

REVIEW

USE OF ANTIBIOTIC THERAPY IN PEDIATRIC DENTAL PATIENTS : A REVIEW

SINGH NEERU¹ GOYAL VIRINDER²
SHAVETA³ PARMOD GUPTA⁴

¹Professor & Head,

²Professor

³Post-graduate Student

⁴Sr. Lecturer

Department of Pediatric Dentistry
Dasmesh Institute of Research
and Dental Sciences
Faridkot (Punjab)

Address for Correspondence:

NEERU SINGH

Principal, Professor & Head
Department of Pediatric Dentistry
Dasmesh Institute of Research
and Dental Sciences
Faridkot (Punjab)

ABSTRACT

The prevalence of multidrug resistant micro-organisms is increasing due to widespread use of antibiotics. These multidrug resistant organisms are diminishing our ability to control the spread of infectious diseases. At present, there are no antibiotics to which resistance has not appeared. A dental professional must take on the responsibility of proper and judicious use of antibiotics to treat the oral infections. To minimize the rate at which the resistance to antibiotics is developing, antibiotics must be used conservatively. The proper guidelines based on scientific evidence need to be followed by dental professional when prescribing antibiotics for children. American Academy of Pediatric Dentistry has recommended the guidelines for conservative use of antibiotics in oral conditions including oral wounds, pulpitis, apical periodontitis, trauma, periodontal diseases and primary herpetic gingivostomatitis in children. If antibiotics are indicated, the antibiotic selection and duration of antibiotic should be based on host risk and severity of infection.

INTRODUCTION

The discovery of antibiotics revolutionized the ability of the man to cure infectious diseases. But the widespread use of antimicrobials has driven the emergence and spread of resistant organisms^{8,9}. Multidrug resistance has become common in the clinical settings, diminishing the ability to control the spread of infectious diseases¹⁰. At present, there are no antibiotics to which resistance has not appeared¹.

Various inappropriate patterns of antibiotic use for a variety of specific clinical conditions include³:

- ◆ Use of antibiotics to treat symptoms that are clearly viral in nature.
- ◆ Reliance on excessively broad spectrum antibiotics when narrower-spectrum agents would be more appropriate.
- ◆ Errors in the timing and duration of antibiotic prophylaxis at the time of surgery.
- ◆ Poor adherence by patients to prescribed antibiotic regimens, including premature cessation of therapy and the unsupervised use in the future.

So, the judicious use of antibiotics by each clinician must be stressed to control the rate of which resistance to the antibiotics is increasing.

Considerations for administration of antibiotics in pediatric dentistry.

The greater proportion of water in the tissues of children, and their increased bone sponginess, facilitate faster diffusion of infection. So, the adequate dose adjustment of the prescribed medication is required in children².

The following factors must be considered before deciding to administer antibiotics in pediatric dentistry²:

THE SEVERITY OF THE INFECTION.

- In the case of acute infection, the use of antibiotics is based on the degree of inflammation, rate of progression and systemic manifestations^{1,2}.
- Infection that has progressed to extraoral facial spaces is sufficiently aggressive indicating that the host defenses are unable to control the infection. Hospital admission is required in severe cases.
- Antibiotics are rarely recommended for the treatment of mild trauma; though in cases involving important soft tissue or dentoalveolar lesions, antibiotic prophylaxis against infection is advisable. The vaccination calendar (antitetanus vaccination) must be considered when trauma occurs in a contaminated environment².

● Patient's immune defense and medical status:

Healthy children requiring the extraction of a single deciduous tooth with an abscess, or endodontic treatment of a permanent tooth, may be operated upon without the need for antibiotic treatment. In contrast, immunocompromised children, or patients with cardiac problems, require antibiotic treatment. Prior to any dental treatment of children with some syndrome, medical problem or any other unfamiliar disorder, it is advisable to consult the pediatrician, in order to determine individual susceptibility to infections induced by bacteremias.

According to guidelines by AAPD/ AHA(American Academy of Pediatric Dentistry & American Heart Association), the children with history of intravenous drug administration, and children with certain syndromes (e.g., Down or Marfan syndrome), may be at risk of developing bacterial endocarditis, due to the associated cardiac anomalies^{2,4}.

