Title : A TWENTY-FIVE YEAR REVIEW OF OPERATING MORTALITY

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Introduction. Recent reviews[1,2] of operative mortality have cited the prime risk factors to be: 1) physical status of the patient, 2) emergency versus elective nature of the procedure, and 3) judgmental decisions of the physicians involved. However, no mention was made of monitoring techniques, nor whether alterations in management improved subsequent statistics. In 25 years, our understanding of critical pathophysiology has increased, as has technology, we felt that a chronologic review of our operative mortality figures in this regard would be enlightening.

Methods: Deaths occurring within 24 hours of operation from the years 1953-1977 inclusive were surveyed. Operative, medical and autopsy records were reviewed. Age, sex, physical status by ASA classification, operative site, severity of operation, anesthetic technique, transfusion requirements, time and primary cause of death were recorded.

Results: 173 deaths were documented for a total of 178,590 operations. Mean age was 52 ± 19 years, with no difference for 5-year periods. For all 25 years abdominal procedures accounted for the highest mortality (51%). Table 1 shows incidence figures and surgical sites by 5-year periods. 82% of all deaths (136 cases) were major procedures. All minor procedures (9 cases-5%) were emergencies. Anesthetic techniques for 5-year periods reveal: 1) diethylether was used in > 50% of cases until 1962, 2) in 1963-1967 diethylether was used in 39% of cases, halothane 27%, 3) in 1968-1972 major distribution occurred between diethylether (20%), halothane (20%), N_2O with a muscle relaxant (20%), and a narcotic technique (27%), 4) after 1972 neuroleptic techniques account for 71% of cases. Percentages by ASA classification reveal 65 patients (37%) in Class I and II, and 108 (62%) in Class III, IV and V. For the periods 1953-1957 and 1958-1962, a majority of fatalities were judged as good risk: 14/27 (52%) and 19/33 (57%) respectively. Subsequently higher risk patients comprised the majority of deaths: 44/62 (71%), 26/30 (84%) and 11/21 (57%), respectively. The leading cause of death for the total period and for 5-year periods was hemorrhage (51%). Other major causes were: septic shock (7%), unexplained cardiac arrest (11%), pulmonary edema (5%), acute MI (4%), airway obstruction (5%). All cases of airway obstruction resulted from bleeding or malposition of a fresh tracheostomy after radical laryngeal surgery; anoxia under anesthesia due to insecure airway caused 2

deaths (1%) and aspiration 2 (1%).

Discussion: Only one patient in this series received a regional anesthetic, reflecting our preference for general anesthesia for surgery which is lengthy or involves major blood loss. 17% of all patients received either N_2O as their only anesthetic or O_2 only, reflecting their moribund status. Changes in management reflect some changes in cause of death. Before 1962, 18 of 34 deaths (53%) due to major hemorrhage (> 6000 cc) were complicated by sudden ventricular fibrillation or asystole, despite adequate blood replacement. In 1961, after we instituted the practice of warming all transfused blood and avoiding empiric administration of calcium,[3] sudden ventricular fibrillation or asystole ceased to occur as a complication of transfusion. Cardiac complications (MI, pulmonary edema, unexplained cardiac arrest) are still a significant cause of death, despite use of ECG, CVP and electrolyte and arterial blood gas determinations as standard management techniques. We now recognize the inadequacy of these techniques as precise indicators of cardiac dynamics; careful identification of the patient at risk and our greater intraoperative use of Swan-Ganz catheterization should improve the problem of morbid cardiac complications.

References.
1. Marx GF, Mateo CV, Orkin LR: Computer analysis of postanesthetic deaths. Anesthesiology 39:54-58, 1973.
2. Vacanti C, VanHouten RJ, Hill RC: A statistical analysis of the relationship of physical status to postoperative mortality in 68,388 cases. Anesth Analg (Cleve) 49:564-566, 1970.
3. Howland WS, Belleville JW, Zucker MB, Boyan CP, Cliffton EE: Massive blood transfusion. Failure to demonstrate citrate intoxication, Surg Gyn Obst 105:529-540, 1957.
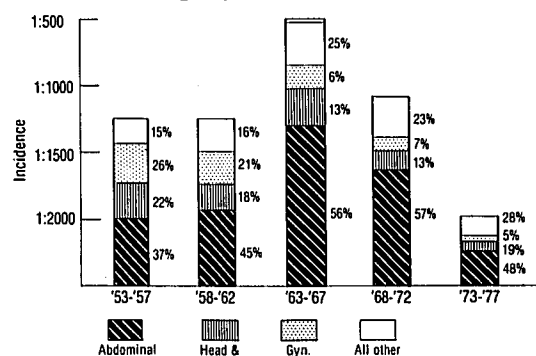
Table 1.
Mortality incidence by 5-yr. periods with % distribution among types of surgery.