CASE REPORTS

Cardiac Arrhythmias Associated with Succinylcholine in a Patient with Pheochromocytoma

THEODORE R. STONER, JR., M.D., AND KARL F. URBACH, M.D.

It is well known that the intermittent use of succinylcholine may give rise occasionally to bradycardia, cardiac arrhythmias, and even cardiac arrest. These effects have been noted especially in severely burned patients and patients who have been digitalized.

Bradycardia and arrhythmias produced by succinylcholine occur more frequently after second or subsequent injections of the drug than after single injections. Also, it has been suggested that the incidence of arrhythmias with continuous succinylcholine infusion is rare compared with that following intermittent injections.

In the case described below, cardiac arrhythmias were associated with continuous succinylcholine infusion in a patient during removal of a pheochromocytoma.

CASE REPORT

A 140-pound, 40-year-old woman was admitted to the hospital with a diagnosis of pheochromocytoma. The patient had had symptoms of transient weakness and palpitations since 1961. In 1962 the symptoms became worse and were associated with episodes of perspiration, pounding headaches, and hypertension in the range of 130/90 mm Hg to 170/110 mm Hg.

In the hospital the 5-hydroxyindoleacetic acid test and the tyramine test disclosed no abnormalities. On four occasions 3-methoxy-4-hydroxymandelic acid (VMA) was elevated (on a low-VMA diet). Radiographic study of the adrenal veins revealed a large left adrenal mass. The patient was placed on 60 mg phenoxycbenzamine hydrochloride daily for two weeks prior to surgery; the last 40-mg dose was given at 5 a.m. on the day of operation. Blood volume before surgery was 6.3 l (predicted normal 3.9-4.5 l).

At 6:30 a.m. on the morning of surgery, the patient received 150 mg pentobarbital and 0.4 mg scopolamine. She appeared well sedated in the operating room at 8 a.m. Blood pressure was 160/100 mm Hg, pulse rate 84 per minute. An arterial needle was inserted under local anesthesia for direct arterial-pressure monitoring prior to and during induction of anesthesia.

Induction was accomplished with 300 mg sodium thiopental followed by 65 per cent N₂O—35 per cent O₂ and halothane. The electrocardiogram remained stable and blood pressure fell to 140 mm Hg systolic. After five minutes, the N₂O was reduced to 50 per cent, then discontinued. The patient was ventilated with 2.5 per cent halothane and O₂ with assisted respirations. A 0.2 per cent infusion of succinylcholine was started to provide relaxation for intubation and for the subsequent course of operation. There was no airway obstruction. With the onset of relaxation, a ventricular bigeminal rhythm appeared. This ceased when the succinylcholine infusion was stopped. Succinylcholine infusion was again started, with recurrence of the abnormal rhythm, which again disappeared with cessation of the infusion. This was repeated on two more occasions with the same results. During this period, intubation was not attempted and there was no airway obstruction. Finally, succinylcholine infusion was discontinued because of the recurrent arrhythmias. The patient was intubated with a 32 F endotracheal tube under deep halothane anesthesia without a relaxant; no arrhythmias occurred even though the intubation was difficult and required several attempts.

Surgery and anesthesia then proceeded without difficulty until manipulation of the tumor resulted in multiple premature ventricular contractions and finally, ventricular tachycardia. These arrhythmias were brought under control with 240 mm lidocaine in two divided doses and, finally, with three 1-mg doses of propranolol hydrochloride. After the tumor was removed, the patient received 0.4 mg atropine for a transient episode of hypotension and bradycardia. At the termination of the procedure, a 0.2 per cent succinylcholine infusion was again administered to facilitate closure of the abdominal wound. This time no arrhythmias occurred.

The patient was anesthetized 24 hours later because of suspected postoperative intra-abdominal hemorrhage. A 0.2 per cent succinylcholine infusion was used. No arrhythmias occurred throughout the anesthetic course.

Received from the Department of Anesthesiology, U.S. Public Health Service Hospital, Staten Island, New York.
DISCUSSION

Cardiac arrhythmias produced by succinylcholine infusions are relatively rare in general surgical patients, especially those in whom anesthesia is induced with thiopental. The arrhythmias associated with succinylcholine infusion in our patient suggest that this was a consequence of the presence of a pheochromocytoma, i.e., of elevated blood levels of catecholamines.

It has been suggested that succinylcholine induces arrhythmias because of its chemical similarity to acetylcholine. However, several hypotheses other than acetylcholine-like activity have been offered to explain the production of cardiac arrhythmias with succinylcholine: increases in serum potassium, postganglionic sympathetic stimulation, direct myocardial effect, and direct stimulation of the adrenal gland by succinylcholine have been postulated. In the case presented, infusion of succinylcholine repeatedly resulted in a ventricular bigeminal rhythm during induction. This was not reproducible at the end of the first procedure after the pheochromocytoma had been removed, nor 24 hours later when the same anesthetic technique was used in a second operation. It is logical, therefore, to assume that the association of the arrhythmias with the succinylcholine infusion at the beginning of our case was in some way associated with the pheochromocytoma, i.e., with high blood levels of catecholamines.

The adrenal medulla behaves like an autonomic ganglion and is stimulated to secrete catecholamines by acetylcholine. One can speculate that because of its similarity to acetylcholine, succinylcholine stimulated the medullary adrenal tumor in our patient to secrete large amounts of catecholamines. The rise in catecholamine level was not accompanied by an increase in arterial blood pressure, probably because of the alpha blocking action of phenoxybenzamine.

A direct action of succinylcholine on the myocardium in conjunction with abnormally elevated catecholamine blood levels cannot, of course, be ruled out. Whatever the mechanism, caution in the use of succinylcholine in the presence of a pheochromocytoma is indicated.

REFERENCES


Surgery

MEAN BODY TEMPERATURE Four young male subjects were exposed for one hour to environmental temperatures of 6.5, 14.0 and 20.0 C. Heat production, skin temperature at seven locations, and rectal temperature were measured. Formerly used equations for calculating mean body temperature, roughly two-thirds of the rectal temperature plus one-third of mean skin temperature, were found not to be satisfactory. During the initial period of exposure to cold, the coefficient of skin temperature for calculating mean body temperature should be much smaller than at later stages of cooling. (Livingston, S. D.: Calculation of Mean Body Temperature, Canad. J. Physiol. 46: 15 (Jan.) 1968.)