Case Report: Implantation of a Triple-Chamber ICD

S. BOVEDA, L. SCHMUTZ, P. ORTIZ, M. SALVADOR-MAZENQ
Centre Hospitalier Universitaire Rangueil, Toulouse, France

Summary

This case report presents a patient admitted to the hospital for severe pulmonary edema occurring after an acute inferior myocardial infarction. The patient was admitted three times for edema over a 15-month time period. The second time, he also presented with spontaneous monomorphic VT at 180 beats/min, which was treated with external cardioversion shock. The patient had an ejection fraction of 33%, ischemic cardiomyopathy, complete left bundle branch block, and a significant risk of ventricular arrhythmia despite a negatively programmed biventricular pacing test. Therefore, we decided to implant a biventricular defibrillator.

Key Words

Monomorphic ventricular tachycardia, ejection fraction, ischemic cardiomyopathy, left bundle branch block

Clinical Case

The patient was admitted in October 2000 (when he was 47 years old) for severe pulmonary edema occurring after an acute inferior myocardial infarction. He required intubation and mechanical ventilation procedures associated with classic intensive care. His cardiovascular risk factors were untreated arterial hypertension for 10 years and active smoking. The surface ECG revealed a complete left bundle branch block (see Figure 1). Coronary angiography performed during the acute necrosis phase revealed an occlusion of the right coronary artery, which had been treated with angioplasty, as well as stenosis of the circumflex artery, which was treated with angioplasty, followed by implantation of a stent. The hemodynamics slowly improved after therapy of the coronary arteries. The isotopic ejection fraction was measured at 33% after the acute phase. The etiological assessment looking for arterial hypertension revealed previous stenosis of the right renal artery. This lesion had been treated by angioplasty in November 2000.

In December 2000, this patient was admitted for the second time for left cardiac decompensation, probably caused by a poorly controlled diet. Coronary angiography did not reveal any worsening of the hemodynamics.

In April 2001, the patient was again admitted for severe pulmonary edema. The ECG revealed a monomorphic ventricular tachycardia at 180 beats/min, which was treated with an external cardioversion shock. The coronary angiography showed restenosis on the right coronary artery at the angioplasty site treated 6 months earlier. Another angioplasty was performed, and a stent was implanted. The ventricular late potentials performed in spite of the left bundle branch block were positive. The programmed ventricular pacing test was negative despite an aggressive program of three decremental extrasystoles with three fixed cycles at the apex and the right ventricular outflow tract. The recent tachycardia was thus associated with the restenosis of the right coronary artery, and an ICD implantation was rejected as a viable option [1-7]. Treatment with bisoprolol (5 mg/day) was started. In October 2001, the patient presented with fainting spells and ventricular bigeminy on the Holter ECG. Restenosis was found on the right coro-

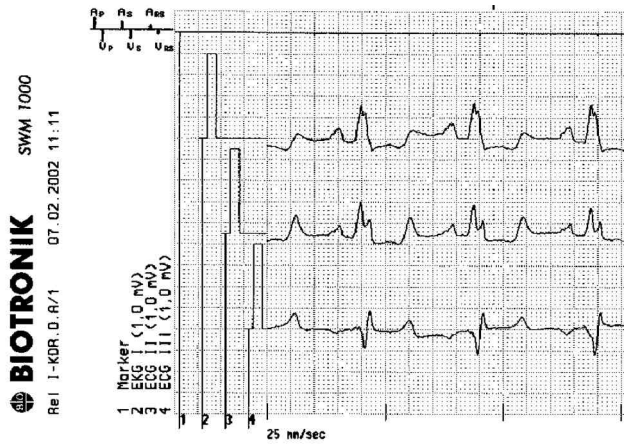

Figure 1. Surface ECG showing intrinsic rhythm and complete left bundle branch block.

nary artery, and a third treatment was applied to this site. Systematic programmed ventricular pacing was performed. Once again, it was negative.

In January 2002, the patient was admitted for acute pulmonary edema due to excessive overeating over the winter holidays. The patient was treated without any difficulty and was categorized as NYHA class II after the treatment. A cardiac echography was performed to verify asynchronous left ventricular contraction. This was confirmed with bi-dimensional echography and Doppler, resulting in a pulmonary flow/aortic flow delay of 60 ms and an aortic ejection delay of 170 ms. A routine ECG Holter was performed and showed several ventricular tachycardia events in the last 24 hours. The patient had an ejection fraction of 33%, ischemic cardiomyopathy, complete left bundle branch block, and a significant risk of ventricular arrhythmia despite a negatively programmed biventricular pacing test. Therefore, we decided to implant a biventricular defibrillator (Tupos LV, Biotronik, Germany), an ICD with an additional connector for a coronary sinus lead for biventricular pacing (see Figures 2 – 6). The distal part of the coronary sinus lead (Corox LV-H, Biotronik) has a preshaped helix for fixation in the vessel. We hoped to improve the patient's hemodynamic parameters and prevent the risk of ventricular arrhythmia [1-10].

