Surgical Site Infections; A Study of Incidence, Risk Factors and Causative Organisms in Emergency Abdominal Surgeries

Thesis

Submitted for partial Fulfillment of The Master Degree (M.sc.) in General Surgery

By

Ahmad Gamal Abdelhalim Abo Arab

M.B. B.Ch.

Supervised by

Prof. Dr. Shaaban Mohamed Abd Elmageed

Professor of General Surgery

Faculty of Medicine, Ain Shams University

Dr. Hesham Mohamed Omran

Assistant Professor of General Surgery

Faculty of Medicine, Ain Shams University

Dr. Mohamed Hesham Saeed

Lecturer of General Surgery

Faculty of Medicine, Ain Shams University

Faculty of Medicine

Ain Shams University

2020

سورة البقرة الآية: ٣٢

ACKNOWLEDGEMENT

First and foremost, I am deeply thankful to God, for without his grace, this work would never have been accomplished.

I would like to thank my father who was very helpful, supportive and encouraging during the course of this study. I am deeply thankful to my mother for her love and support. Also my gratitude goes to my brothers and sister for their unflagging love and unconditional support throughout my life and my studies.

I wish to express my deepest appreciation and gratitude to **PROF. DR. Shaaban Mohamed Abd Elmageed,***Professor of General Surgery, Faculty of Medicine,* Ain Shams University, *for his direct supervision, valuable advice and suggestions, expert guidance, constructive criticism during the course of this study.*

I am indebted to **Dr. Hesham Mohamed Omran**, Assistant Professor *of General Surgery, Faculty of Medicine,* Ain Shams University, *for supervising this work and for his critical insights and continuous guidance.*

I am deeply thankful to **Dr. Mohamed Hesham Saeed** *Lecturer of General Surgery,Faculty of Medicine,* Ain Shams University, *for his utmost co-operation, guidance and patience throughout the conduction of this work.*

I wish to offer my sincere appreciation to **PROF. DR. AYMAN *ABDALLA ABDRABOU*** *for his valuable advice, continuous supervision and support for giving me the opportunity to train under the supervision of a skilled and visionary surgeon, to whom I owe immense gratitude for what I learned from him.*

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Abb.	Full term
AGNB	Aerobic gram negative bacilli
AMP	Antimicrobial prophylaxis
AMPC	Ampicillinase C
AORN	Association of perioperative Registered Nurses
CD4+	Cluster of differentiation4
CD8+	Cluster of differentiation8
CDC	Centers for Disease Control and Prevention
CMV	Cytomegalovirus
CONS	Coagulase negative staphylococci
E. coli	Escherichia coli
EBV	Epstein–Barr virus
ESBL	Extended spectrum beta-lactamase
HAI	Healthcare-Associated Infection
HAIs	Health care-associated infections
HbA1c	Hemoglobin A1c
HIV	Human immunodeficiency virus
MDR	Multiple drug resistance
MRSA	Methicillin-resistant S. aureus
NICE	National Institute for Health and Clinical Excellence
NNIS	National nosocomial infection incidence
NPWT	Negative pressure wound therapy
PDGF	Platelet-derived growth factor
SENIC	Study on the efficacy of nosocomial infection control study
SEN-V	SEN virus

List of Abbreviations Cont...

Abb.	Full term
SIR	Standardized infection ratio
SMR	Standardized Mortality Ratio
SSI	Surgical Site Infection
SSIRS	SSI risk score
TGF-ß	Transforming growth factor beta
TTV	Transmitted virus

ABSTRACT

Background: Surgical site infection (SSI) is the most commonly reported nosocomial infection. Surgical site infections are responsible for increase in cost, morbidity, and mortality related to surgical operations. Surveillance with information feedback to surgeons and other medical staff has been shown to be an important element in the overall strategy to reduce the numbers of SSIs.

Objectives: To determine the incidence and factors responsible for, causative micro-organisms and effective antibiotics for surgical site infections following emergency abdominal operations.

Subjects and methods: a total of 252 patients were enrolled in the current study and were prospectively followed till the tenth day post-operatively. Data collection sheets were filled in for all the patients. If any symptom or sign of infection appear during this period then proper investigation was instituted for the diagnosis of infection and to assess the type and severity of the infection. If any collection of pus identified it was drained out and sent for culture and sensitivity test. Proper antibiotic was given to every patient both preoperative and post-operative periods. Antibiotic was changed where necessary after getting the report of culture and sensitivity test.

Results: Surveillance of SSIs in the current study revealed an SSI incidence of 21.4%. The most frequent organisms detected by wound swab cultures were E. coli (41.6 %), followed by Klebsiella and coagulase negative staphylococci, with the emergence of resistant strains like MDR, AMPC, ESBL strains. Sensitivity to antiobiotics showed Colistin, Polymyxin B, Vancomycin and Tigecycline to be fully functional, next in sensitivity was piperacillin tazobactam, then meropenem, followed by imipenem and amikacin. SSI was found to be increased with the advancement in age, Smoking cigarettes and HCV positive cases. The fourth post-operative day was the commonest day for the occurrence of SSI with discharge from the wound being the most prevalent sign.

Conclusion: The incidence of SSI among emergency postoperative patients in General Surgical Departments at Ain Shams Specialized Hospital - Police Hospital is high compared to that in the developed world.

A surveillance system for SSI with feedback of appropriate data to surgeons and hospital authorities is highly recommended to reduce the SSI rate General Surgical Departments at Ain Shams Specialized Hospital - Police Hospital and other Departments as well.

Key words: Upgrading the infection control policy.

