Surgical Site Infection

A protocol of an essay

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In general surgery

By

Ahmed Abdel Moneim Marzouk

M.B.B.Ch - Ain Shams University

Under supervision of

Prof. Dr. Alaa Abdallah Farag

Professor of general surgery

Faculty of medicine – Ain Shams University

Dr. Hany Said Abd El Baset

Lecturer of general surgery

Faculty of medicine – Ain Shams University

Faculty of Medicine
Ain Shams University
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List of Abbreviations

CDC	Centers for Disease Control
AIDS	Acquired Immune Deficiency Syndrome
ASA	American Society of Anaesthesiologists
CABG	Coronary Artery Bypass Graft
ECM	Extracellular Matrix
ETO	Ethylene Oxide
GI	Gastro Intestinal
GM	Gram Stain
gm	Gram
HDPE	High-density Polyethylene Mesh
hr	Hour
IL	Interleukin
kg	Kilogram
min	Minute
mL	Milliliter
MRI	Magnetic Resonance Imaging
MRSA	Methicillin-resistant S. Aureus
NNIS	National Nosocomial Infections Surveillance
PCMX	Para-Chloro-Meta-Xylenol
PMN	Polymorphonuclear Neutrophils
SSI	Surgical Site Infections
TB	Tuberculosis
TNF	Tumor Necrosis Factor
UT	Urinary Tract
UV	Ultra Violet
VRE	Vancomycin-Resistant Enterococci
ºC	Degree celzius

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SUMMARY

Postoperative SSIs remain a major source of illness and a less frequent cause of death in the surgical patient. These infections number approximately 500,000 per year, among an estimated 27 million surgical procedures, and account for approximately one quarter of the estimated 2 million Nosocomial infections in the United States each year. Infections result in longer hospitalization and higher costs. The incidence of infection varies from surgeon to surgeon, from hospital to hospital, from one surgical procedure to another, and—most importantly—from one patient to another.

Surgical site infections (SSIs) are divided into incisional SSIs and organ/space SSIs. Incisional space SSIs are further classified as involving only the skin and subcutaneous tissue (superficial incisional SSIs) or involving deep soft tissues (e.g. fascial and muscle layers) of the incision (deep incisional SSIs). Organ/space SSIs involve any part of the anatomy (organs or spaces) other than the incision opened or manipulated during the operative procedure.

Wound healing is the body's natural process of regenerating dermal and epidermal tissue. When an individual is wounded, a set of complex biochemical events takes place in a cascade to repair the damage. These events overlap in time and may be artificially categorized into separate steps: the inflammatory, proliferative, and remodeling phases.

The pathogens isolated from infections differ, primarily depending on the type of surgical procedure. In clean surgical procedures, Staphylococcus aureus from the exogenous environment or the patient's skin flora is the usual cause of infection. In other categories of surgical procedures, including clean-contaminated, contaminated, and dirty, the polymicrobial aerobic and anaerobic flora closely resembling the normal endogenous microflora of the surgically resected organ are the most frequently isolated pathogens.

Recently, American consumer groups have called for mandatory public reporting of individual hospital, in an effort to raise public awareness and motivate hospitals to make infection prevention a top priority.

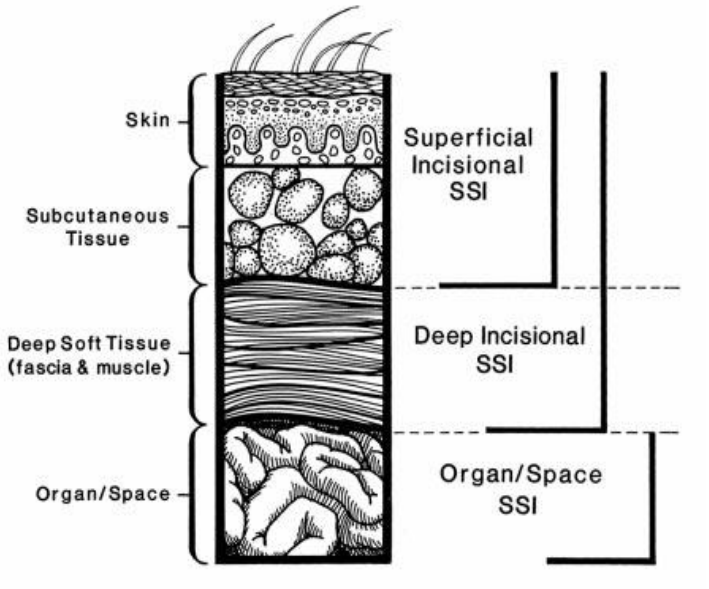
Disinfection and sterilization are essential for ensuring that medical and surgical instruments do not transmit infectious pathogens to patients. Because sterilization of all patient-care items is not necessary, health-care policies must identify, primarily on the basis of the items' intended use, whether cleaning, disinfection, or sterilization is indicated.

Since the introduction of routine prophylactic antibiotic use, infection rates in the most contaminated groups have reduced dramatically. Infection rates in US National Nosocomial Infection Surveillance (NNIS) system hospitals were reported to be: clean 2.1%, clean-contaminated 3.3%, contaminated 6.4% and dirty 7.1%]. There is, however, considerable variation in each class according to the type of surgery being performed.

Rapid covering and healing of both acute skin defects and chronic skin defects are important objectives for wound healing. The best way to heal a wound is to close it according to surgical standards as quickly as possible after injury.

Definitions

Definitions of surgical site infections are based on those published by CDC (Centers for Disease Control) in 1992, and are classified as incisional (superficial or deep), or organ/space infection. **(Jennie Wilson, 2008).**



Classification of SSIs, fig.1 **(Mangram, 1999).**

Superficial incisional infection:

This is defined as a surgical site infection that occurs within 30 days of surgery and involves only the skin or subcutaneous tissue of the incision, and meets at least one of the following criteria:

Criterion 1: Purulent drainage from the superficial incision.

