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Comparison study between bacteriological aetiology and outcome of VAT & VAP

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ABSTRACT

Mechanical ventilation (MV) is a life saving process but it carries risks of respiratory tract infection as ventilator associated tracheobronchitis (VAT) and ventilator associated pneumonia (VAP) leading to increase morbidity and duration of mechanical ventilation in intensive care unit (ICU). VAT is an intermediate stage between colonization and VAP.

Aim of the work: To compare between VAT and VAP as regards microbiological diagnosis and outcome of patients.

Subjects and methods: The current study includes twenty patients admitted to respiratory ICU with respiratory failure developed VAT and VAP after 48 h of MV and to evaluate their impact on patient's outcome.

Results: Klebsiella was the commonest organism in both groups and that duration of stay on MV was observed in VAT patients and most of VAT patients progressed to VAP.

Conclusion: From the study we concluded that VAT infection is as severe as VAP and it needs more attention to prevent its presence as, once present, it usually progress to VAP increasing mortality rate in ICU.

Introduction

Mechanical ventilation is life saving process but it carries risks of VAT and VAP which are associated with increase morbidity, duration of MV and mortality in ICU. VAT is believed to be an intermediate stage between colonization of the lower respiratory tract and VAP. However VAT may be a separate entity that may contribute to increase length of ICU stay and duration of MV Both VAP & VAT are clinically characterized by presence of fever, mucopurulent bronchial secretions & leukocytosis. In contrast to VAP, VAT does not involve pulmonary parenchyma and as a result does not cause radiographic pulmonary infiltrates. Accurate diagnosis of VAT is challenging as many conditions commonly encountered in critically ill patients can mimic its signs & symptoms [1].

Aim of the work

To document practice of clinical & microbiological diagnosis of VAT & VAP and to evaluate the impact of VAT & VAP on patient's outcome.

Subjects and methods

The study included twenty patients admitted to respiratory I.C.U suffering from respiratory failure and mechanically ventilated.

Exclusion criteria

- Patients with ongoing nosocomial infection.
- Pregnant women.
- Patients with community acquired pneumonia.
- Patients with neutropenia <1000 WBC/mm^3.

All patients were subjected to:

- Full history taking, general and local chest examination.
- Lab investigations (ABG, CBC and Renal function tests).

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- Follow up for developing lower respiratory tract Infection by daily assessment of
- patients as regards:
  1. Tracheal secretions quantity and character (Volume of secretions was graded according to the following scale: Scanty <30 ml/day and profuse >100 ml/day).
  2. Temperature
  3. PaO_2/FIO_2 twice weekly
  4. Assessment of chest X-ray twice weekly
  5. Leukocytic count
- Microbiological assessment by quantitative culture of respiratory secretion by Mini-BAL maneuver to take samples from lower respiratory tract.

Mini-BAL sampling was done at the first day of mechanical ventilation and after 48 h of mechanical ventilation.

Patients with positive culture after 48 h were included in the study. Patients were divided into two groups; group I (VAT) group II (VAP).

VAT diagnosed according to the following criteria:

Patient has no clinical or radiological evidence of pneumonia and has two of the following signs and symptoms in absence of other obvious cause:

- Fever (temp > 38 °C or < 36 °C).
- Leucocytosis > 12.000/mm^3.
- Sputum production; increase amount and change of color to yellow, greenish or pus.
- Positive cultures obtained by mini-BAL catheter (We used <10^3 as cut off value of colony count for positive culture for diagnosis of VAT. For diagnosis of VAP we used the same criteria for diagnosis of VAT with the development of CXR shadow suggestive of pneumonia, which equal to CPIS score >6 and we used 10^3 as cut off value of colony count for diagnosis of VAP) [2].

Mini- BAL technique

Materials used

a. Nelaton catheter size (18-FG), its distal end was cut and used as outer protective catheter.
b. Infant rhyle catheter size (10-FG) was used as the inner catheter and sterile K-y gel was used to block the distal end of the outer catheter.
c. Sterile gloves and 3 syringes 20 ml each of normal saline and a specimen container.

