Selective Digestive Decontamination in Critically Ill Patients

Essay

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Intensive Care Medicine

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بسم الله الرحمن الرحيم
قَالُوا سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا
عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ
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Mohammad Abdelhamid Eleawa

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List of Abbreviations

AB-SOD	:	Selective oropharyngeal decontamination with antibiotics
AGNB	:	Gram-negative aerobic microorganisms
AMRB	:	Antimicrobial-resistant bacteria
APACHE II	:	Acute physiolology and chronic health evaluation
BLF	:	Bovine lactoferrin
CHX-SOD	:	Topically applied chlorhexidine gluconate
EPIC II	:	Extended prevalence of infection in intensive care
EPIC	:	European prevalence of infection in intensive care study
ESBL	:	Extended spectrum beta lactamase
HLF	:	Human LF
ICUS	:	Intensive care units
IGA	:	Immunoglobulin A
IL-1B	:	Interlukin 1 BETA
IPI	:	Intrinsic pathogenicity index.
LF	:	Lactoferrin
MDR	:	Multidrug resistant
MODS	:	Multiple organ dysfunction syndrome
MRSA	:	Methicillin-Resistant staphylococcus aureus
NICE	:	National institute for health and clinical excellence
PLF	:	Porcine LF
P-PKC	:	Phosphorylated protein kinase C
PPMS	:	Potentially pathogenic microorganisms
PTA	:	Polymyxin E, tobramycin, and amphotericin B
RCTS	:	Randomized controlled trials
SAPS II	:	Simplified acute physiology score

List of Abbreviations (Cont.)

SDD	:	Selective decontamination of the digestive tract
SOAP	:	Sepsis occurrence in acutely ill patients
SOD	:	Selective oropharyngeal decontamination (SOD)
SPP.	:	Species.
SSI	:	Surgical site infections
TLR	:	Toll-Like family of receptors.
TNF-B	:	Tumor necrosis factor-beta
VAP	:	Ventilator -associated pneumonia
VAT	:	Ventilator-associated tracheobronchitis

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Introduction

Infection is a common problem for patients in intensive care units (ICUs) and is associated with considerable morbidity, mortality, and costs. Infection and related sepsis are the leading cause of death in non-cardiac ICUs, with mortality rates that reach 60% and account for approximately 40% of total ICU expenditures. Importantly, the incidence of sepsis is increasing, as is the number of consequent infection- related deaths ***(Vincent et al., 2009).***

Potentially pathogenic microorganisms such as Gram negative bacteria (including Pseudomonas aeruginosa), Gram-positive bacteria (including Staphylococcus aureus), and yeasts rapidly colonize stomach and intestines of critically ill patients. Retrograde colonization of the oral cavity and throat may occur, and micro aspiration into the lung could eventually result in pneumonia. Prevention of colonization of oral cavity, throat, stomach, and intestines could reduce the incidence of respiratory tract infections, thereby improving outcome of intensive care unit (ICU) patients. Selective decontamination of the digestive tract (SDD) is one strategy to prevent colonization of oral cavity, throat, stomach, and intestines of ICU patients ***(Haas et al., 2010)***.

SDD did not become routine practice because mortality reduction was not demonstrated in individual trials, beneficial effects on duration of ventilation, ICU stay or hospital stay were not demonstrated, cost-efficacy had not been demonstrated, and selection of antibiotic resistance was considered a serious side-effect ***(Bonten et al.,2003).***

Although meta-analyses have shown that the use of SDD reduces the occurrence of ventilator-associated pneumonia and improves **ICU** survival, the effectiveness of SDD has remained controversial. Large randomized, controlled trials on the use of SDD showed improved survival of ICU patients treated with SDD. A second concern regarding use of SDD has been the fear for the emergence of antimicrobial resistance; studies even demonstrated a decline in colonization with P. aeruginosa and enterobacteriaceae that were resistant against tobramycin, ceftazidime, imipenem and ciprofloxacin ***(Schultz et al., 2003).***

Aim of the Work

This work will discuss the principles of selective digestive decontamination, in addition to highlight its merits & finally to understand overall outcomes in critically ill patients.

