Antibiotic Prophylaxis in Open Fractures

BACKGROUND

Open fractures are high energy injuries with an increased risk of infection due to potential exposure of bone and deep tissue to a variety of environmental debris. Infection can lead to serious complications including nonunion of wounds and osteomyelitis.

DEFINITIONS

The Gustilo-Anderson classification system is the most commonly used grading system for open fractures. Fractures are designated as one of three types based on wound size, soft tissue involvement, contamination, and fracture pattern.

Table 1: Gustilo-Anderson Classification System

Type I fracture	Open fracture with clean wound <1 cm long
Type II fracture	Open fracture with laceration >1 cm long without extensive soft tissue damage
Type III fracture	Open segmental fracture, open fracture with extensive soft tissue damage, or traumatic amputation

BETA-LACTAM ALLERGY MANAGEMENT: Cefazolin is a safe option in patients with documented penicillin allergies due to its unique structural characteristics. Cross reactivity between PCN and advanced generation cephalosporins is also very rare. These agents (ceftriaxone) are generally considered safe for patients with distant (>10 years) or non-severe reactions to PCN. Patients who report a rash only or have previously tolerated cephalosporins of any kind may safely be given the agents listed in this guideline.

USE OF METRONIDAZOLE WITH ALCOHOL: The CDC no longer recommends avoiding alcohol when taking metronidazole. Current evidence doesn't support that metronidazole use with alcohol results in vomiting (a disulfram-like reaction). It does not inhibit liver aldehyde dehydrogenase nor does its use with alcohol increase levels of acetaldehyde. Thus, metronidazole is considered safe to use in patients who have recently used alcohol or are intoxicated.

RECOMMENDATIONS

<u>Type I and II Fractures</u>

- Preferred: Cefazolin 2 g (3 g if > 120 kg) IV q8h
- Severe cephalosporin allergy: Clindamycin 900 mg IV q8h
- Known MRSA colonization: Add vancomycin 15 mg/kg IV q12h
- Duration of prophylaxis: 24 hours

Type III Fractures

- No gross contamination:
  - Preferred: Ceftriaxone 2g IV q24h
  - Severe cephalosporin allergy: levofloxacin 500 mg IV q24h
  - Known MRSA colonization: Add vancomycin 15 mg/kg IV q12h
  - Duration of prophylaxis: 48 hours or 24 hours after wound closure, whichever is shorter

- Contamination with soil or fecal material:
  - Preferred: Ceftriaxone 2 g IV q24h + metronidazole 500 mg IV q8h
  - Severe Cephalosporin allergy: Levofloxacin 500 mg IV q24h + metronidazole 500 mg IV q8h
  - Known MRSA colonization: Add vancomycin 15 mg/kg IV q12h
  - Duration: 48 hours after wound closure
  - **Consider orthopedic infectious diseases consult**

- Contamination with standing water:
  - Preferred: Piperacillin/tazobactam 4.5 g IV q8h over 4 hours
  - Penicillin allergy: Levofloxacin 500 mg IV q24h + metronidazole 500 mg IV q8h
  - Known MRSA colonization: Add vancomycin 15 mg/kg IV q12h
  - Duration: 48 hours after wound closure
  - **Consider orthopedic infectious diseases consult**

Guidance Summary

<table>
<tr><th></th><th>Preferred Therapy</th><th>Severe cephalosporin allergy</th><th>Duration</th></tr>
<tr><td>Type 1 and 2 Fracture</td><td>Cefazolin 2g q8h</td><td>Clindamycin 900mg q8h</td><td>24 hours</td></tr>
<tr><td>Type 3 Fracture</td><td>Ceftriaxone 2g q24h</td><td>Levofloxacin 500mg IV q24h</td><td rowspan="3">48 hours or 24 hours after wound closure (whichever is shorter)</td></tr>
<tr><td>Type 3 Fracture Contaminated with Soil or Fecal Material</td><td>Ceftriaxone 2g q24h PLUS Metronidazole 500mg IV q8h</td><td>Levofloxacin 500mg IV q24h PLUS Metronidazole 500mg IV q8h</td></tr>
<tr><td>Type 3 Fracture with Standing Water Exposure</td><td>Piperacillin/tazobactam 4.5g q8h over 4hours</td><td>Penicillin Allergy: Levofloxacin 500mg IV q24h PLUS Metronidazole 500mg IV q8h</td></tr>
<tr><td>Known MRSA Colonization</td><td colspan="3">Add vancomycin 15 mg/kg q12h</td></tr>
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