C.; JOFRE, J.; CORTES, M. & MANTEROLA, C. Use of antibiotics in dental implant surgery: a decision based on evidence from systematic review. *Int. J. Odontostomat.*, 9(1):137-147, 2015.

ABSTRACT: Questions remain whether postoperative infections and implant failure can be reduced with the use of antibiotics. Especially, when its routine use can cause adverse effects and may contribute to the development of antibiotic-resistant bacteria. Moreover, there is no consensus regarding appropriate dosage regimen of antibiotics to prevent bacterial infection in implant dentistry. To determine effectiveness of different antibiotics regimens to prevent early infection after implant placement. A systematic review of all relevant studies addressing the use of antibiotic for dental implant surgery was carried-out. Implant groups not using antibiotics, were also analyzed. Primary outcomes were incidence of postoperative infection and frequency of implant failure due to infection. From 164 articles reviewed, 11 fulfilled the selection criteria representing 9472 placed implants. Regimens associated with the use of postoperative antibiotics showed a lower incidence of early infection (postoperative regimens 0%, pre and postoperative regimens 0.22% and 0.53%, long- and short-course, respectively (P= 0.275)). Regarding failure due to infection, no differences between groups were found (P= 0.249). A trend favoring the use of postoperative antibiotic to prevent early infections was observed. Further studies should be carried out in order to provide evidence-based clinical guidelines for use of antibiotics in dental implant placement.

KEY WORDS: antibiotic prophylaxis, dental implants, systematic review, infection.

INTRODUCTION

High success rates of osseointegrated implants for teeth replacement has been well documented (Liddel & Klineberg, 2011). However, risk of failure is high during the first year after implant placement (Garlini *et al.*, 2003; Rasmusson *et al.*, 2005; Levin *et al.*, 2006). Presence of bacterial biofilms, overheating, and surgical trauma are considered the main reasons of early implant failure (Heuer *et al.*, 2011). Oral microorganisms play a key role in biomaterial associated infections, since implant surfaces are prone to be colonized during surgery (perioperative contamination) (Cortizo *et al.*, 2012).

Infections around biomaterials are difficult to treat and require immediate implant removal. For this reason, efforts to avoid microorganism contamination have to be addressed (Esposito *et al.*, 1998). Antibiotic prophylaxis seems to be appropriate in clean-contaminated surgery as implant placement procedure (Dent *et al.*, 1997), where an infection rate in a range of 10% to 15% is expected (Resnik & Misch, 2008). However, there is still debate about whether postoperative dental infections that lead to implant failure could be reduced with the use of antibiotics and aseptic surgical techniques. Moreover, the routine use of

^{*} Epi-Clin. MSc, Responsible Research, Center for Advanced Prosthodontics and Implant Dentistry (CRAI), University of Concepción, Concepcion, Chile.

^{**} DDS, PhD, Director, Center for Advanced Prosthodontics and Implant Dentistry (CRAI), University of Concepción, Concepcion, Chile.

^{***} Pharm.D, MSc, Professor, Department of Public Health, Faculty of Medicine, Coordinator Chilean branch of the Iberoamerican Cochrane Network, Universidad Católica de la Santísima Concepción, Concepción, Chile.

^{****} MD, PhD, Professor, Department of Surgery, Faculty of Medicine, University of La Frontera, Temuco, Chile.

^{*****} Center for Biomedical Research, Universidad Autónoma de Chile, Temuco, Chile.

antibiotics could cause some adverse effects, from mild gastrointestinal symptoms to more serious hypersensitivity reactions (Esposito *et al.*, 2008; Sharaf & Dodson, 2011) as well as to contributing to the selection of antibiotic-resistant bacteria.

American Heart Association (AHA) (Wilson *et al.*, 2008) and British Society of Antimicrobial Chemotherapy (BSAC) (Gould *et al.*, 2006) guidelines propose the use of antibiotic prophylaxis before dental surgical procedures in patients with endocarditis or that are immunocompromised.

Antibiotics are also recommended in cases when surgery is performed in infected sites, in prolonged surgeries that affect mucosa membranes or when large foreign materials are placed (Kaiser, 1986; Anitua *et al.*, 2009). Currently, no case-specific guidelines are available for the use of antibiotics in healthy patients with an indication for implant surgery (Mazzocchi *et al.*, 2007). Additionally, it should be considered that most dental implants are located in previously compromised sites with a certain degree of infection (Nelson & Thomas, 2010), which could be a main risk for infection and risk of implant failure. However, since implant failure is multifactorial, the major drawback of previous systematic reviews (SRs) was to consider it as a primary outcome.

In daily practice, dentists face the difficult choice of using or not using prophylactic antibiotics, applying general rules of risk-benefit analysis in order to decide. Although, several dosage regimens of antibiotics have been proposed (preoperative or postoperative both single or multiple doses, or preoperative followed by postoperative doses) (Ahmad & Saad, 2012), there is no evidence available that fully supports the treatment choice. There are randomized clinical trials (Abu-Ta'a *et al.*, 2008; Esposito *et al.*, 2008; Anitua *et al.*; Caiazzo *et al.*, 2011; Esposito *et al.*, 2010a) that showed clear trends favoring the use of antibiotics, but these studies do not reach the conventional level of statistical significance. A meta-analysis (Esposito *et al.*, 2010b) based on 4 randomized trials (1007 patients), reported that 2 g of amoxicillin administered 1 hour before surgery significantly reduces dental implant failure. However, authors cannot conclude if this regimen is more effective than postoperative administration. The major drawback in these systematic reviews was to consider implant failure as primary outcome, because this is a complex and multifactorial process, in which postoperative infection is one of several causes for implant failure. Therefore, when other important factors are not considered, it could lead to a biased estimation of the antibiotic's effect.

The present systematic review was carried out to address the question of determining the most safe and effective antibiotic dosage regimen to prevent early postoperative peri-implant infection.

MATERIAL AND METHOD

Selection criteria for studies. Type of studies and participants: All relevant study designs addressing questions related to the use of antibiotics for dental implant surgery were included, as well as comparisons between different dosage regimens with or without antibiotics (placebo or no intervention). Participants were adults ≥ 18 years, partial or totally edentulous, who had undergone dental implant surgery.

Discussion articles, letters to the editor, clinical guidelines and systematic reviews were excluded from this review. Additionally, studies were not considered that had issues unrelated to this topic, or with patients who did not meet one or more criteria for inclusion, or articles from which an abstract is unavailable.

Types of interventions

1. Use of antibiotics in one or more doses: a) Preoperative, b) Postoperative, c) Pre-and postoperative.
2. Without antibiotics or with placebo.

Types of outcome

Outcomes were grouped by regimen and time as follows:

1. Preoperative beta-lactam antibiotic or alternative, any dose.
2. Preoperative followed by postoperative beta-lactam antibiotic or alternative, any short course dose (<5 days).
3. Preoperative followed by postoperative beta-lactam antibiotic or alternative, any long course dose (≥ 5 days).
4. Postoperative beta-lactam antibiotic or alternative, any dose.
5. No beta-lactam antibiotic, nor alternative antibiotic /or placebo used.

Primary outcomes for this study were the incidence of early infection and frequency of implant failure due to infection.