Bacterial Air Filters

This issue of Anesthesiology contains two provocative studies which prospectively evaluate the efficacy of bacterial filters inserted in the breathing circuit in reducing postoperative pneumonia.1,2 The first by Garibaldi et al.1 was prompted by the observation that the use of bacterial filters was becoming widespread (12 of 21 hospitals surveyed in Utah in 1979 used filters) despite the fact that reports of bacterial infection due to contaminated anesthesia equipment were few and inconclusive. Garibaldi’s study is well designed. Patients were initially allocated to groups based on the anatomic site of surgery, then randomly assigned to a filter or a non-filter group. Breathing circuits were otherwise the same for both groups of patients. A study nurse, unaware of the treatment group, monitored the patients’ postoperative hospital course for signs or symptoms of pneumonia and for other details of care, such as duration of operation, antibiotic treatment, etc. The diagnosis of pneumonia was based on criteria established for surveillance and control of nosocomial infections by the Center for Disease Control.

There were no differences in the incidence of pneumonia whether or not filters were used. There also were no differences between the two groups in other outcome criteria which might have suggested postoperative pulmonary complications, such as postoperative fever, abnormal chest x-ray, sputum production, and abnormal physical examination. Not surprisingly, the incidence of postoperative pneumonia was greater than average in either group among patients with a history of chronic obstructive pulmonary disease and smoking than in those without such a history. Pneumonia was also more prevalent among patients with high-risk anesthesia classifications and those having thoracic surgical procedures, but again, bacterial filters did not alter the situation. Longer operations were associated with a greater risk of pneumonia than shorter procedures. However, the interdependence of duration of operation and factors such as physical status and site of operation on the incidence of pneumonia were not examined. The authors conclude by noting the economic impact of the use of bacterial filters in anesthesia breathing circuits. If data from their survey of 21 Utah hospitals regarding the use of filters is extrapolated to the rest of the United States, then the cost of this practice adds 20–30 million dollars each year to the health care budget. Garibaldi et al.1 suggest that this practice is not cost-effective.

The design used by Feeley et al.2 for their study is somewhat different than that of Garibaldi but the results and the conclusions are essentially the same. Feeley randomly assigned patients to two groups. The “sterile” group received anesthesia employing sterile, disposable, plastic breathing circuits with a bacterial filter. The “nonsterile” group was anesthetized using reusable rubber breathing circuits that had been washed with soap and water and were dried after their previous use; bacterial filters were not used. Feeley’s patients generally were serious operative risks; 20 per cent were taking immunosuppressive drugs in conjunction with renal transplantation; 17 per cent were undergoing craniotomy; 15 per cent were having cardiac surgery. A physician, unaware of the treatment group, reviewed the charts postoperatively and made the determination of whether patients had contracted a pulmonary infection. Criteria for infection were different than those employed by Garibaldi so that the overall rates of pulmonary infection in the two studies were different. However, there was no difference in the rate of postoperative pulmonary infection between Feeley’s two groups, including the rate among those patients treated with immunosuppressive drugs. Feeley et al.2 conclude that simple hygienic measures are satisfactory for prevent-
ing cross-infection from the anesthesia breathing circuit.

These studies are significant for several reasons. First, they emphasize the importance of the scientific method in the practice of medicine. Garibaldi et al.\(^1\) do not dispute that bacterial filters reduce the movement of airborne bacteria within anesthesia tubing and that bacterial colony counts are invariably lower in tubing sites that are distal to a filter than in those that are proximal. They agree that it is a logical hypothesis that bacterial filters should lower the risk of developing pneumonia. Feeley et al.\(^2\) similarly concede the accuracy of studies which have documented the presence of bacteria on and in anesthesia equipment. However, both have questioned the clinical relevance of these points. They expose their reservations to the next step in the deductive reasoning process, the step which often is neglected in clinical medical practice. They subject a logical hypothesis to the scrutiny of a prospective, controlled trial to determine clinical efficacy. As is often the case, the hypothesis cannot be substantiated.

These studies should also have a significant economic impact on anesthesia practice. We should stop using bacterial filters for breathing circuits until such time when equally well-designed and executed experiments cause us to question the validity of the conclusions of Garibaldi and Feeley. These studies should also cause us to evaluate the other "logical hypotheses" that have led to modifications in our practice. There are many areas that could be examined, but in the category of filters alone, we have accepted to a greater or lesser extent, millipore epidural catheter filters, gas-line filters, and filters for removing microaggregates from transfused blood. Although the value of these devices at first seems obvious, evidence that their use improves patient care is either completely lacking, in the case of the first two devices, or highly debatable, in the case of blood filters. If these devices are not clinically efficacious, then at least, their use introduces an unnecessary expense into anesthesia practice. At the most, their use may be associated with complications which can be more serious than the disease they are intended to prevent. The best way to avoid such situations is to ensure that the scientific basis of our practice remains strong and that all "logical hypotheses" are adequately tested before they are accepted.

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References

Anesthesiology

Total Parenteral Nutrition in the Perioperative Period—
A Time for Caution?

The state of nutrition of the surgical patient has long been a subject of discussion among anesthesiologists. Starvation, a "lack of glycogen in the liver", was first suggested by Opie and Alford in 1915 to be responsible for a susceptibility to liver damage in patients exposed to chloroform.\(^1\)\(^-\)\(^3\) Overnutrition by contrast, has been implicated as a major problem in the anesthetized obese patient, but concern has been mainly for physical and mechanical problems, rather than for the accompanying altered metabolism and organ function.

It was not until the early 1970s that surgeons and anesthesiologists began to truly understand the basis of altered metabolism in the starving or undernourished patient,\(^4\) and how anesthesia and trauma might interfere with "caloric homeostasis" in such a patient. Clearly, it was shown that vital tissues could use substrates other than glucose. A large proportion (19.6 per cent) of basal metabolic expenditure is devoted to nourishing the central nervous system. Investigations in humans and animals showed that the brain is able to utilize ketone bodies in addition to glucose.\(^5\)\(^,\)\(^6\) It also became apparent that the myocardium can utilize ketone bodies as metabolic fuel, and that both the myocardium and the liver can utilize free fatty acids. In fact, evidence accumulated