World Health Organization

Department of Violence and Injury Prevention and Disability
World Health Organization

Prevention and management of wound infection

Guidance from WHO's Department of Violence and Injury Prevention and Disability and the Department of Essential Health Technologies

Introduction

Open injuries have a potential for serious bacterial wound infections, including gas gangrene and tetanus, and these in turn may lead to long term disabilities, chronic wound or bone infection, and death. Wound infection is particularly of concern when injured patients present late for definitive care, or in disasters where large numbers of injured survivors exceed available trauma care capacity. Appropriate management of injuries is important to reduce the likelihood of wound infections. The following core principles and protocols provide guidance for appropriate prevention and management of infected wounds.

Core Principles

- **Never close infected wounds**[1]. Systematically perform wound toilet and surgical debridement (described in Protocol 1 given below). Continue the cycle of surgical debridement and saline irrigation until the wound is completely clean.
- **Do not close contaminated wounds**[2] **and clean wounds that are more than six hours old**. Manage these with surgical toilet, leave open and then close 48 hours later. This is known as **delayed primary closure**.
- **To prevent wound infection**:
    - Restore breathing and blood circulation as soon as possible after injury.
    - Warm the victim and at the earliest opportunity provide high-energy nutrition and pain relief.
    - Do not use tourniquets.
    - Perform wound toilet and debridement as soon as possible (within 8 hours if possible).
    - Respect universal precautions to avoid transmission of infection.
    - Give antibiotic prophylaxis to victims with deep wounds and other indications (described in Protocol 3).
- **Antibiotics do not reach the source of the wound infection**. Antibiotics only reach the area around the wound; they are necessary but not sufficient and need to be combined with appropriate debridement and wound toilet as described above.
- **Use of topical antibiotics and washing wounds with antibiotic solutions are not recommended**.

1. An ***infected wound*** is a wound with pus present.
2. A ***contaminated wound*** is a wound containing foreign or infected material.

Protocols

Protocol 1: Wound toilet and surgical debridement

Apply one of these two antiseptics to the wound:

- ***Polyvidone-iodine 10%*** solution apply undiluted twice daily.
  The application to large open wounds may produce systemic adverse effects.
- ***Cetrimide 15% + chlorhexidine gluconate 1.5%***

Note: The freshly prepared aqueous solution (0.05%) of ***Chlorhexidine gluconate 5%*** is not recommended in emergency situations (risk of flakes according to water quality)

1. **Wash the wound** with large quantities of soap and boiled water for 10 minutes, and then irrigate the wound with saline.
2. **Debridement**: mechanically remove dirt particles and other foreign matter from the wound and use surgical techniques to cut away damaged and dead tissue. Dead tissue does not bleed when cut. Irrigate the wound again. If a local anaesthetic is needed, use 1% ***lidocaine*** without epinephrine.
3. **Leave the wound open**. Pack it lightly with damp saline disinfected or clean gauze and cover the packed wound with dry dressing. Change the packing and dressing at least daily.

Protocol 2: Management of tetanus-prone wounds

1. Wounds are considered to be tetanus-prone if they are sustained either more than 6 hours before surgical treatment of the wound or at any interval after injury and show one or more of the following: a puncture-type wound, a significant degree of devitalized tissue, clinical evidence of sepsis, contamination with soil/manure likely to contain tetanus organisms, burns, frostbite, and high velocity missile injuries.
2. For patients with tetanus-prone injuries, WHO recommends TT or Td and TIG.
3. When tetanus vaccine and tetanus immunoglobulin are administered at the same time, they should be administered using separate syringes and separates sites.

Tetanus vaccine

ADULT and CHILDREN over 10 years:

- ***Active immunization with tetanus toxoid (TT) or with tetanus and diphtheria vaccine (Td)***

  1 dose (0.5 ml) by intramuscular or deep subcutaneous injection. Follow up: 6weeks, 6 months.

CHILDREN under 10 years:

Diphtheria and tetanus vaccine **(DT)**
0.5 ml by intramuscular or deep subcutaneous injection. Follow up at least 4 weeks and 8 weeks.

Tetanus immune globulin (TIG)

In addition to wound toilet and absorbed tetanus vaccine. Also consider if antibacterial prophylaxis (Protocol 3 below) is indicated.

ADULT and CHILD

- ***Tetanus immunoglobulin (human)*** 500 units/vial
  250 units by intramuscular injection, increased to 500 units if any of the following conditions apply: wound older than 12 hours; presence, or risk of, heavy contamination; or if patient weights more than 90 kg.

Note: national recommendations may vary

Protocol 3: Antibiotic prophylaxis and treatment

Antibiotic prophylaxis

Antibiotic prophylaxis is indicated in situations or wounds at high risk to become infected such as: contaminated wounds, penetrating wounds, abdominal trauma, compound fractures, lacerations greater than 5 cm, wounds with devitalized tissue, high risk anatomical sites such as hand or foot. etc. These indications apply for injuries which may or may not require surgical intervention. For injuries requiring surgical intervention, antibiotic prophylaxis is also indicated and should be administered prior to surgery, within the 2 hour period before the skin is cut.

Recommended prophylaxis consists of penicillin G and metronidazole given once (more than once if the surgical procedure is > 6 hours).

- ***Penicillin G*** ADULT: IV 8-12 million IU once. CHILD: IV 200,000 IU/kg once.
- ***Metronidazole*** ADULT: IV 1,500 mg once (infused over 30 min). CHILD: IV 20 mg/kg once.

Antibiotic treatment

If infection is present or likely, administer antibiotics via intravenous and not intramuscular route.

Penicillin G and metronidazole for 5-7 days provide good coverage.

- ***Penicillin G*** ADULT: IV 1 - 5 MIU every 6 hours.
  After 2 days it is possible to use oral Penicillin: Penicillin V 2 tablets every 6 hours.
  CHILD: IV 100mg/kg daily divided doses (with higher doses in severe infections),
  In case of known allergy to penicillin use erythromycin.

  In case of sudden allergy reaction (seldom):
  IM adrenaline 0.5 - 1.0 mg to adults. 0.1 mg/ 10 kg body weight to children.

- ***Metronidazole*** ADULT: IV 500 mg every 8 hours (infused over 20 minutes).
  CHILD: IV 7.5 mg/kg every 8 hours.