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Review Article

ANTIBIOTICS, WHEN & WHY? - A REVIEW

Sandhu Singh Sukhpash^{1*}, Nagpal Ravi², Goel Mahima³, Jagdev Paramjot⁴, Kaur Amneet⁵

¹Reader, Department of Conservative Dentistry and Endodontics, MN DAV Dental College & Hospital, Solan, India

²Senior Lecturer, Department of Conservative Dentistry and Endodontics, MN DAV Dental College & Hospital, Solan, India

³Senior Lecturer, Department of Oral and Maxillofacial Surgery, MN DAV Dental College & Hospital, Solan, India

⁴Reader, Department of Orthodontics and Dentofacial Orthopaedics, MN DAV Dental College & Hospital, Solan, India

⁵Private Practitioner, Fatehgarh Sahib, Punjab, India

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*Corresponding Author: **Dr Sukhpash Singh Sandhu**, Reader, Department of Conservative Dentistry and Endodontics, MN DAV Dental College & Hospital, Solan, India, Mob: 09857307322. E-mail: drssandhu@gmail.com.

ABSTRACT

Since many years, antibiotics in different forms have got definite application in the fields of Medicine and Dentistry to heal various superficial and deep seated body and dental and oral infections. Nevertheless, lack of sound scientific knowledge regarding judicious application of antibiotics, tradition, mentality or common trend of prescribing antibiotics for each and every patient with endodontic involvement, especially without emphasizing the need for an endodontic treatment planning, too often terminate into untoward consequences and many failures. This in turn, raises doubtfulness in the consciousness of a patient regarding the professional skill of a surgeon, with often loss of faith in the profession as well.

Keywords: Clinical condition, Bacteria, Antibiotics, Aerobes, Anaerobes.

INTRODUCTION

The average adult mouth contains more bacteria than the entire human population of our planet Earth. In a so called 'clean mouth' 1,000 to 100,000 bacteria consisting of more than 300 bacterial species can be attached to each tooth surface¹. Protection from this exposure and the development of diseases is usually provided by the individual's intact immunologic system. In dental health care environment, both the patient and the health care professional must also contend with exposure to the microorganisms from the blood and the saliva. As many as 264 morphologically and biochemically distinct bacterial groups colonize the oral cavity, including aerobic, facultative and obligate anaerobic, gram-positive and gram-negative organisms². These microorganisms support each other in a synergistic fashion. During an infection, individual members of the microbe community:

1. Produce metabolites that facilitate enhance growth of other microbes:
2. Create an increasingly acidic tissue pH that facilitates enhanced growth of certain microbes :
3. Consume oxygen, which allows growth of one or more opportunistic anaerobes {As a result of this symbiotic environment among oral organisms, most odontogenic infections ultimately dominate, outnumbering aerobes by ratio of at least 2:1.

Dental operators worldwide face an increasing number of antibiotic-resistant organisms. Enterococci, a normal part of human gastrointestinal flora, are pathogens of low virulence that function as opportunists in the appropriate clinical setting. They are readily passed from patient to patient or from patient to health care professionals. They have become the second most common cause of urinary tract infection and the third leading cause of wound infection and bacteremia.

As health professionals, we face number of critical and confusing issues concerning antibiotics. Our scientific knowledge base and clinical judgment are paramount. We must guard against using faulty dosage (too high or too low) or inappropriate use of antibiotics. Society needs to guard against the indiscriminate and uncontrolled use of antibiotics in plants, animals and live-stock that often produce a residue of the drug in food supply.

Lack of education of health care professional and the public to the limitations and capabilities of bacteria have resulted in abuse of antibiotic therapy and the drug-resistant bacteria.

The use of antibiotics needs to be limited to the management of active infectious disease or the prevention on metastatic infection in high-risk patients. The prophylactic use of antibiotics is often a matter of professional judgment. The American Dental Association (ADA) Council suggests that the use of antimicrobial therapy may be benefit in selective surgical procedure.

Among generic drug prescriptions written in 1995, antibiotics comprised 50% of the top ten drugs prescribed in that year. This data reflect the extensive role that antimicrobial drugs play clinically in both medicine and dentistry, often for inappropriate prophylaxis or for localized, self timing, minor infections. This inappropriate use of antibiotic has an indirect impact on infection management because organisms are no longer susceptible to many of our chemical weapons.

Correlation between Clinical Symptoms and Microorganisms associated with Endodontic diseases³

Since Miller (1890)⁴ demonstrated the presence of bacteria in necrotic pulp tissue, the role of the oral microflora in the pathogenesis of pulpal and periapical pathosis has become increasingly evident. Improvements in anaerobic techniques have permitted a more detailed knowledge of the microflora within the infected root canals and associated periapical lesions. *Peptococcus magnus* and *Bacteroides* species were commonly found in clinically acute cases, while oral streptococci and enteric bacteria were frequently isolated from clinically asymptomatic cases. Periapical pathosis is considered an endogenous infection caused by the oral microflora. Therefore, many investigators have attempted to isolate and identify various microorganisms from root canals or periapical regions.

