

Infective Endocarditis in Children — New Approach in Antimicrobial Prophylaxis

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ABSTRACT

Infective endocarditis (IE) is an infection of the endocardium and/or heart valves with the formation of a thrombus and secondary damage of the involved tissue, with significant mortality and severe complications. The prevention of bacterial endocarditis is of great controversy. Antimicrobial prophylaxis is usable in the prevention of endocarditis by killing bacteria before or after their extension to the damaged endocardium. No human studies offer strong evidence to support the efficacy of antibiotic prophylaxis so far, thus it could be potentially dangerous. Therefore, the European Society of Cardiology (ESC) may need to reconsider and update the previous guidelines with the proposal of reducing the prophylactic approach of IE. The 2015 Task Force recommends prophylaxis for highest risk patients undergoing highest risk procedures, focused on prevention rather than prophylaxis of IE, especially in nosocomial endocarditis.

Keywords: infective endocarditis, prophylaxis, antibiotics

Infective endocarditis (IE) is an infection of the endocardium and/or heart valves with the formation of a thrombus and secondary damage of the involved tissue, with significant mortality and severe complications.

The incidence of IE ranges from 0.05–0.12 cases/1000 children and the hospital admissions for IE have increased in the pediatric age group from 1960.¹ This rise is due to substantial changes in the epidemiological profile, as a consequence of the progress in pediatric cardiology and cardiovascular surgery in congenital heart disease (CHD) and also in neonate and pediatric intensive care units, in particular, because of the use of central venous catheters (CVCs).^{2,3} Other causes of IE, such as degenerative heart disease and intravenous drug abuse are not common in pediatric population, as compared to adults.

Most of the patients with IE have an identifiable risk factor for the disease: CHD,^{2–5} especially those with cyanotic CHD, critically ill patients and premature infants with CVC.^{2,6–9} The estimated mortality rate in children with IE is 5%.

Concerning the microbiology in this age group, staphylococci and streptococci are the most common pathogens;^{2,10} in neonates, *Klebsiella pneumoniae* and *Enterobacter* species may be added as etiologic agents.¹¹

The term IE is referred to both bacterial and fungal endocarditis; the latter is caused by *Candida* species, found mainly in fixed CVC and intravenous nutrition containing high glucose concentrations.⁹

In relation to the high morbidity and mortality of IE, the preventive strategies of bacterial endocarditis are of great interest. The theoretical base suggests that antimicrobial prophylaxis is usable in the prevention of endocarditis by killing bacteria before or after their extension to the damaged endocardium.⁶ The pathogenesis of IE and also animal studies suggest that antimicrobial prophylactic therapy can prevent endocarditis.¹²

No human study offers strong evidence to support the efficacy of antibiotic prophylaxis so far, thus, it could be potentially dangerous.^{1,9,13-15}

Therefore, the European Society of Cardiology (ESC) may need to reconsider and update the previous guidelines with the proposal of reduction of prophylaxis. The 2015 Task Force recommends prophylaxis for highest risk patients undergoing highest risk procedures, focused on prevention rather than prophylaxis of IE, especially in nosocomial endocarditis. Patients at the highest risk, for whom antibiotic prophylaxis should be considered, include three categories:¹⁶

1. Patients with prosthetic heart valves, including bioprosthetic and homograft valves or transcatheter valve implantation, or those with prosthetic material used for cardiac valve repairment;
2. Patients with prior history of IE;
3. Patients with CHD: any type of cyanotic congenital defect and those with congenital heart disease who have palliative shunts, conduits or other prostheses; after surgical repair with a prosthetic material with no residual defects.

Prophylaxis recommendations are for 6 months after the procedure, or lifelong if residual shunt or valvular regurgitation is persistent after surgery.

Antibiotic prophylaxis is not recommended in common valvular lesions, including bicuspid aortic valve, mitral prolaps with regurgitation, hypertrophic cardiomyopathy with latent or resting obstruction.^{1,16}

In patients with high risk, methods of general hygiene should be applied, especially dental and skin hygiene.^{15,17}

On the subject of important procedures in which antibiotic prophylaxis is necessary, high risk dental procedures such as tooth extractions and dental abscess, procedures that involve the manipulation of gingival tissue or the periapical region, IE prophylaxis is needed.

Related to respiratory tract procedures, gastrointestinal or urogenital procedures or trans-oesophageal echocardiography, skin and soft tissue procedures — routine prophylaxis is not justified. Nevertheless, respiratory tract interventions that involve the incision or biopsy of the respiratory tract mucosa (tonsillectomy, adenoidectomy or bronchoscopy with biopsy), or invasive procedures to treat established infections (such as drainage of an abscess) should receive prophylactic antibiotherapy.

In cardiovascular interventions, perioperative antibiotic prophylaxis should be considered in patients undergoing surgical or transcatheter implantation of a prosthetic valve, intravascular prosthetic or other foreign material.

The antibiotic regimens recommended for IE prophylaxis in children are:

- Amoxicillin per os, 50 mg/kg;
- Ampicilin or Cefazolin/Ceftriaxone 50 mg/kg intramuscular (IM) or intravenous (IV) for those who are unable to take oral medication;
- Cephalexin 50 mg/kg or Clindamycin 20 mg/kg or Azithromycin/Clarithromycin 15 mg/kg per os, for those allergic to penicilin;
- Cefazolin or Ceftriaxon 50 mg/kg IM or IV, or Clindamycin 20 mg/kg IM or IV, or Vancomycin 15 mg/kg for those allergic to penicillin and unable to take oral medication.¹⁸

It is recommended that the antibiotics should be administered 60 minutes prior to the procedure, with the exception of intravenous vancomycin, which should be administered 120 minutes before the procedure.

In conclusion, the evidence to support antibiotic prophylaxis in IE is questionable. The new guidelines recommend limitation of the antibiotic prophylaxis of IE for patients at high risk, who undergo high risk procedures, particularly in the case of the already mentioned dental procedures. Furthermore, the importance of hygiene measures, especially oral and cutaneous hygiene should be emphasized, and also the importance of the non-specific infection control measures that prevent healthcare-associated IE.

CONFLICT OF INTEREST

Nothing to declare.

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