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Original Research Article

Ventilator Associated Pneumonia in the Critical Care Unit in a Tertiary Care Hospital by Burkholderia Cepacia by an Unusual Mode of Infection

Saurabh Mitra[1], Swagnik Roy[1], Rajat Dasgupta[2]

[1]Assistant Professor, [2]Demonstrator,
Department of Microbiology, K P C Medical College and Hospital, Kolkata.

Corresponding Author: Saurabh Mitra

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ABSTRACT

The present study was carried out on suspected cases of ventilator associated pneumonia in the critical care unit over a period of eleven months in a tertiary care hospital in West Bengal. A total number of 128 suspected cases of respiratory tract infection were reported. Samples were collected from the above cases and cultured for bacterial growth. Out of the 128 samples a total of 45 were culture positive. Of the culture positive cases, 14 were *Burkholderia cepacia*. Unexpectedly high number of, *Burkholderia cepacia* isolated for the first time from this unit prompted extensive searching. This led to isolation of *Burkholderia cepacia* from the chlorhexidine gluconate mouthwash used in the ward. Prompt action was taken leading to control of the situation.

Keyword: Ventilator - associated pneumonia, endotracheal tube aspirates, microscan system, nonfermenters, nosocomial infections.

INTRODUCTION

Ventilator associated pneumonia (VAP) is an infection of lung parenchyma occurring 48-72 h or more after intubation due to organisms incubating at the time mechanical ventilation (MV) was commenced. [1] It is the most common nosocomial infection encountered in the intensive care unit (ICU), with 9-28% of all intubated patients developing VAP. [2,3] Intubation independently increases the risk of developing nosocomial pneumonia at least seven‑fold, with a peak in incidence occurring around day 5 of ventilation. [4] Most cases seem to result from aspiration of pathogenic microorganisms that commonly colonizes the oropharyngeal airway of the critically ill patient. Risk factor of VAP includes: (i) Increase the risk of colonization by potential pathogens (e.g. prior antibiotic therapy, contaminated ventilator circuits, decreased gastric acidity), (ii) increased possibility of aspiration of oropharyngeal contents into the lower respiratory tract (e.g. intubation, decrease level of consciousness, presence of nasogastric tube) and (iii) reduced host defense mechanism in the lung and permit overgrowth of aspirated pathogen (e.g. chronic obstructive pulmonary disease, old age, upper abdominal surgery). Aspiration of oropharyngeal secretions into the bronchial tree is a major factor in the development of VAP. [5]

Burkholderia cepacia or the *Burkholderia cepacia complex* (BCC) is a catalase-producing, non-lactose-fermenting, gram- negative bacterium. *B cepacia* is an important human pathogen which often causes pneumonia in immune-

compromised individuals with underlying lung disease or malignancies. Apart from pneumonia (especially in patients with cystic fibrosis), they also cause a wide variety of infections ranging from superficial to deep-seated and disseminated infections, meningitis, peritonitis (in patients undergoing peritoneal dialysis), [6] septicaemia and bronchiectasis. BCC survives and multiplies in aqueous hospital environments where it may persist for long periods. Due to high intrinsic resistance of the BCC to antibiotics and antimicrobial compounds, all of these infections can prove very difficult to treat and may be fatal. Nosocomial infections caused by BCC include blood stream infections (BSI), pneumonias, and surgical wound infections. Out breaks of nosocomial infections due to BCC have been commonly reported in literature and generally linked to contamination of various fluid used in hospitals.

MATERIALS AND METHODS

The present study was carried out on critically ill immunologically debilitated patients because the study population consists of patients on mechanical ventilator in the critical care ward of a tertiary care hospital in West Bengal.

Patients receiving treatment for respiratory failure on mechanical ventilator presenting with features of VAP were investigated for causative organism. The endotracheal tube aspirates samples were cultured under aerobic condition culture by conventional method and causative organisms were identified by automated method (microscan system Siemens). The organism isolated were *Burkholderia cepacia* in a significant number of cases along with other organisms like *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Escherichia coli*, and other nonfermenters like *Pseudomonas aeruginosa*, and *Acinetobacter baumannii*

Extensive search was carried out to locate the source, this included investigation of care givers, paramedical staffs and other hospital personnel and instruments like suction apparatus, humidifiers, and ventilator circuits. Samples were taken from nebulizer drugs especially from batches that were used in those patients who were subsequently infected. All these samples were subjected to culture by conventional method. Finally *Burkholderia cepacia* was isolated from the chlorhexidine gluconate which was used on the bedside for oral care in patient with endotracheal tube in -situ.

RESULTS

During an 11-month period, patients admitted to the critical care unit were evaluated. Among those requiring MV with a CPIS score >6 were evaluated for VAP. Bacteriological culture was done on the endotracheal aspirate by conventional method on blood agar and nutrient agar medium.

