

Effect of Gastric Residual Volume Monitoring on Incidence of Ventilator-Associated Pneumonia in Mechanically Ventilated Patients Admitted to Intensive Care Unit

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ABSTRACT

Aim: To investigate the effect of residual gastric volumes in intensive care patients on the incidence of ventilator-associated pneumonia.

Study Design: Randomized controlled trial

Place and Duration of Study: Department of Medicine, Department of Medicine, Chandka Medical College Hospital, Larkana from 1st July 2019 to 31st December 2019.

Methodology: One hundred patients were enrolled in the study in both genders admitted to ICU. After having given written consent, patients received comprehensive information, such as age, sex, body mass index and medical history. GRV was measured every 3 hours and GRV>250 cc gastric intolerance was described. Vomiting and VAP occurrence, GRV, mechanical ventilation time and ICU remainder, APACHE II and SOFA rates and death rate were observed.

Results: The mean APACHEII and SOFA scores, ICU length of stay, and duration of mechanical ventilation in the GRV>250ml group were significantly higher than in the GRV≤250 ml group. No significant difference was observed regarding VAP between GRV>250ml group and GRV <250ml group, p-value >0.05. Infection, vomiting and mortality rate was high in patients with GRV >250ml as compared to patients with <250ml with p-value <0.05.

Conclusion: No significant difference was observed regarding VAP incidence between patients with GRV >250ml and GRV <250ml. However, infection, vomiting and mortality rate was high in patients with GRV >250ml.

Key words: Gastric, Residual volume, Intensive Care Unit, Ventilator-associated pneumonia

INTRODUCTION

In critically ill patients who are under mechanic ventilation, early enteral feeding is the normal metabolic support. Enteral feeding is the preferred route of nutrition support for patients whose nutritional needs cannot be met by oral feeding.¹ However, over 50 % of patients with ICU experience gastric dysmotility, leading to sluggish gastric emptying.² Delayed gastric emptying can lead to many issues that can affect the outcomes and insufficient or incomplete heating intake of ICU. The risk of VAP may be increased by nausea, regurgitation and aspiration.³⁻⁵

Hence, the monitoring of residual gastric volumes (GRV) to minimise the occurrence of these complications is recommended. In cases of high GRV, it therefore appears essential to decrease enteral feeding volume or the formulation osmolality. Several studies have dealt with problematic issues in the measurement of gastric volume for critically ill patients undergoing mechanical ventilation.^{6,7} Previous studies that track relationships between GRV and VAP have not yet been well designed to display GRV as a reliable predictor of increased risk for VAP.⁸ The effects of conflicting variables were not adapted in the above-mentioned studies, hence the findings should be interpreted carefully. The use of GRV as a strong predictor of ICU patients is disputable, according to previous findings.⁸ The present study was conducted aimed to examine the effects gastric residual volume monitoring on incidence of ventilator-associated pneumonia in

mechanically ventilated patients admitted to intensive care unit.

MATERIALS AND METHODS

This randomized controlled trial study was conducted at Department of Medicine, Department of Medicine, Chandka Medical College Hospital, Larkana from 1st July 2019 to 31st December 2019. A total of 100 patients were enrolled in the study in both genders admitted to ICU. Following written consent, patients obtained comprehensive population data including age, gender, body mass index, and medical history. The criterion for exclusion included history of esophageal gastrointestinal bleeding and involvement, intestinal obstruction, enteral feeding by the yeast, acute pancreatitis and pregnancy. GRV was measured every 3 hours and GRV>250 cc gastric intolerance was described. Group I comprises 66 patients with GRV < 250 ml and Group II consist of 34 patients with GRV > 250 ml. Patients were divided into two classes. Vomiting and VAP frequency, GRV, mechanical ventilation period and ICU stays, APACHE II and SOFA rates and mortality rates were observed. All the data was analyzed by SPSS 24.

RESULTS

There were 65% males while 35% were females. Mean age of the patient was 52.37±14.24 years. Mean BMI was 25.63±2.76 kg/m². We found that 38% patients had diabetes mellitus, 28% patients had renal diseases, 16%

patients had cardiac diseases, 25% patients had liver diseases 49% patients had respiratory diseases (Table 1).

