

Mechanical Ventilation. AS Slutsky and L Brochard, editors. *Update in Intensive Care and Emergency Medicine*, volume 40, JL Vincent, series editor. Berlin: Springer-Verlag. 2004. Hard cover, illustrated, 419 pages, \$179.

This text is the latest installment of the popular *Update in Intensive Care Medicine* series edited by Vincent. The book presents a state-of-the-art critical review of the literature related to acute respiratory failure and its treatment with mechanical ventilation. Rather than focus on the diagnosis and pathophysiology of the various types of respiratory failure, this collection instead delves deeply into the various modalities of mechanical ventilation, its applications, monitoring, benefits, and risks.

The book is organized into 6 sections, each with 3–7 chapters. The contributing authors are unquestionably experts in the field of critical care medicine, and they represent a multitude of backgrounds, both in training and nationality. In addition, the authors are nicely matched to their subjects of interest, with many authors describing their own contributions to our understanding of various specific aspects of ventilation, while equally addressing their critics' conflicting theories.

Unfortunately, the editors did not include a stated aim, so it is difficult to gauge exactly to whom this book is directed. I found the text most suited to fellows and faculty in critical care seeking a careful literature review of mechanical ventilation.

In the opening section, "Epidemiology," the chapters set out to frame the problem of acute respiratory failure and its need for mechanical ventilation, touching on the epidemiology of mechanical ventilation itself, long-term outcomes following ventilation, and the process of assessing and changing the community's practice of mechanical ventilation. The first chapter, "The Importance of Acute Respiratory Failure in the ICU," gives voice to the inherent struggle of this book; while it aims to broadly discuss mechanical ventilation, the lack of clinical studies for most types of respiratory failure—excepting acute lung injury and acute respiratory distress syndrome (ARDS)—essentially makes this a book about mechanical ventilation specific to acute lung injury and ARDS.

Acknowledging that respiratory failure requiring ventilation is one of the main causes for admission to intensive care units

(ICUs) worldwide, the authors emphasize that, even in ARDS, patients are more likely to succumb to multi-organ dysfunction syndrome than hypoxemia. This sets the stage for later chapters, which describe the systemic response to ventilation. Frutos-Vivar and colleagues offer a nice encapsulation of modern ventilation practice patterns across the world. The final chapter of the section, "Understanding and Changing the Practice of Mechanical Ventilation in the Community," is a novel examination of the barriers to implementing change in our practice of mechanical ventilation, applying learning theory to critical care, and emphasizing the need to disseminate teaching to multiple levels of an ICU team, including respiratory therapists, nurses, house staff, and attending physicians.

Section 2, "Patient-Ventilator Interactions, Weaning, and Monitoring," is arguably the most physiologically and clinically oriented of the book. Chapters by Younes and by Parthasarathy and Tobin explore the complex interactions between the patient's neural control of breathing and the ventilator's superimposed pattern. The chapter by Parthasarathy and Tobin is more successful at defining asynchrony between patient and ventilator inspiratory and expiratory times, and it identifies helpful cues that indicate when a patient is wasting effort. However, both chapters assume a considerable baseline familiarity of complex respiratory physiology and of modes of ventilation, engaging in a high-level discussion before the book has introduced many of the topics. A chapter on ventilation for patients with obstructive airways disease follows, which is, unfortunately, the only chapter dedicated to this common and complicated topic. Mancebo's approach to obstructive disease is both thorough and concise, and he includes an excellent explanation of intrinsic versus extrinsic positive end-expiratory pressure (PEEP). Nonetheless, he deals tersely with some of the difficult controversies in obstructive lung disease, such as the observation that hypercapnia may worsen as hypoxemia is corrected. The text implies that hypercapnia invariably occurs when a patient with a chronic obstructive pulmonary disease exacerbation is given oxygen, and neglects to advise that adequate oxygenation should be achieved regardless of the P_{CO_2} . The remainder of the section is devoted to clinical topics such as the physician's role in analyzing ventilator waveforms and titrating pressure support; liberation from me-

chanical ventilation; and new monitoring techniques, including esophageal pressure as a surrogate for pleural pressure or end-expiratory lung volume as a marker for overdistention. These chapters were uniformly excellent and clinically relevant. Finally, Sinderby and colleagues cover "neurally-adjusted ventilatory assist," one of the newer ventilation modes, which uses diaphragmatic electric activity to trigger ventilation. Sinderby provides a fantastic discussion of the theory, pros, and cons of neurally-adjusted ventilatory assist, but misses an opportunity to include practical instructions to clinicians, such as how to set the gain.

Section 3 explores noninvasive ventilation, with 3 in-depth chapters devoted to its indications, causes of success or failure, and use in immunocompromised hosts. Each of these chapters extensively reviews the literature on noninvasive ventilation, emphasizing the importance of selecting patients most likely to benefit from the therapy, especially those with chronic obstructive pulmonary disease, cardiogenic pulmonary edema, or immunocompromised status. The authors elegantly discuss the controversy of using noninvasive ventilation in patients with active myocardial ischemia. The only discussion I found missing in this section was on the recent literature regarding noninvasive ventilation following extubation failure, in which a higher risk of mortality was seen in the noninvasive-ventilation group than in the group that received standard therapy with oxygen alone.¹ I suspect that **Mechanical Ventilation** went to press before the latter paper was published.

