Managment of Open Pediatric Orthopedic Fractures

Purpose:

To provide guidance on the management of open orthopedic fractures in pediatric trauma patients.

Background/definitions:

An open fracture is a fracture in which there is an open wound or break in the skin near the site of the broken bone. Most often, this wound is caused by a fragment of bone breaking through the skin at the time of injury. The fractured bone is exposed to contamination from the external environment and is susceptible to infection.

Guideline Inclusion Criteria:

- Injured children and adolescents 18 years and younger with confirmed or suspected open fractures.

Guideline Exclusion Criteria:

- Injured patients >18 years old.

Practice Recommendations for Management:

1. Orthopedic surgery should be consulted on all open pediatric orthopedic fractures.
2. Classification is made according to the Gustillo classification of open fractures. This classification is made at the time of operative debridement.
    - Type I: open fracture with wound <1cm long; clean
    - Type II: open fracture with wound >1cm long; soft tissue damage, avulsions, tissue flap, minimal to moderate contamination
    - Type III: extensive soft tissue damage, open segmental fracture; significant contamination.
        - Type IIIA: soft tissue coverage is adequate (primary closure/delayed primary closure or skin graft)
        - Type IIIB: periosteal stripping, bone exposure, massive contamination; will require either rotational flap or free flap for

coverage
    - Type IIIC: open fracture with arterial injury requiring repair to salvage limb
3. Antibiotics should be initiated within 60 minutes of patient arrival:
    - Type I and II:
        - Preferred: Cefazolin 30 mg/kg IV now and q8hr x 3 total doses (not to exceed 2000mg/dose)
        - Severe cephalosporin allergy: Clindamycin 10mg/kg IV now and q8hr x 3 doses (not to exceed 900 mg/dose)
        - Known MRSA colonization: add vancomycin 15mg/kg IV q12hr
        - Duration of prophylaxis: 24 hours
    - Type III
        - No gross contamination:
            - Preferred: Cefazolin 30 mg/kg IV now and q8hr x 3 total doses (not to exceed 2000mg/dose)
            - Severe cephalosporin allergy: Clindamycin 10mg/kg IV now and q8hr x 3 doses (not to exceed 900 mg/dose)
            - Known MRSA colonization: add vancomycin 15mg/kg IV q12hr
            - Duration of prophylaxis: 48 hours or 24 hours after wound closure, whichever is shorter
        - Contamination with soil or fecal material
            - Preferred: ceftriaxone 75mg/kg IV now and q24hr (not to exceed 2000mg/dose) **AND** metronidazole 15mg/kg IV now and q8hr (not to exceed 500 mg/dose)
            - Severe cephalosporin allergy: Clindamycin 10mg/kg IV now and q8hr (not to exceed 900 mg/dose)
            - Known MRSA colonization: add vancomycin 15mg/kg IV q12hr
            - Duration of prophylaxis: 48 hours after wound closure
            - Consider orthopedic infectious disease consult
        - Contamination with standing water:
            - a. Preferred: Piperacillin/tazobactam 100mg/kg IV q8hr over 4 hours (not to exceed 4.5g IV)
            - b. Penicillin allergy: Clindamycin 10mg/kg IV now and q8hr (not to exceed 900 mg/dose) **AND** metronidazole 15mg/kg IV now and q8hr (not to exceed 500 mg/dose)
            - c. Known MRSA colonization: add vancomycin 15mg/kg IV q12hr
            - d. Duration of prophylaxis: 48 hours after wound closure
            - e. Consider orthopedic infectious disease consult
    - Variances in dosing within 5mg/kg are acceptable based upon dosage rounding in Pharmacy.
    - If there are any drug-related questions (drug choice, dosing, allergies, alternative options), discuss with pharmacy.

4. Tetanus toxoid should be administered if the patient had an incomplete immunization, if it has been >1- years since the last booster, or if immunization history is unknown or unclear. Tetanus immunoglobulin should be administered if patient has never been immunized and present with wound that is felt to be tetanus prone.
5. Patients with open fractures should be taken to the operating room for irrigation and debridement within 24 hours of initial presentation whenever possible. Patients with severe fractures associated with gross wound contamination should be brought to the operating room as soon as clinically feasible based on the patient's condition and resources available. All patients will receive an initial bedside irrigation with removal of obvious foreign contamination and application of clean dressings to wounds in the emergency department.
6. Whenever possible, skin defects overlying open fractures should be closed at the time of in initial debridement in the operating room.
7. Soft tissue coverage should be completed within seven days of injury whenever possible for open fractures associated with wounds requiring skin grafting or soft tissue transfers.
8. Skeletally mature patients between 14 and 18 years of age may follow the adult open fracture protocol (PRO 12 Management of Open Fractures).

Outcome Measures and Guideline Adherence:

- Orthopedic response times for urgent consults, time to antibiotic administration, time to OR for debridement and time to wound coverage for open fractures will be monitored through the pediatric trauma performance improvement process.

Related Policies:

- PRO 12 Management of Open Fractures
- Antibiotic Prophylaxis in Open Fractures

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References:

1. Davis M, Della Rocca G, Brenner M, et al. (2022) ACS TQIP Best Practices in the Management of Orthopedic Trauma. Best Practices in the Management of Orthopedic Trauma | ACS TQIP (facs.org)

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