Procedure

According to Abd ElFattah et al.,[3] the Nelaton catheter used as outer catheter, was gently advanced into the endotracheal tube until resistance is met, indicating that the catheter is wedged into the distal airway, then retracted 4–5 cm. The infant rhyle catheter is advanced in a telescopic manner through the outer catheter extruding the K-y gel plug.

- A 20 ml syringe was connected to the inner catheter to administer its content of normal sterile saline that was aspirated again using the same 20 ml syringe while maintaining the catheter position. Aspiration process repeated until an appropriate specimen is obtained.
- The sample was poured into specimen container carefully to avoid contamination and close the lid tightly. Both catheters were removed together from the airways.
- Good closed suctioning of patient's airway was done.
- The samples taken were subjected to bacterial culture and colony count.
- All identified microorganisms were reported with their antibiotic sensitivities.

Bacterial culture and colony count

1. A 0.01 ml sterile calibrated loop was placed into the respective specimen and then onto the center of three media plates (blood agar, chocolate agar, and macconkey agar).
   The media plates were then streaked using the pin wheel streak method and incubated at 35 °C.
   Stained films from bacterial growth were examined by microscopy for the type of bacteria, Gram reaction (Gram-positive or Gram-negative) and morphology of the bacteria (cocci, diplococcic, rods or coccobacilli).
2. Bacterial culture growth was quantitated according to the number of colonies observed per plate were counted as follows:
   <10 colonies per plate represented <10^3 cfu / ml.
   10–100 colonies per plate represented 10^3–10^4 cfu/ml.
   100–1000 colonies per plate represented 10^4–10^5 cfu/ml.
   1000 colonies per plate represented >10^5 cfu/ml.
   All identified microorganisms were reported with their antibiotic sensitivities.

Results

Clinical criteria were as follows

- Group I:10 VAT patients received systemic antibiotics (100%) had colored secretions, 60% were profuse in amount, 40% were scanty, the mean temp. was (37.87 ± 0.47) the mean leucocytic count was (14.18 ± 5.04) × 10^3/ml the mean PaO_2/FIO_2 was (166.75 ± 39.9) and no patient has CXR shadows suggesting VAP (0%).
- Group II:
  10 VAP patients received systemic antibiotics(100%) had colored secretions, 30% were profuse, 70% were scanty, the mean temp. was (37.9 ± 0.69) °C the mean leucocytic count was (13.91 ± 6.47) × 10^3/ml, PaO_2/FIO_2 ratio was (166.20 ± 38.21) and the presence of CXR shadows suggestive of VAP were in (100%) of patients.

No significant difference between group I and group II on admission as regards clinical criteria (in comparing; secretion amount ($p = 0.234$), temperature($p = 0.542$) and Leucocytic count ($p = 0.457$), and in comparing PaO_2/FIO_2 ($p = 0.65$) (see Table 1).

The microbiological distribution of the micro organisms at day 1(Tables 2–5) showed that the commonest bacteria isolated from group I was klebsiella (60%) and from group II was klebsiella (90%).

Clinical outcome after 7 days of MV

Group I (VAT) showed that secretions were still colored in all patients, the amount decreased in 6 patients (60%), 4 patients (40%) had profuse amount . and group II (VAP), secretions were also still colored in all patients (100%) their amount decreased in 4patients (40%), 6patients (60%) had profuse amounts (Tables 7 and 8) and there was no significant difference between group I and group II as regards secretion outcome ($p = 0.337$) (see Table 6).

As regards temperature, group I showed that 4 patients (40%) had normal temperature 6 patients (60%) had high temp. with mean temp (37.75 ± 0.77)and group II showed 5 patients (50%) had normal temp. and 5 patients (50%) had high temp. with mean temp. (37.8 ± 1.23) °C. There was no significant difference between

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