Anesthesiology:
April 2001 - Volume 94 - Issue 4 - pp 710-711
Case Reports

Electrocautery-induced Tachycardia in a Rate-responsive Pacemaker

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Submitted for publication August 25, 2000.

Accepted for publication November 30, 2000.

Supported in part by the Department of Anesthesiology, Toronto Western Hospital, University Health Network, University of Toronto, Toronto, Canada.

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ELECTRIC interference by cautery on demand pacemakers can cause inhibition and loss of pacing. [1] We report a case in which electrocautery induced a pacemaker in ventricle-paced, ventricle-sensed, inhibited, rate-responsive (VVIR) mode to pace at a programmed maximum rate of 130 pulses/min.

Case Report

A 59-yr-old man was scheduled for elective transurethral resection of prostate surgery for benign prostatic hypertrophy. He had a history of third-degree heart block necessitating the insertion of a VVIR pacemaker (META II, 1204H; Telectronics, Englewood, CO) 5 yr previously. The patient's pacemaker function was assessed to be satisfactory 1 month before surgery. Preoperative ECG showed complete pacemaker dependency and ventricular pacing at a rate of 60 pulses/min. In the operating room, spinal anesthesia was performed, and 1.5 ml hyperbaric bupivacaine, 0.75%, was administered. A satisfactory sensory level of T6 was obtained. Vital signs were stable, and a three-lead electrocardiogram showed P waves at 100 beats/min and ventricular paced rhythm at 60 pulses/min (fig. 1, top). Surgery was initiated. Each time unipolar electrocautery (with ground pad on thigh position Force 40; Valleylab Inc., Boulder, CO) was used, the paced ventricular rate gradually increased to a plateau at 130 pulses/min (fig. 1, bottom). The patient was asymptomatic, and his blood pressure was 120/85 mmHg. Conversely, each

time electrocautery was stopped, the paced rate gradually returned to 60 pulses/min. The paced rates of 60 and 130 pulses/min were the minimum and maximum programmed settings in the VVIR mode. Electrocautery usage did not cause pacemaker inhibition or loss of pacing. Surgery was completed without complications. While in the postanesthetic recovery unit, electrocardiographic monitoring showed paced rhythm at 60 pulses/min throughout.

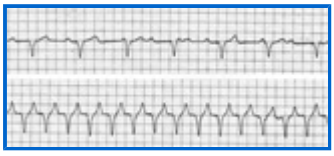

Fig. 1

Discussion

Review of pacemaker information indicates that this single-lead ventricular pacemaker is of the rate-responsive type programmed in rate-responsive mode [2,3] (VVIR 60-130 pulses/min). The rationale for rate responsiveness is to increase the rate of cardiac pacing during periods of physical activities. This pacemaker uses the principle of thoracic bioimpedance. [2] An increase in minute ventilation sensed by changes in thoracic bioimpedance leads to a proportional increase in cardiac pacing rate.

The following is our proposed mechanism for the rapid pacing noted. Many medical devices, in addition to pacemakers, use the technology of bioimpedance. [3] ‡ ‡ Burlington DB: Interaction between minute ventilation rate-adaptive pacemakers and cardiac monitoring and diagnostic equipment. Available at: http://www.fda.gov/cdrh/safety/minutevent.html. Accessed October 14, 1998. In this case, when electrocautery is used in this patient with a rate-responsive pacemaker, the pacemaker senses the mixture of bioimpedance signals as an indication of elevation of minute ventilation, resulting in sensor drive pacing at 130 pulses/min. [5,6] ‡

As most anesthesiologists are unfamiliar with rate-responsive pacemakers, and facing the situation of rapid ventricular pacing in the perioperative setting may lead to two problems. First, rapid ventricular pacing may result in supply-demand imbalance and myocardial ischemia. Second, pacemaker-induced tachycardia may be misinterpreted as intrinsic ventricular tachycardia, resulting in inappropriate treatment.

After reviewing the literature, we recommend the following for patients with rate responsive pacemakers undergoing surgery. [2,3] ‡ First, these pacemakers should be reprogrammed out of the rate-responsive mode before exposure to electrocautery or other medical devices with electromagnetic interference. Second, the maximum rate-responsive programmed rate may be decreased to a rate that the patient can tolerate without side effects.

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