APACHE II score, SOFA score, ICU stay and duration of mechanical ventilation were significantly higher in patients with GRV >250ml as compared to patients with GRV <250 ml [P-value <0.05] (Table 2).

Among patients with GRV<250ml 16 (24.24%) had VAP while among patients with GRV>250ml 10 (29.41%) patients had VAP, no significant difference was observed. Infection, vomiting and mortality rate was high in patients with GRV >250ml as compared to patients with <250ml with p-value <0.05 (Table 3).

Table 1: Baseline details of all the patients

Variable	No.	%
Mean age (years)	24.52±6.48	
Gender		
Male	65	65.0
Female	35	35.0
Body mass index (kg/m ²)	25.63±2.76	
Co-morbidities		
Diabetes	38	38.0
Renal diseases	28	28.0
Respiratory	49	49.0
Cardiac	16	16.0

Table 2: Comparison of APACHE II, SOFA, ICU stay and duration of mechanical ventilation between both groups

Variables	Group I (GRV <250ml)	Group II (GRV >250ml)	P-value
APACHE II	22.36±4.16	27.47±4.76	<0.001
SOFA Score	10.91±1.84	11.77±1.64	0.02
ICU Stay	9.96±3.78	11.65±4.72	0.003
Duration of MV	5.97±2.56	7.35±3.58	0.02

Table 3: Comparison of outcomes between both groups

Variables	Group I (GRV <250ml)	Group II (GRV >250ml)	P-value
VAP	16 (24.24%)	10 (29.41%)	>0.05
Infection	22 (33.33%)	21 (61.76%)	0.001
Vomiting	28 (42.42%)	27 (79.11%)	0.002
Mortality	8 (12.12%)	13 (38.24%)	0.01

DISCUSSION

In present study we found no significant difference regarding VAP incidence between patients with GRV >250ml and patients with GRV <250ml. Many of previous studies demonstrated that raised GRV >250ml didn't affect in increasing ventilator associated pneumonia VAP.^{9,10}

The use of a less gastric residual volume interrupting was not indicated by a recently published meta-analysis of six RCT and six observational studies.¹¹ Routine monitoring of GRV is not recommended for patients who undergo mechanical ventilation and results in a reduced workload. However it cannot be seen that an increased quantity of calories supplied contributes to better survival.¹² Just one of the six observer studies changed the outcome on the basis of ambiguous risk factors, making it difficult to interpret the results.³ In the study described above, the authors have indicated that with GRV more than 250 ml or GRV more than 200 ml, the intake frequency has increased significantly.^{3,4} Just two of the RCTs had high quality. The rise in GRV did not result in any adverse complications. The nurses, however, were not blinded to the group

assignments; thus, in the first week after randomization, the patients in the intervention group received just about 200 kcal more.^{13,14} In its analysis, Metheny et al¹³ showed that gastrointestinal tractors under 200-500 ml appear well-tolerated, and that the VAP should be considered as the possible risk factor for GRVs; however, feeding should stop in cases of gastrointestinal tracts > 500 ml particularly during regurgitation or aspiration. Ozen et al¹⁵ have shown that the differences in calculating GRV do not allow these activities dependence on feeding intolerances and that GRV usage can be discontinued in the medical ICU as a standardised preventive strategy.

In our study we found that APACHE II score, SOFA score, ICU stay and duration of mechanical ventilation were significantly higher in patients with GRV >250ml as compared to patients with GRV <250 ml (P-value <0.05). These results were comparable to the study by Faramarzi et al¹⁶ in which patients with raised GRV >250ml had significantly longer ICU stay, higher mechanical ventilation duration and higher APACHE II and SOFA score as compared to patients with GRV <250ml.

We found that among patients with GRV<250ml 16 (24.24%) had VAP while among patients with GRV>250ml 10 (29.41%) patients had VAP, no significant difference was observed. Infection, vomiting and mortality rate was high in patients with GRV >250ml as compared to patients with <250ml with p-value <0.05. These results were similar to some previous studies in which vomiting, infection rate and mortality were high in patients with GRV 250ml.^{17,18}

CONCLUSION

No significant difference was observed regarding VAP incidence between patients with GRV >250ml and GRV <250ml. However, infection, vomiting and mortality rate was high in patients with GRV >250ml.

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