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Review Article

ANTIBIOTICS IN DENTISTRY- A DUAL SIDED SWORD

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ABSTRACT

Antimicrobial drugs have been described as the greatest li by other chemotherapeutic agents such as metronidazole, trimethoprim, daprone and ionized. Since the introduction of penicillin in 1940, research has produced a wide range of antibiotics. The widespread benefits of these antimicrobial agents have however been achieved at a price. Antibiotics have potentially serious adverse effects and are often very expensive. In addition excessive enthusiasm has led to extensive misuse of these drugs with consequent emergence of resistant strains of bacteria. Hence the major emphasis today is on judicious use of antimicrobial agents based on the knowledge of the likely pathogen and it's probably susceptibility. But many a times it takes time to get this information and hence go in for antibiotic prophylaxis. The following article presents a review on the role of Antibiotics and its role in Dentistry.

Key words:- Antimicrobial, Antibiotic, Infection, Dentistry, Prophylaxis, Resistance.

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INTRODUCTION

Antibiotic Prophylaxis refers to the use of antimicrobial agents for preventing the setting in of an infection or suppressing contacted infection before it can clinically manifest. Antibiotics are frequently given prophylactically, however in a number of circumstances this is at best wasteful if not harmful. The basis of effective, true, chemoprophylaxis is the use of drug to prevent infection by one organism of virtually uniform susceptibility. Ex Benzyl penicillin against a group. A streptococcus. But the term chemoprophylaxis is commonly extended to include suppression of disease as well as prevention of infection.

The main categories of chemoprophylaxis may be summarized as: [1,2]

i) True prevention of infection. Ex: rheumatic fever, UTI.

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ii) Prevention of opportunistic infection. Ex: IE – after dental procedures, Peritonitis – after bowel surgery, Immuno-compromized patients.

iii) Suppression of existing infection before it causes overt disease. Ex: TB, Malaria, animal bites.

iv) Prevention of exacerbation of chronic infection. Ex: bronchitis in cystic fibrosis.

v) Prevention of spread amongst contacts (In epidemics or sporadic cases).

Prophylaxis of bacterial infection can be achieved often by doses that are inadequate for therapy. Infection occurs where there is significant quantitative and qualitative bacterial insult; it occurs more readily if the patients host defense mechanisms are reduced, rendering the patient more susceptible for infection.

Literature Review: Principles of prevention of bacterial invasion of wound began formulation 100 years before advent of antibiotics.

Thus by turn and century principles of antisepsis and asepsis had been firmly established, infection rates

after surgery dropped from 90% to 15%. Even when good technique is followed, infection rates following some types of surgeries are unacceptably high. In contemporary surgical practice prophylactic antibiotics are used to reduce the high rate.

1940 – Antibiotics introduced. But a major controversy developed regarding actual efficacy of antibiotics to prevent infection.

Carefully controlled studies in animals and humans by Burke, Polk and Stone initially defined the principles of antibiotic prophylaxis. These principles are well established.

i) The antimicrobial agent is chosen on the basis of the most likely microorganism to cause the infection.
ii) An antibiotic loading dose should be employed.
iii) The antibiotic should be present at sufficient concentration in the blood and target tissues prior to dissemination of offending organisms.
iv) Antibiotic should be continued only as long as microbial contamination from the operative site persists.
v) The benefit from the prophylaxis must outweigh the risk of antibiotic induced allergy, toxicity, superinfectious acid emergence of antibiotic resistant microorganisms. [3,4]

Prophylaxis is considered only if normal aseptic techniques cannot prevent access of organisms to the sites at risk.

Complications of antibiotic prophylaxis: Short term duration of antibiotic prophylaxis does not provide adequate time for complications to arise. Occasional report of pseudomembranous colitis associated with prophylactic use of ampicillin, cephalosporins acid clindamycin, but this is relatively rare complication. Main concern is the in the issue of encouraging the growth of resistant bacteria.

ANTIBIOTIC PROPHYLAXIS IN DENTISTRY: The empiric use of antibiotic prophylaxis for dental procedures, especially those that cause bleeding in the mouth, has become reasonably well established practice among dental professionals.

- Many dentists are confused for indications for antibiotic prophylaxis and rely on the recommendation from practitioners.
- Lewis and Grant hypothesized that surgical procedures provided microorganisms with access to the systemic circulation that would result in endocardins.
- Clinicians and researchers are increasingly concerned about the overuse of antibiotics and resulting development of resistant strains of microorganisms.
- The current situation clearly requires, judicious and prudent consideration before antibiotic therapy is administered. [5,6]

CLINICAL SITUATIONS CONSIDERED FOR PROPHYLAXIS:

Infective endocarditis: IE

Also called acute or subacute bacterial endocarditis. It is defined as an exudative and proliferative inflammatory alteration of endocardium, characterized by vegetations on the surface or within the endocardium that is caused by an infection with microorganisms. Heart valve commonly involved, but affects inner lining of cardiac chambers. It is well recognized that IE arises from a preexisting lesion, usually composed of fibrin and platelets that develops from the disruption of endothelial lining via abnormal development disease or presence of foreign bodies and turbulent blood flow. Horder – first to discuss scientifically possible connection between IE and oral bacterial agents. Lewis and Grant – proposed relationship between surgical procedures bacteremias and IE. AHA formally issued in first statement on IE prophylaxis in 1955. AHA recommended parentral regimen of penicillin as first choice for prophylaxis and oral penicillin as a less desirable second choice. Since then AHA and ADA have modified recommendations several times (1977, 1984, 1990) gradually shortening and simplifying the protocol. [5,6]

Although there has been much historical controversy about prophylactic use of antibiotics, there is little doubt that patients with cardiac vascular defects have greater incidence of IE and that oral bacteria are frequent culprits.

