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Prevention of bacterial endocarditis

Recommendations by the American Heart Association

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Institutions	American Heart Association; American Dental Association; Infectious Diseases Society of America; American Academy of Pediatrics; American Society of Gastrointestinal Endoscopy.
Support	American Heart Association.

Background

Bacterial endocarditis is a potentially life-threatening condition. It results from infection of susceptible (usually previously abnormal) cardiac structures resulting from bacteremia. A number of diagnostic and therapeutic procedures can cause transient bacteremia. Antibiotic prophylaxis at the time of these procedures may thus be able to prevent endocarditis. Although this approach is plausible and has been validated in some animal models, controlled clinical trials in humans have not been performed and are unlikely to be undertaken. In the absence of such trials, recommendations such as those presented here must be based on extensive review of the available evidence. This paper is an update of the AHA committee's 1990 recommendations.

Approach

The presumed benefit of antibiotic prophylaxis depends on the cardiac abnormality for which prophylaxis is being considered and the procedure causing bacteremia. Certain cardiac conditions are more susceptible to endocarditis than others; furthermore, established endocarditis is more dangerous in certain settings (such as prosthetic valves) than others. Both the risk of bacteremia and the likely organisms vary according to the procedure being performed; some organisms are more likely to cause endocarditis than others.

As a result, the decision whether or not to prophylax and the choice of antibiotics will depend both on the cardiac abnormality and on the procedure (as well as on certain other patient-specific factors).

Cardiac conditions

Cardiac conditions are classified into high, moderate and negligible risk. The latter category is felt not to require prophylaxis. The principal differences between the high and moderate risk categories lie in the antibiotic regimens recommended for GI and GU procedures, and in whether or not prophylaxis is needed for certain lower-risk procedures.

- **Negligible risk**

  These cardiac conditions are felt *not* to require prophylaxis.

Isolated *ostium secundum* ASD and surgically repaired ASD, VSD and PDA (beyond 6 months and without sequelae).
Mitral valve prolapse *without* mitral regurgitation and *without* thickened leaflets.
Innocent or physiologic murmurs (echo required in the adult population to rule out valvular lesion).
Cardiac pacemakers and defibrillators.
History of isolated bypass surgery, history of Kawasaki disease *without* valvular dysfunction and history of rheumatic fever *without* valvular dysfunction.

- **High risk**

These conditions are:

All prosthetic heart valves (including bioprostheses and homografts).
Any history of previous bacterial endocarditis.
Complex cyanotic congenital heart disease and surgically constructed systemic pulmonary shunts.

- **Moderate risk**

Most cardiac conditions requiring prophylaxis will fall into this category.

Congenital cardiac malformations, not falling into the high or negligible risk categories (such as PDA, VSD, ostium primum ASD, bicuspid aortic valve and coarctation).
Acquired valvular heart disease (such as rheumatic heart disease, valvular stenosis and regurgitation).
MVP with regurgitation and/or myxomatous leaflets.
Hypertrophic cardiomyopathy.

In the article text is a more detailed description of the issue of mitral valve prolapse, including the significance of valve morphology and audible clicks. The only patients with MVP who are not recommended for prophylaxis are those patients with isolated prolapse, normal appearing leaflets, no doppler evidence of regurgitation and no murmurs (with maneuvers). Patients with MVP and only a systolic click represent a controversial subset and warrant either prophylaxis or a very vigilant search for intermittent regurgitation (doppler and auscultation with maneuvers). The importance of MVP as an etiology for endocarditis in the pediatric age group is stressed. See text for more details.

Principal recommendations

Procedures requiring prophylaxis

Procedures	**Prophylaxis recommendations**

Dental and oral procedures	
Dental procedures with bleeding: • extractions • cleaning • periodontal procedures • dental implant placement • endodontic surgery (root canal) • initial placement of orthodontic bands • intraligamentary local anesthesia	Prophylaxis recommended In addition, consider antiseptic rinse immediately prior to procedure
Dental procedures unlikely to cause bleeding: • Restorative dentistry (including cavity filling) • Nonintraligamentary local anesthesia • Intracanal endodontic treatment post-placement • Suture removal • Placement and adjustment of orthodontic and prosthodontic devices	Not recommended If unanticipated bleeding, consider antibiotic prophylaxis within 2 hours
Respiratory tract	
• Surgical operations involving respiratory mucosa, including tonsillectomy/adenoidectomy • Bronchoscopy with rigid bronchoscope	Recommended
• Flexible bronchoscopy, with or without biopsy	High risk patients: Optional Others: not recommended
• Endotracheal intubation • Tympanostomy tube insertion	Not recommended
Gastrointestinal tract	
• Esophageal sclerotherapy and dilatation • ERCP in the presence of obstruction and biliary tract surgery • Surgery involving the intestinal mucosa	High risk: recommended Moderate risk: optional
• Endoscopy, with or without biopsy • Transesophageal echocardiography	High risk: optional Others: not recommended
Genito-urinary tract	
• Prostate surgery • Urethral dilatation • Cystoscopy *In the presence of infection:* • Urethral catheterization • Uterine D&C; therapeutic abortion; sterilization; insertion or removal of IUD	Recommended In case of infection, culture guided therapy (until sterilization, when possible)

• Vaginal hysterectomy • Vaginal delivery	High risk: optional Others: not recommended
• Caesarean section *In uninfected tissue:* • Urethral catheterization • Uterine D&C; therapeutic abortion; sterilization; insertion or removal of IUD	Not recommended

Antibiotic regimens

In the following, prophylactic regimens for adults are listed. For dosages in the pediatric population, please refer to the article.

