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ROLE OF ANTIBIOTICS IN ENDODONTICS - A REVIEW

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ABSTRACT
Antibiotics are commonly used in dental practice. Many dental practitioners prescribe the antibiotics to prevent possible development of pain and swelling. This is being done more out of tradition rather than any sound scientific base. This overuse of antibiotics which is leading to the emergence of antibiotic resistant bacterial strains is a global concern. Being an endodontist or even a dental Surgeon, it is imperative that one must stress the importance of appropriate endodontic intervention in all the involved cases, with oral antibiotic administration used only as an adjunct. Moreover, one must be aware of all the pros and cons of antibiotic therapy and of course, the very fact that whether they are needed or not in a particular case in the first place. The purpose of this paper is to enlighten the dental fraternity about the true rationale behind advocating the antibiotics during endodontic interventions.

KEYWORDS: Antibiotics, endodontic intervention.

INTRODUCTION
Microorganisms have been well known to play a role in pulpal and periapical diseases. The bacteria associated with primary endodontic infections are mixed, but are predominantly gram-negative anaerobic rods, whereas the bacteria associated with secondary infection comprise only one or a few bacterial species – most important of which is Enterococcus faecalis.[2] Eradication of causative microorganisms during root canal treatment procedures helps attain successful results. Because of the complex nature of the root canal system and the presence of many inaccessible areas, a combination of mechanical instrumentation and irrigation is necessary to decrease the amount of bacteria/micro-organisms in the root canal system.[3] However chemo- mechanical preparation is often not enough, and many bacteria may remain in the root canal system.[4-6] Intracanal medicaments in endodontics have been used for a number of reasons including the elimination or reduction of microorganisms, rendering canal contents inert, prevention of post-treatment pain, and to enhance anesthesia. Calcium hydroxide is the most commonly used intracanal medicament, however its efficacy towards Enterococcus faecalis is questionable.[7] Waltimo et al. found that calcium hydroxide dressing between appointments did not show the expected effect in disinfecting the root canal system and in treatment outcome.[8] In the recent years, a new concept has been developed, which employs the use of a combination of anti bacterial drugs (metronidazole, ciprofloxacin and minocycline) for disinfection of pulpal and periradicular lesions. It has been reported that this mixture can sterilize root dentin.[3] Antibiotics are generally only useful for the treatment of bacterial infections. It is important to remember that not all fevers are due to infections and not all infections are caused by bacteria. The majority of infections seen in general practice are of viral origin and antibiotics can neither treat viral infections nor prevent secondary bacterial infections in these patients. Even where a bacterial aetiology is established, an antibiotic may not be always necessary. Many bacterial infections resolve spontaneously. Minor superficial skin infections may be more suitably treated with a local antiseptic. Collections of pus should be drained surgically and if drainage is adequate, antibiotics are often not required.

Indications of Antibiotics
Antibiotic are not an alternative to dental intervention; they are adjunct.[3],[4] Antibiotics are indicated when clinical signs of involvement are evident. The major use of antibiotic prophylaxis for dental procedures, are cases which cause bleeding in the oral cavity, has become a common practice among dentists.[5] Antibiotics are indicated in dental practice for treating immune-compromised patients, evident signs of systemic infection and if the signs and symptoms of infection progress rapidly.[6]

Antibiotics during Root Canal Treatment
The risk of adverse effects following systemic application and the ineffectiveness of systemic

antibiotics in some pulpal and periapical conditions has led to the use of locally applied antibiotics in root canal treatment, that is within the canal system (Mohammadi & Abbott 2009).[7] The first reported locally used antibiotic product was a polyantibiotic paste containing penicillin, bacitracin, streptomycin and caprylate sodium (Grossman 1951).[8] Taking into account that endodontic infections are polymicrobial, tetracyclines (tetracycline HCl, minocycline, demeclocycline, doxycycline), a group of broad spectrum antibiotics that are effective against a wide range of microorganisms, have been proposed as intracanal topical antibiotics. Sato et al. (1996) demonstrated the penetration through dentine and the antibacterial efficacy of a mixture of minocycline, a tetracycline, with ciprofloxacin and metronidazole, placed in root canals previously irrigated ultrasonically.[9] Molander et al. (1990) demonstrated that intracanal clindamycin offers no advantage over conventional calcium hydroxide root canal dressing.[10] BioPure MTAD (Dentsply Sirona, Salzburg, Austria), a mixture of doxycycline, citric acid and a detergent (Tween 80), has been proposed as a final irrigant because of its numerous properties: antimicrobial activity, smear layer- and pulp-dissolving capability, effect on dentine and adhesion, and biocompatibility (Torabinejad et al. 2003).[11] However, microorganisms isolated from root canals have resistance against this group of antibiotics (Jungermann et al. 2001, Sku_cait_e et al. 2010, AlAhmad et al. 2014), and tetracyclines may promote fungal growth (MacNeill et al. 1997).[12,13,14,15] Abbott et al. (1990) demonstrated that when placed in the root canal, the concentration and effectiveness of 3.2% demeclocycline (Ledermix, Lederle Pharmaceuticals, Wolfratshausen, Germany) were significantly reduced in peripheral dentine and in the apical third over time.[16]

