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NOSOCOMIAL PNEUMONIA

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Nosokomiyal pnömoni.

INTRODUCTION

A pneumonia is defined as being nosocomial when signs and symptoms were absent during the first 48 to 72 hours after admission. Nosocomial pneumonia (NP) accounts for 10-20 % of hospital-acquired infections and ranks behind urinary tract and surgical wound infections as the third most common in-hospital acquired infection. Recent data indicates that NP is indeed the second most common nosocomial infection in the United States, following only urinary tract infections in frequency. It is seen in 5-10 patients per 1000 admissions. The incidence of NP increases even up to 17-20 % in postoperative patients and patients in intensive care units. With the mortality rate of 20 to 50 %, in some studies up to 80 %, is NP the leading cause of death from nosocomial infection.

PATHOGENESIS

NP can develop through two pathways; hematogenic or through aspiration. The pathogenesis of NP mostly has the following three sequential pathogenic steps: Colonization of the upper respiratory tract, aspiration into the lungs, and interaction of bacteria with antibacterial defenses of the lung.

The origins of microorganisms that commonly cause nosocomial pneumonia are usually:

1. The patients' own oropharynx, respiratory tract, gut, or sites of concomitant infection,
2. Other patients, with the hands of medical personnel as the principal route of transmission, and/or
3. The ward environment (especially respiratory equipment).

Airborne transmission usually is not an important mechanism relating to in-hospital pneumonia, although tuberculosis, viral infections, and *Legionella* infections can be transmitted by this route.

In contrast to healthy individuals or patients hospitalized for non-critical (e.g. psychiatric) problems, rapid colonisation of the upper respiratory tract by Gram negative bacteria (GNB), staphylococci and anaerobes is common in patients hospitalized with acute severe illness and in surgical patients. Changes in the flora of these patients are further accentuated by the use of antimicrobial agents. The respiratory equipment can also predispose to the acquisition of resistant bacteria. Thus, a surgical patient with a serious illness is likely to have *Pseudomonas spp,* coliforms, staphylococci and/or the pathogen of his ward neighbour as the cause of pneumonia. Although the role of anaerobic bacteria in NP is not settled yet, anaerobes are implicated in up to 80% of the cases in addition to aerobic bacteria.

Postoperative pneumonia usually results from silent aspiration of oropharyngeal and gastric contents, and the infecting flora has certain unique features in this setting. Stress ulcer prophylaxis with antacids or histamine-2-blockers may have a direct correlation with the risk of developing NP through gastric colonisation with bacteria. In addition to this, enteral nutrition (with or without medical stress ulcer prophylaxis) is also associated with gastric colonization with the resultant possibility of transmission of microorganisms to the trachea.

A number of generally accepted risk factors which have been associated with the development of NP are summarized in the following table:

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Tracheostomy, intubation, mechanical ventilation
Thoracoabdominal surgery, abdominal surgery, especially with long duration
Hospitalization beyond seven days
Advanced age
Antimicrobial therapy
Gastric hypoacidity, enteral nutrition
Obesity
Heavy smoking, chronic bronchitis, chronic obstructive pulmonary disease,

DIAGNOSIS

The diagnosis of NP is a formidable task. Infections of the lower respiratory tract are a major cause of fever in surgical patients. Since many patients have fever postoperatively, and pulmonary infiltrates are often due to atelectasis, establishing the diagnosis of pneumonia is often difficult. That is why the diagnosis of NP should be based on at least four of the following findings:

Fever
Rales or dullness
New positive x-ray signs of a pulmonary infiltrate
Purulent sputum
Leukocytosis
CRP elevation

X-ray signs have been considered mandatory, but they might be absent. Especially the retrocardial space cannot be judged sufficiently without a lateral x-ray. To establish the etiological agent - and so the correct diagnosis - an adequate specimen for microbiological analysis must be obtained which really is a difficult task. Because of the colonization of the upper airways, cultures of expectorated sputum or samples obtained by intratracheal suctioning may be misleading. However, a Gram's stain of these specimens may be useful in supporting the diagnosis (the presence of 25 or more PMNL and ten or fewer epithelial cells per low power field supports bacterial infection, especially when large numbers of organisms of uniform morphology are present). Perhaps more important is the temporal change in the Gram's stain.

Today, Bronchoalveolar Lavage (BAL) and Protected Specimen Brush (PSB) are the two techniques with an acceptable sensitivity and specifity for the diagnosis of NP and their use should be encouraged in an intensive care setting. Other methods, such as the evaluation of presence of elastin fibers in intratracheal aspirations or sputum, or invasive techniques, such as transbronchial or transthoracic needle aspirations could also be used when possible and required.

TREATMENT

Selection of appropriate antimicrobial therapy at the beginning is determined by anticipating the pathogens on the basis of clinical presentation and local epidemiology and is therefore empiric. In contrast to the community-acquired pneumonia, the treatment should be designed initially to cover all (above mentioned) possible pathogens and tailored later to reflect the results of the culture and its resistance pattern. This strategy requires therapy with at least two antimicrobial agents at the onset. Antianaerobic coverage is also mandatory. Potential regimens could be the following:

Extended spectrum penicillin + aminoglycoside + nitroimidazole
Ticarcillin/clavulanate + aminoglycoside
3° generation cephalosporin+ureidopenicillin
Aztreonam + clindamycin
Imipenem / cilastatin

Apart from the antimicrobial strategy, vigorous coughing, deep nasotracheal suction, endotracheal intubation and/or fiberoptic bronchoscopy are necessary in cleaning the airways. A new sterile catheter should be used each time a tracheostomy or a nasotracheal tube is suctioned. Sterile disposable gloves are a prerequisite.

PREVENTION

Prophylactic efforts should be directed at,

Prevention of colonization of the upper respiratory tract
Prevention of aspiration, and
Enhancing lung antibacterial defenses.

Selective decontamination of the gastrointestinal system in intensive care patients with the use of non-absorbable antimicrobials (e.g polymycin B, neomycin, tobramycin, amphotericin B) and sometimes with the addition of parenteral drugs may be of importance but has not been documented to be of value in relation to outcome.