Cardiac Arrest After Medication Through Central-Venous Catheter

Case Report

EDWARD ZAPANTA, M.D., AND FREDERICK W. PITTS, M.D.
Department of Neurosurgery, Los Angeles County and University of Southern California Medical Center, Los Angeles, California

A central-venous catheter offers definite advantages in the management of the hypothermic anesthetized patient. Its use in monitoring appropriate fluid replacement is well documented.\textsuperscript{4,8,10,13,16,45,47,129,24} Because this route of fluid administration is so easily available it is tempting to use it for the introduction of medications. We are reporting a case of an anesthetized patient who, while being rewarmed from a hypothermic state, suffered cardiac arrest after the intracardiac administration of medication through a central-venous catheter.

Case Report

A 43-year-old Negro man was admitted to the LAC-USC Medical Center on September 17, 1968, because of the sudden onset of drooping of the left eyelid and a throbbing pain behind the left eye. The past history was unremarkable; there was no history of hypertension or cardiac disease.

Examination. The patient was alert and cooperative. Pulse was 60, blood pressure, 165/100. There was ptosis of the left eyelid, a dilated left pupil, and ocular muscle paresis indicative of a third nerve palsy. There were no signs of meningeal irritation. The remainder of the examination was normal. Subsequent bilateral carotid angiograms under local anesthesia demonstrated a bilobed aneurysm in the region of the posterior communicating artery. There was no evidence of hematoma or spasm. The patient was unchanged by the diagnostic studies, remaining a Grade 1 patient (Botterell gradation).

Operation. On September 21, 1968, the patient underwent a left frontotemporal craniotomy under general anesthesia with hypothermia. Preparations for surgery included premedication with Demerol, Thora-

zine, and Scopalamine. A central-venous catheter was placed by cutdown into the left cephalic vein in the antecubital area. A second No. 14 angiocatheter was placed in a right hand vein. The anesthesia consisted of nitrous oxide, pentothal, anectine, and curare administered in the usual manner. Hypothermia was obtained with a cooling blanket. The patient was monitored with continuous EKG, esophageal thermometer, and peripheral pulse gauge. The actual surgery was uneventful except that two aneurysms (a posteriort communicating aneurysm and an anterior choroidal aneurysm) were found instead of the anticipated single bilobed lesion. They were clipped uneventfully. The patient's temperature at the time of clipping was 86°F.

Postoperative Course. Rewarming was begun immediately and about 1½ hours after the completion of the surgery the temperature had risen to 94°F. At this point atropine 0.8 mg and neostigmine 2.5 mg were administered to reverse the curare effect. They were given successively via central-venous catheter, but in less than 1 minute there was sudden loss of EKG pattern, blood pressure, and heart sounds. External cardiac massage was immediately begun. Intravenous epinephrine and sodium bicarbonate were given via peripheral angiocatheter but there was no response. Transthoracic intracardiac epinephrine was then given with restoration of EKG, blood pressure, and peripheral pulse within a few minutes.

The patient's pupils were now noted to be bilaterally fixed and dilated. A neosyne-

phrine intravenous drip was instituted, and the patient returned to the neurosurgical intensive care unit. His temperature at this time had reached 98°F; the blood pressure was 120/80, pulse rate 110, and his breathing was spontaneous and regular. The electrocardiogram now revealed a supraventricular

Received for publication January 23, 1969.
tachycardia. Electrolytes and CBC were normal. The patient was seen by a cardiology consultant approximately 6 hours after the cardiac arrest. An electrocardiogram, using the venous catheter as a saline bridge lead, demonstrated high upright “P” waves indicating that the catheter tip was located in or near the right atrium. Sinus tachycardia was also noted and attributed to hypovolemia. The patient improved when infused with fluids. There was no other evidence of EKG abnormality. The pupils returned to normal size and reactivity, and the patient regained consciousness within 12 hours. He showed no signs of dysphasia, and the left third nerve palsy was less marked.

The patient, however, had a right hemiparesis. Repeat left carotid arteriogram showed no filling of either aneurysm, and no evidence of intracerebral hematoma. We felt that the hemiparesis was due to disturbance of blood supply to the internal capsule, secondary to clipping of the anterior choroidal artery aneurysm. The patient has continued to convalesce uneventfully, and the hemiparesis shows improvement.

Discussion

Complications secondary to the use of central-venous catheters are well documented.1 Pneumothorax, air embolism, other emboli, and intra-thoracic hemorrhage have been reported. Although serious, the significance of these complications must be balanced against the potential value of a central-venous catheter. It has been very useful in guiding fluid replacement, and it has also proved of diagnostic value in early heart failure during surgery.11,14 It provides a means of studying the electrodynamics of the interior of the right atrium with a saline bridge electrode.7,15,19,26 The central-venous catheter offers an approach in the treatment of air embolism, and its value in operating on patients in the sitting position for posterior fossa and cervical explorations is well known.18,23

There may also be some therapeutic advantage in using the central-venous catheter to administer medications directly into the heart. The use of intracardiac drugs, such as epinephrine and calcium, is a routine part of cardiac resuscitation, and it would seem logical to administer these drugs through a central-venous catheter if one is in place when a cardiac catastrophe occurs.

Our case, however, shows that this method of drug administration may cause serious complications. The cardiac arrest that occurred after the intra-atrial administration of atropine and neostigmine in our patient was almost certainly a result of the direct effect of these drugs on the myocardium. The therapeutic use of these agents in anesthesia is well documented.5,9 In this case the neostigmine was administered to reverse the effect of curare;5,9 atropine was given to counteract the muscarinic effect of the neostigmine.9 Their pharmacological actions may affect the heart through the mechanism of a transient excess of acetylcholine in the right atrium.

Several factors could have contributed to our patient’s cardiac irritability. He was undergoing surgery under hypothermia;2,12 there was a state of relative hypovolemia secondary to dehydration from Mannitol; and the tip of the central-venous catheter was in the right atrium.5 Despite these predisposing factors the patient tolerated well the surgical procedure and the anesthetic until the point of drug administration through the central-venous catheter. Because the cardiac arrest occurred immediately after the drug administration, we feel that the cause and effect relationship presented here is a valid one. Although these drugs seem safe when applied to the peripheral circulation,1,12 their pharmacological nature is such that they may cause cardiac arrest when introduced directly into the heart.

We need further evaluation of the effects of direct intracardiac administration of medications not only because of the possible complications but because of the possible advantages in the administration of drugs such as epinephrine. In addition, the role of these drugs in association with hypothermia and Mannitol needs further study. It is conceivable that without the cardiac irritability introduced by these factors the undesirable effect of intracardiac drug administration would be much less. We are currently evaluating drugs that stimulate autonomic nervous system activity, as well as electrolytes and agents like thorazine which might on occasion be introduced into a hypothermic patient through a central-venous catheter. The