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THE ROLE OF ANTIBIOTICS IN THE SUCCESS OF DENTAL IMPLANTS

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ABSTRACT: In the recent years the practice of oral implantology has been expanding widely and is creating an area of interest for the dental practitioners and awareness among the patients. Though the use of prophylactic antibiotics during implant placement still remains controversial, several clinical studies suggest that the use of prophylactic antibiotics significantly improves short and long term implant survival. Also prior to oral surgical procedures patients with risk for developing infectious endocarditis and immuno compromised antibiotic prophylaxis is well recommended.

KEYWORDS: Antibiotics, Implants, prophylatic

INTRODUCTION

Endosseous dental implant use represents one of the fastest growing areas of restorative dentistry. Dentists and other physicians are often faced with the decision of whether to prescribe prophylactic antibiotics for complex oral surgeries such as dental implants. The guidelines from the American College of Surgeons suggest that complex oral maxillofacial surgery, which includes the placement of dental implants, may benefit from prophylactic antibiotic coverage. The indications of antibiotic use in oral implantology are therapeutic and preventive. Most often they are used with preventive aim, but there are cases of peri implant diseases in which the use of antibiotics is imminent.

According to the Canadian dental association (CDA), "all dental procedures where significant oral bleeding and/or exposure to potentially contaminated tissue occurs typically (will) require antibiotic prophylaxis"[1]. The American Dental Association (ADA) also suggests similar guidelines[2] . In addition, the American College of Surgeons and the American Heart Association (AHA) guidelines[3] suggests that complex oral surgery, including implant placement, will benefit from prophylactic antibiotic coverage.

Oral flora and Bacterial resistance to antibiotics – area of concern

The World Health Organization has identified antimicrobial resistance as one of the three greatest threats to human health.[4] According to Pallasch, "Fifty years of therapy were based on the assumption that if antibiotics treated infections, surely they must prevent them. All microorganisms are resistant to some antibiotics and some microorganisms are resistant to all antibiotics."[5] Smith 1998 and Barker 1999 the development of resistant strains of bacteria is rapidly becoming a major concern among health care providers and researchers worldwide[6,7].

Early implant failure is associated commonly with streptococci, anaerobic gram positive cocci ,and anaerobic gram-ve rods 8 . In case of peri – implantitis the predominantly seen organisms are anaerobic gram negative bacilli such as *Poryphyromonas gingivalis* and *Prevotella intermedia* . anaerobic gram negative such as *Veilonella* species and *Spirochaetes* including *Treponema denticola.*

Presently no single micro organism has been closely associated with infection of any implant system. More recently, *Staphylococcus aureus* has been demonstrated to have the ability to adhere to titanium surfaces[9]. This may be significant in the colonisation of dental implants and subsequent infections. Patients exposed to long-term pre- or postoperative antibiotic regimens may actually become sensitized to the antibiotic. We have now entered an era where some bacterial species are resistant to the full range of antibiotics presently available, with the methicillin-resistant *Staphylococcus aureus* being the most widely known example of extensive resistance.

Antibiotic Prophylaxis Recommendations

The following recommendations are based on the current guidelines of the American Heart Association (AHA) and the American Academy of Orthopaedic Surgeons (AAOS).[10] **(Table -1)**

Table-I. Antibiotic Prophylaxis Recommendations

Situation (No Follow-up Dose Recommended)	Agent	Regimen*
Standard general prophylaxis:	Amoxicillin, Cephalexin**, or Cephradine	2.0 g orally **30 – 60 minutes before procedure**
Unable to take oral medications:	Ampicillin Cefazolin	2.0 g IM or IV **30 – 60 minutes before procedure** 1.0 g IM or IV **30 – 60 minutes before procedure**
Penicillin-allergic	Clindamycin	600 mg orally **30 – 60 minutes before procedure**
Penicillin-allergic and unable to take oral medications:	Clindamycin	600 mg IV **30 – 60 minutes before procedure**

Guidelines of the American Heart Association (AHA) and the American Academy of Orthopaedic Surgeons (AAOS

Prophylactic Protocol (Misch)

Category 1: Low risk of infection. Simple extractions without grafting and second stage surgery in healthy patients. No antibiotics required. 0.12% Chlorhexidine rinse is recommended pre- and postoperatively.

Category 2: Moderate risk of infection. Traumatic extractions, socket grafting procedures and immediate implant placements. A recommended preoperative loading dose of antibiotics and a single postoperative dose. 0.12% Chlorhexidine rinse twice a day until suture removal.

Category 3: Moderate to high risk of infection. Multiple implants with extensive soft-tissue reflection or multiple immediate implants and bone grafts requiring membranes. A preoperative loading dose of antibiotics followed by 3 postoperative doses per day for 3 days. A 0.12% Chlorhexidine rinse twice a day until suture removal is also recommended.

Category 4: High risk of infection. Implant placements with sinus floor lifts, autogenous block bone grafts and the same procedures as category 2 and 3 but on medically compromised patients. Suggested regime is as category 3 but postoperative antibiotics should be continued for 5 days.

Category 5: High risk. All sinus augmentation procedures. Loading dose of antibiotics a day before the procedure (ensuring adequate levels in sinus tissues before surgery) and a beta-lactamase (Augmentin) antibiotic continued for 5 days. This is due to the high incidence of beta-lactamase pathogens in maxillary sinus infections. Chlorhexidine rinse 0.12% twice a day is also recommended, until suture removal.