Discussion

The decision to implant an ICD in our patient might have been made after the first spontaneous episode of ventricular tachycardia, since it was an indication for secondary prevention. However, this ventricular arrhythmia seemed to be closely related to a restenosis of the right coronary artery. The non-inducibility by programmed ventricular pacing lead us to decide against ICD implantation. However, due to the persistence of non-sustained ventricular arrhythmia, in addition to fainting, we eventually decided that this patient met the criteria for ICD implantation, since he had risk factors for ventricular arrhythmia, despite a second run of negatively programmed pacing. Additionally, the asynchronous contraction found on the echogram lead us to consider biventricular pacing for this patient, in spite of a functional symptomatology of a high NYHA class II, in addition to left ventricular decompensation episodes that seemed related to an occasionally poorly balanced diet.

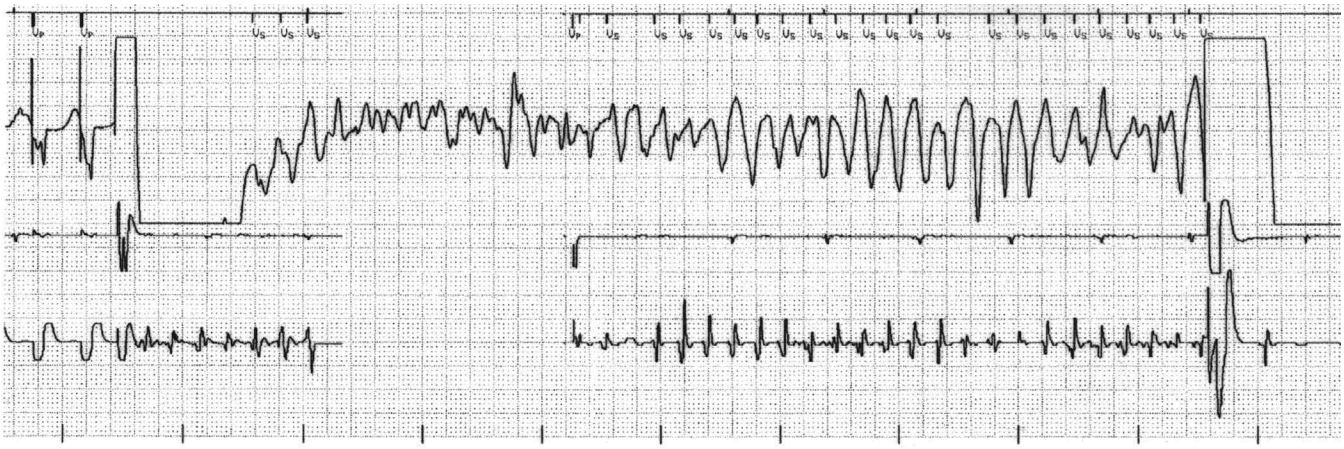

Figure 2. Defibrillation threshold: VF is reduced with a 15 J shock.

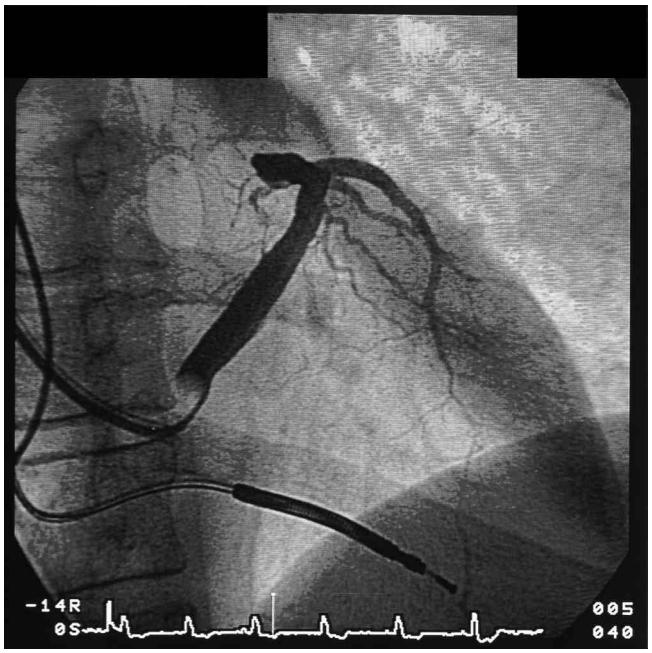

Figure 3. Coronary sinus angiography during ICD implantation.

