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Review Article

EVALUATION OF THE USE OF ANTIBIOTICS PROPHYLAXIS IN DENTAL SURGERY: LITERATURE REVIEW

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ABSTRACT

Background: Infective endocarditis is a cardiovascular infection resulting from the migration of oropharyngeal bacteria during dental manipulation. It is, however, caused by other factors and conditions not related to dental surgery. As a result, antibiotic prophylaxis is important in dental practice, and this paper would discuss this issue further.

Objectives: We focus in this paper on antibiotics in the perioperative dental condition, and only relevant studies would be discussed.

Methodology: PubMed database was used for articles selection, were papers on dental antibiotics were obtained and reviewed.

Conclusion: In summary, the stance on preoperative antibiotic prophylaxis is controversial between the British and American guidelines. While the evidence is divided between giving antibiotic prophylaxis in patients of certain dental interventions, there is also evidence advised against prophylactic antibiotics for any dental procedure. Further research is needed to determine the effect of antibiotics on post-dental procedures' infective endocarditis and other complications.

Key words: Infective Endocarditis, Dental, Antibiotic prophylaxis.

Introduction

The problem with antibiotic prophylaxis for dental procedures is mainly with antibiotic effectiveness in preventing infective endocarditis, and similarly important, in adversely developing antibiotic resistance. According to the Russian Dental Association, the extent to

which the partial secondary edentia has spread in Russia, makes up 40-75% depending on the age group [1-4].

Periodontal disease is a common problem particularly affecting the extremities of age: adolescents, children, and the elderly. The prevalence of periodontal infection is around 10–15% of the world population. [5] It is also common in diabetic patients, where it leads to poor glycemic control, and, inevitably an increase in both microangiopathies as well as macroangiopathy. Moreover, the treatment of periodontal infections was shown to improve glycemic control by (0.29) reduction in three months follow up, but the sustainability was not studied. [6] The economic burden of periodontal disease is tremendous, especially in children where its' economic expenditures exceed those for all other pediatrics diseases collectively. [7] In high technological counties, the highly trained personnel are available, and hence the best care is delivered to their citizens. [7] The fundamental therapy is the surgical procedures rather than the antimicrobial for any periodontal disease, which in addition to controlling the local infection prevents and reduces bacteremia and the risk of infective endocarditis. Infective endocarditis (IE) results from bacterial vegetation on the heart tissue or vessels. The most common bacteria seen are staphylococci and streptococci, specifically Staphylococcus aureus accounts for the most aggressive forms of IE.

Methodology

PubMed database was used for articles selection, and the following keywords were used ((“Antibiotic”[Mesh]) AND ((“Dental”[Mesh]). In regards to the inclusion criteria, the articles were selected based on the inclusion of one of the following topics; fluorosis. Exclusion criteria were all other articles that did not have one of these topics as their primary endpoint.

Review

In a normal person, up to 700 types of bacteria are found to habitat our mouths as commensals or flora. [8] The maintenance of homeostasis between this flora and the immune system reserves human health and any disequilibrium results in periodontal disease. [9] The commonest organisms are thought to be saprophytic bacteria, depending on the epidemiology, but the commonest are streptococcus species and staphylococcus aureus, other Staphylococcus species, Enterobacteriaceae, anaerobes, and fungi in addition to rarely encountered organisms like mycobacterium species.

