Chemoprophylaxis against infective endocarditis following dental surgery

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Patients with certain cardiovascular abnormalities are recognised to be at risk —and some at high risk— of developing infective endocarditis following episodes of bacteraemia. Whenever a clinically important bacteraemia is anticipated in such susceptible patients, chemoprophylaxis (use of systemic antimicrobials) is advocated. However, the effectiveness of such measures remains unclear. Patients undergoing dentisty/ oral surgery (especially extractions) experience bacteraemias (mainly viridans streptococci) lasting minutes. For susceptible patients undergoing the latter procedures, it is appropriate to sensibly educate them about the risks, ensure good dental hygiene, consider prior topical antisepsis, and be vigilant to the possible failure of chemoprophylaxis. Currently advocated chemoprophylactic guidelines are confusing and ambiguous. For patients susceptible to infective endocarditis—including those at high risk—undergoing potentially bacteraemic dental/oral surgical procedures, the recommendations in this account have been simplified. In individuals with a history of penicillin hypersensitivity or recent exposure, instead of erythromycin, the use of clindamycin (orally) or vancomycin (parenterally) is stressed.

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Introduction

Infective endocarditis (IE) is associated with substantial mortality and morbidity. The disease is perceived as largely preventable by the appropriate use of chemoprophylaxis. However, the real value of such measures remains unknown. Despite overwhelming evidence that bacteraemia follows oral/dental surgical and non-surgical procedures, whether and to what extent such episodes constitute a clinically significant risk is still debated.[1-4] In many patients with IE, no prior important, potentially bacteraemic event can be identified.[2,5] It has been surmised that such infections ensue in patients with periodontitis, in whom transient bacteraemias commonly arise following mastication and/or brushing of the teeth.[6]

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Even in association with predisposing cardiovascular lesions (Table 1), the risk of developing IE is small, and there is no proof that chemoprophylaxis is effective. Whatever current consensus exists, it is based solely on indirect (in vitro) evidence and animal experimentation, and is not founded on clinical trials in humans. In the absence of predisposing cardiovascular risk factors, prophylactic antibiotics are deemed wasteful, encourage the emergence of resistant flora, and expose patients to unnecessary side effects.

Bacteraemias resulting from dentistry or oral surgery

Dental procedures—particularly those entailing extractions (Table 2)—carry a high risk of transient bacteraemia.[2,6-8] This is due to the vast numbers of bacteria which colonise the periodontal pockets surrounding the teeth, an area equivalent to the palm of the hand.[9]

The majority of consequential bacteraemias are due to viridans group streptococci, although the actual risk of developing IE under these circumstances is difficult to ascertain. Surgery and various other elective procedures on the respiratory, gastrointestinal, and genitourinary tracts also cause important

Table 1. Cardiovascular conditions or devices rendering patients susceptible to infective endocarditis

- Most congenital heart and great vessel abnormalities, but not for ASD or ligated PDA
- Chronic rheumatic heart valve disease
- Mitral valve prolapse with regurgitation (murmur)
- **Prosthetic (tissue or synthetic) heart valves**
- **Implanted atrioventricular or ventriculo-atrial shunts***
- **Previous infective endocarditis**

Bold case denotes "high risk"

* Usually not for implanted pacemakers or defibrillators

ASD atrial septal defect

PDA patent ductus arteriosus

Table 2. Bacteraemic dental procedures warranting chemoprophylaxis

Extractions

Surgical removal of teeth or fragments

Periodontal surgery

Reimplanting avulsed teeth

Scaling and cleaning

Surgery involving mucosal flap

Cavity preparation

Implant surgery

Mucosal biopsy

Procedures which cause bleeding

Incision and/or drainage of infected tissue

Instrumentation beyond the apex of the tooth

Intraligamentary injections

Clinical judgement is paramount in deciding whether or not to give chemoprophylaxis

bacteraemias.[4] However, in many of the latter instances, predicting the organisms remains conjectural.