Procedure and situation	**Prophylactic regimen recommended**
Dental, oral, respiratory tract and esophageal procedures	
Standard regimen	Amoxicillin 2.0 g orally one hour before procedure
Unable to take orally	Ampicillin 2.0 g IM or IV, within 30 minutes before procedure
Penicillin allergic	Clindamycin 600 mg or Azithromycin 500 mg or Clarithromycin 500 mg or for patients who have not had an immediate local or systemic reaction to a pencillin (urticaria, angioedema or anaphylaxis) and who can tolerate first generation cephalosporins: Cephalexin or Cefadroxil 2.0 g orally, 1 h before procedure
Pencillin allergic and unable to take orally	Clindamycin 600 mg IV or Cefazolin 1.0 g IM or IV (for patients who can tolerate, see above) within 30 minutes before procedure
Genitourinary and gastrointestinal (not esophageal) procedures	
High risk patients	Ampicillin 2.0 g IV or IM plus gentamycin 1.5 mg/kg (up to 120 mg) within 30 min of starting procedure followed by ampicillin 1.0 g IV/IM or amoxicillin 1 g orally 6 hours later
High risk patients allergic to ampicillin	Vancomycin 1.0 g IV over 1-2 h plus gentamycin 1.5 mg/kg IV/IM (up to 120 mg) to be completed within 30 min of starting procedure

Moderate risk patients	Amoxicillin 2.0 g orally 1 h before procedure or ampicillin 2.0 g IM/IV within 30 min of starting procedure
Moderate risk patients allergic to ampicillin	Vancomycin 1.0 g IV over 1-2 hr, to be completed within 30 min of starting procedure

It should be noted that the current recommendations do not include an erythromycin-based regimen for oral prophylaxis, because of problems with pharmacokinetics and gastro-intestinal tolerability. The authors note, however, that patients who previously used erythromycin for endocarditis prophylaxis and who tolerated it at the recommended doses can continue to do so.

Specific situations

- Patients already taking antibiotics for another reason (particularly pencillin for rheumatic fever prophylaxis) should be given an agent from a different class for endocarditis prophylaxis.
- Patients at risk for endocarditis who undergo surgical procedures involving infected tissue should have antibiotic prophylaxis directed at the most likely pathogens.
- Patients at risk for endocarditis who undergo open heart surgery should have prophylaxis directed primarily at staphylococci (with an agent appropriate to the hospital's antibiotic susceptibility pattern). Cardiac transplant recipients should probably be considered at moderate risk for endocarditis and receive prophylaxis accordingly.

Comment

As in the past, these recommendations are based not on controlled clinical trials (which are unlikely to be carried out) but on best-available evidence and consensus. Nevertheless, they are important both because of the strength of the indirect evidence upon which they are based and for medico-legal reasons (they will rapidly become standard-of-care).

The lower dose of amoxicillin and the lack of a second dose 6 hours post-procedure for oral regimens is a substantial change from the previous recommendations. The lack of an erythromycin regimen for oral procedures is another substantial change.

The exact significance of "optional" prophylaxis in some of the situations noted above is not entirely clear. Prudence will probably dictate recommending prophylaxis in most of them. As always, these recommendations are meant to be interpreted with the individual patient in mind. The article text contains much interesting and valuable material that was not summarized here; I strongly recommend reading it at least once.

August 1, 1997

References

References related to this article from the NLM's PubMed database.

Reader Comments

October 23, 1997

Letters to the editor concerning this article appeared in the October 15 issue of JAMA. These letters concern clarification of the need for prophylaxis with dermatologic procedures, traumatic lacerations and mitral valve prolapse without an audible murmur.

Date: Sat, 17 Feb
From: "Dr. Chew" <matthew@pop.jaring.my>

In the recommendations regarding urological procedures, it is not clear whether changing of long term urinary catheter requires antibiotic prophylaxis. We know that prolonged catheterization increases the chances of bacteriuria and thus, should we consider changing catheters the same as catheterizing an infected bladder?

In a recent issue of Arch. Int. Med, there is a study on whether changing urinary catheter in the elderly who are on catheter for long term results in bacteraemia. It seems that not the usual gram negative bacteria are found but coagulase negative Staphylococcus, and the authors think that the risk of bacteraemia is low. However, they suggested that antibiotic prophylaxis needs to be seriously considered if prostheses like hip prostheses are present. The authors also identified mucosal breaks as a risk factor for bacteraemia.

Another point is that replacing erythromycin with a newer macrolide may not be necessary unless the organisms present in the community are well known to be resistant to erythromycin. Switching to a newer macrolide increases the cost of antibiotic prophylaxis and this may not be a good idea in the developing world where infective endocarditis is fairly common.

> *The Archives study you mention looked at 480 blood cultures drawn during 120 catheter changes in 39 patients with indwelling urinary catheters. The authors found an incidence of bacteremia resulting from the procedure in about 4% of catheter changes. None of these bacteremias led to clinical incidents, but we do not know how many patients had valvular heart disease or prostheses. Interestingly, a significant number of the bacteremias were caused by coagulase negative staphylococci, which were not cultured from the urine, but which were often cultured from the catheter itself.*
>
> *It would certainly seem prudent to treat indwelling catheter changes as equivalent to catheterizing infected urine, particularly in the presence of a prosthetic heart valve. Whether the antibiotic regimen chosen should reflect the possibility of coagulase negative staphylococcal bacteremia is unclear to me.*
>
> *As noted in the summary, the reason erythromycin is no longer recommended is because of GI intolerance and erratic bioavailability, not because of susceptibility patterns. Thus, if it is preferable from an economic standpoint, it can still be used. --mj*

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