The practice in the past used to be prescribing antibiotics for almost every patient with dental disease, it was also a common practice to go for antimicrobial prophylaxis. For every patient, This is particularly important before surgical dental procedures where the incidence of bacteremia is thought to be high. This bacteremia is thought to increase the risk of infective endocarditis which is mediated immunologically due to similarities between the periodontal organisms and the intimal lining of the heart. [10] Infected prosthesis, particularly however if the infection is evident like the patient is ill-looking, sick, febrile, or with palpation. However this was challenged with data showing that reduction of infective endocarditis was almost negligible—compared to the risks accompanying antibiotics—around (5.3%). The joint prosthesis was found to be out of the question and antimicrobial prophylaxis did not reduce the incidence of joint prosthesis infection in both low and high-risk periodontal surgery. [11]

Indication of antibiotics in dental diseases

Dental infections are common in practice and the cornerstone of prevention is dental hygiene, however, if the infection is evident like the patient is ill-looking, sick, febrile, or with palpable lymphadenopathy then the antibiotic prescription is warranted. Certain dental procedures are considered for antibiotic prophylaxis and these include gingival manipulation, tooth extractions, scaling, root canal manipulation, and perforation of the oral mucosa. [12] The American Heart Association recommends antibiotic prophylaxis for dental procedures when the following indications are present: prosthetic valves or associated materials, previous history of infective endocarditis, unmanaged or partially managed cyanotic congenital heart disease, and patients with heart transplants. [13] Also, other patients at increased of developing infective endocarditis include the history of rheumatic fever, bicuspid aortic valve, mitral valve prolapse, or aortic stenosis with calcification. [12] This is mainly due to the increased risk of acquiring post-operative infective endocarditis in patients with valvular heart disease.

Antibiotic Prophylaxis

In the past antibiotic prophylaxis was used generously but the net result regarding fighting Infective endocarditis was not gratifying, the economic burden was not the main problem but the emergence of antimicrobial resistance (AMR) was the main worry that derived the health authorities to review the antibiotics guidance and to issue new guidelines in 2013. The antimicrobials were reserved only for certain high-risk individuals, particularly those with prosthetic heart valves, those with a positive history of infective endocarditis, and those with a vascular prosthesis.

Incidence of Infective endocarditis bacteremia with all its consequences or of the infection spread locally to the tissues around the tooth, this concern had led to unnecessary over-prescription of antimicrobials which led to the emergence of AMR. was thought in the past to be associated with bacteremia following any manipulation of the periodontal tissues precipitating the spread of bacteria into the bloodstream causing the infection of the prosthesis.

The effectiveness of antimicrobial prophylaxis (AP) restriction to those who are at high risk of developing complications like Infective endocarditis was studied to prevent infections and Infective endocarditis versus AMR causation was an important question and it was studied in many kinds of research.

American Heart Association (AHA) and the American Dental Association (ADA) Guidelines for Antibiotic Prophylaxis

In 2007 the AHA and ADA six categories which their conditions necessitate being given AP BEFORE any dental surgery that includes gingival manipulation. Antimicrobial prophylaxis is indicated in the following six conditions which are considered by both bodies to be high-risk individuals, namely heart valve prosthesis, any heart

implants, previous IE, any patient with heart transplant complicated with valvulopathy, un-repaired congenital cyanotic defects, and those who undergone repair over the past six months.

The recommendations include giving the antibiotics one hour before the dental surgical procedure, the best is ampicillin if not tolerated then clindamycin or azithromycin. An alternative to ampicillin includes intravenous cephalexin 2 g for adults (or 50 mg/kg for children), cefazolin, or ceftriaxone 1 g for adults (or 50 mg/kg for children). [14] Cephalosporins should not be used in patients with anaphylaxis, angio-oedema, or urticaria after intake of penicillin or ampicillin due to cross-sensitivity. Enteral is thought to be superior to parenteral. if the pills can not be taken then intravenous or intramuscularly. If the patient is already on antibiotics then they should be shifted to another class of antibiotics. If the patient is hypersensitive to penicillin then clindamycin is the second drug of choice. This is best summarised in (Table 1) adapted from the European Society of Cardiology. [14] If the patient forgot to take the dose one hour before the procedure then it would be given two hours following the surgery.

