DIAGNOSIS OF NOSOCOMIAL PNEUMONIA IN INTUBATED INTENSIVE CARE PATIENTS

Thesis

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By

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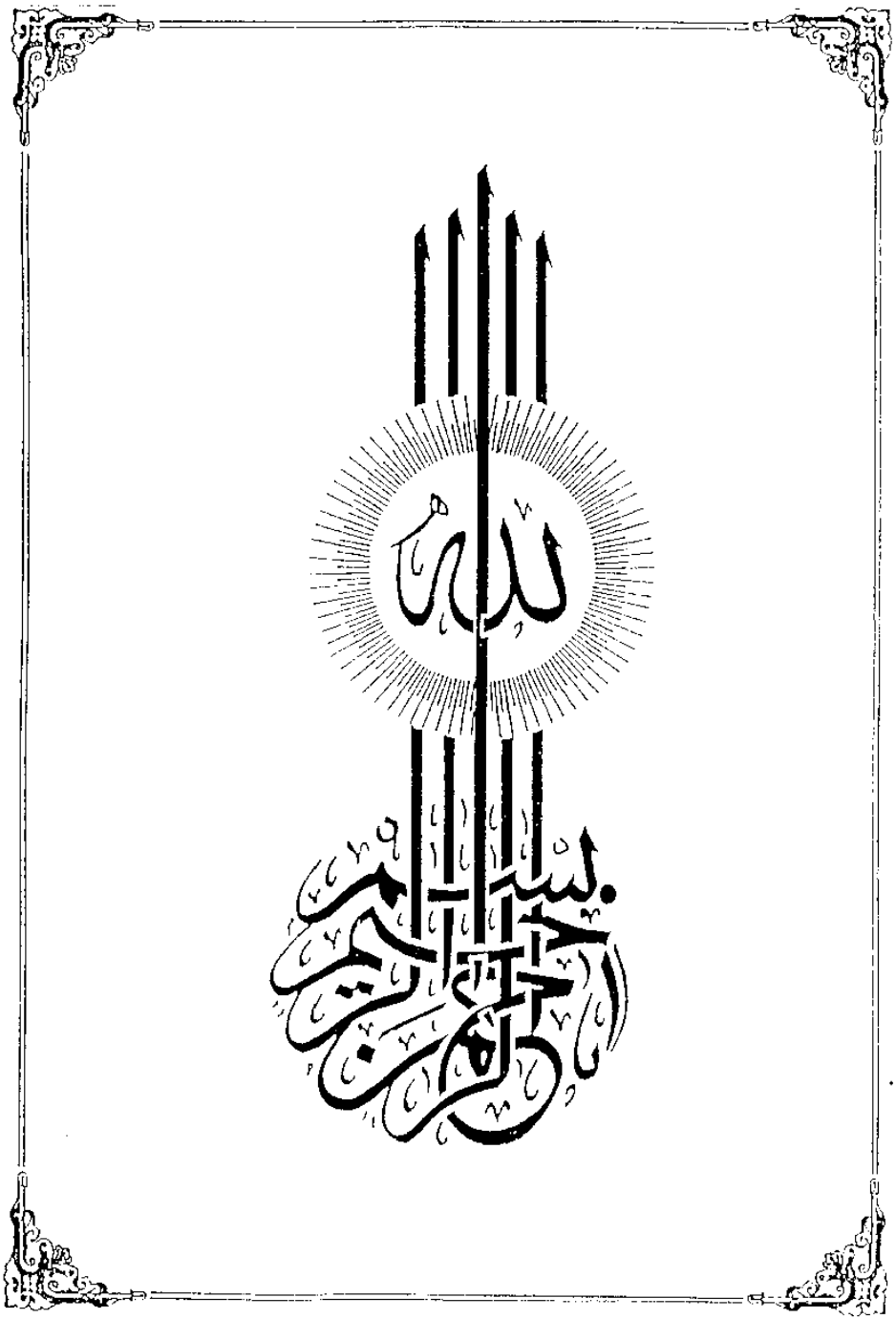

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Introduction

INTRODUCTION AND AIM OF WORK

Hospital acquired pneumonia is still a major cause of morbidity associated with high mortality. The incidence of nosocomial pneumonia (NP) in intensive care units (ICUs) may be as high as 66% (Stevens et al. 1981).Other studies revealed an incidence of 80%.

NP in ICU patients is a resource consuming disease associated with a high mortality (43%) (Louman et al, 1992).

The relationship between oropharyngeal colonization especially with Gram negative bacilli and the subsequent development of nosocomial infection of the lower respiratory tract has been well established (Johanson et al, 1969).

Pneumonia most often develops after the failure of lung defenses to clear or kill an aspirated challenge (Johanson et al. 1969).