Ancillary precautions

Medical and dental practitioners should understand the limitations of chemoprophylaxis and appreciate the role of the following additional strategies.

Patient education and awareness

Patients with relevant cardiovascular disorders/devices deserve an explanation of their status with regard to the need for chemoprophylaxis at vulnerable times. Issue of an appropriate warning card should help reinforce patient awareness.[10] In high risk patients undergoing cardiac surgery, dentists should be part of the team responsible for pre- and post-operative management.

Appropriate dental hygiene

In susceptible patients, due attention to dental hygiene is extremely important.[11] Appropriate patient instruction, dietary advice, and regular dental examinations all have a role in minimising the need and gravity of dental procedures. Edentulous patients may also be at risk from ulceration due to ill-fitting dentures.

Prior use of topical antiseptics

Plaque (supra- and sub-gingival) is the main source of microorganisms responsible for bacteraemia during dentistry. Reductions in the number of such organisms at source can be achieved just prior to the procedure,[12] by irrigating the gingival crevice with antiseptics (e.g. 1% chlorhexidine or povidone-iodine).

Awareness of post-procedure morbidity

Even after procedures carried out under cover of appropriate chemoprophylaxis,[13,14] it appears that IE may, nevertheless, supervene (especially within the first 30 days).[1] Patients should be warned of this risk and asked to report back regarding any unexplained illness.

Recommendations for infective endocarditis chemoprophylaxis

The frequently updated detailed guidelines for chemoprophylaxis against IE[15-21] devised by various expert committees, are particularly confusing and cumbersome.[22] Commonly, they entail complex algorithms that the majority of medical and dental practitioners find difficult to remember if not comprehend. Ambiguous wording such as "not prescribed penicillin more than once in the previous month" is particularly unhelpful and confusing. Does prescribing of a single dose confer the same

constraints as a course of therapy (say, for two weeks)? The list of possibly susceptible or high risk cardiovascular conditions is long and daunting. Equally-weighted alternative drug options and routes of administration are a further area of confusion.

Under the circumstances, for patients undergoing dental work, practitioners may consider using the simplified recommendations for chemoprophylaxis against IE which are set out below, in conjunction with Tables 1 to 3 and Fig 1.

1. Patients requiring general anaesthesia (GA) are best given parenteral chemoprophylaxis.
2. Hospitalisation is advisable for high risk patients (Table 1) and those requiring GA.
3. For routine dental procedures, each antibiotic need only be given as a single dose. Bacteraemias following routine dental procedures are usually of very short duration (a few minutes), whereas the bactericidal activity of routine doses of prophylactic antibiotics endures for many hours.[6,8,23,24]
4. Parenterally, the intravenous (IV) rather than the intramuscular (IM) route is likely to be more reliable. In patients receiving anticoagulants, IM injections cause haematomas and are best avoided.
5. For patients about to undergo elective cardiac surgery, the antibiotic regime should be selected after conferring with the surgeons and microbiologists.
6. In contrast to chemoprophylaxis against IE, at present such prophylaxis is not advocated for dental procedures undertaken in patients with prosthetic joints. Prosthetic joint infections (with oral bacteria) related to dental procedures have not been authenticated, although there are anecdotal reports.[2,25]

Chemoprophylaxis at such vulnerable times aims to achieve bactericidal drug concentrations in the systemic circulation to prevent seeding and adherence in the heart/circulation and is not intended as a means of eliminating such organisms from the mouth. The rationale for adding gentamicin in high risk regimes, is to synergistically enhance antibiotic activity against relatively more resistant streptococcal strains[26,27] that might colonise such patients (possibly due to prior courses of antibiotic therapy).

