

Wound infection

Physiology

Wound infection results from bacterial contamination of the wound. Infection rate is proportionate to:

- Number of bacteria;
- Type of bacteria;
- Incisions involving mucus surfaces;
- Sites of existing infection in the body;
- The use of prosthetic implants.

Sources of bacteria:

1. Endogenous from the patient's viscera (98 per cent);
2. Endogenous from the patient's skin;
3. Exogenous sources (see below)

Note

- Nosocomial infections are acquired in hospital
- Community-acquired infections are acquired outside hospital

Sources of infection include the following.

- **Patient's own body flora:**
 - Failure of correct aseptic technique;
 - Contaminated surgery.
- **Indirect contact:**
 - Contact from hands of doctors, nursing staff, patients, visitors;
 - Contaminated surfaces, e.g. door handles, cups.
- **Direct inoculation:**
 - Surgeon or environmental flora through failure of aseptic technique;
 - Contaminated instruments or dressings;
 - Colonization of indwelling drains, catheters, IV lines.
- **Airborne contamination:**
 - Skin and clothing of staff, patients, and visitors;
 - Air flow in operating theatre or ward.
- **Haematogenous spread:**
 - IV and intraarterial lines;
 - Contaminated infusions;
 - Sepsis at other anatomical sites.
- **Food- and water-borne.**
- **Faecal-oral.**
- **Insect-borne.**

Risk groups for wound infection

The incidence of wound infection after surgical operations is related to the type of operation.

The common classification of risk groups is as follows:

- 1) **Clean** (e.g. hernia, thyroid, and breast mastectomy): an uninfected operative wound without inflammation and where no viscera are opened. Infection rate is 1% or less.
- 2) **Clean contaminated**, where a viscus is opened under controlled circumstances & with little or no spillage. Infection rate is less than 10%.
- 3) **Contaminated**, where there is obvious spillage or obvious inflammatory disease e.g. gangrenous appendix. Infection rate is 15-20%.
- 4) **Dirty or infected**. Gunshot wound with devitalized tissue or in the presence of frank pus or gross soiling e.g. perforated large bowel. Infection rate is up to 40%.

Factors affecting the occurrence of wound infection can be classified into:

- 1) Preoperative factors.
- 2) Operative factors
- 3) Postoperative factors.

- **Preoperative factors**

Local factors include pre-existing infection e.g. perforated appendix or an infected compound fracture. General factors include being a nasal carrier of staphylococcus or having a skin infection e.g. crop of boils as well as malnourishment and immunosuppression.

- **Operative factors**

These are lapses in theatre techniques e.g. failure of adequate sterilization of instruments, the surgeon's hands or dressings. There may be skin or nasal carriers of staphylococci among the nursing and surgical staff.

Wound infections are especially common when the alimentary, biliary or urinary tract is opened during surgery, allowing bacterial contamination to occur. Wounds placed in poorly vascularized tissue such as an amputation stump are also prone to infection in particular gas gangrene from anaerobic clostridial contamination, since necrotic tissue is a good medium for bacterial growth.

- **Postoperative factors:**

- 1) Cross infection from elsewhere on the patient's body or from other infected cases in the ward during dressing changes or wound inspection.
- 2) New infection due to contamination of the wound from the nose or hands of the surgical or nursing staff.

The risk factors for wound infection can also be Classified as:

- **General:**
 - Age;
 - Malnutrition;
 - Immunosuppression, including steroid therapy, chemotherapy;
 - Endocrine and metabolic disorders, e.g. diabetes, jaundice, uraemia;
 - Malignancy;
 - Obesity;
 - Hypoxia and anaemia.
- **Local:**
 - Type of surgery;
 - Lengthy procedures;
 - Presence of necrotic tissue;
 - Presence of residual local malignancy;
 - Presence of foreign bodies including prosthetic implants;
 - Presence of ischaemia;
 - Presence of Haematoma.
- **Microbiology:**
 - lack of antibiotic prophylaxis;
 - type and virulence or organism;
 - Size of inoculate.

Common types of infection**Wound abscess**

A wound abscess presents all the clinical features of acute inflammation: calor(heat), rubor (redness), dolor (pain)and tumour(swelling),to which can be added functio leasa (loss of function). Pyogenic organisms, predominantly Staphylococcus aureus, cause tissue necrosis and suppuration. Pus is also composed of dead and dying white blood cells which release damaging cytokines, oxygen-free radicals and other molecules. An abscess is surrounded by an acute inflammatory response, and a pyogenic membrane composed of fibrinous exudate and oedema, and the cells of acute inflammation. Granulation tissue (macrophages, angiogenesis and fibroblasts) forms later around the suppuration and leads to collagen deposition. If excessive or partly sterilised by antibiotics (antibioma), a chronic abscess may result.

Cellulitis and lymphangitis

This is the nonsuppurative invasive infection of tissues. In addition to the cardinal signs of inflammation, there is poor localisation. Spreading infection is typical of organisms such as Beta-haemolytic streptococci , staphylococci and C. perfringens. Tissue destruction and ulceration may follow, caused by release of streptokinase, hyauronidase and other proteases.

Lymphangitis is caused by similar processes but presents as painful red streaks in affected lymphatics.

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