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CASE REPORT
Rare arrhythmias

Patient with multiple ICD interventions (RCD code: V-2A.O)

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Abstract

The authors report a case of a 58-year-old man with coronary artery disease and left ventricular aneurysm following inferior wall infarction, who was implanted with a single chamber cardioverter-defibrillator (ICD) for primary prevention of sudden cardiac death. The patient presented with complaints including multiple ICD shocks due to recurrent ventricular tachycardia (VT) resistant to the implemented treatment, decreased quality of life and high level of anxiety associated with multiple hospitalizations. Pharmacological treatment was unsuccessful and led to drug-induced bradycardia. Due to developed pacemaker syndrome the patient underwent ICD upgrade to a dual-chamber device followed by radiofrequency ablation. Despite a number of interventions, VT did not completely disappear. A slight decrease in the number of ICD shocks was observed. After adjustment of the pacing lower rate up to 75 bpm, ventricular arrhythmias were reduced and eventually retreated. In the six months follow-up period no VT was recorded. The authors discuss the current recommendations for VT treatment with the indications for re-ablation or aneurysmectomy. JRCD 2016; 3 (1): 20–23

Key words: rare disease, ventricular tachycardia, ventricular aneurysm, pacemaker syndrome, ablation

Case presentation

A 58-year-old male patient was admitted to the Municipal Hospital in Chrzanów due to heart palpitation with a high level of anxiety after several implantable cardioverter defibrillator (ICD) shocks. The patient had a history of coronary artery disease, chronic total occlusion of the right coronary artery, left ventricular aneurysm following inferior wall infarction. He underwent implantation of a single-chamber ICD for primary prevention of sudden cardiac death (SCD). On admission, the patient was in good general condition, with symmetric vesicular murmur on auscultation, regular heart rate of 78 bpm, normal blood pressure of 110/70 mm Hg, with no abdominal symptoms or peripheral edema. No abnormalities were detected in the laboratory tests (including cardiac markers, electrolytes or blood cells morphology). Electrocardiogram (ECG) showed sinus bradycardia (55 bpm) with first-degree atrioventricular block (AV) block (PQ 360 ms), with pathological Q waves in leads III and aVF (Figure 1).

Transthoracic echocardiography (TTE) displayed enlarged atria with areas of 24 cm^2, dilated left ventricle with end-diastolic diameter of 63 mm, low ejection fraction of 35% due to global hypokinesia and inferior wall aneurysm and no important valvular abnormalities (Figure 2).

The stored data in the ICD revealed a number of high energy interventions due to VT. In most cases antitachycardia pacing (ATP) was used. However, no results were observed. In the case of unsuccessful ATP, arrhythmia was terminated by cardioversion (Figure 3).

The patient had been previously hospitalized several times (about 4–5 times a year) due to ICD interventions caused by a number of VT episodes (Figure 4). The patient had often experienced bouts of arrhythmia, which poorly responded to medical therapy and ATP. Tachycardia termination had occurred most frequently after electrical cardioversion provided by the ICD after use of all ATP sequences. At times, the patient had received up to 6 shocks per day. Due to high incidence of ventricular arrhythmia further investigation ensued. Coronary angiography revealed no significant changes in respect to the previous examination performed in 2011.

The patient underwent radiofrequency (RF) ablation to eliminate arrhythmic substrate. During electrophysiological study (burst stimulation from the right ventricular outflow tract) two kinds of VT were induced (from the right and the left ventricle). In the first stage the RF application was performed near the aneurysm border,

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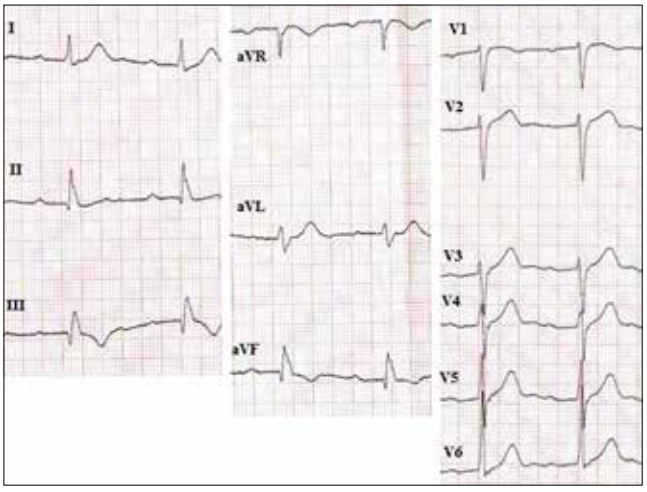