Criterion 2: The superficial incision yields organisms from the culture of aseptically aspirated fluid or tissue, or from a swab and pus cells are present.

Criterion 3: At least two of the following symptoms and signs:

– Pain or tenderness

– Localized swelling

– Redness

– Heat

And a. the superficial incision is deliberately opened by a surgeon to manage the infection, unless the incision is culture-negative.

Or b. the clinician diagnoses a superficial incisional infection. **(Allami et al, 2005).**

Note: Stitch abscesses: *These are defined as minimal inflammation and discharge confined to the points of suture penetration, and localized infection around a stab wound. They are not classified as surgical site infections.* **(Keith et al, 2009).**

Deep incisional infection:

This is defined as a surgical site infection involving the deep tissues (i.e. fascial and muscle layers) that occurs within 30 days of surgery if no implant is in place, or within a year if an implant is in place and the infection appears to be related to the surgical procedure, and meets at least one of the following criteria:

Criterion 1: Purulent drainage from the deep incision but not from the organ/space component of the surgical site.

Criterion 2: The deep incision yields organisms from the culture of aseptically aspirated fluid or tissue, or from a swab and pus cells are present.

Criterion 3: A deep incision that spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following symptoms or signs (unless the incision is culture-negative):

– Fever (>38°C)

– Localized pain or tenderness

Criterion 4: An abscess or other evidence of infection involving the deep incision that is found by direct examination during re-operation, or by histopathological or radiological examination.

Criterion 5: Diagnosis of a deep incisional surgical site infection by an attending clinician**. (Allami et al, 2005).**

Note: *An infection involving both superficial and deep incision is classified as deep incisional SSI.* **(Miransky et al, 2001).**

Organ/space infection:

This is defined as a surgical site infection involving any part of the anatomy (i.e. organ/space), other than the incision, opened or manipulated during the surgical procedure, that occurs within 30 days of surgery if no implant is in place, or within one year if an implant is in place and the infection appears to be related to the surgical procedure, and meets at least one of the following criteria:

Criterion 1: Purulent drainage from a drain that is placed through a stab wound into the organ/space.

Criterion 2: The organ/space yields organisms from the culture of aseptically aspirated fluid or tissue, or from a swab and pus cells are present.

Criterion 3: An abscess or other evidence of infection involving the organ/space that is found by direct examination, during re-operation, or by histopathological or radiological examination.

Criterion 4: Diagnosis of an organ/space infection by an attending clinician. **(Allami et al, 2005).**

Note: *Occasionally, an organ/space infection drains through the incision. Such infection generally does not require re-operation and is considered to be a complication of the incision, and is therefore classified as a deep incisional infection.* **(Mangram et al, 1999).**

Notes on the application of definitions of surgical site infections

Clinician's diagnosis:

These should be carefully evaluated before being accepted as meeting the definition of SSI. The prescription of antimicrobials is not a sufficient evidence of a clinician's diagnosis of SSI without confirmation that an SSI was the reason for treatment. If the reason for antimicrobial treatment has not been documented the surveillance staff should discuss the case with the medical staff. A clinician's diagnosis can be confirmed verbally if it is not documented in the notes but to meet the definition of superficial SSI there must also be at least two clinical signs of infection. **(Horan et al, 1992).**

The identification of SSIs that meet the definitions of infection can be facilitated by the following measures:

- Encourage medical and nursing staff to clearly document the clinical symptoms of SSI they observe both in case notes and on laboratory request forms.

- Encourage medical staff to write a diagnosis of SSI in the case notes**.**
- Develop clear guidance for staff on when a wound swab should be taken: there should be some signs of infection, e.g. discharging pus, redness, swelling, heat, pain.
- Microbiology results should be interpreted in conjunction with clinical information. Advice from a Medical Microbiologist should be sought if there is doubt about the interpretation of a result. **(Taylor et al, 1990).**

Micro-organisms from culture:

A positive culture does not necessarily imply infection and a negative result may not necessarily exclude infection. Microbiology results should be interpreted in conjunction with the information from clinical sources and advice from a Medical Microbiologist should be sought if there is doubt about the interpretation of a result. **(Taylor et al, 1990).**

The presence of pus cells is required to avoid the inclusion of positive cultures that reflect colonization rather than infection of the wound. Not all laboratories look for pus cells when examining wound swabs. Micro-organisms reported from wound cultures are not necessarily indicative of SSI and if pus cells are not indicated as present in the wound culture report there must also be at least two clinical symptoms of infection and a clinician's diagnosis. **(Brebbia et al, 2006).**

More than one SSI from the same incision:

Occasionally, more than one surgical site infection (which meets one of the definitions) may occur from the same surgical procedure. This should only be considered as a different infection when a specimen, obtained from the same wound, yields organisms that are unrelated to the previous infection. If a superficial SSI develops into a deep or organ space SSI, report the most severe or worst SSI only. If a superficial SSI develops into a deep or organ space SSI, report the most severe or worst SSI only. **(Brebbia et al, 2006).**

Specific sites of organ/space surgical site infection

Definitions of specific sites of organ/space surgical site infection are based on those used by the American National Nosocomial Infection Surveillance system. **(Jennie Wilson, 2008).**

Arterial or venous infection:

Arterial or venous infection, including arteriovenous graft, must meet at least one of the following criteria:

Criterion 1: Organisms are cultured from arteries or veins removed during a surgical operation, and blood cultures yielded no organisms or were not done.

Criterion 2: There is evidence of arterial or venous infection during a surgical operation or on histopathological examination.