Immunocompromised patients do not tolerate transient bacteremia following invasive dental management. Therefore, patients subjected to chemotherapy irradiation or bone marrow transplantation must be treated accordingly. This criterion also applies

to patients with the following conditions: human immunodeficiency virus (HIV) infection, immune deficiencies, neutropenia, immunosuppression, anemia, splenectomy, habitual steroid use, lupus erythematosus, diabetes and organ transplants^{2,7}.

AHA recommends antibiotic prophylaxis for the following cardiac conditions. These cardiac conditions are associated with highest risk of adverse outcome⁷(see Table 1)

Antibiotic selection for odontogenic infections²

Oral antibiotics that are effective against odontogenic infections comprise penicillin, clindamycin, erythromycin, cefadroxil, metronidazole and the tetracyclines. These antibiotics are effective against streptococci and oral anaerobes. Penicillin V is the penicillin of choice in cases of odontogenic infection. For the prophylaxis of endocarditis, associated to dental treatments, amoxicillin is the antibiotic of choice. Amoxicillin with clavulanic acid (clavulanate) can be used against the betalactamases commonly produced by microorganisms associated with odontogenic infections². Clindamycin is an alternative in the case of patients who are allergic to penicillins. The latest generation macrolides, clarithromycin and azithromycin can also be used if the child is allergic to penicillin. Cephalosporin(eg cefadroxil) are additional options when a broader spectrum of action is required. Metronidazole is usually used against anaerobes, and is characteristically reserved for situations in which only anaerobe bacteria are suspected.

Tetracyclines are of very limited use in dental practice since these drugs can cause alterations in tooth color, they must not be administered to children under 8 years of age.

Duration of antibiotic therapy in odontogenic infection

The ideal duration of antibiotic treatment is the shortest cycle capable of preventing both clinical and microbiological relapse². When indicated, the drug should be administered as soon as possible for the best result. The most effective route of drug administration must be considered(IV or IM or oral). If the infection is not responsive to initial drug selection, a culture and susceptibility testing of isolates from the effective site may be indicated. The minimal duration of drug therapy should be

<p>Table 1. CARDIAC CONDITIONS ASSOCIATED WITH THE HIGHEST RISK OF ADVERSE OUTCOME FROM ENDOCARDITIS FOR WHICH PROPHYLAXIS WITH DENTAL PROCEDURES IS REQUIRED</p> <p>Prosthetic cardiac valve or prosthetic material used for cardiac valve repair</p> <p>Previous Infective Endocarditis</p> <p>Congenital heart disease (CHD)</p> <p>Unrepaired cyanotic CHD, including palliative shunts & conduits</p> <p>Completely repaired congenital heart defect with prosthetic material or device, whether placed by surgery or by catheter intervention, during the first 6 months after the procedure</p> <p>Repaired CHD with residual defects at site or adjacent to the site of a prosthetic patch or prosthetic device (which inhibits endothelialization)</p> <p>Cardiac transplantation recipients who develop cardiac valvulopathy</p>

All dental procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of oral mucosa require antibiotic prophylaxis.

The following procedures and events do not need prophylaxis⁷:

- Routine anaesthetic injections through non-infected tissue
 - Taking dental radiographs
 - Placement of removable prosthodontic or orthodontic appliances
 - Adjustment of orthodontic appliances Placement of orthodontic brackets
 - Shedding of deciduous teeth
 - Bleeding from trauma to lips or oral mucosa
- Prophylactic Antibiotic Regime depends upon patient's condition (see Table 2).

