

## CASE REPORTS

### Fibrillation Resulting from Pacemaker Electrodes and Electrocautery during Surgery

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Since heart block requiring artificial pacing with electronic pacemakers may develop following cardiac surgery, pacemaker electrodes often are sutured in the myocardium to be available if pacing is required. The low-resistance conductors placed in the myocardium may allow small currents to flow from other electrical instruments directly to the heart. Though usually harmless, these small currents may cause ventricular fibrillation when carried directly to the myocardium. An example of intraoperative ventricular fibrillation caused by an electrocautery unit in a patient with implanted electrodes is presented.

#### CASE REPORT

A 51-year-old man with inactive rheumatic heart disease complicated by aortic insufficiency and mitral stenosis, functional class III, was scheduled for an aortic valve replacement and open mitral commissurotomy. After oxygenation, anesthesia was induced with thiopental and intubation facilitated with succinylcholine. Anesthesia was maintained with 0.5 per cent halothane in 50 per cent nitrous oxide. Hexafluorenum and succinylcholine were used for relaxation throughout. After cardiopulmonary bypass, the spontaneous heart rate was 60 beats per minute.

Electrodes ‡ were implanted in the myocardium and connected to a pacemaker power pack § by extension wires and alligator clamps. The clamp of one electrode was inadvertently placed on a wet drape near the incision. A Bovie ¶ electrocautery was used to achieve hemostasis prior to closure; the groundplate was under the patient's buttock. Each time the electrocautery was used the heart was observed to fibrillate. The artificially-

paced rhythm resumed immediately each time cautery was discontinued. An alligator clamp noted to be touching the wet drapes was moved, contact with the drapes thus broken, and cautery continued without the recurrence of fibrillation. The patient required artificial pacing for about six hours postoperatively after which the rhythm returned to normal. He recovered without further difficulty.

#### DISCUSSION

This case illustrates one of the problems encountered during use of electrical devices with low-resistance conductors present in the myocardium. Very small currents are required to cause fibrillation. Weinberg *et al.*<sup>1</sup> have pointed out that only 35 microamperes and 0.06 volt are required to fibrillate a dog heart; as little as 180 microamperes<sup>2</sup> will fibrillate a human heart when applied directly to the myocardium. Such small currents may come from other electronic equipment attached to the patient and may pass through the implanted electrodes. Noordijk *et al.*<sup>3</sup> described the pathways of current from an incorrectly-grounded electrocardiograph through the heart to a line-powered pacemaker, resulting in fibrillation. Burchell<sup>4</sup> and Whalen and Starmer<sup>2</sup> directed attention to the problem associated with current leakage from other electronic apparatus attached to the patient.

The circuit of a well insulated, battery-powered pacemaker may easily be isolated from other circuits, as shown by Fein,<sup>5</sup> who demonstrated the safe application of electrocautery in patients with implanted pacemakers. Circuits may, however, unexpectedly involve implanted electrodes and the heart to result in sudden and unanticipated fibrillation. In the case reported, a portion of the current apparently flowed from the cautery tip through the wet drapes, the implanted electrodes, the

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‡ Chardack catheter electrodes.

§ Medtronic demand pacemaker.

¶ Bovie Electrosurgical Unit Model AG, Liebel-Flarsheim Company, Cincinnati, Ohio.

heart, and then to the groundplate. Spontaneous remission probably was due to the already functioning pacemaker. Fibrillation was diagnosed by direct observation of the heart; the electrical noise caused by the cautery rendered cardioscope monitoring ineffectual.

When the heart is not exposed and cautery is used, continuous monitoring of heart sounds or pulse is the only practical means of detecting ventricular fibrillation or other arrhythmias instantly. The anesthesiologist needs to be alert to the fact that electronic devices, although used daily with apparent safety, may cause arrhythmias in certain situations.

## REFERENCES

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## Extreme Obesity

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The management of the extremely obese patient requires, among other considerations, meticulous measures to prevent atelectasis and pneumonia postoperatively. Experience has shown that the obese patient is particularly prone to develop this complication, with characteristically disastrous consequences.<sup>1,2</sup> A rational and successful management of one such case is reported.

## CASE REPORT

The patient was a 27-year-old, mentally retarded, 275-pound 4 foot, 7 inch woman (fig. 1) with a history of an endocrinopathy which, despite complete endocrine work-up, was undiagnosed. She also had cholecystitis and cholelithiasis. She was presented to us, as an outpatient, by our surgical colleagues as a candidate for cholecystectomy on an elective basis. Despite vigorous attempts with diet, no weight loss could be accomplished. The patient was admitted to the hospital three days prior to surgery and was educated (with some difficulty because of her mental retardation) in the use of the Bennett ventilator. She was informed at this time that when she awoke after operation the trachea would be intubated and a ventilator would be helping her to breathe. On the morning of surgery, 5 cc. of 2 per cent xylocaine was nebulized via the respirator, to anesthetize the pharynx and larynx. Five per cent cocaine was used topically in one nostril, and a No. 32 French nasotracheal tube was passed blind nasally without difficulty. Anesthesia was

then induced with a sleep dose of thiopental and maintained with halothane-oxygen with *d*-tubocurarine in dosage sufficient to produce complete muscular paralysis and optimum surgical conditions. The operation was completed in one and one-half hours, and the patient returned to the recovery room with the nasotracheal tube in place, being ventilated with an Ambu bag. She was maintained on the Bennett ventilator, without reversal of *d*-tubocurarine (which we usually carry out in patients who have received *d*-tubocurarine) and ventilated with great care to use large tidal volumes and repeated sighs until she was wide awake and alert. The nasotracheal tube was left in place and the patient hyperventilated every half hour for the first 48 hours post-surgery. The tube was then removed and the patient given a session on the ventilator via mouthpiece every hour for the next two days. Recovery was completely uneventful, with no pulmonary or other complications.

## COMMENT

The management of the obese patient has been discussed in many reports and the techniques recommended have varied from spinal anesthesia (continuous) to all of the various forms of general anesthesia.<sup>1,2,3</sup> We felt we would prefer a technique which would assure: (1) the least possibility of airway obstruction; (2) complete paralysis, to expedite surgery; (3) ability to provide adequate oxygen concentrations during and after anesthesia; (4) that residual paralysis from the muscle relaxant would not pose a problem; (5) the ability to give large tidal volumes and periodic sighs to

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