Notable changes include:

1. Reducing the oral dose from 3 gms to 2gms.
2. Follow up dose of antibiotic is continued.
3. Replacing erythromycin with other antibiotics as alternatives to the penicillins.
4. Dajaci and colleagues reported that 2gms of amoxicillin provides several hopes of antibiotic coverage.

AHA recommends that patients diagnosed with mVP with regurgitation receive prophylaxis before undergoing dental procedures, but patients with alone and no regurgitation, no antibiotic prophylaxis required. It is prudent for dentist to ask for medical evaluation before dental care, rather than giving prophylactic antibiotics.

Patient with prosthetic joints:

Infection no prosthetic joint may be classified as early and late onset. Early prosthetic joint infection- due to microbial contamination of surgical site during placement of prosthesis. Late prosthetic joint infection (LPJI) occurs 3 or more months after surgery and may involve delayed infection from microorganisms introduced at the time of surgery via hematogenous spread from distant site, such as mouth. Mortality rate in LPJI – 18%. Incidence associated with dental procedures is low (0.04%). Hence – ADA recommends prophylactic antibiotics only for patients with total joint replacement and not for patients with pins, screws or plates and patients with compressed immune systems.

DENTAL PROCEDURES CONSIDERED FOR PROPHYLAXIS: 3rd molar surgery, infection rate 1%. Localized JP and early onset periodontists may need prophylactic antibiotic. In implants – preoperative antibiotics decrease the rate of implant failure. [7,8]

ANTIBIOTIC PROPHYLAXIS IN IMMUNOCOMPROMISED PATIENTS: Patients undergoing chemotherapy: Routine procedures – No AP required. Invasive procedure – AP required. Patients with HIV infection In absence of bacterial infection – No AP required. Antibiotics to be used because of higher risk of systemic infection Patients with diabetes – IDDM – increased rate of systemic disease – hence AP required. Poorly controlled diabetics – AP required for invasive procedures.Well controlled diabetics who are not dependent an insulin therapy – AP not required. IV drug users & Patient who has undergone splenectomy.

ANTIBIOTIC RESISTANCE: In 1998, the Standing Medical Advisory Committee (SMAC) published The Path of Least Resistance. In it, it stated that dentists account for 7% of all community prescriptions of antimicrobials. This may not seem much; nevertheless, dentists dispensed 3.3 million prescriptions for antibiotics in 1993, and by 1996 this figure had increased to 3.5 million prescriptions. According to the British Dental Association, there are 22 000 general dental practitioners in the UK. This means each practitioner could be prescribing, on average, 159 antibiotic courses each year, an average of three prescriptions a week, implying a greater antibiotic usage by dentists than might be thought initially. The relationship between antibiotic use and resistance is complex. A population genetics study demonstrated that the volume of drug use can influence the selection pressure for antibiotic resistance, but a quantitative relationship between these two factors was not demonstrated.2 Reduction in antibiotic resistance can only occur following a significant reduction in antibiotic use. [9]

It has been argued that the time required for a drop in the prevalence of antibiotic resistance to occur will be more than the time required for resistance to develop under a constant selective pressure. An important factor influencing the emergence of resistance in a bacterial population is the selective pressure applied by antibiotics. Exposure of oral bacteria to low concentrations of minocycline has led to the emergence of strains that show reduced susceptibility to this drug. Thus, the concentration that antibiotics can achieve in the oral cavity may be critical in selecting resistant bacteria within the oral flora. Making a choice of antibiotic to treat oral infections taking into consideration the concentrations that various drugs may achieve, however, is not straightforward. Many β-lactam antibiotics achieve very low concentrations in saliva in comparison with the concentration that is attained in serum, but the level of susceptibility for oral streptococci is such that the low saliva concentration does not cause problems.4,5 Similarly, erythromycin does not reach as high a concentration in saliva as in serum. In contrast, the concentration of azithromycin found in saliva is significantly higher than is found in serum, but in the management of dental infection, azithromycin has been shown to depress concentrations of a non-steroidal anti-inflammatory drug in periodontal tissue, administered for pain relief. [10] Thus, the choice of which antibiotic to prescribe is not simply a matter of picking the drug with the greatest antimicrobial activity. In medical practice, a low correlation between community prescribing and antibiotic resistance to urinary coliforms and Streptococcus pneumoniae was illustrated in a cross sectional study involving 405 general practices in southwest and northwest England. However, that study used overall prescriptions as a crude measure for population exposure; social interactions were not examined. General medical practitioners are responsible for 80% of antimicrobial prescribing in the UK.[1] It has been demonstrated that most of the antibiotics are prescribed in the community and that the majority of prescribing was for conditions including otitis media, upper respiratory tract infection, bronchitis, pharyngitis and sinusitis[10].

These are infections associated with microorganisms found in the oropharynx. The majority of prescriptions written in the community are written by general medical practitioners, and the drugs prescribed will have a significant impact on the selection of resistance among bacteria in the oral flora. Nevertheless, the role of dental prescribing in the selection of resistant bacteria is an area that has received relatively little attention. This review seeks to address this deficit.

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