Antibiotic prophylaxis for Open Fractures

An open (compound) fracture is a fracture with an open wound in the area (even if bone is not visibly protruding). These are often associated with high-energy trauma, and are at increased risk of infection due to surrounding tissue injury and introduction of skin and environmental organisms into the fracture site.

The management of open fractures is focused on preventing infection (through appropriate cleaning of contaminated wound/tissue/bone), antimicrobial prophylaxis, and bone stabilization.

Because the infection risk is dependent on the degree of damage to bone and soft tissues, the choice and duration of antibiotic prophylaxis are based on the classification of open fractures.

CLASSIFICATION OF OPEN FRACTURES

Modified Gustilo-Anderson Grading system

Grade	Description
I	wound < 1 cm, simple fracture pattern, no skin crushing
II	wound 1-10 cm; simple fracture pattern; moderate tissue injury
III A	Wound > 10cm, extensive soft tissue damage but adequate soft-tissue coverage of bone
III B	Wound > 10 cm, extensive soft tissue damage with bone exposure (inadequate soft tissue coverage) or major wound contamination
III C	Wound associated with extensive soft tissue damage with arterial injury requiring repair; concerns for limb preservation

From Samai and Villela (2018) which was adapted from Gustilo and Anderson (1976) and Gustilo, Mendoza and Williams (1984)

ORGANISMS

Gustilo Type I and II: Gram-positive cocci (skin flora):
Gustilo Type III: Gram-positive cocci (skin flora); gram-negatives +/- soil organisms including anaerobes (e.g. *Clostridium sp)*

Timing of treatment initiation: as soon as possible, ideally within 1h of presentation. Delay in administration of antibiotics is associated with poorer outcomes.

Duration of treatment: There is no clear benefit in prolonging prophylactic antibiotics for more than 72h after injury, or 24h after wound closure (whichever comes first)

Open fracture type	Recommended antibiotic prophylaxis *to start as soon as possible, ideally < 1 hour after presentation
Gustilo type I and II	**Cefazolin**[1] 2 g IV q8h x 24h *If known MRSA carrier or previous MRSA infection*: **Cefazolin**[1] 2 g IV q8h x 24h ***AND*** **Vancomycin**[2] 15 mg/kg IV (max 2 g) q12h x 24h *If severe hypersensitivity reaction to cephalosporins*: **Vancomycin**[2] 15 mg/kg IV (max 2 g) q12h x 24h
Gustilo type III	**Ceftriaxone** 2 g IV q24h for up to 24h after wound closure or 72h *(whichever comes first)* *If known MRSA carrier or previous MRSA infection:* **Ceftriaxone** 2 g IV q24h **AND** **Vancomycin**[2] 15 mg/kg IV (max 2 g) q12h x 24h after wound closure or 72h *(whichever comes first)* *If severe hypersensitivity reaction to cephalosporins*: **Vancomycin**[2] 15 mg/kg IV (max 2 g) q12h **AND** **Tobramycin3** 5 mg/kg IV (max 400 mg) q24h for up to 24h after wound closure or 72h *(whichever comes first)*
Soil contamination **Fecal contamination** **Impaired vascularization**	**Ceftriaxone** 2 g IV q24h **AND** **Penicillin**[4] **G** 4 million units IV q4h for up to 24h after wound closure or 72h *(whichever comes first)* *If severe hypersensitivity reaction to all beta-lactam antibiotics*: **Vancomycin**[2] 15 mg/kg IV (max 2 g) q12h **AND** **Tobramycin**[3] 5 mg/kg IV (max 400 mg) q24h for up to 24h after wound closure or 72h *(whichever comes first)*
Water contamination (e.g. water sports)	**Piperacillin-tazobactam**[5] 4.5 g IV q6h for up to 24h after wound closure or 72h *(whichever comes first)* *If severe hypersensitivity reaction to penicillin antibiotics*: **Vancomycin**[2] 15 mg/kg IV (max 2 g) q12h **AND** **Tobramycin**[3] 5 mg/kg IV (max 400 mg) q24h for up to 24h after wound closure or 72h *(whichever comes first)*

[1]Cefazolin: If weight > 120 kg, increase dose to 3 g IV; cefazolin can be safely given if allergy only to penicillins; if CrCl 10-30 mL/min, give q12h instead of q8h; if CrCl <10 mL/min: 1 g IV q24h
[2]Vancomycin: If CrCl < 30 mL/min, give q24h instead of q12h; therapeutic drug monitoring not needed if only x 24h
[3]Tobramycin: If CrCl < 60 mL/min, decrease dose to 2 mg/kg IV; therapeutic drug monitoring not needed if only x 24h
[4]Penicillin: If CrCl 10-50 mL/min: decrease dose to 3 million units; If CrCl < 10 mL/min decrease dose to 2 million units
[5]Piperacillin-tazobactam: If CrCl 20-40 mL/min: 4.5 g IV q8h; CrCl < 20 mL/min: 2.25 g IV q6h; hemodialysis: 2.25 g IV q8h

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