INTRODUCTION

1.1 BACKGROUND

Wound infection continues to be a baffling problem since time immemorial. The sixteen-century French surgeon Ambroise Paré is famous for saying, "I dressed the wound, and God healed it" ***(Hunt, 1997)***.

Before the mid-19th century, surgical patients commonly developed postoperative "irritative fever," followed by purulent drainage from their incisions, overwhelming sepsis, and often death. It was not until the late 1860s, after Joseph Lister introduced the principles of antisepsis that postoperative infectious morbidity decreased substantially. Lister's work radically changed surgery from an activity associated with infection and death to a discipline that could eliminate suffering and prolong life ***(Mangram, 1999).***

Koch laid down the first definition of infective disease known as Koch's postulates. Koch's postulates providing the agency of an infective organism: it must be found in considerable numbers in the septic focus, it should be possible to culture it in a pure form from that septic focus and it should be able to produce similar lesions when injected into another host. Louis Pasteur recognized that micro-organisms were responsible for spoiling wine, turning it into vinegar ***(Williams, 2008).***

Surgical site infection is one of the important types of healthcare associated infections accounting for about 15% of all infections among hospital inpatients. However, SSI is the most common nosocomial infection in surgical patients ***(WHO, 2009).***

Surgical site infections are serious, as they are associated with a considerable morbidity and it has been reported that over one-third of postoperative deaths are related at least in part, to SSI ***(Astagneau, 2001).***

Moreover, SSIs can double the length of postoperative hospital stay, increase the rate of readmissions after discharge as well as increase the likelihood of ICU admission, and thereby increase the costs of provided health care services ***(Health Protection Agency Annual Report and Accounts, 2011/12).***

The prevalence of SSIs varies greatly between countries. In Western countries, SSIs occur at a rate of 2-15% in general surgery ***(Jodrá, 2006).***

However, in developing countries, the frequency of SSIs among general surgery patients can reach up to 26.8% in Egypt ***(Abdel-Halim et al., 2010).***

Although complete elimination of SSI in surgical patients is impossible, a reduction in its incidence to a minimal level can produce great benefits for the patients and would economize resources ***(Chiew and Theis, 2007).***

The infection of a wound can be defined as the invasion of organisms through tissues following a breakdown of local and systemic host defences, leading to cellulitis, lymphangitis, abscess and bacteraemia ***(Williams, 2008).***

The criteria used to define surgical site infections have been standardized and described three different anatomic levels of infection: superficial incisional surgical site infection, deep incisional surgical site infection and organ/space surgical site infection ***(Doharty, 2006).***

According to the degree of contamination wounds may be classified as clean, potentially contaminated, contaminated, and dirty. The incidence of infection, morbidity and mortality increases from clean to dirty. The risk of infection is greater in all categories if surgery is performed as an emergency ***(Kirk, 2004)***

Multiple risk factors and perioperative characteristics can increase the likelihood of superficial surgical site infections. Important host factors include; diabetes mellitus, hypoxemia, hypothermia, leucopenia, nicotine, long term use of steroids or immunosuppressive agents, malnutrition and poor skin hygiene. Perioperative / environmental factors are operative site shaving, breaks in operative sterile technique, early or delayed initiation of antimicrobial prophylaxis, inadequate intraoperative dosing of antimicrobial prophylaxis, infected or colonized surgical personnel, prolonged hypotension, poor operative room air quality, contaminated operating room instruments or environment and poor wound care postoperatively ***(Doharty, 2006).***

Wound infections usually appear between fifth and tenth post-operative day, but they may appear as early as first post-operative day or even years later. The first sign is usually fever. The patient may complain of pain at the surgical site. The wound rarely appear severely inflamed, but edema may be obvious because the skin sutures appear tight ***(Doharty, 2006).***

The use of antibiotic prophylaxis before surgery has evolved greatly in the last twenty years. It is generally recommended in elective clean surgical procedures using a foreign body and in clean-contaminated procedures that a single dose of cephalosporin, such as cefazolin (first generation cephalosporin), be administered intravenously by anesthesia personnel in the operative suit just before incision. Additional doses are generally recommended only when the operation lasts for longer than two to three hours ***(Nichols, 2009).***

Advances in infection control practices include improved operating room ventilation, sterilization methods, barriers, surgical technique, and availability of antimicrobial prophylaxis. Despite these activities, SSIs remain a substantial cause of morbidity among hospitalized patients. This may be partially explained by the emergence of antimicrobial-resistant pathogens and the increased numbers of surgical patients who are elderly and/or have a wide variety of chronic, debilitating, or immuno-compromising diseases. There also are increased numbers of prosthetic implant and organ transplant operations performed. Thus, to reduce the risk of SSI, a systematic but

realistic approach must be applied with the awareness that this risk is influenced by characteristics of the patient, operation, personnel, and hospital ***(Guideline for Prevention of Surgical Site Infection, 1999).***

1.2 RATIONALE

Surgical site infection still causes considerable morbidity and high cost to the health care system and is becoming increasingly important in medico-legal aspects. Infections increase the discomfort and disability experienced by patients following surgical procedures. Moreover, the most severe form may endanger life. In this study it has been tried to find out the rate, address the risk factors and the isolation of the common organisms responsible for surgical site infections following emergency abdominal operations. In addition, the sensitivity patterns of the microorganisms were ascertained. Assumingly, application of the recommendations of this study in our field of practice will have a repercussion on the rate of surgical site infections in our hospital and thereby will improve surgical outcome, patient safety, satisfaction and consequently the costs of healthcare services provided through our resources and facilities.