

EDITORIAL VIEWS

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The "Not-so-educated Hand" of the Pediatric Anesthesiologist

CULLEN ET AL.¹ in 1954 first alluded to the "educated hand" of the anesthesiologist. Egbert and Bisno² measured this skill in attending staff and trainees and concluded that "more skillful" anesthesiologists could ventilate an adult test lung more constantly during changes in compliance than could their less experienced, junior colleagues. Success at manual ventilation was improved further when the anesthesiologist used a closed rather than a semiclosed circle system and when he or she was permitted to listen over the breathing tubes. Manual ventilation delivered by a skillful anesthesiologist was more constant than that delivered by a pressure cycled ventilator and was perhaps equal in constancy to that delivered by a volume cycled ventilator.²

Pediatric anesthesiologists have traditionally resorted to manual ventilation for small infants during some thoracoabdominal procedures when rapid changes in resistance to lung inflation are likely to occur. Texts of pediatric anesthesia have advised this course of action, suggesting that small changes in compliance can be immediately detected and ventilatory pressure rapidly adjusted to compensate for this change.

A study reported in this issue of ANESTHESIOLOGY raises serious questions about the educated hand of the pediatric anesthesiologist. Spears and colleagues³ have quite convincingly demonstrated that even very experienced pediatric anesthesiologists cannot reliably detect extreme changes in compliance by the feel of the reservoir bag alone. This is perhaps not too surprising when we consider the relative size of the compression volume of the anesthesia circuit compared to the small tidal volume to be delivered. The feel of the reservoir bag also can vary independently of the contained pressure if the extent

of its inflation changes—an effect of the Laplace relationship between the pressure of the contents, the radius of the bag, and the palpable tension in the wall of the bag.

Those of us who have believed that there is an advantage to manual ventilation must thank Spears *et al.*³ for pointing out that it is not the feel of the bag alone that we have relied upon, but rather the ability to manipulate the bag manually in response to the information that we gain from observation of the patient, the surgical site, and the attached monitors.

The other question that the report³ poses is whether, in this day of reliable volume-cycled ventilators, we really still need to resort to manual ventilation of the lungs of some infants. Mechanical ventilation provides very predictable and constant gas exchange over long periods of time. Major fluctuations in arterial carbon dioxide tension, undesirable in infants, can be avoided. The ventilator also leaves our hands free for our many (especially when caring for very small infants) other intraoperative duties. The advent of the pulse oximeter and end-tidal carbon dioxide sampling (more difficult in infants but certainly possible) has provided us with the means easily and continuously to monitor the adequacy of mechanical ventilation.

Therefore, I believe that many of us are relying more and more on mechanical means of ventilation even for the smallest infants. However, for small infants, especially when there is reduced compliance, some anesthesiologists will continue to be more comfortable providing manual ventilation. Certainly, if any adverse change in pulmonary function is detected, the pediatric anesthesiologist probably still will respond initially by reinstituting manual ventilation and directly checking the inflation of the lungs. The educated hand will be brought back into action, but it should be complemented by all of the information available from our eyes, our ears, and the electronic monitors—and not just the feel of the bag!

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