Review Article

Antibiotic use among general practitioner dentists and endodontists in root canal therapy: a review

Running Title: Antibiotic use among general practitioner dentists and endodontists

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Abstract:
The degree of endodontic pathosis and infection is variable including different conditions for which dentists prefer to prescribe antibiotics with different types and doses according to the degree of infection and the age of the patient to control the infection and prevention of systemic spread of the pathosis. Few studies have focused on the use of antibiotic among general practitioner dentists and endodontists in root canal therapy but most of them were trials. This review highlights the use and types of antibiotics prescribed by general practitioner dentists and endodontists in root canal therapy.

Keywords: GPDS, endodontists, root canal, endodontic infection.

1. Introduction

Root canal therapy is a precise operation for regaining healthy tooth including debridement of the diseased pulp tissues and any existing infection [1]. Root canal infection is caused by many variable bacterial species especially anaerobic bacteria and certain facultative bacteria are predominant in infected root canals and the periapical tissues [2]. Endodontic microorganisms can form biofilms which lead to increased bacterial resistance to antibiotic [3]. The increased use of antimicrobial agents may lead to increased bacterial resistance to these antibiotics which make them unable to destroy the bacterial infection [4]. There are various stages of endodontic pathology that require antibiotic use for disinfection of the root canals. The root canal infection begins with inflammatory reaction and may spread to the regional lymph nodes or spread systemically [5]. Dentists should be careful before prescribing antibiotics for root canal therapy as inappropriate use of antibiotics can lead to adverse effects like bacterial resistance to antibiotic, nausea, gastrointestinal problems and may lead to fatal anaphylactic reactions [6]. In addition, the success of the
endodontic treatment mainly depends on the precise cleaning of the root canals and debridement of the infected pulp tissues and usually no need for antibiotic [7]. Many studies have concluded that dentists should prescribe antibiotics only when infection isn't limited to the tooth but has spread systemically or the patient suffers from immunocompromised diseases and there is a need for antibiotics to overcome the infection [8]. The challenging factor in antibiotic prescription for infected root canals is that the causative bacteria aren't known as there are more than 40 species of oral microorganisms that can cause infected root canals, so broad spectrum antibiotic is usually used [9]. In this review, we tried to highlight the types of antibiotics prescribed mainly by both general practitioner dentists (GPDS) and endodontists for root canal therapy.

2. Clinical applications of antibiotics in root canal therapy

The used antibiotic should achieve at least its minimal inhibitory concentration in the infection site against the existing microorganisms [10]. The drug efficacy is affected by the degree of infection like presence of periapical abscess, presence of pus and necrotic liquefied pulp which isn't vascularized, all of these conditions decrease the distribution of the drug to the infection site as the vascular supply to the area of infection is limited and the antibiotic distribution will be limited to the vascularized tissues surrounding the infection site minimizing the systemic spread of the infection [11]. So, drainage of pus is necessary as antibiotics only without adequate drainage will be ineffective [12]. Adjunctive use of antibiotics after adequate cleaning of the root canals and drainage of abscess, if present, is recommended with systemic clinical conditions like cellulitis, fever, malaise and lymphadenopathy [13]. Prophylactic use of antibiotics is recommended with immunocompromised patients or with special medical conditions like cardiac patients to avoid the possibility of occurrence of
endocarditis [14]. There are many conditions associated with antibiotic prescription in root canal therapy like:

2.1. **Antibiotics use as a prophylactic for surgical root canal therapy**

Many GPDS and endodontists prefer to prescribe antibiotics as a prophylactic for surgical endodontic cases to prevent postoperative infection [15]. Dentists are different in their prescription of antibiotics dose for surgical endodontic cases, some dentists prefer only preoperative dose of antibiotics and others prefer prolonged course consisting of preoperative and postoperative doses of antibiotics to avoid re-infection or systemic spread of the infection [16]. There are other factors that control the prescription course and dose of antibiotics like the medical history of the patient, his overall health status, number of teeth which will undergo surgical endodontic therapy and the degree of existing infection [17].

