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Early Identification of Postsurgical Sepsis and Surgical Site Infection

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ABSTRACT

One of the most typical sources of hospital infection is surgical site infection. The term "Surgical Site Infection", which is separated into "Wound infections" and "organ or space infections," was coined by the Centers for Disease Control to describe the issue of postoperative infections. The organization also created the criteria that identify this type of infection. It might be difficult to recognize the problem early and to start evidence-based treatments quickly. The prognosis of these individuals can be considerably improved by early discovery, protocolized therapy based on the first bundle, prompt control of the septic focus, and the use of adjuvant therapies.

KEY WORDS: Surgical site infection, sepsis, postoperative

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INTRODUCTION

One of the most typical sources of hospital infection is surgical site infection (SSI). [1] Age over 60, malnutrition or obesity-related malnutrition, immunosuppression, concurrent pre-existing disorders, longer surgical duration, type of surgery (clean, contaminated, or unclean), prolonged preoperative stay, and use of drainage are some of the variables that are linked to SSI rates. [2] As the care given in the operating room is insignificant in the development of SSI and surgeons themselves are accountable for the incidence of infection of aseptic wounds, the operating room is the key to the prevention of SSI's success.[3]

The term "surgical wound infection" was redefined by the Centers for Disease Control (CDC) to refer only to infections that develop within the first 30 days following surgery. According on the planes involved, this infection can be superficial or deep. It accounts for 40% of nosocomial infections in the operated patient, while sepsis of the surgical wound was the most common. Organ-space infections, which do not affect the skin over the incision, the fascia, or the muscle layers, affect any organ or intraabdominal tissue that has been handled or accessed during the surgical process. Although there are specific pathogens in each type of surgical intervention, the endogenous flora of the patient's skin, membranes, mucous membranes, or hollow viscera is the source of pathogen for the majority of surgical site infections (SSIs). [4]

SURGICAL SITE INFECTION AND POSTSURGICAL SEPSIS

The term "Surgical Site Infection" (SSI), which is separated into "Wound infections" and "organ or space infections," was coined by the Centers for Disease Control to describe the issue of postoperative infections. The organization also created the criteria that identify this type of infection. Aging, hunger, invasive operations, emergency and filthy surgery, extended operating times, long preoperative stays, poor surgical skill, and others have all been linked to the development of SSI.[1,2]

The classification of surgery into four major categories—clean surgery, clean-contaminated surgery, contaminated surgery, and dirty surgery—results from the fact that a surgical wound is susceptible to infection and the likelihood that this infection will occur depends on the degree of contamination that occurs during the operation.[4]

Surgical Wound Classification Grades (I-IV) as Defined by the CDC
Class I/Clean: An uninfected operative wound in which no inflammation is encountered, and the respiratory, alimentary, genital, or uninfected urinary tract is not entered. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. Operative incisional wounds that follow no penetrating (blunt) trauma should be included in this category if they meet the criteria.

Class II/Clean-Contaminated: An operative wound in which the respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions and without unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina, and oropharynx are included in this category, provided no evidence of infection or major break in a sterile technique is encountered.

Class III/Contaminated: Open, fresh, accidental wounds. In addition, operations with major breaks in a sterile technique (eg, open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions in which acute or no purulent inflammation is encountered are included in this category.

Class IV/Dirty-Infected: Old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation.

The fact that the procedure is filthy is a component that has traditionally been stated as making it easier for postoperative septic problems to develop and making surgery more difficult. Another risk factor for the development of SSIs is urgent surgery. Another risk factor related to hospitalization that favors SSIs is the lengthier preoperative stay.[5]

In the United States, severe sepsis results in 215,000 yearly fatalities and costs $16.7 billion; it is a major issue, and its incidence is rising as a result of invasive operations, immunosuppressive medications, transplants, more infections, and antibiotic resistance. Those with sepsis who survive it have lower quality of lives. [6]

After elective surgery, staphylococcal or enterobacterial infections are the most frequent types of postoperative site infections. Most of the time, a local cure takes care of the issue; without periincisional cellulitis or systemic sepsis, intravenous antibiotics are not usually required, and many instances can be resolved without hospitalization. Gram-negative infections commonly develop from contamination of intestinal contents during surgical manipulation in emergency surgery situations, which is a messy situation. These may include both Bacteroides fragilis and Anaerobic Streptococci. In addition to surgically removing necrotic tissue, systemic antibiotic medication is necessary for treatment.[7, 8]

Perioperative antimicrobial prophylaxis has well-established fundamental guidelines. Forpreventive measures of asepsis and antisepsis, as well as isolation, intestinal decontamination, hand washing, and the use of sterile clothing, remain indispensable for the prevention of infections. The antimicrobial chosen must be effective in the prevention of surgical wound infection, which must be demonstrated through inclinical work. [9]

Hence in sterile procedures Staphylococcus epidermidis predominates, although gram-positive and gram-negative, aerobic and anaerobic bacteria are present during clean surgical procedures, whether they are contaminated, filthy, or clean. [10]

Only infections that were not present or incubating at the time of hospital admission are regarded as nosocomial. Surgical wound infections are classified as incisional and deep. A surgical wound infection known as an incisional surgical wound infection is one that affects the skin, subcutaneous tissue, or muscles beneath the surgical site within the first 30 days following surgery. If no implant was inserted after surgery, a deep surgical wound infection would develop within the first 30 days afterward; if an implant was implanted, it would occur within the first year. [11]

The following factors will be used to make the diagnosis: the patient's history, the clinical picture, laboratory and microbiological testing, and guided cabinet studies.[1]

Basic concepts for treating infections include extensive drainage of localized purulent collections, hygienic-dietary precautions, and treatment of shock if it is present. These strategies depend on isolated microorganisms and involve both general and targeted antibiotic therapy. [1-4]

Figure 1: Infected surgical wound with exposed subcutaneous tissue sutures and fibrinopurulent remains.

