

A Prospective Study on Microbiological Analysis of Endotracheal Secretions in Patients on Mechanic Ventilators: Hospital Based Study

Deepak Kumar Kalra

Associate Professor, Department of TB & Respiratory Diseases,
Shri Dev Suman Subharti Medical College, Dehradun, Uttarakhand, India.

ABSTRACT

Introduction: Respiratory infections are related with high morbidity and mortality in critically ill patients. For better outcomes, rapid diagnosis and appropriate antibiotic therapy is very much essential. Intubated and ventilated patients are further at risk of acquiring respiratory infections because of complex interplay between the endotracheal tube, host immunity and virulence of invading bacteria. It may lead to Ventilator Associated Pneumonia (VAP).

Methodology: 208 total numbers of cases were included in this study. This study was conducted in the Department of TB & Respiratory Diseases, Subharti Medical College, Meerut, U.P. The duration of study was over a period of six month.

Results: In our study, total 208 cases were included, out of which 98 cases were seen, who develop the respiratory infection. Among the 208 cases 130 were male & 78 were female. In our study, 63.4% cases were found with lethargy clinical manifestations followed by Respiratory distress (44.2%), Hypothermia (24.1%), Sclerema (12.1%), hyperthermia (8.6%).

Conclusion: This study concludes that Culture of ET aspirate is easy, cost-effective procedure which helps in identifying the organism. Delays in initiation of antibiotic treatment may lead to poor outcomes.

Keywords: Endotracheal Secretions, AST, Mechanic Ventilators, Organisms.

*Correspondence to:

Dr. Deepak Kumar Kalra,

Associate Professor, Department of TB & Respiratory Diseases, Shri Dev Suman Subharti Medical College, Dehradun, Uttarakhand, India.

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INTRODUCTION

For respiratory support and airway protection of critically ill patients, the endotracheal tube (ETT) is a life-saving device. Though, its continuous presence in the trachea can have harmful consequences. It can disrupts the physiological mechanisms that maintain mucus homeostasis.^{1,2} The ETTs collected after discontinuation of mechanical ventilation has been studied by the authors recently and a significant degree of luminal occlusion has been found which was measured by high-reso Drs Pincirolì, Mietto, Piriypatsom, Pirrone, Kacmarek, and Berra are lution computed tomography (HRCT). Even with optimal humidification and standard ETT suctioning, similar levels of ETT block were also found in chest CT scans of intubated patients. The degree of ETT obstruction positively correlated with in vitro measurements of air flow resistance.³ Both the process of mucus buildup and luminal narrowing leads to an increased ventilatory effort. It might delay liberation from the ventilator.^{4,5}

Moreover, potential lung pathogens often colonize the ETT lumen.^{6,7} As complex biofilms bacteria grow⁸, with the plastic

surface offering the ideal environment for their proliferation and acquisition of antibiotic resistance.⁹

Respiratory infections are related with high morbidity and mortality in critically ill patients. For better outcomes, rapid diagnosis and appropriate antibiotic therapy is very much essential. Intubated and ventilated patients are further at risk of acquiring respiratory infections because of complex interplay between the endotracheal tube, host immunity and virulence of invading bacteria. It may lead to Ventilator Associated Pneumonia (VAP). The etiologic agents vary due to various factors such as types of patients in an ICU, duration of hospital stay, pre-existing illness and prior antimicrobial therapy. Before initiating an empiric antimicrobial therapy, it is essential to have the knowledge of microbial flora of the locality. Such information needs to be analyzed periodically and institution based antibiotic policies formed from time to time and made available to all consultants treating infectious disease. The foregone discussion showed the significance of the present study.

MATERIALS & METHODS

Study Population: 208 total number of cases were included in this study.

Study Area: This study was conducted in the Department of TB & Respiratory Diseases, Subharti Medical College, Meerut, U.P, India. The duration of study was over a period of six month.

Study Duration: The duration of study was over a period of six month.

Sample Collection: in the present study on the first day of intubation, endotracheal secretions were sent for bacteriological culture and sensitivity to identify the organisms that already existed at the time of intubation. This would help in initiating antibiotic therapy appropriately and help in preventing the occurrence of VAP or Hospital acquired pneumonia (HAP). In this study, gram negative enteric bacteria was the most common isolate with Klebsiella followed by Pseudomonas and Enterobacter that were sensitive to aminoglycosides.

Data Analysis: Data were analyzed by the using Microsoft excel.

