Anesthesia for Patients with Asthma

Low Risk but Not No Risk

In this issue of *Anesthesiology*, Warner and colleagues use a unique database of residents of Rochester, Minnesota, who have a history of asthma to evaluate the risk of perioperative pulmonary complications associated with surgery. They conclude that most persons with asthma can safely undergo anesthesia using modern techniques.

The study of low-incidence phenomena requires many cases to define the risk of adverse outcomes precisely. Despite the large database used in the Warner study, the anesthetic risks in the patients with asthma were low enough that 706 of them did not result in even one incidence of major complications. Thus the true incidence of such problems is low, but probably not zero.

An alternative approach to the study of low-incidence events is studying collections of sentinel events or adverse outcomes. This is the approach used in the ASA Closed Claims Project Database, in which all cases represent outcomes for which a patient made a malpractice claim. This approach lacks a precise denominator, so it is impossible to define a true incidence of adverse outcomes. However, data from that database make it clear that severe adverse outcomes do result from bronchospasm. The ASA closed claims database now contains 3,533 closed claims, of which bronchospasm was the damaging event or mechanism of patient injury for 88 claims. The ASA database includes claims from insurance organizations that insured about one half the anesthesiologists in the United States between 1975 and 1994, implying that the adverse outcomes from bronchospasm indeed represent a very small number of the millions of anesthetics administered during this period.

Although the ASA database supports the concept that adverse outcomes from bronchospasm are uncommon, it also provides evidence that asthma is a risk factor for an adverse outcome. Twenty-eight (32%) of the patients who experienced a morbid event had a history of asthma and ten more (11%) had a history of chronic obstructive pulmonary disease or smoking. The 32% incidence of asthma in the group with severe complications exceeds the 4% incidence of asthma in the general population, making it likely that asthma is a significant risk factor for an adverse outcome.

Several other studies make it clear that we cannot dismiss bronchospasm as a cause of adverse events. A quality-assurance database at the University of Washington Medical Center now contains 30,654 consecutive general anesthetics, among which there were 70 cases (0.23%) of clinically significant bronchospasm. Ten percent of these patients had a history of asthma. Several studies have shown that Warner and colleagues cite found incidences of bronchospasm among persons with asthma ranging from 0.8% to nearly 30% in those with severe disease who were undergoing general anesthesia.

How do we reconcile the apparent discrepancy between the Mayo Clinic results and other existing data? Several factors may contribute to the quandary. The very strict definition of asthma excluded patients with chronic bronchitis or chronic obstructive pulmonary disease, the patients most likely to have perioperative respiratory complications. Asthma is defined as reversible airway reactivity, and when properly controlled, most persons with asthma are asymptomatic. The patient with chronic obstructive pulmonary disease is more likely to have ongoing illness with abnormal baseline function and secretions. Another explanation may be that the Mayo Clinic database included all patients ever diagnosed with asthma rather than patients with active asthma. The incidence of complications in the Mayo study for patients with symptoms within 30 days was actually 4.5%, as opposed to 0.8% in patients without symptoms in the previous 30 days. Other studies may not have considered that the patients had asthma if they had such a long symptom-free interval. Only 41% of the Mayo Clinic patients had received a prescription in the previous year, raising questions about the severity of the asthma. Of the four patients who had symptoms at the time of surgery, two had complications. Based on that 50% incidence, we could conclude that persons with symptoms of asthma are actually at very high risk.

Certainly the generally good outcome for the patients in this series makes it clear that for patients with
asthma who currently have no symptoms, the risk of complications is extremely low. This conclusion must be made with the caveat that some of the success may have resulted from excellent anesthetic management. The anesthetic routines for patients with asthma that have been in place for many years, including prophylactic bronchodilators and deep anesthesia for airway manipulation, probably minimized the risk for adverse outcomes. The recognition that propofol prevents intubation-induced bronchospasm in both healthy adults and those with asthma may help further limit the likelihood of adverse outcomes in patients with this disease. These interventions are associated with low risks and minimal costs and thus should continue to be considered for the management of asthma.

Several reasonable lessons can be learned from the existing literature, including this excellent addition from the Mayo Clinic: (1) Persons with asthma but no symptoms are at low risk for severe morbidity from anesthesia; (2) persons with asthma are, however, at a low but increased risk for severe morbidity; and (3) adverse outcomes from bronchospasm occur in patients with no previous history of asthma.

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References

Nitric Oxide and the Arterial Baroreflex

A key concept in anesthesiology is that autonomic control of cardiovascular and interneural signal transduction is mediated by the understanding of how the arterial baroreceptors for normal homeostasis receive information. To this end, the arterial baroreflex has achieved remarkable clinical depth. Examples include the understanding of biochemical processes, such as the synthesis of nitric oxide from L-arginine, the design of clinical trials, and the development of new drugs such as nitroglycerin. Nitric oxide is synthesized from L-arginine by nitric oxide synthase, which is activated by growth factors and intracellular calcium. The release of nitric oxide from endothelial cells and smooth muscle cells results in relaxation of vascular smooth muscle, decreased platelet aggregation, and vasodilation. The nitric oxide pathway is an important aspect of the arterial baroreflex, as it is involved in the regulation of blood pressure and cardiovascular function. The nitric oxide pathway is also important in the regulation of other cardiovascular functions, such as coronary blood flow and peripheral vascular resistance.

Key words: Anesthesia, arterial baroreflex, nitric oxide, nitroglycerin, cardiovascular function.