Chapter I

Epidemiology of infection in ICU

Infection is a common problem for patients in intensive care units (ICUs) and is associated with considerable morbidity, mortality, and costs. Infection and related sepsis are the leading cause of death in non-cardiac ICUS, with mortality rates that reach 60% and account for approximately 40%of total ICU expenditures. Importantly, the incidence of sepsis is increasing ***(Vincent et al., 2009).***

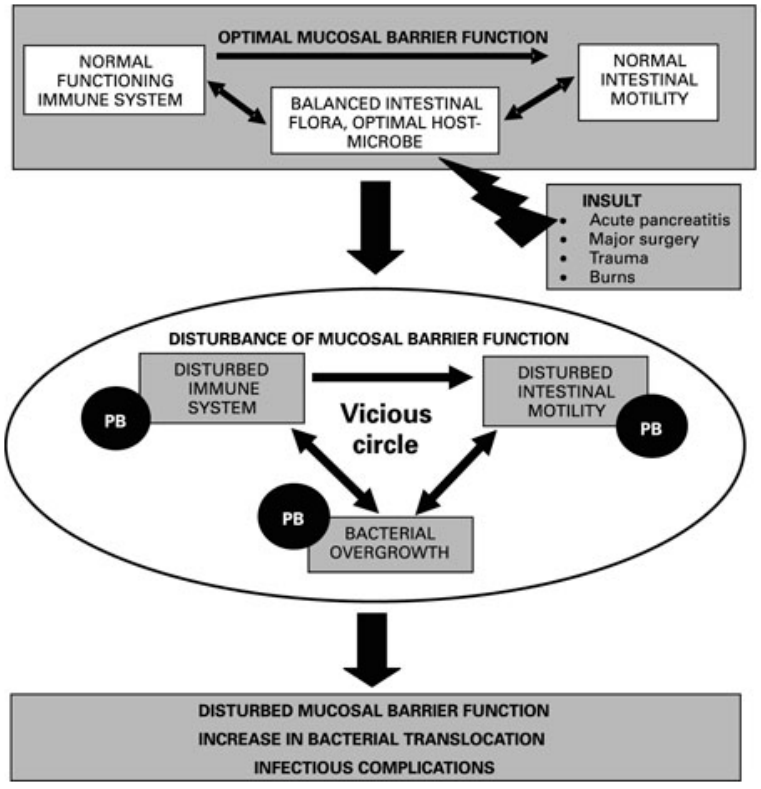

Fig. (1): Causes of bacterial translocation

Nosocomial infections can be defined as those occurring within 48 hours of hospital admission, 3 days of discharge or 30 days of an operation. They affect 1 in 10 patients admitted to hospital. Annually, this results in 5000 deaths with a cost to the National Health Service of a billion pounds (In UK). On average, a patient with hospital acquired infection spent 2.5-times longer in hospital, incurring additional costs of £3000 more than an uninfected patient. Intensive care units (ICU) have the highest prevalence of hospital-acquired infections in the hospital setting. The European Prevalence of Infection in Intensive Care Study (EPIC), involving over 4500 patients, demonstrated that the nosocomial infection prevalence rate in ICU was 20.6%. **(*Inweregbu et al., 2005).***

ICU-related infections, in particular pneumonia, constitute a major problem during critical illness. Up to 50% of critically ill patients develop pneumonia. When critically ill patients develop pneumonia, ICU and hospital mortality may double.

In accordance, patients with pneumonia need mechanical ventilation for a longer period of time and have a prolonged stay in ICU and hospital. Consequently, costs rise when pneumonia develops.

ICU-related infections can be classified into: primary endogenous, secondary endogenous and exogenous infection. ***(Haas, et al., 2010).***

Primary endogenous infections:

Are caused by pathogens carried in throat, stomach, and/or intestines of patient on ICU-admission. They occur generally within one week after admission and can be prevented by parenteral antibiotics administered directly after admission to the ICU.

Secondary endogenous infections:

May also occur soon after admission to the ICU. Contrary to primary endogenous infections, pathogens involved with secondary endogenous infections are not carried in throat, stomach, and/or intestines on admission but acquired during stay in ICU, and mostly from other patients via the hands of caregivers.

Most of these infections could be banned if colonization is prevented.

Exogenous infections:

Can occur at any time during stay in ICU and occur when exogenous pathogens are accidentally introduced into a sterile internal organ without previous carriage.

Micro-organisms differ in their pathogenicity. For example, vast majorities of ICU patients carry *Enterococcus* spp. In high concentrations in the intestines; infections caused by these microorganisms are rare. Conversely, 30%-40% of ICU patients who carry aerobic Gram-negative bacteria (including *P. aeruginosa* and*Klebsiella* spp.) in the oral cavity, throat or intestines develop an infection caused by these organisms. The pathogenicity can be expressed in the ***Intrinsic Pathogenicity Index (IPI).***

IPI is number of patients infected by species x/number of patients carrying species x in throat or intestines.

The range of IPI is from 0 to 1. Carriage of a microorganism with an IPI close to 0 will seldom be followed by an infection. Carriage of a microorganism with an IPI close to 1 will almost always be followed by an infection. According to the IPI, microorganisms can be divided in low, potentially and highly pathogenic microorganisms. Prevention of carriage