THE CAUSES OF POST OPERATIVE WOUND INFECTION, IN VIEW TO DECREASE ITS INCIDENCE IN HOSPITAL PRACTICE

AN ESSAY

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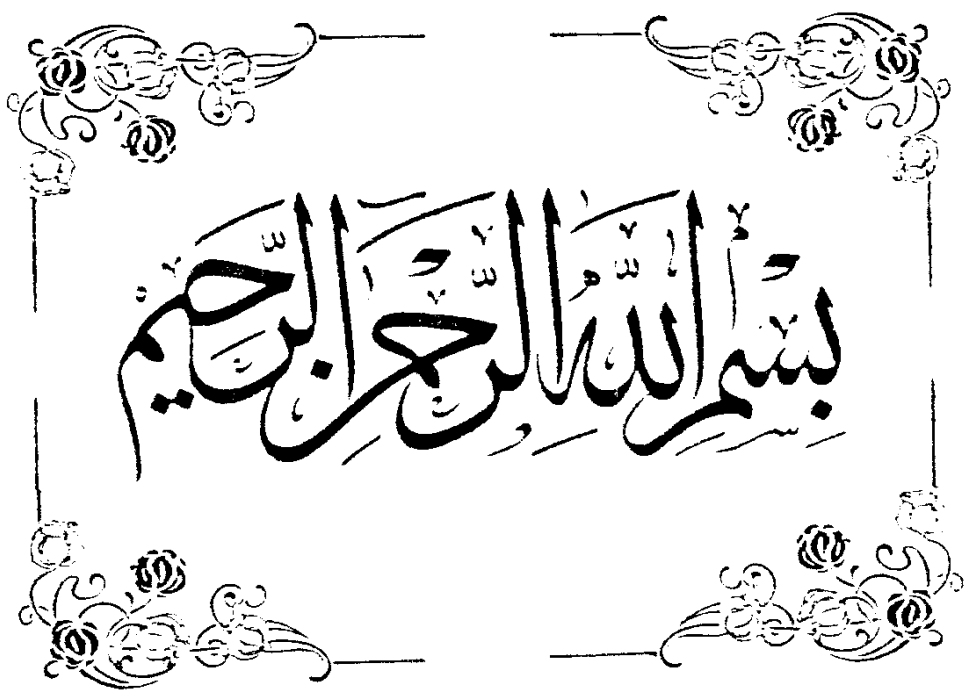