The final 3 sections of the book deal exclusively with ARDS and ventilator-induced lung injury (VILI), exploring the pathophysiology and new and experimental treatments.

Section 4, "ARDS/VILI: Mechanisms," aims to expand our understanding of injury in ARDS/VILI to the molecular level, touching on plasma-membrane unfolding, aberrant deformation-induced lipid trafficking, and capillary stress fracture. The discussion is largely theoretical and based on animal studies, but the text is accompanied by helpful figures. The most interesting chapter of the section is by Imai and Slutsky, "Systemic Effects of Mechanical Ventilation." Though it is slightly redundant regarding the mechanisms of VILI, this chapter nicely bridges the gap from bench to bedside, stating a believable case for how ventilator-induced stretch might translate into multi-organ dysfunction.

Section 5, "ARDS/VILI: Assessment," introduces one of the recent controversies in acute lung injury. Gattinoni and colleagues present the idea that ARDS is caused by 2 very different mechanisms: extrapulmonary insults (such as sepsis or trauma) and pulmonary injury (such as pneumonia or aspiration). They elaborate that the chest-wall mechanics differ substantially between the 2 entities, and they propose that therapy (level of PEEP, recruitment maneuvers, and use of prone positioning) might be superior if tailored to the type of ARDS.

Kavanagh wrote "Targets in Mechanical Ventilation for ARDS," a provocative chapter that considers 3 common goals of ventilation (oxygenation, ventilation, and PEEP) and closely examines the literature of titrating therapy to specific end points in each. I greatly enjoyed his discussion of targets, especially his concluding remarks, which emphasize the need to determine the greatest threat to the patient and prioritize the goals of ventilation accordingly.

The remaining chapters debate the utility of the static pressure-volume curve as a tool to minimize VILI. Ranieri and colleagues briefly describe the various ways the pressure-volume curve is measured, but I thought these procedures deserved more detailed explanation for the practicing clinician. I was also surprised that the authors failed to emphasize the need for paralysis as one of the major drawbacks of routine pressure-volume measurements.

Finally, in the last section, "ARDS/VILI: Therapy," the discussion moves beyond the findings of the landmark ARDS Network trial² into exciting work on novel ventilation strategies, recruitment maneuvers, and salvage therapies. Amato and colleagues revisit the pathophysiologic debate of collapse versus flooding in a well-written and nicely illustrated review of recruitment literature. Putensen and collaborators advocate permitting spontaneous breathing with assistance,

even in ARDS, as a way to improve ventilation/perfusion matching and decrease ICU days. Kacmarek covers some of the newest potential adjunctive therapy, including tracheal gas insufflation, partial liquid ventilation, nitric oxide, and the idea of biologic variability, which asserts that even the ventilator circuit relies on occasional surges or decelerations for optimal functioning. Interestingly, the controversy over corticosteroids in ARDS (whether to give them early, late, as a bolus, or in small physiologic doses) is not discussed, which is disappointing, given pervasive practice variation across the country.

The book concludes with a "Summary of Clinical Trials of Mechanical Ventilation in ARDS" by Brower and Rubenfeld. This well-conceived chapter meticulously examines the science leading to the influential ARDS Network trial² and addresses the sometimes conflicting results of trials based on smaller tidal volume. Though it is a fantastic review for any student of critical care, this chapter would have been more appropriately placed earlier in the book.

In all, I found **Mechanical Ventilation** a state-of-the-art review of both historical and contemporary literature regarding ARDS, VILI, and mechanical ventilation. Physically, the book is user-friendly, has a resilient hard cover, and is compact but with a legible font. The cover appears dated, but the contents are up-to-date, except in rare instances. One problem is that the book suffered from hasty editing; there are a substantial number of trivial typographical errors (eg, the chapter heading "Lung Morphology in ARDS: Ho [sic] it Impacts Therapy") and awkwardly written passages. The same chapter includes figure legends that indicate that the figures show aeration zones in black, light gray, and dark gray, but the figures actually show the areas in black, red, and light gray. Image quality and relevance varied by chapter, with most chap-

ters achieving the right balance between text and figures.

My main reservation about **Mechanical Ventilation** is that it assumes a very high level of baseline familiarity with the topic. Unlike other textbooks of ventilation, this text does not include basic explanations of the way a ventilator is assembled, how the ventilator senses flow and pressure, or how to troubleshoot various technical issues such as auto-cycling, cuff leaks, and water-logged filters. Though advanced topics such as neurally-adjusted ventilatory assist, noninvasive ventilation, and proportional assist each are given considerable space, there is no general discussion of basic ventilator modes. The targeted audience appears to be critical-care fellows, senior respiratory therapists, and faculty, for the book is organized around the literature of ventilators and modern controversies, rather than with a patient-centered clinician's approach. As such, I find this book an excellent reference for critical-care researchers and ICU directors, but would not advocate it for readers hoping for clinical pearls.

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