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Introductory Chapter: Surgical Site Infections - A Quick Glance

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1. Surgical site infections

Surgical site infections (SSIs) are infections of the incision or organ space that occur after surgery [1].

Thus, infections that occur in the wound created by an invasive surgical procedure are generally referred to as surgical site infections (SSIs). SSIs are one of the most important causes of healthcare-associated infections (HCAs).

The United States Centers for Disease Control and Prevention (CDC) has developed a definition for SSI as an “infection related to an operative procedure that occurs at or near the surgical incision within 30 days of the procedure or within 90 days if prosthetic material is implanted at surgery.” This CDC definition thus describes three levels of SSI [2]:

- *Superficial incisional*, affecting the skin and subcutaneous tissue. These infections might show localized signs such as redness, pain, heat, or swelling at the site of the incision or by the drainage of pus.
- *Deep incisional*, affecting the fascial and muscle layers. These infections can be detected by the presence of pus or an abscess, fever with tenderness of the wound, or a separation of the edges of the incision exposing the deeper tissues.
- *Organ or space infection*, which involves any part other than the incision that is opened or manipulated during the surgical procedure, for example, a joint or the peritoneum. These infections can be suspected by the drainage of pus or the formation of an abscess detected by histopathological or radiological examination or during re-operation.

The endogenous bacteria on a patient's skin are believed to be the main source of pathogens that contribute to surgical site infection [3]. To help prevent SSI, preoperative surgical site skin preparation standard of care entails scrubbing or applying alcohol-based preparations containing antiseptic agents prior to incision, most commonly chlorhexidine gluconate or iodine solutions. These agents have an excellent action against a wide range of bacteria, fungi, and viruses.

Assessment of risk factors for developing SSI can be generally grouped by patient, wound, and procedural variables.

Patient variables that increase risk of SSI include:

- Very young or very old age
- Diabetes

- Smoking
- Steroid use
- Immune compromised patients
- Colonized or infected remote body site
- Obesity
- Malnutrition
- Length of preoperative stay
- Wound contamination

Procedural variables that can affect the risk for SSI include factors related to preoperative skin preparation, sterilization protocols, and the surgery itself such as:

- Antimicrobial prophylaxis
- Duration of surgical scrub
- Preoperative hair removal
- Skin antisepsis protocol
- Choice of preoperative skin preparation
- Operating room ventilation
- Wound class
- Sterilization of instruments and environment
- Foreign matter in the surgical site
- Surgical techniques
- Duration of surgery

In 2016, the World Health Organization (WHO) published global guidelines for the prevention of surgical site infection which are evidence-based and present additional information in support of actions to improve practice [4].

Strong guideline recommendations by the WHO include:

- Patients with documented nasal carriage of *Staphylococcus aureus* should be decolonized by intranasal applications of mupirocin 2% ointment with or without chlorhexidine gluconate (CHG) body wash.
- Mechanical bowel preparation alone should NOT be used in adult patients undergoing elective colorectal surgery (without the administration of oral antibiotics).

- Hair should NOT be shaved whether before surgery or in the operating room. If absolutely necessary, hair should only be removed with a clipper.
- Preoperative antibiotic prophylaxis should be administered before surgical incision, when indicated.
- Preoperative antibiotic prophylaxis should be administered within 120 minutes before the surgical incision, taking into consideration the half-life of the antibiotic.
- Surgical hand preparation can be performed by either scrubbing with a suitable antimicrobial soap and water or by using a suitable alcohol-based handrub before donning sterile gloves.
- Alcohol-based antiseptic solutions based on CHG for surgical site skin preparation should be used in patients undergoing surgical procedures.
- Adult patients undergoing general anesthesia with endotracheal intubation for surgical procedures should receive 80% fraction of inspired oxygen intraoperatively and, if feasible, in the immediate postoperative period for 2–6 hours.
- Preoperative antibiotic prophylaxis administration should not continue after completion of the operation.

Actually, regarding a few of the WHO recommendations, the CDC stated that available evidence suggested uncertain trade-offs between the benefits and harms regarding such practices and that they advocated no recommendation/unresolved issue.

SSI rate is a percentage and is calculated as the number of SSIs divided by the total number of patients.

The rate of surgical site infections (SSIs) is low for most surgical procedures. However, because of the relatively large surgical volume in many hospitals, SSIs are sometimes considered the most common healthcare-associated infections [5]. SSIs are often localized to the incision site but can also extend into deeper adjacent structures [6].

Because of the presence of intraluminal bacteria, gastrointestinal procedures are among the highest risk procedures for SSI. Rates of SSI following bile duct, liver, or pancreatic surgery are as high as 10 per 100 procedures, according to data published by the National Healthcare Safety Network. Rates of SSI following colon surgery are ~5 per 100 procedures, and rates of SSI following gallbladder surgery are 0.7 per 100 procedures [7].

A prevalence survey undertaken in 2006 suggested that ~8% of patients in hospitals in the UK have a healthcare-associated infection (HCAI). SSIs accounted for 14% of these infections, and nearly 5% of patients who had undergone a surgical procedure were found to have developed an SSI. However, the true prevalence is expected to be higher since many of these infections occur after the patient has been discharged from hospital and are thus underreported and underestimated [8].

In an annual report from a UK hospital in 2009, the crude SSI rate was 4.4% [9].

Some studies done in Brazil, Sweden, China, and the USA report SSI prevalence rates of 7.2, 5.9, 6.2, and 2.9%, respectively, after appendectomy [10].

Within the context of this book, some of the risk factors and practices associated with SSI will be displayed, and an outline of the recommendations published by several authorities shall be portrayed. Additionally, since dental procedures pose a major concern in infection control, a comprehensive report on factors related to infection control in dentistry will be presented.

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