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To assess the efficacy of subglottic aspiration in prevention of ventilator-associated pneumonia

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Abstract

Background: The present study was conducted to assess the efficacy of subglottic aspiration in prevention of ventilator-associated pneumonia.

Materials and methods: The present study was conducted on 120 patients hospitalized for critical illness of both genders. They were divided into 2 groups of 60 each. Group I ($n = 60$) patients were intubated with HiLo™ Evac endotracheal tube with sub-glottic secretion suction. Group II patients ($n = 60$) were intubated with HiLo™ Contour endotracheal tube without such facility. Presence of VAP day of onset of VAP after instituting mechanical ventilation, length of mechanical ventilation, length of ICU stay and mortality was recorded.

Results: Incidence of VAP in group I was 4.2 days and in group II was 10 days. Ventilator days (at onset of VAP) in group I was 7.12 and in group II was 8.45, length of ICU stay (at onset of VAP) in group I was 8.45 and in group II was 6.24, total ventilator days in group I was 6.12 and in group II was 8.22, mortality was 11 in group I and 25 in group II. The difference was significant ($P < 0.05$).

Conclusion: Authors found that intermittent sub-glottic suctioning reduces the incidence of VAP including late-onset VAP.

Keywords: Endotracheal tube, sub-glottic, ventilator-associated pneumonia

Introduction

Ventilator-associated pneumonia (VAP) is defined as pneumonia that occurs 48-72 hours or thereafter following endotracheal intubation, characterized by the presence of a new or progressive infiltrate, signs of systemic infection (fever, altered white blood cell count), changes in sputum characteristics, and detection of a causative agent ^[1].

Hospital acquired pneumonia (HAP) accounts for up to 25% of all Intensive Care Unit (ICU) infections and more than 50% of the antibiotics prescribed. The development of HAP 48 h after endotracheal intubation and initiation of mechanical ventilation is known as ventilator associated pneumonia (VAP) ^[2]. Figures quoted by the International Nosocomial Infection Control Consortium suggest that the overall rate of VAP is 13.6 per 1000 ventilator days. However, the individual rate varies according to patient group, risk factors, and hospital setting. The average time taken to develop VAP from the initiation of MV is around 5 to 7 days, with a mortality rate quoted as between 24% and 76% ^[3].

The complex interplay between the endotracheal tube, presence of risk factors, virulence of the invading bacteria and host immunity largely determine the development of VAP ^[4]. The presence of an endotracheal tube is by far the most important risk factor, resulting in a violation of natural defense mechanisms (the cough reflex of glottis and larynx) against micro aspiration around the cuff of the tube. Using an endotracheal tube which incorporates a separate dorsal lumen ending in the sub glottic area, above the cuff, for drainage of sub glottic secretions therefore should result in reduction in the development of VAP ^[5]. The present study was conducted to assess the efficacy of subglottic aspiration in prevention of ventilator-associated pneumonia.

Materials and Method

The present study was conducted in the department of Anesthesiology. It comprised of 120 patients hospitalized for critical illness of both genders. The study protocol was approved from institutional ethical committee. Written informed consent was obtained from all patients or their attendants. Patients data such as name, age, gender etc. was recorded. They were divided into 2 groups of 60 each. Group I ($n = 60$) patients were intubated with HiLo™

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Evac endotracheal tube which incorporates a separate dorsal lumen ending in the sub-glottic area, above the cuff, for sub-glottic secretion drainage. Group II patients ($n = 60$) were intubated with HiLo™ Contour endotracheal tube without such facility for drainage of sub-glottic secretions. In Group I, sub-glottic secretions were suctioned manually whereas in group II, no such suctioning was done.

In both groups, Presence of VAP day of onset of VAP after instituting mechanical ventilation, length of mechanical ventilation, length of ICU stay and mortality was recorded. Results were subjected to statistical analysis. P value less than 0.05 was considered significant.