Griffe et al. (1980)⁵ also found that the presence of '*B. melaninogenicus*' in human root canals was significantly associated with clinical features, such as foul odour, pain and sinus tract formation, and was probably related to apical tenderness to palpation and to swelling in symptomatic pulpal necrosis. Furthermore, Yoshida et al. (1987)⁶ suggested that, in addition to '*B. melaninogenicus*', *Peptostreptococcus magnus* (formerly *Peptococcus magnus*) may play a important role in the development of clinical symptoms, whereas facultative isolates such as oral streptococci and enteric bacteria were commonly found in asymptomatic cases. Haapasalo (1989)⁷ noted that acute symptoms were usually related to the presence of specific organisms, such as *Prevotella buccae*, *Porphyromonas endodontalis* and *Porphyromonas gingivalis*. Trowbridge & Stevens (1992)⁸ in their review of the microbiological and pathological aspects of pulpal and periapical disease also emphasized the role of the Gram-negative bacteria, especially the black-pigmented *Prevotella* and *Porphyromonas* species, in the pathogenesis of pulpal and periapical inflammatory lesions.

Pain and swelling

Oral pain is the principal emergency that sends patients to the dentist to seek immediate relief. However, not every case of this sort may be apparent to the dentist because the perception of pain is variable, and is modulated by emotional state, cultural background and personal tolerance. It may be further ameliorated by analgesics or narcotics. Furthermore, oral pain can be of nondental origin. Although pain may present as a pre-endodontic treatment emergency, it can also develop during or after root canal therapy (flare-up) either alone or associated with swelling. Seltzer & Naidorf (1985)⁹ presented possible aetiological factors for the development of endodontically related pain and swelling. Among these factors were;

1. Alteration of the local adaptation syndrome, which can also be caused by endodontic therapy;
2. Changes in periapical tissue pressure;
3. Microbial factors;
4. Effect of chemical mediators;
5. Changes in cyclic nucleotides;
6. Immunological phenomena; and
7. Various psychological factors.

The finding that *Peptostreptococcus* was associated with pain, whereas its individual species were not, was a reflection of sample size because isolations of individual species were not numerous. Moreover, the use of tests supplementary to those in the bacterial identification kits permitted comment on *S. parasanguis* which was not associated with pain. Swelling, present in seven cases, was found to be associated with the presence of *Fusobacterium necrophorum*, *Prevotella* spp. and *Peptostreptococcus*.

Tenderness to percussion

Percussion may determine the presence of pathosis in the periapical tissues, a positive result indicating inflammation in the periodontal ligament. This inflammation can be of pulpal origin or be induced by periodontal disease. The distinction between the two origins depends upon other clinical tests to evaluate pulpal status. In this present study root canals of teeth which were tender to percussion, yielded both Gram-positive and Gram-negative bacteria.

Wet canal and purulent exudates

One of the conditions that must be satisfied prior to root canal filling is the absence from the root canal of an excessive exudate. This exudate may appear as a tissue fluid in case of flared apex or can result from periapical inflammation caused by mechanical, chemical or biological agents. The presence of even a slight purulent exudate may indicate the possibility of a incipient exacerbation. The term 'wet canal' in this study means presence of a clear, hemorrhagic or purulent exudate.

Although wet canals have not been associated previously with the presence of facultative anaerobic bacteria, the exudate itself has been investigated microbiologically. Yoshida et al. (1987)⁶ found a association between *Peptostreptococcus magnus* and mucous exudation and between *Bacteroides*, *Eubacterium* and *Veillonella* species and serous exudation. However, purulent exudate is not synonymous with either mucous or serous exudation.



Sinus

A sinus tract usually indicates a necrotic pulp, a suppurative apical periodontitis or sometimes periodontal abscess in the area and can arise as a result of a failure of the root canal therapy. By placing a piece of gutta-percha in the sinus tract, the source of these lesions occasionally can be traced (Torabinejad & Walton 1989)¹⁰. This lateral drainage pathway is created along a route through the adjacent tissues offering the least resistance. Haapasalo *et al.* (1987)⁷ found that the microflora present in teeth with sinus is predominantly mixed and anaerobic. The present study also found a mixed flora but it was not uniformly anaerobic; however, the anaerobe *Eubacterium lentum* was the most commonly isolated species.

ANTIBIOTICS IN ENDODONTICS¹ (WHY TO AND WHERE TO USE?)

Although antibiotics are frequently prescribed to treat endodontic pain patients, there is little evidence from the clinical literature to support this indication.