Figure 1. Electrocardiogram. Sinus bradycardia with first-degree atrioventricular block, old inferior wall infarction (pathological Q waves in III, aVF)

and later in the right ventricle. Despite such treatment the patient had multiple hospital readmissions due to recurrent ventricular tachyarrhythmia neither responding to pharmacotherapy nor ATP, which required delivery of high-energy shocks. Furthermore, a high level of shock-related anxiety impaired patient's psychological well-being and the quality of life. Pharmacological treatment resulted in bradycardia. Due to the presence of iatrogenic, drug-induced bradycardia and the associated ventricular pacemaker syndrome, the ICD was exchanged for dual-chamber ICD system.

The patient experienced clinical improvement. However, the effect was not as spectacular as expected. The ICD interventions continued to occur, although with lesser frequency. The patient lived in great stress due to the fact that each palpitation triggered fear of another ICD discharge. During a recent hospitalization lower rate (LR) of the ICD was set at 75 bpm. During subsequent 6 months the patient had a routine ICD checkup and reported no abnormal ICD interventions. Interestingly, the patient was in good general condition, with very good exercise tolerance and a positive attitude to life. The treatment included the following: acetylsalicylic acid (ASA) 75 mg qd, metoprolol 50 mg bid, amiodarone 200 mg qd, ramipril 5 mg qd, torasemide 5 mg qd, atorvastatin 20 mg qd, pantoprazole 20 mg qd.

Discussion

The incidence of left ventricular aneurysm is estimated at 3.5–5% in patients after myocardial infarction. In 85% of cases aneurysms occur in apical or anteroseptal localization, only 5–10% of aneurysms are localized in the base of the heart. The most common problems related to this condition include angina pectoris, congestive heart failure, thromboembolism and VT. About 50% of patients report chest pain due to changes in wall tension and increased oxygen demand secondary to distorted left ventricular shape. One third of patients present with heart failure symptoms related to loss of contractile tissue and retention of blood in aneurysm cavity. About 50–70% cases present with thrombus in the aneurysm pocket with a 30% risk of death due to systemic embolism. Ventricular tachycardia is the most common type of arrhythmia which develops in the re-entry mechanism [1].

Sudden cardiac death (SCD) is the main cause of mortality in patients with congestive heart failure. A number of studies have shown higher effectiveness of ICD shocks in prevention of SCD compared to pharmacological treatment [2]. High energy intervention is related to special psychological problems. Approximately 18–38% patients with ICD present with mood disorders, a high level of anxiety, fear of shocks and death [3].

In our case the major problem of the patient was related to recurrent ventricular arrhythmia that induced high energy therapy applied by the ICD. The functioning of the ICD was normal. All