Results

Table 1: Distribution of patients

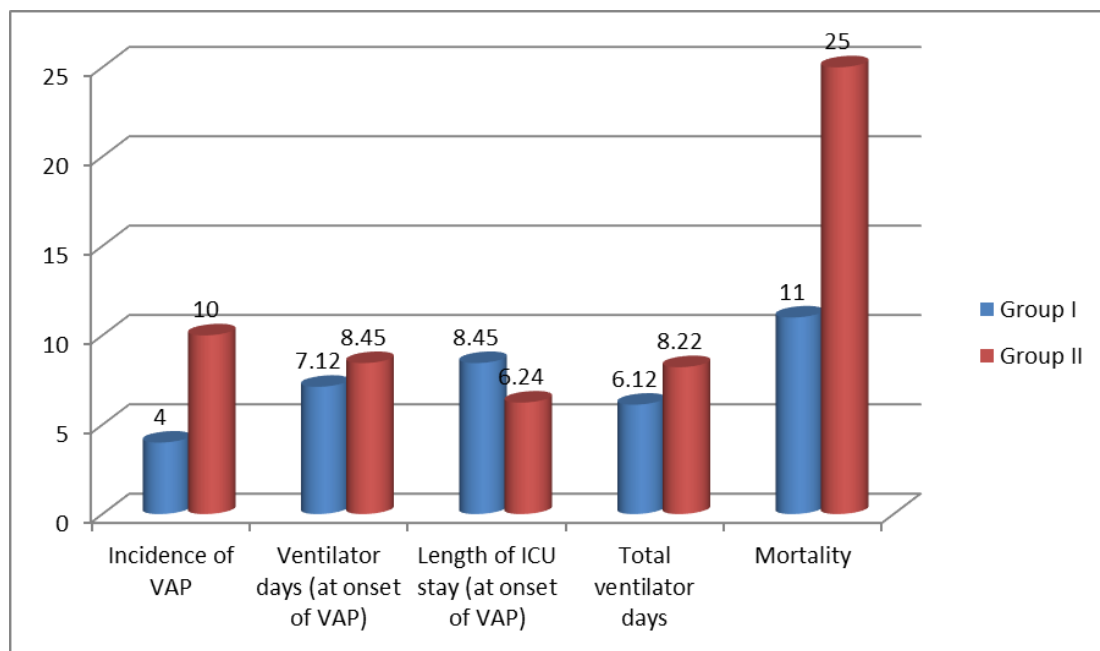
Total- 120		
Groups	Group I (With sub-glottic secretions suction)	Group II (Without sub-glottic secretions suction)
Number	60	60

Table 1 shows that both groups had 60 patients each. In group I, sub-glottic secretions suction was done while in group II no suctioning was done.

Table 2: Comparison of parameters

Parameters	Group I	Group II	P value
Incidence of VAP	4	10	0.01
Ventilator days (at onset of VAP)	7.12	8.45	0.52
Length of ICU stay (at onset of VAP)	8.45	6.24	0.02
Total ventilator days	6.12	8.22	0.05
Mortality	11	25	0.01

Table 2, graph I shows that incidence of VAP in group I was 4.2 days and in group II was 10 days. Ventilator days (at onset of VAP) in group I was 7.12 and in group II was 8.45, length of ICU stay (at onset of VAP) in group I was 8.45 and in group II was 6.24, total ventilator days in group I was 6.12 and in group II was 8.22, mortality was 11 in group I and 25 in group II. The difference was significant ($P < 0.05$).



Graph I: Comparison of parameters

Discussion

The key to the development of VAP is the presence of an ETT or tracheostomy, both of which interfere with the normal anatomy and physiology of the respiratory tract, specifically the functional mechanisms involved in clearing secretions (cough and mucociliary action) [6]. Intubated patients have a reduced level of consciousness that impairs voluntary clearance of secretions, which may then pool in the oropharynx. This leads to the macroaspiration and microaspiration of contaminated oropharyngeal secretions that are rich in harmful pathogens [7].

Infectious bacteria obtain direct access to the lower respiratory tract via: (1) microaspiration, which can occur during intubation itself; (2) development of a biofilm laden with bacteria (typically Gram-negative bacteria and fungal species) within the endotracheal tube; (3) pooling and trickling of secretions around the cuff; and (4) impairment of mucociliary clearance of secretions with gravity dependence of mucus flow within the airways [8]. The

present study was conducted to assess the efficacy of subglottic aspiration in prevention of ventilator-associated pneumonia.

In this study, both groups had 60 patients each. In group I, sub glottic secretions suction was done while in group II no suctioning was done. Vijai *et al.* [9] conducted a study to Hypothesised that intermittent suctioning of sub- glottic secretions would prevent VAP. Group I patients were intubated with endotracheal (ET) tube with facility for sub- glottic suctioning, and Group II ($n = 50$) patients were intubated with ET tube without suctioning. It was seen that VAP was present in 6% of patients in Group I and 22% of patients in Group II. Both early-and late-onset VAPs were significantly reduced in Group I. Both ventilator days (8.0 vs. 6.45; $P = 0.001$) and ICU stay on the day of onset of VAP were significantly more in the Group I. Total ventilator days were significantly less with lower incidence of mortality in the Group I.

We observed that the incidence of VAP in group I was 4.2

days and in group II was 10 days. Ventilator days (at onset of VAP) in group I was 7.12 and in group II was 8.45, length of ICU stay (at onset of VAP) in group I was 8.45 and in group II was 6.24, total ventilator days in group I was 6.12 and in group II was 8.22, mortality was 11 in group I and 25 in group II. The difference was significant ($P < 0.05$). Smulders *et al.* [10] included 150 patients with an expected duration of mechanical ventilation >72 h and were randomized to intermittent sub-glottic secretion drainage or control group. Patients randomized to intermittent sub-glottic secretion drainage had a statistically lower incidence of VAP than patients intubated with the conventional endotracheal tube. No statistical differences were found in the duration of mechanical ventilation, length of ICU stay, length of hospital stay and mortality.

Conclusion

Authors found that intermittent sub-glottic suctioning reduces the incidence of VAP including late-onset VAP.

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