Most cases of VAP were caused by Gram-negative bacteria, which accounted for majority of causative organisms. *Pseudomonas aeruginosa* 9, (20 %), *Acinetobacter baumannii* 8, (17.7%), *E. coli* 3, (6.6%), citrobacter 4(8.8%), *Klebsiella pneumoniae* 4 (8.8%) but *Burkholderia cepacia*, *BCC* 14, (31.1%) was the most common Gram-negative bacteria associated with VAP and *Staphylococcus aureus* 3(6.6%) was the most common Gram-positive bacteria among patients with VAP.

Burkholderia cepacia comprised of maximum number of cases, 31.1 %. The organisms isolated from the patients and those isolated subsequently from the mouth wash sample showed identical sensitivity pattern on automated method (microscan system Siemens) indicating their origin from same source.

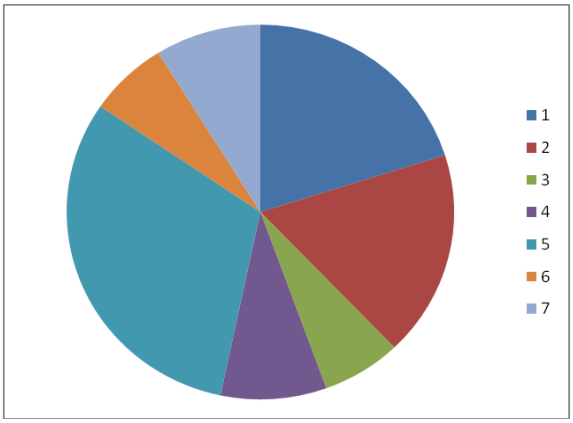

Figure 1

1) *Pseudomonas aeruginosa* 9 20%)
2) *Acinetobacter baumannii* 8, (17.7%)
3) *E. coli* 3,(6.6%)
4) *Citrobacter* 4(8.8%),
5) *Burkholderia cepacia BCC* 14, (31.1%)
6) *Klebsiella pneumonia* 4 (8.8%)
7) *Staphylococcus aureus* 3(6.6%)

DISCUSSION

Non-fermentative Gram negative rods occupy the second position after enterobacteriaceae as opportunistic pathogens responsible for nosocomial infections. *Pseudomonas aeruginosa*, *Acinetobacter baumannii* and *Stenotrophomonas maltophilia* are the most frequently encountered non-fermentative agents of nosocomial infections in intensive care units. Multidrug resistance exhibited by these species can cause serious problems in the clinical setting. *B. cepacia* with its high transmissibility between hospitalized patients and multiple drug resistance can now be added to this list. *B. cepacia* though usually nonpathogenic in healthy hosts, is commonly associated with colonization and pulmonary infection in CF patients However, the pathogenicity of *B. cepacia* is not always limited to individuals with CF, infection occurs through exposure to contaminated solutions in hospitalized patients.

In the study, Nosocomial *Burkholderia cepacia* infections in a Turkish university hospital: a five-year surveillance, by Murat Dizbay, Ozlem Guzel Tunccan, Busra Ergut Sezer, Firdevs Aktas, Dilek Arman carried out in the Department of Infectious Diseases and Clinical Microbiology, Gazi University School of Medicine, Ankara, Turkey [7] BCC is implicated as the causative agent of various type of infection e.g. pneumonia (included VAP), Bloodstream (included catheter related BSI) urinary tract ,surgical site and skin-soft tissue. Of these pneumonia was the most frequent infection due to BCC and Oropharyngeal bacterial colonization during intubation, poor cough reflex, and direct inhalation of contaminated aerosols into the lower respiratory tract have been involved in the higher risk for pneumonia of patients receiving mechanical ventilation.

A study named The Pathogenesis of Ventilator-Associated Pneumonia: Its Relevance to Developing Effective Strategies for Prevention, [8] carried out by Nasia Safdar MD MSc, Christopher J Crnich MD MSc, and Dennis G Maki MD, the author has mentioned BCC as a major etiological agent for epidemic VAP caused by caused by contamination of inhaled medication nebulizer reservoirs.

In 2012 an original article published in 2012 Jan by Martin M, [1] Winterfeld I, Kramme E, Ewert I, Sedemund-Adib B, Mattner F. [9] 12 cases were identified whereby the first detection of BCC was in respiratory specimens of 11 patients and 1 in a wound swab from the oral cavity. Of these patients six developed ventilator-associated pneumonia (VAP). Investigations revealed that five different batches of an alcohol-free mouthwash containing hexetidine were highly contaminated. Isolates of BCC from patients and mouthwashes were genetically indistinguishable proving to be the suspected source.

CONCLUSION

In hospitals, *B. cepacia* has been found to contaminate antiseptics, disinfectants, nebulizer solution, and dextrose solution in the present study B cepacia was found to grow in the 0.2% chlorhexidine gluconate used as oral care

solution in the hospital ward. With every single act of using the contaminated solution for mouthwash or oral care, the ventilated patients ran the risk of developing lower respiratory tract infection. So tracing back and searching for the source is very important in infection control point of view along with maintaining ward statistic of isolates and their susceptibility records which was found to be very true in our study perspective.

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