Table 1: Distribution of cases according to gender

Sex	Cases who did not develop respiratory infection	%	Who develop respiratory infection	%
Male	130	62.5%	47	47.9%
Female	78	37.5%	51	52.1%
Total	208	100%	98	100%

Table 2: Distribution of cases according to Clinical feature, sepsis & blood culture

Clinical feature	Clinical sepsis	%	Blood culture positive	%
Respiratory distress	92	44.2%	48	48.9%
Lethargy	132	63.4%	62	63.2%
Sclerema	25	12.1%	14	14.2%
Hypothermia	50	24.1%	15	15.3%
Hyperthermia	18	8.6%	6	6.1%
Apnea	25	12.1%	11	11.2%

Table 3: Distribution of cases according to infection

Infection with	n	%
Gram positive	46	46.9%
Gram negative	52	53.1%
Total	98	100%

Table 4: Distribution of cases according to isolated organisms

Gram negative bacteria	n	%
Klebsiella pneumoniae	32	61.5%
E. coli	6	11.5%
P. aeruginosa	4	7.6%
Proteus spp.	4	7.6%
Enterobacter spp.	6	11.5%
Total	52	100%

Table 5: Distribution of cases according to isolated organisms

Gram positive bacteria	n	%
CONS	21	45.6%
Staphylococcus aureus	23	50%
Streptococcus pneumonia	2	4.4%
Total	46	100%

OBSERVATIONS & RESULTS

In our study, total 208 cases were included, out of which 98 cases were seen, who develop the respiratory infection. Among the 208 cases 130 were male & 78 were female. In our study, 63.4% cases were found with lethargy clinical manifestations followed by Respiratory distress (44.2%), Hypothermia (24.1%), Sclerema (12.1%), Hyperthermia (8.6%). In the presence study, infection with gram positive bacteria found 46.9% , while gram negative infection were seen 53.1%. Different organism isolated in this study which showed in table 4.

DISCUSSION

To prevent or combat respiratory failure, endotracheal intubation and mechanical ventilation are life-saving procedures. In several clinical conditions like, life threatening infections, sepsis and acute respiratory distress syndromes, neurological dysfunctions need to take ventilatory support.

Though mechanical ventilation helps to prevent deaths due to respiratory failure yet sometimes it leads to life threatening lung infections by itself. The reason could be due to infectious organisms getting access either by endogenous or exogenous route resulting in ventilator associated pneumonia (VAP). Although, the presence of an endotracheal tube in the airway is critical for the management of the mechanically ventilated patient. It also leads to the development of VAP by unsettling normal protective mechanism which is related with the intraluminal formation of biofilm by multidrug resistant organisms. 10 These infections may result from constant growth of an agent that existed prior intubation. It depends on various factors like pre-existing lung disease, prior colonizing organisms and oral commensals, as a part of systemic dissemination etc.

Therefore, in the present study on the first day of intubation, endotracheal secretions were sent for bacteriological culture and sensitivity to identify the organisms that already existed at the time of intubation. This would help in initiating antibiotic therapy appropriately and help in preventing the occurrence of VAP or Hospital acquired pneumonia (HAP). In this study, gram negative enteric bacteria was the most common isolate with Klebsiella followed by Pseudomonas and Enterobacter that were sensitive to aminoglycosides. It was found that culture positivity was more common in elderly male patients who were smokers, admitted for respiratory causes or had pre-existing lung diseases. Whereas no growth or commensals were obtained in predominantly female patients and patients ventilated for other than respiratory causes representing near normal lung. A study was conducted by Ferrer et al on airway colonizing agents in the development of future VAP. They found that airway colonization by potentially pathogenic microorganisms on admission was associated with failure of non-invasive ventilation for exacerbation of COPD.11 In contrast, DrakulovicMB et al observed that patients admitted to a respiratory intensive care unit, initial tracheal colonization was not

associated with mortality or length of stay in hospitals.¹² Ortqvist et al found in a study of patients with community acquired pneumonia that respiratory tract colonization was related with a significantly increased mortality and length of stay but was not a risk factor for nosocomial pneumonia.¹³ Lakshmi Durai raj et al studied patterns and density of early tracheal colonization in intensive care unit patients. Their study revealed that there was not any baseline characteristics that predict patterns of colonization, nor did they find association with outcomes.¹⁴ Corne P et al studied the role of nasal carriage of staphylococcus aureus in respiratory tract infections of critically ill patients. Through molecular evidence, they found that *S. aureus* strain isolated from nares was genetically identical to that isolated from the bronchial sample of the same patient in 15 out of 16 cases. This showed a link between *S. aureus* nasal carriage and *S. aureus* pneumonia or bronchitis in the majority of critically ill patients.¹⁵ Similar results were found by Garrouste- Orgeas M et al in one of their study.¹⁶ Various studies shows that there exists a relationship between the organism causing VAP and pre-existing colonizing microbe. It has been found by Koeman M et al that topical oral decontamination with either chlorhexidine (CHX, 2%) or CHX/colistin (CHX/COL, 2%/2%) decreases the incidence of VAP.¹⁷

CONCLUSION

Culture of ET aspirate is easy, cost-effective procedure which helps in identifying the organism. Delays in initiation of antibiotic treatment may lead to poor outcomes. There is a risk of emergence of MDR pathogens with inadequate, inappropriate antibiotic treatment. Thus the microbiological profile & sensitivity pattern of the local community helps in framing the appropriate institutional antibiotic policy for better outcomes.

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