Figure 2: Surgical wound in the midline, open, with abundant granulation tissue and fibrin remnants. Delayed closure.

Syndrome of Systemic Inflammatory Response (SIRS): It is the collection of events that, regardless of their origin, are brought about by the immune system being activated broadly. The idea of SIRS is useful for identifying patients with inflammatory symptoms and makes it evident that the reason has to be found and treated (infectious, autoimmune, ischemia-reperfusion, acute neurological lesions, etc.). It is characterized by the fulfillment of two or more of the following requirements: [12]

- Axillary temperature greater than 38° or less than 36°.
- Heart rate greater than 90 per min.
- Respiratory frequency greater than 20 per min or a carbon dioxide blood pressure less than 32 mmHg.
- WBC count greater than 12,000, less than 4,000, or the presence of more than 10% immature forms

A SIRS with an infectious etiology is considered to indicate sepsis. A previously sterile tissue, fluid, or cavity is said to have become infected when pathogenic (or potentially harmful) microbes invade it. The infection cannot always be definitively diagnosed, but sepsis can still be suspected and treated if there is a strong clinical suspicion. [13]

Sepsis along with hypotension, despite appropriate fluid resuscitation, is referred to as septic shock. The following causes of hypotension should also be ruled out because they call for distinct medical care: hemorrhage, severe pulmonary embolism, myocardial infarction, etc.[14]

The key to improving these individuals' treatment results is early detection of severe sepsis. Rapid use of first resuscitation techniques, early administration of suitable antibiotics, and swift eradication of the outbreak appear to be key factors in lowering these very sick patients' fatality rates. [15]

The first step in management is the early identification of a patient with a clinical picture consistent with SIRS. Look for organ failure and shock. This will enable the prompt implementation of the treatment's fundamentals, which must start where the patient is (emergency room, hospital room, critical patient unit, etc.) and proceed sequentially throughout his hospital stay. Patients' chances of surviving can be significantly increased by the protocolized management of severe sepsis. Appropriate care during the initial hours of severe sepsis or septic shock will affect its course, just like it does in trauma, acute myocardial infarction, or stroke.[16]

The Sequential Organ Failure Assessment (SOFA) score

Organ system	SOFA score				
	0	**1**	**2**	**3**	**4**
Respiratory, PO_2/FiO_2, mmHg (kPa)	≥400 (53.3)	<400 (53.3)	<300 (40)	<200 (26.7) with respiratory support	<100 (13.3) with respiratory
Coagulation, Platelets, $\times 10^3/mm^3$	≥150	<150	<100	<50	<20

Organ system	SOFA score				
	0	1	2	3	4
Liver, Bilirubin, mg/dL	<1.2	1.2–1.9	2.0–5.9	6.0–11.9	>12.0
Cardiovascular	MAP ≥70 mmHg	MAP <70 mmHg	Dopamine <5 or dobutamine (any dose)[b]	Dopamine 5.1–15 or epinephrine ≤0.1 or norepinephrine ≤0.1[b]	Dopamine >15 or epinephrine >0.1 or norepinephrine >0.1[b]
Central nervous system, Glasgow Coma Scale	15	13–14	10–12	6–9	<6
Renal, Creatinine, mg/dL. Urine output, mL/d	<1.2	1.2–1.9	2.0–3.4	3.5–4.9 <500	>5.0 <200

Quick Sequential Organ Failure Assessment (SOFA) score

qSOFA (Quick SOFA) Criteria	Points
Respiratory rate ≥22/min	1
Change in mental status	1
Systolic blood pressure ≤100 mmHg	1

Surgeons and interventional doctors can only provide the patient with compensation for his severe state for a short period of time before moving on to controlling the septic focus. Also, during this window of time, we are able to create the photos that help us establish the accurate etiological diagnosis. Depending on the wise selection of medical teams and careful consideration of risks and benefits, the focus may be treated surgically or via intervention. In addition to the high rates of colon and postoperative sepsis, appendiceal and biliary pathology are particularly common. Gastrointestinal surgery has a tight connection to postoperative sepsis. [17]

The key element that might affect the morbidity and mortality of this operation is the prevention of postoperative sepsis by adequate surgical technique and wise decisions made by the surgeon based on the findings. It is important to emphasize the need of doing an early and thorough examination of the patient's state and physiological deterioration during operation. Surgical intervention should be started if the physiological harm is thought to be serious. The idea of damage control surgery was first applied to trauma patients, but it has now expanded to include really sick ones who have surgical sepsis.[18]

CONCLUSION

We can state with certainty that infection at surgical sites continues to be a public health issue that requires daily attention since it increases operative morbidity and duration of hospital stay. One-third of instances of severe sepsis are caused by surgical patients, and this condition is still the number one killer in non-cardiological ICUs. It might be difficult to recognize the problem early and to start evidence-based treatments quickly. The prognosis of these individuals can be considerably improved by early discovery, protocolized therapy based on the first bundle, prompt control of the septic focus, and the use of adjuvant therapies.

It is crucial to stress that many of the treatments that have been demonstrated to have a major influence on clinical outcomes do not need big financial outlays or high-tech equipment, but rather pathophysiological understanding, a proactive outlook, and the improvement of cooperation. High-priced adjuvant strategies have been ineffective. We must also stress that these patients' management should start as soon as they are admitted to the emergency unit and continue in the critical care unit and surgical ward rather than waiting until they get at UCI.

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