Allergic status	Antibiotic	Single dosage 30–60 minutes before dental procedure	
		Adults	Paediatric
Not allergic	Amoxicillin or ampicillin	2 g orally or intravenously	50 mg/kg orally or intravenously
Allergic to penicillin	Clindamycin	600 mg orally or intravenously	20 mg/kg orally or intravenously

Table 1: Recommended Antibiotic Prophylaxis in Dental Practice

Joint replacement since 2003 was exempt from the conditions that need antimicrobial prophylaxis before dental surgery. In 2009 the American Association of Orthopaedic Surgeons delivered new guidelines stating that AP is indicated for all patients with joint replacement.in 2017 the AHA and ADA updated their guidelines and advised to consider AP in cases of total joint replacement. [15]

The UK has a different guide on antibiotic prophylaxis. According to recently changed in the National Institute of Health (NICE) guidelines, routine antibiotic prophylaxis before dental surgery is no longer recommended. [16]

Commonly used Antibiotics

Dental doctors should be aware of using penicillin in allergic patients, as they would develop hypersensitivity reactions such as anaphylaxis and wheezing. Commonly used antibiotics in dental surgery are summarised in (Table 2) and include those used in prophylaxis. Tetracyclines may cause grey staining of teeth as it deposits there, for this reason, it is avoided in pre-school children, pregnant, and breastfeeding mothers. Similarly, amoxicillin should not be given to patients with infectious mononucleosis as they would develop a bodily rash, this also occurs in patients with lymphocytic leukemia.

Drug	Indications
Phenoxymethyl penicillin	Dental abscesses, sialadenitis, pericoronitis, post-extraction infection
Ampicillin and amoxicillin	Dentoalveolar infections,
Tetracycline	Permanent tooth eruption
Erythromycin	Alternative drug in patients allergic to penicillin
Cephalosporin	Alternative drug in patients allergic to penicillin
Sulphonamides	Bacterial meningitis prophylaxis
Cotrimoxazole	Broad-spectrum used when sensitivity tests are positive for certain bacteria
Metronidazole	Acute ulcerative gingivitis, combined with penicillin in dentoalveolar infections

Table 2: Commonly used Antibiotics in Dental Practice

Post-Dental Procedures' Infections and Complications

While there is no certainty of bacteremia occurring primarily due to dental procedures, and thereafter, causing infective endocarditis, it does not harm to maintain good periodontal health. [17, 18] Evidence suggests that teeth-brushing may have a higher risk for infective endocarditis, than tooth extractions. [19] Further dental cleaning has been found to risk bacteremia, subsequently infective endocarditis, and rarely, a pyogenic liver abscess—implicating streptococcus intermedius from the oropharynx. [20]

Effect of Antibiotic Prophylaxis on Infective endocarditis

Researches that compared the incidence of antibiotic prophylaxis before and after the guidelines found that the incidence was reduced by (64%) at moderate risk and by (20%) at high risk. Regarding the IE, while the incidence increased in the moderate-risk patient by (75%), it increased by (177%) in high risk which needs further study for cause and effect. [21] There are reports that infective endocarditis occurring post-dental procedures is not clinically significant, in a major study of Taiwanese people.

[22] A recent review concluded that further research is required to determine the overall benefit of prophylactic antibiotics in dental care. [23]

Adverse effects of Antibiotic Prophylaxis

In patients with unknown allergy to penicillin, a risk of hypersensitivity is always present, for instance, the tenth of the US population. These patients would develop sudden nausea, and respiratory disruption: wheeze, and laryngeal oedema. Amoxicillin has been reported to induce aseptic meningitis, although this is rare. [24] Organ impairment depends on where the antibiotic is metabolized, this is of particular importance in patients with impaired renal or liver function.

Conclusion

In summary, the stance on preoperative antibiotic prophylaxis is controversial between the British and American guidelines. While the evidence is divided between giving antibiotic prophylaxis in patients of certain dental interventions, there is also evidence advised against prophylactic antibiotics for any dental procedure. Further research is needed to determine the effect of antibiotics on post-dental procedures' infective endocarditis and other complications.

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