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Detrimental Effects of Mechanical Ventilation with Low Tidal Volumes in Patients without Acute Lung Injury (ALI) or Acute Respiratory Distress Syndrome (ARDS)

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PURPOSE

Recent data has shown that the use of reduced tidal volumes during mechanical ventilation of patients with ALI or ARDS can improve outcome, possibly by avoiding overinflation of stiff lungs. This use of small tidal volumes has been extended, in many practices, to patients not suffering from ALI or ARDS. Since the periphery of the lung lacks cilia, its sputum is cleared by cyclic inflation. The use of inadequate inflation volumes could thus cause ventilator associated atelectasis (VAA) and ventilator associated pneumonia (VAP). The present investigation was conducted in order to evaluate this possibility.

METHODS

Study design: Review of records of all patients mechanically ventilated in our MICU during a 6 month period (n=102). Exclusions: Patients with ALI or ARDS and those surviving less than 48 hours after intubation. VAA was defined as any new parenchymal opacity reported by radiology after intubation and before extubation. The occurrance of VAA was correlated with tidal volume, FiO2, body mass index (BMI), Apache II score, ventilator time, mortality, age, sex and the use of sighs.

RESULTS

New radiographic opacities occurred in 34 patients of whom 25 developed clinical pneumonia. There was no association betwen VAA and age, sex, Apache II score, diagnosis, ventilator time or mortality. The occurrance of VAA rose from 5% when the tidal volumes used were greater than 10ml/kg to 80% with tidal volumes smaller than 10ml/kg. VAA was more frequent when high FiO2 and PEEP were used instead of sighs and its frequency of occurrance also increased with increasing BMI. There was a trend toward increased mortality in patients treated with smaller tidal volumes.

CONCLUSION

Patients whose lungs are not severely damaged but nonetheless require mechanical ventilation are more likely to develop VAA and VAP when ventilated with low inflation volumes than when larger volumes are used.

CLINICAL IMPLICATIONS

The use of mechanical ventilation strategies employing low tidal volumes and avoidance of mechanical sighs in patients without ALI or ARDS should be reconsidered and probably abandoned.

DISCLOSURE

W.D. Marino, None.