Several studies have established that host characteristics are important determinants of bacterial colonization of the tracheobroncial tree.Patients with tracheostomies or endotracheal tubes are at particularly high risk for colonization and subsequent pneumonia because of disrupted local clearance mechanisms, underlying immuno-suppression, the frequency of invasive procedures, the use of respiratory therapy equipment, and location in an intensive care environment with exposure to numerous nosocomial pathogens (Stevens et al,1974 & LaForce ,1981).

The pathogenesis is complex involving altered host resistance, decreased mechanical bacterial clearing, ascending bacterial colonization of the pharynx & silent tracheal aspirates (Craven ,1986).

The early infections i.e. within 4 days after admission are often caused by common pathogens such as Pneumococci, Staphylococcus aureus & Haemophilus influenzae.

In contrast NPs that occur late are predominantly caused by Gram -ve bacteria ascending from the gastrointestinal tract (Stoutenbeek . et al,1984 & Stoutenbeek, 1987).

Aim of Work

Detection of the most common organisms causing mechanically ventilated pneumonia in relation to community acquired pneumonia.

Review of Literature

REVIEW OF LITERATURE

NOSOCOMIAL INFECTION

The term "nosocomial" comes from the word nosocome pertaining to a hospital which is derived from the Greek word "nosos" meaning disease. Therefore, a nosocomial infection is an infection associated with a hospital or a health care facility.

Nosocomial infections occur after hospitalization; i.e they are not present or incubating at the time a patient is admitted to the health care facility. Classification of an infection as nosocomial does not mean the infection is always preventable nor that it was caused by improper technique or by an error in practice.

An infection can also be classified as community acquired, meaning that it was present or incubating at the time of admission to the health care facility (Hayes et al,1986).

Incidence

Nosocomial infections represent a major hazard in health care facilities; their effects are felt by the infected patients, their families, and the health care system. Despite the many advances in modern medicine, nosocomial infections still pose a significant risk to patients and result in numerous adverse outcome (Hayes et. al; 1986).

The National Nosocomial Infection Study (NNIS) carried out by the Centers For Disease Control indicates that 5-6 % of hospitalized patients

develop nosocomial infection. It is estimated that the average nosocomial infection prolongs hospital stay by about 2-3 days and result in added direct charges (Bailey and Scott's, 1990). The number of deaths truly attribute to nosocomial infections is staggering. Of the more than two million nosocomial infections that occur in the US hospitals annually, more than 20,000 (1 in 10) contribute directly to death and another 60,000 (3 in 10) are believed to play a significant role in the death of the patient (Haley et. al., 1981).

Haley et al. (1981) found out that about 5.2 nosocomial infections occur among every 100 patients admitted to US hospitals.

Similar surveys in the USA and Europe (Meers et. al.; 1981) and recent World Health Organization surveys covering a wider geographical area have produced very similar figures. Indeed a prevalence of about 10% seems to have been fairly constant in recent years (Ayliffe, 1986).

According to Lacey (1986), this in itself indicates some success in that increase in the infection rate might have been expected because highly susceptible patients have been expected in greater numbers and modern methods of treatment create more opportunities for infection. Nevertheless an examination of many aspects of current hospital practice suggests that the incidence of infection could be reduced.

Modes of Spread

I. Airborne Spread

It is not surprising that airborne spread of infection; for example tuberculosis was demonstrated early in the scientific era of bacteriology, but interest in this route went into eclipse in the early years of this century to be revived in the later 1930s and the 1940s. The contribution of the airborne route to much common hospital infection remains the subject of controversy (Williams,1956).

Clearly, the effectiveness of this route depends on the source, on the number of micro-organisms present and the degree of the dispersal, whether in droplets, in droplet nuclei or on skin scales; on survival and retention of pathogenecity by the micro-organisms in the air or environment- or their death, impairment or dilution there; on the size of the infecting dose; and on the local or general susceptibility of the persons exposed to infection (Lowbury et. al; 1982).

Airborne Bacterial Infections

Tuberculosis: Only patients with smear positive pulmonary tuberculosis are regarded as constituting an infection risk and requiring single room isolation for two weeks treatment (Riley et. al; 1962).

Pneumococcal infection: Much infection by Str. Pneumoniae is endogenous (Gould et. al; 1987) but clusters of cases also occur with some more sensitive strains, which appear to have the ability to cause lobar pneumonia in the relatively healthy (Davies et. al; 1984). It may therefore be

advisable to isolate patients with pneumococcal pneumonia for the first 24 hours when the disease has been convincingly diagnosed by Gram-film of sputum (Speller,1990).

Meningococcal Infection:Uncommon, but isolation for the first 48 hours of treatment is advised (Speller,1990).

Others: Str. Pyogenes and Staph. aureus are carried by many normal people (Williams et. al. 1960). Streptococci are readily shed from the upper respiratory tract by coughing, sneezing and singing (Lidwell 1974). and staphylococci on skin squames during activity.