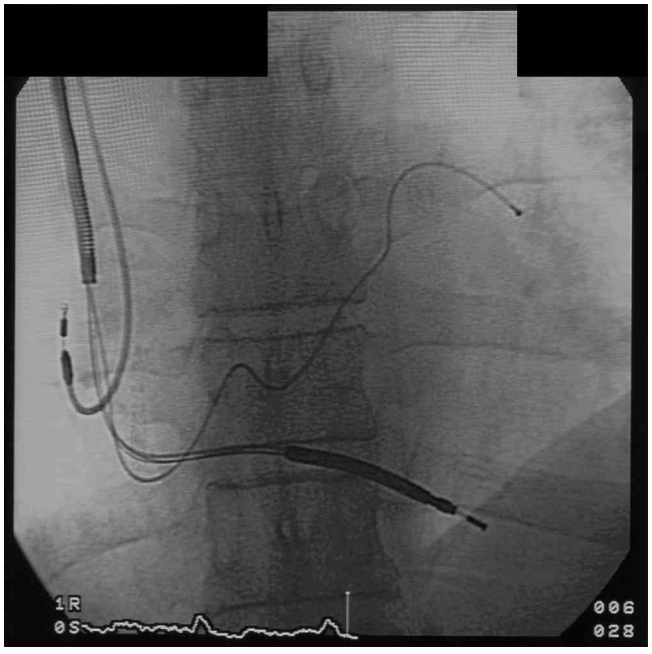

Figure 4. X-ray showing final position of all three leads, including the Corox LV-H (Biotrionik) in the coronary sinus.

Since the patient's follow-up was 2 months after the implementation of ICD therapy and biventricular pacing, it is too early to draw any conclusions. However, we have made the following observations since the implantation:

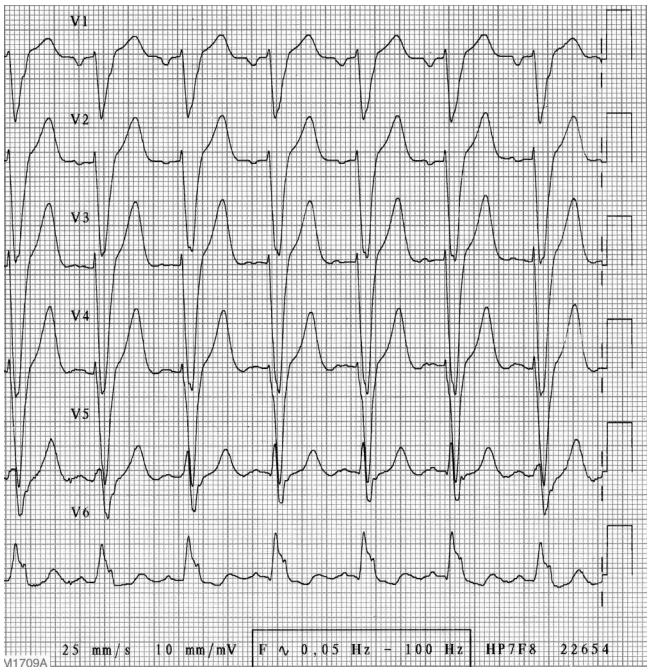

Figure 5. Six-lead ECG before biventricular pacing.

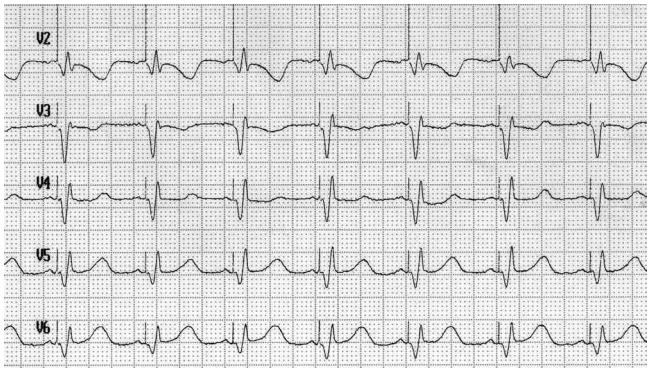

Figure 6. Six-lead ECG with biventricular pacing.

- The functional class of this patient is NYHA class II.
- There has been no cardiac decompensation, but it is probable that the patient has had a better diet during this period.
- The ICD data confirm slow sustained ventricular tachycardia at 110 beats/min, with spontaneous termination, which is sensed but not treated by the ICD since the therapy rate limit has been to a higher value.

Conclusion

This case report discusses the treatment of relatively young patients presenting with ischemic cardiomyopa-

thy, significant left ventricular alteration, and risk of ventricular arrhythmia, without any objective criterion for heart transplantation. Permanent biventricular pacing for treatment of defibrillation can be indicated for these kinds of patients when left ventricular asynchrony associated with intraventricular conduction disturbances are found. The slow ventricular tachycardia events stored in the device memory are evidence in favor of ICD implantation. Further follow-up is necessary for validation of this approach.

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Contact
Dr. Serge Boveda
Centre Hospitalier Rangueil
1 avenue du Pr Jean Poulhes
F-31403 Toulouse
France
Telephone: +33 5 61 32 26 64
Fax: +33 5 61 32 29 59