H₂O, we’d be surprised not to find lung injury unless we realize that the ambient pressure exerted on the chest wall (Pₐ) is also 2 atmospheres, and transpulmonary pressure remains normal (analogous to Figure 1, Bottom). Likewise, a thin inner tube of a tire can withstand the weight of a car because the rigid outer tube limits its transmural pressure, thus keeping the wall stress low.

Undoubtedly, epithelial damage and pulmonary edema occur when alveoli are overstretched. However, the overstretching (volutrauma) results directly from distending pressure (barotrauma). There can be no strain without stress, and emerging data show that high wall stress has a pathogenic property, as expected. Finally, we propose to keep the term “barotrauma” in referring to extra-alveolar air, and to use the more accurate term “alveolar stress injury” for the phenomenon of stress/strain induced epithelial/endothelial damage. It is time that we analyze ventilator-induced lung injury using principles of physics and reconcile the barotrauma and volutrauma camps.

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REFERENCES


Propofol for ICU Sedation

To the Editor:

I read with pleasure the excellent review by Mirenda and Broyles (1995; 108:539-48) in a recent issue of CHEST regarding propofol for ICU sedation. The article was comprehensive and generally well balanced and should serve as a valuable resource to physicians involved in the ICU.

As a cardiac anesthesiologist with ICU responsibilities, I have considerable experience with propofol infusion techniques. Clearly, this drug represents a tremendous advance in anesthesia and sedation due to its pharmacokinetic profile. I believe the cost data from Mirenda and Broyles are misleading. Table 5 on page 546 (CHEST 1995; 108:539-48) describes an overstated dose and therefore cost of propofol for ICU sedation. According to their table, in a 70 kg patient, 100 to 200 mg/h is a typical low dose. This would equal 24 to 48 µg/kg/min. This is accurate. However, the authors describe a high dose of 500 to 1,000 mg/h, which equals 120 to 240 µg/kg/min. These are doses typically used for general anesthesia in the operating room. Indeed, the 240 dose is more than I have ever used.

Based on my hospital’s acquisition cost of $0.48 per mL, a 70-kg patient would use $92.16 at 20 µg/kg/min, $241.92 at 50 µg/kg/min, and $483.84 at 100 µg/kg/min, still in the middle of the midazolam range in Table 5 by Mirenda and Broyles. In most cases, if more than 100 µg/kg/min is needed, a small dose of another drug, perhaps even a neuromuscular blocker, would be more suitable as well as cost-effective.

Finally, I agree with the comments by Mirenda in his letter in Critical Care Medicine that the most practical use of propofol is to attain specific, short-term sedative goals in select patients. However, I disagree with his statement that the “cost of propofol is three to four times that of comparable doses of midazolam,” and this is inconsistent with his own data.

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REFERENCE


To the Editor:

We appreciate the interest and concern of Dr. Sherman regarding propofol for ICU sedation (CHEST 1995; 108:539-48). We also welcome the opportunity to clarify the issues raised.

The concerns over dosage ranges mentioned by Dr. Sherman are obvious and noted repeatedly in the review. Table 1, in fact, thoroughly describes recommended dosage guidelines for propofol use in the ICU setting and concludes with the warning that long-term use should attempt to be limited at 50 µg/kg/min. This goal is usually not difficult to attain in the surgical ICU patient, though, unfortunately, it may need to be exceeded in medical or trauma patients, patients with relative contraindications to neuromuscular blockade, or those patients exhibiting tolerance to ongoing sedation. Though we certainly do not recommend dosages of 120 to 240 µg/kg/min for long-term sedation in any ICU patient (nor does the manufacturer), the point of including such (reference) dosages in Table 5 is to emphasize the possibility of a number of side effects seen with such dosages; one side effect being a significant pharmacy cost. As mentioned in the review, the physician who finds himself prescribing such high doses should review the particular sedation goals in his patient and adjust infusion rates using appropriate adjuncts.

The issue of pharmacy cost of propofol is an important one, though one that is often difficult to address due to variations in acquisition cost both geographically and chronologically. In an effort to remain unbiased, Table 5, which lists typical pharmacy costs for sedation, is referenced1 and based on the most recent data available at the time of writing. Though the acquisition cost and methods used by those authors may be different than that used by Dr. Sherman, our own acquisition cost leads us to similar cost/24 h for midazolam as stated in Table 5 as well as the “high dosage” of propofol. As Dr. Sherman has shown, it is worthwhile for practitioners to arrive at their own data based on cost at their particular institutions.

Finally, we should emphasize that our goal in writing the review was to present the most recent data on propofol sedation in the ICU to the ICU practitioner as objectively as possible. Unfortunately, objective data on cost-benefit analysis are difficult to find. The study by Carrasco et al.3 which found that the pharmacy cost of propofol was consistently three times to four times that of midazolam, was undertaken at one particular institution (in Spain), during a finite period of time and by certain methods. These data may or may not extrapolate to any one particular institution or practice pattern. As such, we would hope that more objective data are generated, however difficult or complex, concerning the cost-effectiveness of propofol, or other sedatives, when used in the ICU.

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