Lowburry et. al (1971) compared the rate of acquisition of various organisms when the patient was protected from airborne infections from contact, and from both. The results suggested infection by Gram negative bacilli was almost entirely by contact as they tend to die when dessicated and infection by the arterial route is confined mainly to spread by nebulized spray, infection by Str. pyogenes by air and staphylococcal infection by both routes air and contact.

Airborne Viral Infections

The most common viral infections to be transmitted by air in hospital are chicken pox, measles, influenza and RSV (Mckendrick et. al; 1976).

Airborne Fungal Infections

Dispersal by spores is a feature of most filamentous fungi, but only Aspergillus spp. have been shown to be a significant cause of airborne

infection; this may occur after cardiac surgery or in immunosuppressed patients. Outbreaks have been associated with building work in hospitals (Opal et. al, 1986). Other fungi occasionally cause clusters of infections by aerial spread e.g. Phycomycetes (del Palacio et. al; 1983).

II. Infection Associated with Water

Legionnaire's Disease

The legionellaceae are widespread in water, including potable water supplies. Many cases of Legionnaire's disease occur sporadically in the community; in one study in England they accounted for 15% of pneumonia cases (Mac Farlane et. al; 1982).

Hospitals are not spared the occurrence of legionellae in their water supplies (Tobin et. al; 1981) and have suffered a series of outbreaks (Bartlett et. al; 1986) mainly of infection with legionella pneumophila particularly serotype I infection but also with legionellae micdadei, leg. bozeman, leg. beachae (Bartlett et. al, 1986).

Water in medical equipment that delivers a nebulized spray may become contaminated (Arnow et. al. 1982). Cases associated with release of stagnant water into the general system have been described (Fischer-Hoch et. al. 1982).

Hospital ventilation systems usually have air cooling towers in which potentially contaminated water flows over pipes through which air is circulated. Faults in such a system may allow direct access of the water to air, or drift from the tower may contaminate the air at a later stage.

Either of these phenomena may have explained the outbreak at Stafford General Hospital (Speller, 1990).

Other Bacteria in Water and in Damp Areas in Hospitals:

Other Gram negative bacteria may be present in hospital water supplies. They may act as opportunistic pathogens in hospital patients. Aeromonas hydrophilia causes pneumonia and sepsis in immunologically impaired patients and was found in maximal numbers in hospital water in hot weather (Picard et. al, 1987).

Pseudomonas spp. are to be found in mainswater supplies and may multiply in most areas, they have simple growth requirements and often show considerable resistance to antibiotics and disinfectants. Ps. aeroginosa is ubiquitious in wet hospital sites, it has been found in food and water, ice machines, pharmacy preparations, mouth wash, dental water units, nebulizers, mattresses, taps, potted plants, flower vases and so on (Levein et. al, 1984; Allen et. al, 1987).

Ps. cepacia and the related Ps. pickettii posses the attributes that make them suitable for the role of hospital opportunistis. Under certain conditions Ps. cepacia will grow in distilled water and in the presence of aqueous chlorhexidine and quaternary ammonium compounds. It has been frequently isolated from badly formulated antiseptics, and even from povidone iodine. Infection from contaminated disinfectant or other fluid is generally associated with application to open wound (Bassett et. al, 1970), intravenous infusion (Phillips et. al, 1971), or uretheral catheterization (Haley et. al, 1984). Ps. cepacia may also colonize nebulizers (Gelbart et. al,

1976) and give rise to respiratory infections. It is an important respiratory pathogen in end-stage cystic fibrosis after intensive antibiotic therapy (Speller,1990).

III. Infection Acquired From Food

Hospital food can also be a source of antibiotic resistant bacteria, which may colonize the gut and later cause infection in susceptible patients (Speller,1990).

Of 463 outbreaks of food poisoning and Salmonella infection in England and Wales in 1985, 36 (7.8%) occured in hospitals. Salmonella sp. And Clostridium perfringens each accounted for 17 - episodes and one outbreak was caused by each of Staph. aureus and a bacillus Sp.,Salmonella infections were particularly associated with poultry or meat, and Cl. perfringens with meat (Speller,1990).

Outbreaks of Salmonella infections in hospitals are important because they may cause serious effects in the very young and elderly and in patients with impaired immunity (Taylor et. al, 1982) and may disrupt the working of the hospital (Kumarasinghe et. al, 1982). The catering faults most often responsible are incomplete defrosting of frozen meat or poultry, insufficient cooking of large amounts of food, inadequate chilling and storage, and contact between food to be consumed without further cooking and raw poultry (Wilkinson,1988).

Hospital food is well known to be a source of Gram negative bacilli often antibiotic resistant that colonize patients with Ps. aeruginosa, Escherichia coli, klebsiella spp and others (Case well et. al, 1987).