Surgical Site Infections (SSI)

Definition

Surgical Site Infection (SSI) is defined by the US Centers for Disease Control and Prevention (CDC) as an infection that occurs after surgery in the part of the body where the surgery took place. The incidence is approximately 1% to 3%, typically occurring within 30 days after surgery.

Nomenclature

The process of **pus** formation, called **suppuration**, occurs when the agent that provoked the inflammation is difficult to eliminate. Pus consists mostly of dead and dying neutrophils and bacteria, cellular debris, and fluid leaked from blood vessels. Suppuration is commonly caused by **pyogenic** (pus-producing) bacteria, such as Staphylococcus and Streptococcus, leading to the formation of an abscess.

Types of Surgical Site Infections (SSI)

The CDC describes three types of surgical site infections:

1. Superficial Incisional SSI (Minor):Limited to the area of the skin where the incision was made, e.g., Cellulitis, Lymphangitis.

2. Deep Incisional SSI (Major): Occurs beneath the incision area, affecting muscle and surrounding tissues.

3. Organ or Space SSI:Infection in any area of the body other than skin, muscle, and surrounding tissue involved in the surgery, including body organs or spaces between organs.

Signs and Symptoms

Non-specific signs include redness, delayed healing, fever, pain, tenderness, warmth, or swelling. **Specific signs** depend on the type of SSI:

- Superficial Incisional SSI may produce Pus discharge without excessive discomfort.

- Deep Incisional SSI: wound site reopening or Significant pus discharge May require spontaneous drainage or a secondary procedure.

- Organ or Space SSI may exhibit pus discharge from a drain.

Bacteria Causes of Surgical Site Infections

1. Streptococci:

   - β-haemolytic Streptococcus (Group A), Streptococcus faecalis

2. Staphylococci:

   - Staphylococcus aureus, Staphylococcus epidermidis.

3. Clostridia:

   - Clostridium perfringens, Clostridium tetani, Clostridium difficile.

4. Aerobic Gram-negative Bacilli:

   - Escherichia coli, Klebsiella spp., Proteus, Pseudomonas spp.

5. Bacteroides: Bacteroides fragilis.

Classification of Sources of Infection

1. Endogenous: Present in or on the host, e.g., SSSI following contamination from a perforated appendix.
2. Exogenous: Acquired from a source outside the body, such as the operating theatre or the ward. This includes the cause of hospital-acquired infection (HAI).

Decisive Period

The critical 4-hour window post-tissue breach, whether from trauma or surgery, before bacterial growth becomes established enough to cause infection.

Surgical Wound Classification

- Clean: No inflammation, sterile technique maintained, and no entry into respiratory, alimentary, or genitourinary tracts.

- Clean-Contaminated: Entry into tracts under controlled conditions but with no contamination.

- Contaminated:Major break in sterile technique or gross spillage, or acute non-purulent inflammation.

- Dirty or Infected:Perforated viscera, delayed treatment, faecal contamination, or presence of devitalized tissue.

Risk Factors for SSIs

May indicate antibiotic prophylaxis in some cases:

- Surgery lasting more than 2 hours.

- Prosthetic implant surgery.

- Emergency surgery.

- Abdominal surgery.

- Medical problems (diabetes, cancer, immunocompromised).

- Elderly adults.

- Overweight.

- Smoking.

Treatment

1. Isolation of Causative Microorganism: Culture-derived antibiotic treatment.

2. Drainage of Abscess and Debridement: Removal of devitalized tissue.

3. Proper Wound Dressing and Local Care.

4. Improving Patient General Conditions and Nutritional Support.

Skin and Soft-Tissue Infections

Skin and soft-tissue infections can be **necrotising or non-necrotising, localised or spreading**.

non-necrotising infections usually respond to broad-spectrum antibiotics. necrotising infections need surgical debridement as well as antibiotic therapy. Spreading necrotising soft-tissue infection constitutes a life-threatening surgical emergency.

Specific Infections:

1. **Impetigo:** Superficial skin infection affecting children. Characterized by blisters forming a honey-colored crust.

- Treatment: Topical antistaphylococcal treatments, oral antibiotics if streptococcal infection present.

2. **Erysipelas:** Streptococcal infection of superficial lymphatics. Manifests as Sharply demarcated erythematous and edematous areas on the face.

- Treatment: Prompt administration of broad-spectrum antibiotics.

3. **Cellulitis/Lymphangitis:**

- Cellulitis: Acute bacterial infection causing inflammation of the deep dermis and surrounding subcutaneous tissue. Beta-hemolytic streptococci and methicillin-sensitive Staphylococcus aureus are common causative agents.Characterized by an expanding, painful, erythematous, and edematous tissue more generalized than erysipelas.

- Lymphangitis: Inflammation of lymphatic channels resulting from infection at a distal site, manifesting as red streaks on the skin.

- Treatment: Broad-spectrum intravenous antibiotics, elevation of affected extremity.

4. **Necrotizing Fasciitis(Synergistic Spreading Gangrene):** Polymicrobial infection with rapid progression.

- Clinical signs: extensive edema, woody-hard texture, pain, crepitus. The fnger

test (A gentle, probing manoeuvre If the tissues dissect with minimal resistance, the fnger test is positive)On some occasions, a dishwater-coloured fuid is noticed seeping from the wound. Abdominal wall infections are known as Meleney's synergistic gangrene and scrotal infections as Fournier's gangrene

- Urgent treatment: fluid resuscitation, high-dose antibiotics, surgical debridement.

5. **Purpura Fulminans:**

- Rare condition with intravascular thrombosis often secondary to acute bacterial (Neisseria meningitidis) or viral (varicella) infections, especially in children.

- Types: acute infectious, neonatal, idiopathic.

- Urgent medical attention required: antibiotics, fluid resuscitation, and surgical intervention.

6. **Gas Gangrene:**

- Caused by Clostridium perfringens.

- Presents with severe pain, crepitus, gas, and distinctive smell.

- Early intervention crucial: high-dose intravenous penicillin, aggressive debridement.

Systemic Inflammatory Response Syndrome (SIRS)

- A systemic manifestation of sepsis.

Definitions of SIRS and Sepsis: Presence of two out of three criteria.

- Hyperthermia (>38°C) or hypothermia (<36°C)
- Tachycardia (>90/min, no β-blockers) tachypnoea (>20/min)
- White cell count >12 × 10^9/litre or <4 × 10^9/litre.

- Sepsis: SIRS with a documented source of infection.

Sepsis Bundle

A combination of evidence-based objectives to be completed within 6 hours for patients with severe sepsis, septic shock, and/or lactate >4 mmol/L.

Sepsis Six

A bundle of medical therapies designed to reduce mortality in sepsis patients:

1. Intravenous fluid challenge.

2. Intravenous antibiotics.

3. Oxygen and monitor urine output.

4. Blood cultures.

5. Full blood count.

6. Lactate measurement.

Universal Precautions

- For surgeons treating infected or 'at-risk' patients to have hepatitis, HIV infection

- Particularly important with splashing/aerosol formation and power tools.

CDC's Universal Precautions:

- Full-face mask or protective spectacles.

- Waterproof, disposable gowns and drapes.

- Boots (no clogs) for injury prevention.

- Double gloving.

- Limited personnel in theatre.

- Minimal movement in theatre.

- Respect for sharps.

- Meticulous operative technique.