

**TITLE:** FAILURE OF ANESTHESIA CIRCUIT BACTERIAL GAS FILTERS TO REDUCE POSTOPERATIVE PULMONARY INFECTIONS

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Hospital acquired infections are a major source of postoperative morbidity and mortality. In the surgical patient, fears of inoculating bacteria into lungs during anesthesia by organisms contaminating the anesthesia machine and circle system have led to the use of disposable gas circuits and bacterial gas filters. Low resistance, disposable filters have been shown effective in preventing passage of large bacterial challenges.<sup>1</sup> However, the relative importance of anesthesia equipment in the pathogenesis of postoperative pneumonias remains unclear.<sup>2</sup> We prospectively studied postoperative pulmonary infections in patients anesthetized with and without filters.

**METHODS AND MATERIALS:** Our study population included 140 adult patients electively anesthetized by general endotracheal anesthesia at the University Hospital and Veterans Administration Hospital, Salt Lake City, Utah. Patients undergoing cardiovascular, thoracic, upper and lower abdominal surgery were randomly assigned a filtered or non-filtered anesthesia circuit. Appropriate elements of the patient's medical history and anesthesia care were recorded. Patients were anesthetized in the operating rooms (OR) of the two hospitals with the usual anesthesia machine and ventilator assigned to that OR. No change in the customary routine cleaning of machines and ventilators occurred during the study. The non-filtered circuit was a single use, disposable plastic circuit; the filtered circuit was a single use, disposable plastic circuit with low resistance, 0.22 micron filters interposed at the circuit attachment to both the inspiratory and expiratory ports of the absorber canister.

During the first 5 postoperative days, a nurse epidemiologist who was unaware of the filter allocation reviewed the patient's chart and nursing notes. Records were made of daily observations of maximum temperature, chest x-ray findings, sputum culture results, physical examination findings and physician diagnoses of pulmonary complications. In addition, the nurse epidemiologist independently classified each patient for probability of pulmonary infection according to criteria established by the Center for Disease Control (CDC). Comparison of outcomes of the filter and no-filter groups were compared by Mantel-Haenszel Chi-square statistics. A  $p < 0.05$  was considered statistically significant.

**RESULTS AND COMMENTS:** Sixty-three and 77 patients were randomly assigned to the no-filter (NF) and filter (F) groups, respectively. There was no difference between the two groups in sex or age distribution. Patients in the two groups had similar histories of pulmonary disease, sputum production, smoking and preoperative chest x-ray results; both groups were also similar in ASA physical status classification, surgery service, duration of surgery, types of surgical procedures, use of halothane, enflurane and nitrous oxide, use of anticholinergics, use of antibiotics and body weight.

The overall rate of pulmonary infections, using standard CDC classifications, was 17.1%; this rate is

similar to other reports for patients subjected to similar surgical procedures.<sup>3</sup> There was no difference in the infection rate between the NF (15.9%) and F (18.2%) groups.

**TABLE: COMPARISON OF INFECTION RATES**

	Infection	No Infection
No Filter (63)	10 (15.9%)	53 (84.1%)
Filter (77)	14 (18.2%)	63 (81.8%)

Chi-square statistic,  $p = 0.55$

In addition, analyses of more sensitive but less specific markers of possible pulmonary infection revealed no difference between the two groups. In particular, the frequency of temperature greater than 38° C was the same (NF 44.4% vs F 46.8%,  $p = .92$ ). Abnormal postoperative chest x-rays occurred in similar percentages (NF 17.5% vs F 20.8%,  $p = .78$ ). Postoperative abnormalities on pulmonary physical examination were also the same in both groups (NF 82.5% vs F 87.0%,  $p = .62$ ). Sputum production was also similar (NF 28.6% vs F 37.7%,  $p = .34$ ).

Our results show that routine use of filters during higher risk surgery does not prevent postoperative pulmonary infections. Our study does not support the use of bacterial gas filters for routine patient care. However, use of filters might be occasionally useful in patients requiring respiratory isolation at the time of surgery.

#### References.

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3. Wightman JAK: A prospective survey of the incidence of postoperative pulmonary complications. *Br J Surg* 55:85, 1968