Choice of antibiotic

The American heart association recommends amoxicillin and penicillin as a first line of treatment due to their superior absorption and prolonged serum levels . However in todays population there is an increased level of penicillin allergies , thus a good alternative is Clindamycin. Amoxicillin is susceptible to degradation by β-lactamase-producing bacteria, which are resistant to a broad spectrum of β-lactam antibiotics, such as penicillin. For this reason, it is often combined with clavulanic acid, a β-lactamase inhibitor. This increases effectiveness by reducing its susceptibility to β-lactamase resistance

There are few published guidelines on infection control during the placement of dental implants. Those available advocate that the surgical field should be isolated and free of contamination. According to Laskin, the antibiotic of choice for the prevention of delayed wound healing should be bactericidal and of low toxicity. Antibiotic coverage is also mandatory for uncontrolled diabetic patients, who are more prone to invasive dental treatment. Provided the risk factors are under control, patients with periodontal disease and diabetes can undergo implant treatment.

General dentists regularly prescribe antibiotics, both to prevent infections or to manage existing oral or dental infections.[1] In dental practice, antimicrobial agents have three major uses: for prophylaxis in patients with compromised immune systems caused by certain diseases or medications, for prophylaxis in patients at risk for developing infective endocarditis (IE), and for treatment of an acute dental infection.[2]

Antibiotics are broadly categorized according to their spectrum of activity . Narrow-spectrum antibiotics are effective against either Gram-positive or Gram-negative micro-organisms but generally are not effective against

both. Extended-spectrum agents affect a variety of Gram-positive and Gram-negative bacteria, while broad-spectrum antibiotics inhibit both Gram-positive and Gram-negative bacteria and, frequently, other bacteria as well.

Chlorhexidine an adjunct to antibiotic therapy

The most commonly used antimicrobials in implant dentistry are antibiotics and antimicrobial rinses, such as 0.12% Chlorhexidine Gluconate. To date Chlorhexidine is considered to be the most potent antibacterial agent in dentistry. The antiplaque activity of Chlorhexidine appears to be due to the retention of the drug on oral tissues and its subsequent slow release in an active form . Chlorhexidine was reported to cause significant reductions in salivary bacterial counts which persisted up to 7 hours when used as a post-treatment rinse. CG has bactericidal characteristics which cause lysis after binding to bacterial cell membranes.

Lambert et al 1997 found that CHX when rinsed preoperatively has been proven to be an effective alternative in reducing infections complications from implant surgery.rinsing with CHX also reduced infective complications during the submerged period of implants.11

Noiri in 2003 showed that chlorhexidine in suspension form is more effective in inhibiting porphyromonas gingivalis than the use of antibiotics.[12]

Review of various studies.

Larsen in 1993 evaluated 125 patients (445)implants and concluded that preoperative antibiotic prophylaxis is sufficient to prevent infection.[13]

Dent et al in 1997 presented data from a clinical study involving 2641 dental implants . of these 1448 were placed under pre antibiotic coverage and 1993 in patients who did not. The failure rate was 1.5% vs 4.0%. The data demonstrates that the use of preoperative antibiotics significantly improves the survival rate of dental implants.[14]

Gynther and associates in 1998 reported in a study of implants placed in 279 patients reported that there was no significant difference in the rate of infection between the group who received prophylactic antibiotics and the group that did not.[15]

Laskin in 2000 selected 387 patients (1743 implants) in the antibiotic groups and 315(1247) patients in the control group. After a follow- up of three years the results suggested fewer failures when antibiotics were used(4.6% versus 10%). When survival of hydroxyapatite (HA) coated implants placed with and without preoperative antibiotics was compared , those placed with preoperative antibiotics had a 3% increase in survival and in case of non – HA coated implants it was 8.2% increase in survival.[16]

Binahmad in 2005 compared a single preoperative dose of penicillin G or 600mg of clindamycin versus a long – term prophylactic dose of 300mg of penicillin V orally four times a day or 150mg clindamicin orally three times a day for 7 days. The authors concluded that long term prophylactic antibiotic use was of no advantage or benefit over a single dose.[17]

Lockhart etal 2007 in a study found that no definite scientific basis existed for the use of prophylactic antibiotics before dental procedures.[18]

Abu-Ta a in 2008 The meta analysis of four randomized controlled trials suggest that Short term antibiotics 2 g of amoxicillin administered 1 hr prior to implant placement (Esposito 2008; Anitua 2009 ; Esposito 2010) or 1 g of amoxicillin administered 1 hr prior to implant placement and 500mg four times a day for 2 days postoperatively significantly decrease early implant failure.[19, 20, 21, 22]

Rizzo etal in 2010 analysed 521 endosseous implants placed under antibiotic coverage and reported efficient reduction in post operative infections.[23]

Sharaf et al 2011 in a review substantiates that single dose of pre antibiotic coverage may slightly reduce the failure rates of dental implants . [24]

Nabeel Ahmad et al in 2012 concluded fairly no advantage was evident from the use of antibiotic regimen.[25]

CONCLUSION

Regulating bodies had worked on guidelines of antibiotics prescribing for several surgical and medical interventions , the guidelines aid practitioners to prescribe antibiotics only when indicated and in choosing the most effective antibiotic type and dose, thus help reducing the chances of infection and the harm of antibiotics over prescribing. Evidence based guidance must come from the limited studies that are available including those cited above. Clinicians are left to define what type of post-implant bacterial management they think is reasonable. The survival rate can also be compared to previous implant experience of the surgeon , implant coating ; bone density ; patient age , race and gender ; incision type; mobility of the implant at placement and health status.

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