

Pulmonary Postoperative Complications: Is There a Place for Anesthesia?

To the Editor:

We read with a great interest the article by Canet *et al.*¹ regarding pulmonary complications after surgery. The authors have evaluated the incidence of this frequent adverse event and its risk factors in more than 2,000 patients. They found that postoperative pulmonary complications occur in 5% of patients and identify several patient-related (*e.g.*, age, low preoperative SpO₂, acute respiratory infection during the month before surgery, preoperative anemia) and surgical-related risk factors (*e.g.*, upper abdominal or intrathoracic surgery, emergency surgery, procedure duration). It is noteworthy that anesthesia was not identified as a risk factor for postoperative pulmonary complications. Instead, the authors¹ considered only two categories for this variable (*i.e.*, general *vs.* regional anesthesia).

Some patients may receive a combination of general and regional anesthesia that aims to decrease postoperative pain and postoperative diaphragmatic dysfunction, thereby reducing risk of pulmonary complications. A large randomized controlled trial has observed that combined epidural and general anesthesia after major surgery decreases postoperative pulmonary complications.² Meta-analysis has also demonstrated that epidural analgesia that lasts more than 24 h decreases the risk of pneumonia.³ General anesthesia combined with epidural analgesia is not equivalent to general anesthesia alone.

General anesthesia is also characterized by the need for ventilatory support. However, the ventilatory "setting" may be different from one patient to another, as shown in large epidemiologic studies performed in the intensive care unit.⁴ However, similar multicenter studies are lacking for surgical patients receiving general anesthesia in the operating room.⁴ Ventilator-induced lung injury was first described in patients with acute lung injury and acute distress respiratory syndrome.⁵ Experimentally, ventilator-induced lung injury has been demonstrated in animals without previous lung injury.⁵ In the context of ventilation for anesthesia, several authors^{6,7} have observed that use of large tidal (more than 10 ml/kg) or high pressure during general anesthesia may influence pulmonary complications. Thus, ventilatory setting as well as other strategies used in operative anesthesia (*e.g.*, fluid administration, analgesia management) usually comprise the "black box" in cohort studies that evaluate risk factors for postoperative pulmonary complications. It is necessary to consider that anesthesia management (*i.e.*, ventilator settings, fluid administration, drugs, techniques used) may have a positive—but also negative—impact on the risk of postoperative pulmonary complications. More data on the practice of anesthesiologists are required.

Emmanuel Marret, M.D., Ph.D.,* Samir Jaber, M.D., Ph.D. *Tenon Teaching Hospital, Assistance Publique Hôpitaux de Paris, Université Pierre et Marie Curie-Paris, Paris, France. emmanuel.marret@tnn.aphp.fr

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In Reply:

We thank Dr. Lebard and colleagues and Drs. Marret and Jaber for their interest in our study of postoperative pulmonary complications (PPC).¹ In reply, we are glad to have the opportunity to provide information that was not included in the article itself.

Lebard *et al.* compare and contrast our study with the excellent work of McAlister *et al.*,² finding discrepancies attributable to differences of aim and design. The previous study was accomplished in a single hospital and included a more narrowly defined surgical population. Our principal aim was to calculate the incidence of PPC and predict risk in a larger sample that would be more representative of a broad general surgical population. To that end, we selected patients from 59 hospitals (which together account for 63% of the anesthesia case load in our geographic area of Catalonia, Spain) using a random sampling procedure to reflect case loads over the course of a calendar year. As Lebard *et al.* point out, the two studies defined PPC according to different criteria. Our list included more minor clinical events, yet we also found that PPC had a significant impact on postopera-

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