For patients with a history of hypersensitivity or recent exposure to penicillins, clindamycin and vancomycin have more appropriate clinical pharmacology than erythromycin.[18,28] The main deficiencies of oral erythromycin are its uncertain bioavailability and liability to produce severe heartburn and dyspepsia. Orally administered newer macrolides (e.g. azithromycin, clarithromycin) which have superior bioavailability, are better tolerated and may prove to be more suitable alternatives.[29] Orally, the liability of clindamycin to give rise to diarrhoea (and even

Table 3. Antimicrobial chemoprophylactic dosage regimes for dental procedures

	Adult dosage		Child's dose
Amoxycillin PO	3 g	1 hr pre-procedure	< 5 years ¼ of adult dose 5-10 years ½ of of adult dose
Clindamycin PO	600 mg	1 hr pre-procedure	
Erythromycin PO	1.5 g	1-2 hr pre-procedure	
Ampicillin IV*	2 g	Immediately pre-procedure	
Gentamicin IV	120 mg	Infused over 10 min immediately pre-procedure	2 mg/kg
Vancomycin IV†	1 g	Infused over 100 min immediately pre-procedure	20 mg/kg

* Not to be mixed with gentamicin in the same solution or syringe

† Occasionally encountered "red man syndrome", hypotension, and bizarre chest/back pain may be attenuated by co-treatment with antihistamines and/or slower infusion

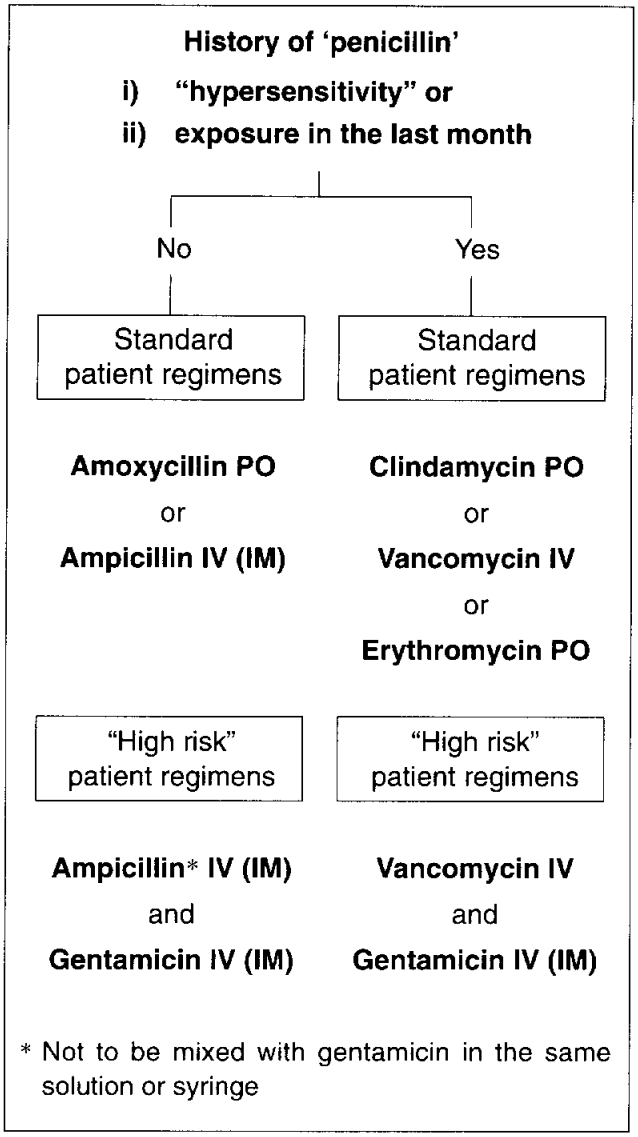

Fig 1. Selection of chemoprophylaxis during dental procedures

pseudomembranous colitis) is not an important consideration with the use of single doses. Parenterally, vancomycin is reliably bactericidal (unlike erythromycin), and its liability to induce "red man syndrome", hypotension, and chest/back pains are largely preventable by its co-administration with antihistamines and ensuring slow infusion.[30]

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