Annotations

Prevention of infective endocarditis

Infective endocarditis remains a serious complication of heart disease and has a mortality of about 30%. The possibility of prophylaxis against the condition is attractive, yet there is no absolute statistical proof of the efficacy of any of the prophylactic regimens advised. There is however general agreement that it is logical to use antibiotics at times of particular risk to kill bacteria which may enter the blood stream before they can cause endocarditis.

Children at risk

Infective endocarditis occurs in all congenital heart lesions except isolated ostium secundum defects. The most common lesions associated with endocarditis are tetralogy of Fallot, ventricular septal defect, and aortic stenosis. Small ventricular septal defects which do not cause symptoms carry a greater risk than large ones. The risk still remains after the congenital heart defect has been successfully operated on, except after closure of a persistent ductus arteriosus where there seems to be no risk. The risk is significant after palliative surgery and vegetations may occur at the site of a systemic-pulmonary artery shunt. Children with rheumatic heart disease, fortunately rare in Britain now, are also at risk.

Children with innocent murmurs are not at risk but if there is uncertainty about the significance of a murmur it is better to assume a risk. Echocardiography is becoming increasingly valuable in demonstrating lesions—such as bicuspid aortic valves and prolapsing mitral valves—in which there may be few physical signs but which may be the seat of endocarditis.

Predisposing factors

In children dental treatment, tonsillectomy, and adenoidectomy are the most common predisposing factors. Dental treatment is less often implicated in children than in adults, presumably because of a lower incidence of periodontal disease. During a 25-year period at the Hospital for Sick Children, Toronto, there were 82 cases of endocarditis but only 4 of them followed dental extractions.¹ There is no evidence that the shedding of deciduous teeth is

associated with bacteraemia, but bacteraemia may occur after any dental procedure.

Manipulative procedures or operations on the respiratory, genitourinary, and gastrointestinal tracts may be implicated. The current vogue for ear-piercing in children should be avoided in children at risk. Sometimes the predisposing factor is never found.

Basis for prophylaxis

Surprisingly little scientific work exists on the best means of preventing infective endocarditis. The regimens advised previously have been based on the work of Durack *et al.* in rabbits.^{2 3} They showed that bactericidal drugs must be used and that there should be adequate serum levels of antibiotic, both at the time of the bacteraemia and for a critical period of 6-9 hours afterwards when surviving bacteria might settle on the damaged heart and multiply. Their experiments involved the production of vegetations on aortic valves by inserting catheters and then introducing large doses of streptococci intravenously. Treatment was aimed at sterilising the blood over 24 hours. In practice this may be more difficult than eliminating the transient bacteraemia which occurs after dental treatment in man, so dosage regimens based on Durack's work are likely to give a wide margin of safety.

Streptococcus viridans is the most common organism entering the blood stream from the mouth and this and other organisms from the upper respiratory tract are generally penicillin sensitive. In the recent past most paediatricians have followed the recommendations of the American Heart Association and have given an oral regimen using phenoxymethylpenicillin (Penicillin V) or a combined parenteral and oral schedule.⁴ Unfortunately the absorption of oral phenoxymethylpenicillin is unpredictable so an injection regimen is preferable. Since most dentists do not give intramuscular injections and an injection is difficult to organise at the appropriate time, most children are given the oral regimen despite doubt about its adequacy.

Shanson *et al.*⁵ have recently shown that in adults amoxycillin gives a higher and more sustained serum

level than phenoxymethylpenicillin and that a single 3 g oral dose of amoxycillin one hour before dental treatment gives serum concentrations well above the minimal bactericidal levels for at least 10 hours, thus covering the critical period after treatment.⁶ Studies on oral amoxycillin in children have confirmed the same satisfactory absorption as in adults.⁷

Present recommendations

All children at risk should have a high standard of oral hygiene and regular dental supervision.

Oral amoxycillin using half the adult dose for children under 10 years should be used for prophylaxis outside hospital when dental treatment is carried out without anaesthesia. If anaesthesia is required the patient should be referred to hospital and amoxycillin given parenterally.

All children at risk should be given a card to show to any doctor or dentist. A suitable format is:

This child has a heart lesion and it is essential that he/she has prophylactic therapy against infective endocarditis before dental treatment, removal of tonsils or adenoids, or any procedure affecting the upper respiratory tract. Outside hospital when anaesthesia is not required the following regimen is recommended: amoxycillin 3 g orally one hour before treatment. The dose should be halved for children under 10 years.

If an anaesthetic is required the patient should be referred to hospital and amoxycillin given by intramuscular injection.

If the patient is sensitive to penicillin, erythromycin 1 g orally one hour before treatment is advised, halving the dose for children under 10 years.

In gastrointestinal and genitourinary tract surgery, enterococci are often responsible for endocarditis and prophylactic treatment should be aimed at these organisms. The patient is generally in hospital and a combination of gentamicin 2 mg/kg intramuscularly and ampicillin 1 g intramuscularly (half dose under 10 years) is a suitable combination.

Patients with prosthetic heart valves have a

particularly high risk of developing endocarditis and the organism may have been acquired in hospital. There is less agreement about the best prophylaxis in this group (fortunately small in childhood) and the children should be under observation in hospital. Ampicillin 1 g intramuscularly and cloxacillin 1 g intramuscularly (half dose for children under 10 years) one hour before treatment and repeated 8 hourly for two doses should suffice.

The Medical Services Study Group of the Royal College of Physicians now ask for cases of infective endocarditis to be notified and will provide questionnaires. Children with endocarditis should be included in this study. Data collected from these should determine in how many cases dental treatment was carried out within 3 months of infective endocarditis and in how many antibiotic prophylaxis was used.

References

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