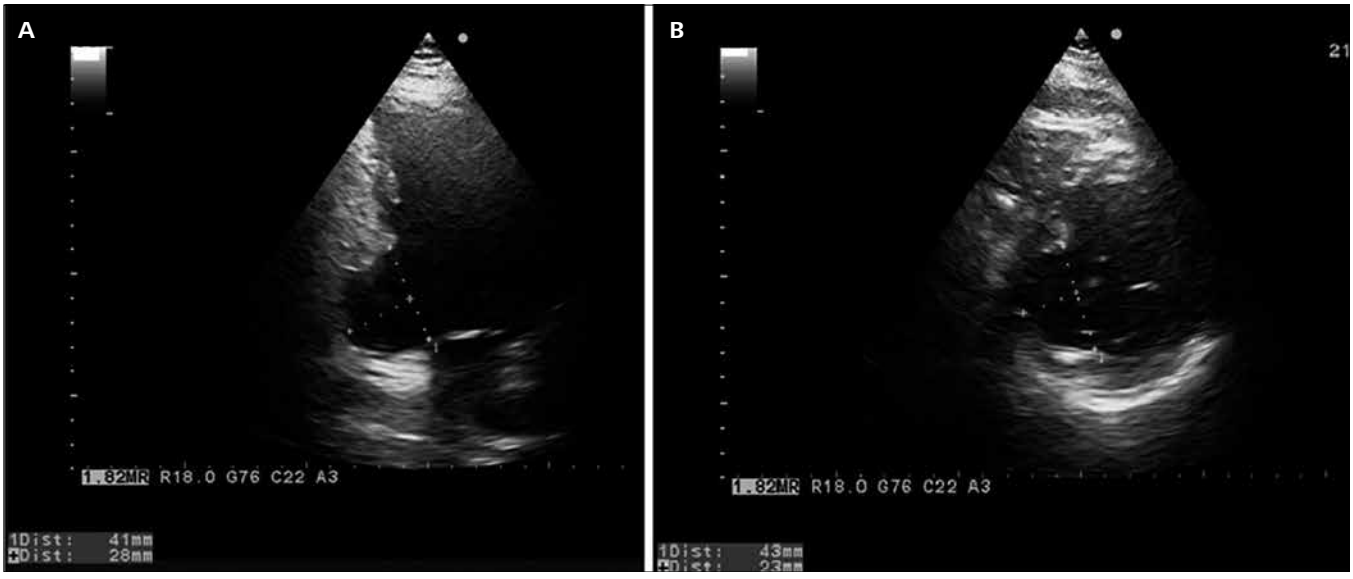

Figure 2. Transthoracic echocardiography. **A.** Apical 2-chamber view. **B.** Parasternal short axis view. Inferior wall aneurysm. Neck diameter – 41 mm; longitudinal axis of aneurysm cavity – 28 mm

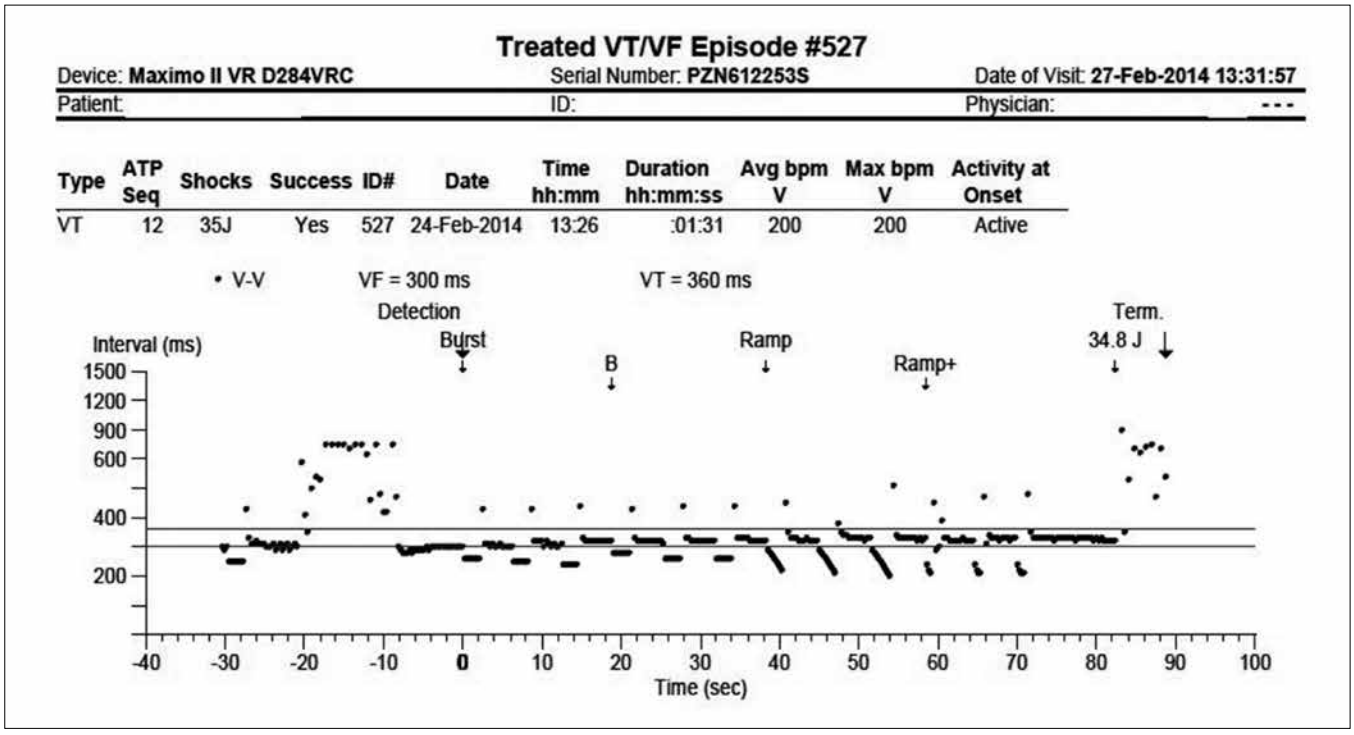

Figure 3. Episode #527 stored in the memory of ICD. After 12 ineffective sequences of antitachycardia pacing (ATP) ventricular arrhythmia was terminated with a 34.8-J shock

interventions were appropriate and resulted in termination of arrhythmias. A characteristic feature was connected with the lack of positive results of ATP and cardioversion was the only successful intervention. A number of scientific investigations showed the effectiveness of ATP in 80–90% cases, even in the cases of fast ventricular tachycardia (FVT) and the reduction in the number of high energy shocks. Antitachycardia pacing is considered to be highly effective treatment of FVT. It results in the improvement in the quality of patient's life without an increased risk of syncope or acceleration of arrhythmia [4]. It should be taken into account, that

