

What Is the Best Position for Preventing Ventilator-Associated Pneumonia?

Preventing aspiration in mechanically ventilated patients continues to be a key component in the battle toward reducing the incidence of ventilator-associated pneumonia (VAP). These aspiration events (especially micro-aspirations) are a major VAP risk factor and thus have become a target of the quality-improvement movement.¹ VAP bundles have been introduced into intensive care units worldwide, and contain modalities designed to minimize aspiration risk. One universal intervention involves placing mechanically ventilated patients into the semi-recumbent position (30–45°) rather than the fully supine position.²⁻⁴

Surprisingly, the data to support semi-recumbent positioning are relatively sparse and are based on 3 small initial studies, the largest of which was published in *The Lancet* in 1999 and involved 85 patients.⁵⁻⁷ That study compared 39 patients in the 45° semi-recumbent position to 47 patients in the fully supine position, and the incidence of VAP was markedly lower in the semi-recumbent group (8% vs 34%, $P = .003$).⁵ Following that landmark study, the semi-recumbent positioning became integrated into practice guidelines, but with lower head-of-bed elevation (> 30°) because of the risk of decubitus ulcers at higher elevations.⁸

Since the widespread adoption of semi-recumbent positioning, there have been virtually no further studies specifically designed to examine patient positioning alone as a risk factor in the development of VAP. However, the semi-recumbent position remains problematic, and although it is superior to the supine position, it is far from ideal in the prevention of aspiration.³⁻⁴ In this issue of the *Journal*, Mauri et al report their feasibility study of the novel lateral-horizontal patient position, which they propose is safe, compared to semi-recumbent positioning, and theoretically may have several advantages.⁹

Mauri et al observed 10 patients in the semi-recumbent position for 64 hours, and 10 patients in the lateral-horizontal position for up to 24 hours.⁹ There were no differences in adverse events, sedation scores, sedation medication need, or hemodynamic changes between the 2 positions. This implies that the lateral-horizontal position is safe; however, it is important to note that the potential to detect an adverse event was higher in the semi-recumbent group, as they were observed longer than the lateral-horizontal group. Thus, it is difficult to determine if the incidence of

adverse events would be equivalent if the 2 groups were studied for the same time periods. This limited preliminary study needs to be replicated with a larger patient group observed for equal time frames to definitively establish the safety of the lateral-horizontal position.

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Given the small size and other study limitations, efficacy could not be established⁹; however, it is interesting to note that the number of aspiration episodes was statistically similar between the 2 positions, despite the fact that the lateral-horizontal group was sampled more frequently over a shorter period, which would bias the results toward a higher likelihood of identifying aspiration events in the lateral-horizontal group than if the 2 groups had been observed for equal time periods. Unfortunately, the lateral-horizontal group was sampled more frequently and the semi-recumbent group was observed longer. Overall, the semi-recumbent group had more observations and, therefore, one could argue there was a higher likelihood of detecting an aspiration event. Despite that bias, the groups had an equivalent number of aspiration episodes, which supports the hypothesis that, given equal observation potential, the lateral-horizontal position would be as effective as the semi-recumbent position in reducing aspiration.

Beyond potential efficacy for preventing aspiration, theoretically, the lateral-horizontal technique has additional advantages that may decrease the incidence of VAP. As Mauri et al note, studies with sheep showed a lower incidence of VAP in a modified lateral-horizontal position than in the semi-recumbent position.⁹⁻¹¹ It is postulated that this is due to the improved clearance of contaminated tracheobronchial secretions, given the dependent orientation of the external portion of the endotracheal tube in the lateral-horizontal position.⁹ Interestingly, Mauri et al also found significantly more ventilator-free days in the lateral-horizontal group, despite an equal incidence of aspiration, as measured by pepsin presence in the tracheal secretions. If we accept the notion that the risk of aspiration is equivalent between the lateral-horizontal and semi-recumbent position, as shown in the Mauri et al study, this finding would suggest that another mechanism is responsible for the shorter duration of mechanical ventilation in the later-

al-horizontal group. Interestingly, the VAP rate was also markedly lower in the lateral-horizontal group, although the difference was not statistically significant, due to the small sample size. Additional study is needed to establish if VAP rate or ventilator days are reduced despite equivalent presence of pepsin-positive tracheal secretions.

In addition to its theoretical secretion-clearance advantages, the lateral-horizontal position is also associated with improved respiratory mechanics and gas exchange in work on acute respiratory failure.⁹ In fact, Mauri et al noted an interesting finding that, although the positive-end-expiratory-pressure requirement was minimally higher in the lateral-horizontal group at the study end, the ratio of P_{aO_2} to fraction of inspired oxygen (P_{aO_2}/F_{IO_2}) was better than in the semi-recumbent group. Given that the differences in positive end-expiratory pressure between the 2 groups were modest, this difference in P_{aO_2}/F_{IO_2} may imply an additional advantage to the lateral-horizontal position. Mauri et al postulate that the improved clearance of edema and lung secretions may improve lung compliance and thus minimize ventilator-induced lung injury by allowing lower ventilator pressures.⁹ The overall effect would be shorter duration of mechanical ventilation, which was also shown to favor the lateral-horizontal position.⁹

VAP continues to plague intensive care units worldwide, and as pressure grows in the pay-for-performance quality arena, additional research is needed to identify low-cost strategies that decrease the VAP rate. I commend Mauri et al on their efforts to identify novel techniques in the quest to minimize aspiration. However, the largest utility of their feasibility study is its role in generating several important hypotheses that warrant further investigation. A larger, prospective, potentially multicenter trial should be undertaken to answer these efficacy questions about a novel technique that appears relatively safe and feasible.

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