

## **ANTIBIOTIC PROPHYLAXIS IN SURGERY**

The aim of surgical prophylaxis is to reduce rates of surgical site and healthcare-associated infections and so reduce surgical morbidity (and mortality).

There is however growing evidence that aspects of prescribing practice may themselves be associated with health care associated infections, notably *C. difficile* infection.

Scottish Intercollegiate Guideline Network (SIGN) 104, Antibiotic prophylaxis in surgery<sup>1</sup>, published in July 2008, has outlined which surgical procedures require prophylactic antibiotic(s) based on a review of the available evidence. Principles of prophylaxis have also been outlined, including timing and duration of antibiotic administration. Whilst SIGN does not specify specific agents for prophylaxis they recommend that:

- Agents with appropriate spectrum of activity for the procedure are used.
- Agents are selected which exert the least ecological impact for the individual and for the wider population.

Antimicrobial Management Teams should review their local surgical prophylaxis policies in collaboration with surgical and anaesthetics colleagues to ensure that they comply with the following principles:

Surgery specific quick reference guides are available to complement SIGN 104 and may be useful for developing policies and training staff.

### **Principles of prescribing for surgical prophylaxis**

#### **1. Indication for prophylaxis**

Indication should comply with SIGN 104 guideline i.e. prophylaxis 'recommended' or 'should be considered' for a procedure.

#### **2. Choice of agent**

- Use narrow spectrum agent(s) when possible.
- Avoid cephalosporins, clindamycin, quinolones and co-amoxiclav whenever possible.
- Use appropriate alternatives for patients with penicillin/ beta-lactam allergy.

#### **3. Timing of antibiotic(s)**

Optimum timing is  $\leq 30$  minutes prior to skin incision, usually at induction of anaesthesia. Antimicrobial cover may be sub-optimal if given  $> 1$  hour prior to skin incision or post-skin incision.

Antibiotics should be administered in Theatre and given as a bolus injection where possible.

#### **4. Recording of antibiotic**

Use "once only" section of drug Kardex to avoid multiple dosing. In addition the agent used may also be recorded on the Anaesthetic Record Sheet.

#### **5. Frequency of administration**

Single dose is indicated for majority of procedures.

Reason for antibiotic administration beyond one dose should be documented and comply with criteria below:

- $> 1.5$  litre intra-operative blood loss (re-dose following fluid replacement).
- Prolonged procedure ( $> 4$  hours)
- Primary arthroplasty (Single dose is preferable but up to 24 hours prophylaxis acceptable).

#### 6. Arrangements for MRSA positive patients

Decolonisation therapy should be used prior to surgery and antimicrobial prophylaxis should include cover for MRSA. Glycopeptides or co-trimoxazole are suitable agents. Gentamicin may also be considered if local resistance rates are low.

#### 7. Complex prophylaxis issues

Complex issues in individual patients should be discussed with a Consultant Microbiologist pre-operatively.

### Restriction of cephalosporins

- Administration of even a single dose of a cephalosporin alters normal gut flora with resultant risk of *C. difficile*. Therefore where possible cephalosporins should not be used for surgical prophylaxis.
- Adding gentamicin to flucloxacillin should be considered where there is a risk of gram negative contamination of the surgical site.

Suggested alternatives to cephalosporins are:

Type of surgery	Suggested antibiotics	Alternatives for Penicillin allergy
Cardiothoracic	Flucloxacillin +/- gentamicin	Vancomycin / teicoplanin or Co-trimoxazole
ENT, maxillofacial and oral	Amoxicillin + metronidazole or Co-amoxiclav	Clarithromycin +/- metronidazole or Clindamycin
Gynaecology	Gentamicin + metronidazole	
Lower GI	Gentamicin + metronidazole	
Obstetrics	Co-amoxiclav	Clarithromycin +/- metronidazole or Clindamycin
Orthopaedic	Flucloxacillin +/- gentamicin	Vancomycin / teicoplanin or Co-trimoxazole
Thoracic	Flucloxacillin or Co-amoxiclav	Co-trimoxazole or Vancomycin / teicoplanin
Upper GI	Gentamicin	
Urology	Gentamicin	
Vascular	Flucloxacillin +/- gentamicin (+metronidazole for amputations)	Vancomycin / teicoplanin or Co-trimoxazole (+metronidazole for amputations)

### Paediatrics

The above suggested restrictions apply to adult patients. Children are at low risk of developing CDAD and changes to antibiotic regimes used for surgical prophylaxis in Paediatrics are not currently considered necessary.

### **Alternative agents for penicillin allergic patients**

- Several options have been suggested for penicillin allergic patients and the choice of agent should be based on the surgical procedure and the patient's risk factors.
- Clindamycin may be a suitable agent in patients at low risk of CDAD.
- Co-trimoxazole may be a suitable agent for MRSA cover in some patients. However it has been associated with rare but serious haematological side-effects, especially in the elderly.
- Glycopeptides should be reserved for major implant surgery where, in addition, there is penicillin allergy or high risk of MRSA.
- All alternative agents for penicillin allergy except teicoplanin require to be administered by IV infusion.

### **Gentamicin in surgical prophylaxis**

- A variety of dosage regimes have been used in surgical prophylaxis: fixed dose (range 80–160mg) or weight based dose (range 2mg/kg to 5mg/kg).
- Patients who are overweight should be dosed according to ideal body weight.
- Doses of up to 300mg can be given as a bolus injection over 3-5 minutes but it is recommended that higher doses are administered as a short infusion.
- A single dose of gentamicin will provide cover for 8 hours in patients with normal renal function and will not result in toxicity even in patients with impaired renal function.
- A second dose of gentamicin may be given in situations of high blood loss or a prolonged procedure.

### **Glycopeptides in surgical prophylaxis**

- In patients with or at high risk of MRSA, glycopeptides such as vancomycin or teicoplanin are recommended in place of a betalactam.
- Glycopeptides may also be used as prophylaxis in penicillin allergic patients in major implant surgery.
- Vancomycin may be less expensive than teicoplanin but administration is more complex.
- Vancomycin requires to be administered as an infusion therefore needs to be prepared and administration started by ward staff approximately 2 hours prior to the planned operating time.
- Teicoplanin has the advantage of being administered as a bolus injection and can be prepared and given in Theatre.
- Local policies should specify which agent is preferred and surgical teams must ensure that if vancomycin is used staff are aware of the requirements for preparation and administration.

### **Post operative infection**

Follow local Antimicrobial Prescribing Policy.

### **References**

1. [www.sign.ac.uk/guidelines/fulltext/104/index.html](http://www.sign.ac.uk/guidelines/fulltext/104/index.html)