2.2. **Antibiotics use in combination with adequate debridement and surgical drainage**

The most important step for the success of the root canal therapy is the adequate debridement of the infected pulp tissue and drainage of infection out from the infected root canals or the periapical area [18]. Chemical and mechanical cleaning of the root canals help in removing the microorganisms and the infected pulp tissues from the root canal which may cause periapical lesions [19]. In cases with localized gingival swelling due to ingress of infection from the infected endodontic tooth, it is preferred to make a gingival incision and drainage of infection for rapid healing [20]. Some studies have shown that dentists may use a short course of adjunctive antibiotics in combination with adequate debridement and surgical drainage with minimizing the use of broad-spectrum antibiotics, while many studies have concluded that antibiotic use is unnecessary after adequate debridement and surgical drainage even in presence
of localized infection, other studies have shown that antibiotic use may monitor the spread of infection in combination with adequate debridement and surgical drainage of the localized infection [21].

2.3.- Antibiotics use in absence of adequate debridement and surgical drainage

Many studies have concluded that adjunctive antibiotic may be unnecessary if adequate debridement and surgical drainage of infection is properly done, while in some cases in which the dental practitioner isn't able to either debride or surgically drain the infection, antibiotic effect isn't clearly known if it provides sufficient relief to the patient from the painful signs and symptoms of the infected root canals and its role in prevention of spread of infection [22]. Many studies have shown that many GPDS and endodontists prefer to prescribe antibiotics in case of adequate debridement or surgical incision of localized infection that can't be done due to different causes. Many patients with localized endodontic infection may insist on taking a dose of antibiotics to decrease their fear from the systemic spread of infection and their thoughts that antibiotics will relieve the pain even in absence of debridement or surgical drainage [23]. The general practitioner dentists and the endodontists should determine the benefits and drawbacks of the antibiotic and the patients should be informed clearly with the degree of effectiveness of antibiotics use in their clinical condition [22].

3. Types of antibiotic usually prescribed by GPDS and endodontists in root canal therapy

3.1.- Amoxicillin:

This type of antibiotics is beta-lactam antibiotics which act by binding to the bacterial protein (called penicillin binding proteins) to inhibit its activity in both gram positive
and gram negative microorganisms [24]. Penicillin VK is also beta-lactam antibiotic which acts by the penicillin binding proteins found in the bacteria cell walls. Root canal infection was found to be mainly affected by anaerobic and facultative bacteria for which amoxicillin is mainly prescribed in these conditions and may be accompanied by metronidazole which shows high efficacy against these types of bacteria [25]. Also, amoxicillin is more effective than penicillin in root canal infection as it can penetrate the microorganisms better than penicillin, amoxicillin has a broad spectrum effect absorbed easily from the GIT when taken orally, dose of amoxicillin is mainly 2-3 times daily while penicillin dose needed is 4 times daily [26]. A previous study in Shiraz, Iran was done to study the antibiotics prescription by GPDS during root canal therapy, the researcher prepared an online survey and sent it to many dentists, 93 dentists participated in the survey showing that most of them preferred to prescribe amoxicillin in the treatment of root canal infection but with varying doses, 80.4% of the dentists prescribed (2gm) of amoxicillin, 6.2% of the dentists prescribed (3gm) of amoxicillin and 5.3% of the dentists prescribed 1gm of amoxicillin. About 2.1% of the dentists prescribed a combination of amoxicillin and metronidazole [27].

4. Conclusion:
This study has concluded that most of root canal therapies can be successful with only adequate cleaning of the canals and drainage of abscess if present. Antibiotics may be used as prophylactic or adjunctive chemical therapy in combination with endodontic treatment. There is a scarcity in studies that were conducted on studying the antibiotic use among general practitioner dentists and endodontists in root canal therapy, also most of them were trials and showed unclear results. It is recommended to establish
more studies which will focus on declaring the use of antibiotics in root canal therapy among general practitioner dentists and endodontists.

**List of abbreviations:**

GPDs: general practitioner dentists

**Conflict of interest:**

The authors declare that there is no conflict of interest regarding the publication of this article.

**Funding:**

none

**Consent for publication:**

Not applicable

**Ethical Approval:**

Not applicable

**References:**