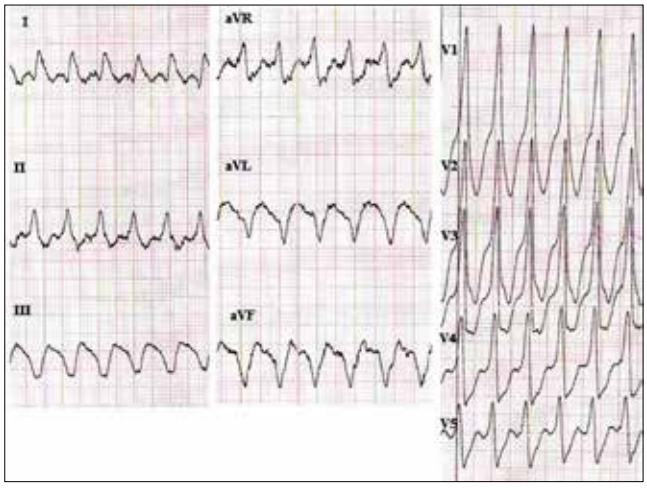

Figure 4. Electrocardiogram during arrhythmia. Ventricular tachycardia (170 bpm) – broad QRS complexes with a different morphology than during sinus rhythm

despite optimal pharmacological treatment, implantation of ICD does not change the incidence of ventricular arrhythmia, however it decreases the risk of death [5]. The patient was referred for ablation due to the lack of successful pharmacological or ATP treatment. Standards show, that this method should reduce mortality and the number of ICD shocks [6-8]. A number of reports have emphasized the fact, that ablation is a therapeutic option in the case of recurrent VT [9,10]. The effect in our patient was not satisfactory. He had been hospitalized a number of times with frequent arrhythmic episodes. Re-ablation by means of more advanced technology such as the CARTO electroanatomical mapping system and an irrigated-tip catheter was considered [11]. Aneurysmectomy was also taken into account. The range of operative mortality in this procedure is 2–18% [1]. The median survival time is estimated at 128 months. The ejection fraction and the age of the patients (but not the type of aneurysm) are predictors of improved long-term survival and a risk of mortality [12]. Most data have demonstrated high effectiveness of surgical aneurysm repair, especially in connection with cryoablation [13,14]. Due to the patient's preference for conservative treatment, qualification for the surgery was delayed. After consultation with experts from the reference center, it was decided to modify pharmacotherapy. High doses of metoprolol with amiodarone were implemented. Pharmacotherapy with high doses of anti-arrhythmic drugs may result in a number of side and pro-arrhythmic effects. According to various reports, poor patient compliance is reported in as many as 50% of cases as a result of poor tolerance to high doses of drugs [15,16]. This treatment resulted in improvement, however it was not satisfactory. Drug-induced bradycardia triggered stimulation of the right ventricle, which led to pacemaker syndrome. According to the literature, the incidence of

pacemaker syndrome is estimated at 5–15% [17]. The patient underwent upgrading of the ICD to the dual-chamber system with good effect. Lower rate of stimulation was established at 75 beats per minute. In a 6-month follow-up period no episodes of ventricular arrhythmia were reported. It is difficult to ascertain what exactly contributed to the disappearance of arrhythmia. High settings of the LR parameter may be significant, however no data related to this issue are found in the available sources. There are some cases in literature concerning effective treatment of ventricular arrhythmia by overdrive pacing with the rate of stimulation faster than arrhythmia [18,19]. In our case the stimulation rate was not as fast. Consequently this issue needs further investigation.

Conclusions

Patients with left ventricular post-infarction aneurysm and recurrent ventricular arrhythmia require special approach due to the complexity of the problem. High doses of antiarrhythmic drugs and/or ablation procedure may be required. It is important to consider implantation of dual-chamber ICD in order to avoid pacemaker syndrome. No reliable information exists on the role of the LR of the ICD in protection against frequent episodes of VT.

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