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Letter to Editor

# Comparison of Synchronized Intermittent Mandatory Ventilation (SIMV) and Adaptive Support Ventilation (ASV) in Weaning of Mechanical Ventilation after Cardiac Surgery

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One of the most commonly encountered issues associated with open heart surgery is the extended duration of endotracheal intubation, as well as the complexity of the subsequent weaning process from mechanical ventilation. It has been demonstrated that as the period of mechanical ventilation is prolonged, patients tend to experience an increasing number of side effects and complications related to this extended support. An effective strategy during this phase is essential for facilitating patient recovery [1].

Patients are typically transferred to the Intensive Care Unit (ICU) following their cardiac surgery for the purpose of weaning them off mechanical ventilation support. This transition is a critical step in the recovery process. Numerous studies conducted in this field have consistently concluded that rapid endotracheal extubation is considered safe for the majority of patients who undergo cardiac surgical procedures [1-2].

Fast-track extubation in the context of cardiac surgery involves the swift removal of the tracheal tube within a time frame of 6 hours following the completion of the surgical procedure. This approach has emerged as a practical and effective option in the realm of post-cardiac care management. Numerous studies have demonstrated that fast-track extubation programs, which include protocols specifically designed for patients undergoing elective coronary artery bypass graft (CABG) surgery, do not lead to an increase in perioperative morbidity or mortality rates. In fact, the implementation of these programs can enhance patient recovery and improve overall outcomes without compromising safety [1-3].

Synchronized Intermittent Mandatory Ventilation (SIMV) is a common respiratory mode used after cardiac surgery, providing mechanical support by delivering mandatory breaths in sync with the patient's inspiratory efforts. However, despite its benefits, SIMV has notable drawbacks, including a gradual and prolonged reduction in mechanical respiration, which can lead to delays in weaning patients off the ventilator [3-4].

Adaptive Support Ventilation (ASV) is a mode in modern mechanical ventilators that allows for partial mechanical support during weaning, based on the operator's settings. ASV ensures a target minute ventilation by adjusting positive inspiratory pressure and respiratory patterns according to the patient's lung compliance and metabolic needs. ASV adapts to changing patient conditions in real-time, allowing for dynamic adjustments that respond to variations in

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respiratory effort and airway resistance. This adaptability facilitates a smoother transition from full mechanical ventilation to spontaneous breathing, promoting more effective weaning strategies. Recent evidence also suggests that patients who utilize ASV experience improved oxygenation and reduced work of breathing. The mode's ability to automatically deliver breaths when the patient shows insufficient effort helps to maintain optimal ventilation parameters, which is particularly beneficial during critical recovery phases post-surgery [1,3].

Furthermore, the use of ASV has been associated with decreased sedation requirements, as patients often feel more comfortable and in control of their breathing patterns. This can lead to faster recovery times and shorter ICU stays, aligning with the goal of enhancing patient outcomes in respiratory management. Some studies have found that ASV reduces the duration of ventilation support after cardiac surgery compared to SIMV mode [1-5].

Our clinical observations also indicated the preference of using ASV mode over SIMV mode in mechanical ventilation after cardiac surgery, so a study was designed to investigate this issue (Ethic number: IR.GOUMS.REC.1399.083).

Eighty patients were enrolled in a multicentric, cross-sectional case-control study, randomly assigned to two groups: ASV and SIMV, with 40 patients in each group. Each group followed its own weaning protocol based on the ASV and SIMV modes during the postoperative period for fast-tracking recovery.

Thirty-eight patients completed the ASV weaning protocol and 36 finished the standard SIMV protocol. Two patients from the ASV group and four from the control group were excluded due to complications unrelated to the ventilation strategies. The primary outcome, duration of tracheal intubation, was shorter in the ASV group than in the SIMV group. Significant differences were also observed between the groups in total sedation doses, arterial blood gas parameters, and hemodynamic measurements.

Our findings indicate that the ASV protocol effectively decreases the overall duration required for tracheal intubation while also making ventilator management significantly easier for patients who are on a fast track following coronary artery bypass graft surgery.

Yazdannik et al. found that ASV mode in mechanical ventilation post-CABG shortens intubation and hospital stays compared to SIMV, indicating its effectiveness for respiratory support in vascular graft surgery. Their results match our findings [2].

Kiaei et al. conducted a comprehensive study concluding that ASV significantly reduces extubation time for patients. They also observed no substantial adverse effects on patients' hemodynamic stability, indicating that ASV is both effective in shortening extubation duration and safe for hemodynamics [5].

We believe that mechanical ventilation support following cardiac surgery could be based on ASV to decrease recovery time. Furthermore, our observations suggest that the implementation of ASV not only streamlines the intubation process but also minimizes the incidence of postoperative complications associated with prolonged mechanical ventilation. By utilizing ASV, we can achieve more precise control over tidal volumes and respiratory rates, thereby optimizing patient comfort and oxygenation.

Moreover, the integration of ASV into our postoperative care protocols may lead to improved hemodynamic stability, as the system can adapt to fluctuations in the patient's condition, ensuring that ventilation remains effective even in the presence of varying lung mechanics.

The use of Adaptive Support Ventilation (ASV) for managing patients after coronary artery bypass graft surgery marks a significant improvement in mechanical ventilation practices. Ongoing research could enhance the benefits of ASV, providing clinicians with valuable insights for personalized ventilation tailored to each patient's needs. We encourage further studies to confirm these findings and assess ASV's broader applicability in different surgical contexts. Investigating the long-term effects and outcomes of ASV will be essential in establishing best practices and optimizing respiratory support across various clinical settings.

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