Bacterial Endocarditis and Incarceration of a Transvenous Pacemaker: Removal under cardiopulmonary by-pass after prolonged traction proved ineffective

Remigio Garcia
Mehdi Hakimi-Naini
Bacterial Endocarditis and Incarceration of a Transvenous Pacemaker

Removal under cardiopulmonary by-pass after prolonged traction proved ineffective.

Remigio Garcia, MD* and Mehdi Hakimi-Naini, MD**

Transvenous electrode endocardial pacing of the right ventricle is the most simple and common modality of permanent pacing at present. The incidence of endocarditis is rare. Only two patients were found in our hospital series of over 200 who had permanent transvenous pacemakers implanted. A 40-year-old housewife developed staphylococcus aureus endocarditis secondary to local wound infection in the power pack pocket, requiring removal of the infected electrode under cardiopulmonary by-pass. Prolonged traction of the retained electrode proved ineffective. The mechanism of electrode entrapment is discussed.

Case Report

A 40-year-old housewife had a 4-year history of Stokes-Adams attacks secondary to recurrent bouts of ventricular tachycardia. After numerous drug treatment combinations proved ineffective, she underwent an uneventful insertion of a permanent transvenous fixed rate pacemaker* January 16, 1969, for overdrive suppression of the ectopic ventricular focus.

The patient had two uneventful early power pack replacements in 1971 and 1972 probably as a result of the rapid pre-set fixed rate of the pacemaker. One year later, in October 1973, she began to complain of frequent syncopal episodes and was admitted to a local hospital where the fixed rate pacemaker was replaced with a de-
mand power-pack set at a rate of 83 beats per minute. Two days after her discharge the Stokes-Adams attacks re-appeared and she was admitted to the Henry Ford Hospital on November 12, 1973. While she was being cared for in the monitor unit, it became apparent that the slower rate of the demand pacemaker was unable to prevent the recurrent ventricular tachycardia (Figure 1). Intravenous lidocaine administration was required.

The patient was an overweight Caucasian female with a blood pressure of 100/70 mm Hg, heart rate of 80 per minute with frequent premature beats. Lungs were clear. Her heart was normal in size with distant heart sounds. There was evidence of local infection in the suture line and the area of the power pack pocket located in the right supramammary region.

The hemoglobin was 12.0 gm/dl, the white cell count was 11,400 cu mm, with a shift to the left. The blood urea nitrogen, creatinine, electrolytes and urinalysis were within normal limits. The latex fixation test was non-reactive. Culture from the pacemaker pocket was positive for staphylococcus aureus, sensitive to cephalosporin, clindamycin, oxacillin, erythromycin and chloromycetin. Chest roentgenogram on admission showed slight cardiomegaly and clear lungs. Blood cultures on the day of admission were negative. Repeat blood cultures remained negative until the thirty-third hospital day when staphylococcus aureus with similar sensitivities was found.

The infection in the pacemaker pocket made its removal mandatory. Because of the recurrent ventricular tachycardia, a temporary transvenous demand unit was first inserted via the left arm to provide possible overdrive suppression of the arrhythmia. At the time of removal of the infected power-pack, on the sixth hospital day, the surgeon was unable to remove the electrode wires by direct hand traction. Cephalozin, 1 gm, intramuscularly every six hours, and local irrigation of the pacemaker pocket with a neomycin solution were administered in an attempt to control the infection. After ten days of antibiotic therapy, a transmediastinal sutureless right ventricular epicardial electrode demand pacemaker at a rate of 92 per minute was inserted. The new power pack was located in the left upper quadrant of the abdomen away from the infected area.

Two days later, on the sixteenth hospitalization day, intermittent application of sustained traction was started on the exposed incarcerated electrode by means of progressive increments in weight added to the end of a rope suspended on an overhead pulley (Figure 2), as suggested by Bilgutay et al. This procedure had to be discontinued after one week of intermittent traction under continuous ECG monitoring and after a maximum weight of two pounds was reached. Dangerous runs of ventricular tachycardia had
Endocarditis and Incarceration of Pacemaker

developed (Figure 3) associated with severe retrosternal pain during the traction. On the twenty-first hospitalization day, pleuritic chest pain appeared, associated with hypoxemia. The chest roentgenogram showed bilateral pleural effusions and an infiltrate in the left lower lobe compatible with a pulmonary infarction. Four grams of cephalozin were being given daily but on December 14, 1973, the thirty-third hospital day, there was spiking fever; repeat blood cultures, for the first time since admission, grew staphylococcus aureus. In view of the failure of the prolonged traction we decided to proceed with the removal of the infected wire under cardio-pulmonary bypass.

At operation, the pacemaker lead was found encased in a sheath of fibrous tissue and firmly attached to the posterior leaflet of the tricuspid valve. These adhesions were freed and a fragment of tissue sent to the laboratory for culture. The electrode catheter was then pulled out from the trabeculations of the right ventricle and removed. The patient's postoperative course was uneventful on a regimen of methicillin, 4 gm, intravenously every eight hours during the first five days then vancomycin, 1 gm, every 12 hours for a total of six weeks. This was suggested by the infectious disease consultant, when some of the early cultures grew streptococcus fecalis. The patient became afebrile one week after operation and has had no recurrence since. Her arrhythmia has been under control with quinidine sulfate, 200 mg, every six hours and propanalol, 5 mg, every six hours in addition to the demand pacemaker at a rate of 92 per minute. The culture of the electrode tip as well as a fragment of atrial tissue were positive for staphylococcus aureus.

Discussion

Complications following the insertion of permanent transvenous electrode pace-
makers are numerous, with early wire dislodgement high on the list. Bacterial endocarditis is a rare complication and only isolated examples are found in the literature. Practically all patients died who were treated medically without removal of the infected electrode. An exceptional nonsurgical cure was recently reported. As a general rule all foreign material, including the power pack and electrodes, must be removed before the infection can be eradicated.

To our knowledge this patient is the third reported survivor from the complication of bacterial endocarditis who required removal of a permanent infected electrode by cardiopulmonary bypass, after prolonged traction proved ineffective. At operation, marked adhesion of the wire to the posterior tricuspid valve leaflet was found, requiring surgical excision under direct vision. Similar incarceration of permanent transvenous electrodes which has been found in autopsy studies may hinder repositioning of

**Figure 4**

Roentgenogram demonstrating the right ventricular location and configuration of the original electrode catheter tip in the right ventricular cavity.
Endocarditis and Incarceration of Pacemaker

the electrodes or make their removal hazardous. The degree of fibrous tissue reaction and tightness of the fibrous adhesions increases with the time lapsed from the initial insertion. In our patient the electrode had been in situ 4 years and 11 months. The type and shape of the electrode tip play a significant role in its incarceration.\textsuperscript{10,13} The Medtronic bipolar electrode model No. 5816 inserted in this patient (Figure 4) has a cylindrical shape, measures 3.4 mm diameter in its body and is 0.6 mm wider at the tip, making its removal by traction more difficult or impossible (Yarnoz and Furman\textsuperscript{10}). This model has been discontinued. New electrodes with smaller tip diameters varying from 2.2 mm to 3.2 mm, now available, are more easily withdrawn when necessary. This case underscores the need for strict aseptic technique during the implantation and changing of permanent pacemakers. The procedures are preferably performed in the operating room, utilizing a portable image intensifier.\textsuperscript{14}

References


11. Huang TY and Baba N: Cardiac pathology of transvenous pacemakers. \textit{Amer Heart J} \textbf{83}:469-474, 1972
