

Septicemia as a Cause of Immediate Postoperative Hyperthermia

JEROME H. MODELL, M.D.*

In December 1964, Saidman *et al.* reported two cases of severe hyperthermia occurring during anesthesia.¹ More recently, additional such cases have been reported, and an abnormality in the oxidative phosphorylation mechanism has been suggested as a possible etiologic factor.² This report presents 6 cases of immediate postoperative hyperthermia where the etiology, although obscure at the time, was subsequently proven.

A 32 year old man, A.S.A. class 1, underwent a two hour operation for the elevation of a zygomatic fracture under sodium thiopental, meperidine, nitrous oxide, and succinylcholine infusion. Approximately two hours postoperatively, the patient, although awake and apparently recovered from the effects of his anesthetic, complained of shaking chills. His temperature was 105.2° F. rectally. A blood sample was drawn for culture, and cooling of the patient was initiated with a water-circulating mattress. Over the next two hours, severe hypotension and tachycardia developed. A presumptive diagnosis of septicemia was made, and the patient was given chloramphenicol and steroids intravenously. Body temperature was reduced and maintained at 95° to 98° F. with the water-cooled mattress. During the next 36 hours, intermittent use of intravenous vasopressor drugs were required to maintain the patient's systolic blood pressure above 80 mm. of mercury. The blood culture grew *Alcaligenes faecalis*. Antibiotic therapy was continued, and within two weeks the patient made an uneventful recovery.

Six days later, 5 healthy adult female patients, A.S.A. class 1 and 2 were given pentobarbital, meperidine and atropine as premedication. Anesthesia was induced with intravenous sodium thiopental and maintained with nitrous oxide by inhalation and a continuous

intravenous infusion of succinylcholine. In all cases, vaginal operations lasting less than thirty minutes were performed. Four of the 5 patients became febrile (101° F. to 104° F.), hypotensive, and demonstrated a tachycardia within one to two hours after recovery from anesthesia. The fifth patient, who had been treated with antibiotics preoperatively for a septic abortion, developed a mild temperature elevation postoperatively, but did not demonstrate cardiovascular symptoms. Blood samples for culture were drawn on all patients. The blood of the 4 patients not receiving prior antibiotics showed *Alcaligenes faecalis*. The patient who had been treated with antibiotics preoperatively had a sterile blood culture. All 5 patients were placed on chloramphenicol therapy and made uneventful recoveries.

Since 4 of these patients demonstrated symptoms suggesting septicemia within minutes to hours of each other, a common source of infection was considered, and all intravenous agents administered in the operating room were cultured immediately. Included were 4 bottles of diluted succinylcholine solution (1 per cent succinylcholine in 5 per cent dextrose and water) that had been prepared at different times by two different people. These solutions ranged in age from two hours to eight days and were kept under refrigeration except during the time 3 of them had been in use. Other agents cultured were: 5 syringes containing 2½ per cent sodium thiopental and 2 stock solutions of thiopental, sample bottle of 5 per cent dextrose in water, meperidine, intravenous tubing, venotubes, syringes, and needles.

All cultures were sterile except for the 4 samples of succinylcholine solution. These solutions, prepared from a common package of 10 ml. ampules of 10 per cent Anectine, all grew *Alcaligenes faecalis* in culture. Since no additional undiluted vials were available for culture, the manufacturer traced their identity through the identification number, and pilot

* The United States Naval Hospital, Pensacola, Florida. Present address: Department of Anesthesiology University of Miami School of Medicine and Jackson Memorial Hospital, Miami, Florida.

samples retained from the lot were subjected to bacteriological examination. Aliquots from these samples were placed into fluid thio-glycollate media and trypticase soy broth at 31° and 37° C. None revealed the presence of organisms.

DISCUSSION

Although hyperthermia, following ether anesthesia in warm operating rooms, was a fairly common complication in the past, in recent years intraoperative and immediate postoperative hyperthermia has not warranted much attention. The reports by Saidman *et al.*¹ and Wilson *et al.*² have renewed interest in this complication. Following a presentation of Wilson's paper,² the audience of approximately 150 revealed that about one-third had recently observed unexplained hyperthermia exceeding 104° F. intraoperatively or immediately postoperatively. Although the etiology in some of these cases may have been related to a disturbance in the oxidative phosphorylation mechanism under halothane anesthesia,² other explanations should be considered. One is the intravenous infusion of contaminated solutions.

Since pilot samples of undiluted Anectine, as well as the dilution fluid, intravenous tubing, needles, and syringes were sterile on culture, it seems likely that the contamination of the dilute solutions occurred either during their preparation or during use of the same solution in preceding patients. It is reasonable to question the possibility of contamination during preparation since other solutions prepared by the same two people during those eight days were not contaminated. One explanation may be the differences in the pH of the final solutions or the ability of the diluent to supply the nutrient requirements of the organism for growth. Contamination of the diluted solutions of succinylcholine during previous use in other patients cannot be ruled out; however, this is also unlikely since one bottle (two hours old) had never been used on any patient.

Although the original source of contamination in this series remains unconfirmed, there is little doubt that *Alcaligenes faecalis* was

infused into the patients with the administration of diluted succinylcholine. These cases re-emphasize that bacteria can be introduced intravenously into patients regardless of the usual precautions taken in the preparation of solutions. Such contamination is not limited to any one drug but is possible whenever the composition of the final solution will support bacterial growth. It seems reasonable, therefore, that such solutions be prepared in a fluid which is less likely to support bacterial growth than dextrose in water. It should also be emphasized that the saving of diluted fluids and later reuse can be hazardous and should be discouraged.

SUMMARY

Six cases are reported in which patients received an infusion during anesthesia containing *Alcaligenes faecalis*. Five developed septicemia and hyperthermia immediately postoperatively, and the sixth (who had been given antibiotics preoperatively) demonstrated only a slightly increased temperature. All patients were given therapy and recovered. The ease with which solutions may become contaminated and introduced intravenously is stressed. Reuse of diluted solutions should be discouraged because it may be a source of contamination. This etiology should be considered in any patient who develops an unexplained increased temperature in the immediate postoperative period.

Burroughs-Wellcome & Co. assisted in the bacteriologic studies.

The opinions expressed herein are those of the author and do not necessarily reflect the opinions of the U. S. Navy.

REFERENCES

1. Saidman, L. J., Havard, E. S., Eger, E. I., II: Hyperthermia during anesthesia, *J.A.M.A.* **190**: 1029, 1964.
2. Wilson, R. D., Nichols, R. J., Jr., Dent, T. E., Allen, C. R.: Disturbances of the oxidative-phosphorylation mechanism as a possible etiological factor in sudden unexplained hyperthermia occurring during anesthesia. Presented at the Annual Meeting of the American Society of Anesthesiologists, Denver, Colorado, October 25, 1965 (Work in Progress Abstract, *ANESTHESIOLOGY*, **27**: 231, 1966).