In addition to limited antimicrobial activity, tetracyclines another commercial product for intracanal use (Abbott et al. 1990).[17] It contains two antibiotics, neomycin and polymyxin B sulphate, but the effect against endodontic flora is not better than with calcium hydroxide (Tang et al. 2004, Chu et al. 2006).[18,19] The use of topical antibiotics in root canal treatment has also been proposed to prevent or reduce postoperative symptoms. However, antibiotics do not reduce the pain or swelling arising from teeth with symptomatic apical pathosis (Keenan et al. 2006, Cope et al. 2014).[20,21] In summary, use of topical antibiotics during root canal treatment is not supported by the evidence.

Prophylaxis of focal infection

The use of antibiotics as prophylaxis for focal infection is common practice, and has been widely accepted in the dental profession. The paradigm of this model of treatment is the prevention of bacterial endocarditis, indicated in risk patients in the context of any invasive procedure within the oral cavity and following the guidelines of the American Health Association (AHA).[22] Nevertheless, there are doubts in relation to this practice. Firstly, transient bacteremia occurs not only after dental treatments such as extractions (35-80%) or periodontal surgery (30-88%). It also occurs in the context of tooth brushing (40%) or while chewing gum (20%), and is proportional to the trauma caused and to the number of germs colonizing the affected zone. Secondly, not only bacteria cause endocarditis, and of those that do cause the disease, many are resistant to the antibiotics administered as prophylaxis (fundamentally amoxicillin). Lastly, it is known that most cases of bacterial endocarditis are not related with invasive procedures, and that dental care is only responsible for a minimum percentage of cases of the disease.

Despite the mentioned inconveniences, antibiotic prophylaxis is still recommended in patients at risk.[23] However, the results of a survey conducted by Tomas-Carmona et al. on the knowledge and approach to the prevention of bacterial endocarditis among Spanish dentists showed that fewer than 30% of the professionals were aware of correct antibiotic indications and posology.[24] There is no scientific basis for recommending systematic antibiotic prophylaxis prior to invasive dental treatment in patients with total joint prostheses.[25] Jacobson published a study on 2693 patients with total joint replacement (hip or knee). In 30 of the patients he detected infection of the prosthesis, and in only one case was a time relationship with prior dental treatment established. Furthermore, 54% of the germs isolated were Staphylococcus aureus and epidermidis.[26] According to the American Dental Association and the American Academy of Orthopedic Surgeons, evaluation is required of antibiotic prophylaxis in patients with total joint prostheses in the presence of immune deficiency, when contemplating high risk dental procedures in patients with prostheses in place for less than two years, and in patients who have already suffered past joint prosthesis infections.[27] Most infections are usually controlled with appropriate antibiotics in 7-10 days. If a diffused periapical swelling caused by an endodontic infection does not show any remission in 3-5 days during treatment with antibiotics, bacterial culture of root canal and antibiotic sensitivity test are highly recommended.

CONCLUSION

Since their discovery many decades ago, safe systemic antibiotics have revolutionized the treatment of infections, transforming once deadly diseases into manageable health problems. However, the growing phenomenon of bacterial resistance, caused by the use and abuse of antibiotics and the simultaneous decline in research and development of new antimicrobial drugs, is now threatening to take us back to the pre-antibiotic era. The dental profession has an obligation to limit the use of antibiotics to those situations that actually require them and to situation where patients will benefit from their use. They should not be used as pain relief medications in the absence of local dental treatment. Antibiotics will not help to resolve pulpitis, they will not prevent post-operative pain or flare-ups. Patients, dentists and doctors need to be educated and diligent

about the role of antibiotics and the long term consequences of their misuse and abuse.

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