In endodontic treatment, antibiotics are indicated for two reasons;

1. Prophylactic
2. Therapeutic

Prophylactic coverage of the patients susceptible to bacteremias and is confined to patients with certain cardiovascular diseases and disorders or compromised host defence mechanisms.

Therapeutic use of antibiotic in the patients with infection of endodontic etiology. Evidences suggest that many dentists are confused about the indications for therapeutic use of antibiotics for endodontic infections. The presence of microorganisms in the tissue does not constitute an infection. Infection exists only when the microorganism being to adversely affect the local host defences and cause damage to the tissues. It is the clinical assessment of the status of the battle between bacteria in tissue and the host defense that provides the answer to dilemma of whether or not to prescribe antibiotics .

CHOICE OF ANTIBIOTICS

Endodontic infections are caused by a highly predictable group of bacteria. The antibiotic sensitivity of these organisms is well-known. As the microbiology and antibiotic sensitivity of these microorganisms are well documented, it is justifiable therapeutic choice to use one of several antibiotics. The initial drug of choice is penicillin. Alternative drugs for use in penicillin-allergic patients are macrolides. These drugs especially penicillin, are effective against the normal oral flora, anaerobic and anaerobic, that most commonly cause endodontic infections as discussed earlier. Culture and sensitivity testing should be accomplished at the time of surgical drainage of intraoral and extra oral swellings and antibiotics should be prescribed immediately same day. If no improvement is seen between 48 hrs, a change of antibiotics based on the culture and sensitivity test indicated.

CONCLUSION

Microbes have proven to be masters of genetic engineering. Bacteria can now collect and exchange genetic information with extraordinary ease. Studies have shown that an average meal with meat and salad results in ingestion of about 1 billion

bacteria, with most containing antibiotic-resistant genes. Antibiotic-resistant genes are passed from one bacteria to another. This includes vertical transfer (i.e passed on to progeny) and horizontal transfer (i.e passed on to other existing genera, species and strains).

In human therapeutic use, antibiotics have been misused and abused, greatly adding to the existing resistance problem. Although the resistance problem is well documented in the microbiologic and nosocomial research literature, it is apparently understood and acknowledged by only an extremely small percentage of physicians and dentists.

Patients have become accustomed to and demand prescriptions for antibiotics for myriad problems including viral infections, trivial infections and non-infections. Physicians and dentists use extended-spectrum antibiotics when narrow-spectrum antibiotics are indicated, often prescribe unnecessarily long courses of antibiotic therapy and prescribe antibiotics for well-defined, limited infections that are being controlled by body's immune and inflammatory systems. Dentists frequently prescribe antibiotics for the patients with dental pain, but no signs of infection. All these practices increase the potential for the development of antibiotic-resistance, allergic responses and super-infections.

The continued abuse of antibiotics in the human, food chain and in human therapeutic must be curtailed. If not, we are on a collision course with the end of the era and a return the dominance of microbes over man.

From this Review we conclude that, one must stress the importance of 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.

REFERENCES

1. Harold C. Slavkin ; Appropriate use of antibiotics in dentistry Quintessence International journal., 2002; 2: 42-62.
2. Gomes BPFA, Drucker DB & Lilley JD; Association of specific bacteria with some endodontic signs and symptoms; International Endodontic Journal., 1998; 27: 291-298.
3. Fouad Ashraf F; Are antibiotic effective for endodontic pain? Endodontic topics 3, 2002; 52-56.
4. Miller WD; Microorganisms of human mouth; 1st edn Philadelphia PA USA: SS White 1890.
5. Griffe MB, Patterson SS, Miller CH, Kafrawy AH et al, The relationship of *Bacteroides melaninogenicus* to symptoms associated with pulpal necrosis; Oral surgery, Oral medicine and Oral pathology., 1980; 50: 457-461.
6. Yoshida M , Fukushima H et al, correlation between clinical symptoms and microorganisms isolated from root canals with periapical pathosis ;Journal of Endodontics., 1987; 13: 8-24.
7. Haapasalo M ; *Bacteroides* spp, in dental root canal infections ; Endodontic Dental Traumatology., 1989; 5: 1-10.

8. Trowbridge HO et al; Microbiologic and pathologic aspects of pulpal and periapical diseases; Current Opinion in dentistry. 1992; 2: 85-92.
9. Naidorf Seltzer S; Endotoxin content in endodontically involved teeth; Journal of Endodontics., 1985; 11: 472-478.
10. Torabinejad M. Walton RE, Principles and practice of Endodontics 1st edn. Philadelphia, Saunders WB, 53-68.
11. Peter Collignon; Antibiotics in food production animals: cause of human health problems? ; Australian Infection Control. 2000; 5: 2.
12. Collignon P. Antibiotics in animals: a resistance problem for man? Microbiol Aust 1999; 20: 120.

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