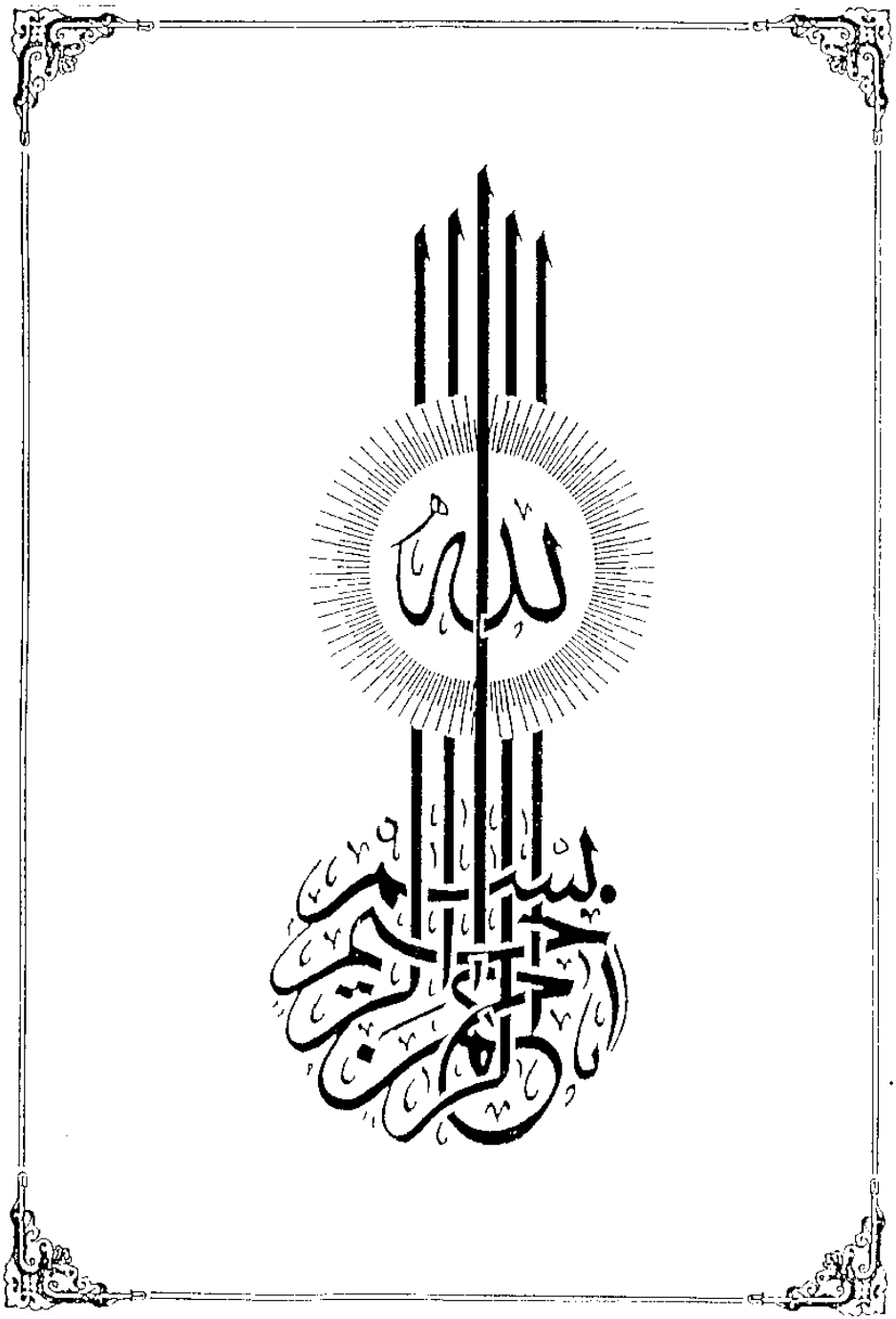

T O M Y P A R E N T S

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C O N T E N T S

I N T R O D U C T I O N

INTRODUCTION

Postoperative and hospital acquired infections have been problems for as long as there have been hospitals. Attempts to prevent their occurrence and spread began hundreds of years ago (5).

Before 1800, in the western world,virtually no real progress against infection had been made, and most, if not all, wounds became infected (7).

A look at the history of combating sepsis and wound infection may give us some idea about our limitations concerning the nature, causes and control of wound infection, and will clarify today's problems.

The history of combating sepsis could be divided into four periods: Pre-Listerian, Listerian, Post-Listerian, and Chemotherapeutic-Antibiotic (7).

Pre-Listerian Period

Altemeier, (1982)(7) reported that:

* Hippocrates, " The Father of Medicine " in 400 B.C., wrote clear descriptions of many conditions including obvious infections such as gas gangrene and staphylococcal lesions. Curiously enough, however, Hippocrates pointed out that healing without pus was desirable, but rarely achieved.

* Ambrose Pare in 1543 accidentally discovered the importance of noncautery care to the healing of military wounds.

* Leeuwenhoek through its microscope invention in 1676, was able to describe microorganisms in decomposing matter. His

studies earned him the title of " Father of Bacteriology ". As a result of his observations, a fundamental argument developed as to the origin of his " animalicules ". Did they generate de novo from inert organic material (spontaneous generation) or did they have the power to reproduce?.

* John Hunter in 1794 developed the experimental method that gave medical science the tools for shaping its own future. His description of inflammation associated with infections developing from gunshot wounds is a classic.

* Schwann's experiments in 1837 showed that putrefaction of meat could be prevented by boiling it and storing it in air-tight glass jars. He had written: " Boil meat thoroughly and put it in a clean bottle and lead air into it that has been passed through red-hot pipes, and the meat will remain fresh for months. But in a day or two after you remove the stopper and let ordinary air in with its little animals, the meat will begin to smell dreadfully; it will teem with wriggling, cavorting creatures a thousand times smaller than a pin head. It is these beasts that make meat bad ".

Before 1850, there was general ignorance and confusion as to the causes of the terrifying picture of infection as a complication of wounds (7).

Before Lister's application of Pasteur's revolutionary studies, during the middle of the 19th century, most, if not all, wounds became infected. A surgeon in a large hospital seldom saw a wound heal by first intention and without inflammation or suppuration. Postoperative or post-traumatic

putrefactive discharges accompanied by inflammation were regarded as inevitable after operation. Even some surgeons considered suppuration as a normal stage of healing, and some surgeons were convinced that " the impurities must be got out " of the wound. Wound infection in the pre-Listerian period was a confused and depressing aspect of surgery, and surgeons were forced to limit their elective surgical operations to the minor or superficial operations. Mortality of deep or extensive wounds approached 70 to 80 percent (5), (7).

This situation was more accentuated in war wounds, Chenu reported that of the 300,000 French soldiers in the Crimea war, approximately 10,000 were killed in battle and a similar numbers died of wound infections. The men undergoing amputation were especially vulnerable to infection, the mortality among the 1,681 persons who under-went resection through the femur was 92 percent and amputations of the tibia had a mortality of 71 percent (7).