Table 2. PROPHYLACTIC REGIMENS FOR A DENTAL PROCEDURE				
I. Standard general prophylaxis for patients at risk:				
Amoxicillin: Adults, 2.0gm(children,50mg Kg) given orally one hour before procedure.				
II. Unable to take medication				
Ampicillin: Adults, 2.0gm(children,50mg Kg) given IMIV within 30 mins before procedure				
III. Amoxicillin /ampicillin/penicillin allergic patients:				
Clindamycin : Adults, 600mg(children 20mg Kg) given orally one hour before procedure				
-OR- Cephalexin or Cephadroxil : Adults, 2.0gm(children,50mg Kg) given orally one hour before procedure -OR- Azithromycin or Clarithromycin: Adults,500mg (children,15mg Kg) given orally one hour before procedure				
IV. Amoxicillin /ampicillin/penicillin allergic patients unable to take oral medications:				
Clindamycin : Adults, 600mg(children 20mg Kg) given orally 30min before procedure				
OR Cefazolin : Adults, 1gm(children 25mg Kg) IMIV within 30 min before procedure				
Allergic to Penicillin or Ampicillin –oral	or	2gm	50mg Kg	
Azithromycin or Clarithromycin	or	600mg	20mg Kg	
Allergic to penicillin or ampicillin and unable to take oral medication	Cefazolin or Ceftriaxone	500mg	15mg Kg	
	or Clindamycin	1gm IMIV	50mg Kg IMIV	
		600 mg IMIV	20mg KgIMIV	

limited to 5 days beyond the point of substantial improvement or resolution of signs and symptoms; this is usually a 5-7 day course of treatment dependent upon the specific drug selected¹. The importance of completing a full course of antibiotic must be emphasized. If the patient discontinues the antibiotic prematurely, the surviving bacteria can restart an infection that may be resistant to the original antibiotic.

Management considerations in odontogenic infections:

American Academy of Pediatric Dentistry recommends the following general principles when prescribing antibiotics for the pediatric population.

Oral wound management

Factors related to host risk and type of wound must be evaluated to determine the risk for infection and subsequent need for antibiotics. Facial lacerations may require topical antibiotic agents. Intraoral lacerations that appear to have been contaminated by extrinsic bacteria, open fractures, and joint injury have an increased risk of infection and should be covered with antibiotics¹.

Pulpitis/apical periodontitis/ draining sinus tract/localized intraoral swelling

Bacteria can gain access to pulpal tissue through caries, exposed pulp or dentinal tubules, cracks into dentin, and defective restorations. If a child presents with acute symptoms of pulpitis, the required dental management should be provided (pulpotomy, pulpectomy or extraction). Antibiotic therapy usually is not indicated if dental infection is contained within pulpal tissue or the immediately surrounding tissue, in the absence of signs of systemic infection (i.e., fever or facial swelling)^{1,6}.

Acute facial swelling of dental origin

A child presenting with a facial swelling secondary to a dental infection requires immediate dental attention. Depending on clinical findings, treatment may consist of treating or extracting the tooth/teeth in question with antibiotic

coverage or prescribing antibiotics for several days to contain the spread of infection and then treating the involved tooth/teeth¹. The dental professional should consider the severity of the infection and the general condition of the child in order to decide referral to a medical center for the administration of antibiotics via the intravenous route.

Dental trauma

For the reimplantation of an avulsed tooth with an open apex and less than 60 minutes extra-oral dry time, local application of antibiotic to the root surface of avulsed tooth has been recommended^{1,5}. The application of antibiotic inhibits extraoral resorption and aid in pulpal revascularization. Systemic antibiotics have been recommended as adjunctive therapy for avulsed permanent incisors with an open or closed apex. Tetracycline is the drug of choice, but penicillin V can be given as an alternative in case of children less than 8 years of age due to risk of discoloration in developing permanent dentition.

Periodontal diseases

In pediatric periodontal diseases (eg neutropenias, Papillon-LeFevre syndrome, leukocyte adhesion deficiency), the immune system is unable to control the growth of periodontal pathogens and in some cases, treatment may involve antibiotic therapy¹. Culture and susceptibility testing of isolates from the involved sites are useful for selecting the most appropriate drug in each case.

Viral diseases

Conditions such as acute primary herpetic gingivostomatitis should not be treated with antibiotic therapy unless there is strong evidence to indicate that a secondary bacterial infection exists¹.

CONCLUSION

The prevalence of resistance to antibiotics is increasing among the micro-organisms decreasing the efficacy of antibiotics. The antibiotics must be used conservatively to minimize the developing resistance. Every dental professional must follow

proper guidelines based on scientific evidence to use

antibiotics conservatively. The host risk factors and severity of infection to be evaluated when prescribing the antibiotics for children.

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