The losses in the Russian army between 1853 and 1856 were also extremely high. Doctor Pirgoff, the great Russian surgeon, who was very active during the war, was horrified by the great number of wounded who died of postoperative infections. His description of the Second Continental Hospital at St. Petersburg is particularly revealing: " The large badly ventilated wards are filled with patients suffering from erysipelas, acute and purulent œdemas and septicaemia. The nurses without any scruples were in the habit of transferring the linen serving as compresses for the wounds from one patient to another. The maladministration of hospitals went as far as to preserve (for purpose of resale)

soiled and ill-smelling lint taken from the wounds, as well as, the dressings, compresses, and linen which were put up in special stockrooms situated close to the sick wards ". He was horrified at the great number of wounded in that war, who succumbed to postoperative and post-traumatic infections (6).

Such practices effectively spread nosocomial infections and earned for hospitals the name of " house of death ". No one knew just why a hospital was a house of death, but many offered explanations, such as the notion that gases hovered about hospitals, entered the wounds, and caused them to rot. This regrettable state was due to ignorance, and inadequacy of medical science (7).

Listerian Period

Nothing was more striking in surgical practice than the difference in the behaviour of injuries according to whether the skin is implicated or not. Thus if the bones of the leg were broken and skin remained intact, the surgeon applied the necessary apparatus without any other anxiety than that of maintaining a good position of the fragments, although the internal injury to bones and soft parts may be severe. If on the other hand, a wound of the skin was present communicating with the broken bones, although the damage might be comparatively slight, the compound fracture was one of the most dangerous accidents that could happen (7).

Into this milieu of sepsis in surgery in the mid 1800s

came Louis Pasteur and Joseph Lister.

* Louis Pasteur; a chemist who was working on fermentation relative to the French wine industry, became interested in the report written in Germany in 1837 by Schwann, who had determined that meat became putrid when subvisible animals got into it (as mentioned before). Pasteur recognized the importance of this experiment and became highly interested in the fermentation of albuminoid matter i.e. putrefaction. Louis Pasteur's studies in fermentation not only showed that putrefaction was a process similar to fermentation, and caused by the growth of microorganisms, but he proved that these could not arise de novo. He developed the germ concept of infection between 1853-1867, and the dreaded complications of infection that occured to wounds thereafter, received new significance (7).

* Semmelweis concluded in 1861 that puerperal fever was an infectious disease spread by the unclean hands of doctors and midwives from a diseased lady to another. Semmelweis work contributed importantly to the theoritical development of germ theory (16).

* Lister repeated Pasteur's experiment on fermentation to convince himself that wound putrefaction and other changes were caused by microbes. He was the first one to apply Pasteur's studies to medicine. Lister searched successfully for an antimicrobial chemical that would inhibit or kill bacteria finding its way into the wounds. It soon appeared that diluted carbolic acid would answer this purpose, first as compresses for dressing and later as spray for operating room environment.

The principle of " antisepsis " was established and practiced by Lister between 1867 and 1875. The introduction of antisepsis has been considered to be one of the great milestones of surgery (5),(7).

It is to be noted here that rubber gloves, in fact, were introduced by Halsted in 1889 in order not to prevent infection by the surgeon's hands, but to protect the delicate hands of William Halsted's instrument nurse, whom he subsequently married, from the effect of carbolic acid (32).

Altemeier,(1982)(7) reported that:

* Ogoston in 1880 discovered that staphylococcus was a principal cause of wound sepsis.

* Koch's announcement of his famous postulates in 1882, followed by the publication of his monograph on " The Cause of Infection in Wounds " showed for the first time the specificity of different types of bacteria for causing distinctive types of clinical pictures. These and other thoughtful descriptions pointed to some of the limitations of antisepsis and set the stage for other advances. He also made of bacteriology an exact science.

* Rosenbach and Billroth discovered the streptococcus in 1883-1884.

* Ernst von Bergmann assisted by Curt Schimmelbusch in 1885, developed his principle and practice of " aseptic surgery " in Germany using the autoclave. By this mean dressing, gowns, towels, and other materials could be rendered sterile. A new day in the practice of surgery, gradually

dawned, offering the hope of surgery free from infection.

* Welch and Nuttall discovered the clostridium welchii in 1892.

* Halsted and Reid emphasized the importance of cleanliness and of non bacterial and technical factors as determinants of infection between 1910-1924. Altemeier, Stevenson and Culbertson have continued and extended the significance of these concepts.

Lack of cleanliness was part of the surgical tradition. Each surgeon kept a special frock coat reserved for operations and work in the wards. Although it naturally became soiled, the surgeon never bothered to have it clean - in fact, a coat's very dirtiness was considered a sign of surgeon's success. When a frock coat became encrusted with blood, pus, and various malodorous discharge, it was discarded. Handwashing was reserved for after operations; preoperatively, it was considered enough to wipe one's hands on the greasy tails of the frock coat. In a similar tradition, Sir Ashley Cooper, operated on King George IV with a knife borrowed from the pocket of a friend, and which he did not bother to wash or wipe (7).

During the years of 1880 to 1910, pathogenic bacteria were being discovered by the dozens, and it seemed to many that all surgical diseases were to be explained by this new science. Surgeons and bacteriologists reasoned that if bacteria caused infection in body tissue or wounds, all they