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SHORT COMMUNICATION

Percutaneous stellate ganglion block as an adjunctive therapy in the treatment of incessant ventricular tachycardia

Andrzej Przybylski[1, 2], Janusz Romanek[1], Marcin Chlebuś[1], Bernadetta Deręgowska[1], Jerzy Kuźniar[1]

1Department of Cardiology, Regional Teaching Hospital No. 2, Rzeszow, Poland
[2]Faculty of Medicine, University of Rzeszow, Rzeszow, Poland

INTRODUCTION

Treatment of heart failure (HF) patients presenting with incessant ventricular tachycardia (IVT) remains challenging. IVT is associated with high morbidity and mortality [1]. In the vast majority of patients, the identification of factors triggering arrhythmia and their specific treatment (i.e. revascularisation) is not possible [1, 2]. Thus, the management strategies focus on the HF treatment, IVT termination, and prevention of recurrences [1, 2]. Treatment options include, but are not limited to, pharmacotherapy, overdrive burst pacing, device programming, sedation, and mechanical circulatory support, or usually a combination of these methods. Catheter ablation seems to be the most effective method; however, its use is limited because of haemodynamic instability of the patients or coexisting morbidities [3, 4]. Moreover, the number of electrophysiological labs that are able to perform IVT ablation in emergency setting is limited.

There are several reports on the efficacy of stellate ganglion block (SGB) as an adjunctive therapy in the management of electrical storm [5–7]. We present the usefulness of percutaneous SGB in two patients with IVT and HF decompensation.

Case 1

A 78-year-old man with post-myocardial infarction HF with ejection fraction of 15% to 20% and an implanted dual-chamber implantable cardioverter-defibrillator (ICD) was admitted to our institution due to ventricular tachycardia (VT) with cycle length of 464 ms, which was below the ICD lower detection rate (Fig. 1). The VT was terminated by manually driven burst pacing from the ICD but recurred after several minutes. Despite the medical treatment with β-blockers and overdrive pacing up to 100 bpm, the IVT continued. Lidocaine infusion was successful, but it had to be stopped due to neurological side effects. Amiodarone infusion was unsuccessful. Due to the progression of HF with severe hypotension and signs of both cerebral and peripheral hypoperfusion, the patient was not considered for immediate catheter ablation, and a decision to perform left SGB was made. IVT recurrences during the procedure were terminated by burst pacing. The procedure was performed under ultrasound guidance to avoid vessel puncture. After negative aspiration, 10 mL of lidocaine was injected. Following the injection, signs of Horner syndrome occurred. The patient remained arrhythmia-free for the following 24 h with improvement of clinical status. IVT recurred the next day. The burst pacing that previously terminated IVT was unsuccessful and SGB was repeated during IVT. Immediately after the injection, IVT was terminated by burst pacing. Again, the patient became arrhythmia-free for the next few hours and he underwent catheter ablation. Potential mapping revealed diffusion low potentials areas (< 1.5 mV) or scar (< 0.5 mV) located on the apical and medial segments of the left ventricle. The activation mapping was not performed because of VT-induced haemodynamic instability. Ablation was performed in places with fragmented and diastolic potentials. Subsequently, the clinical IVT was not inducible during programmed ventricular stimulation with one and two extra stimuli. During the following four days only one episode of VT with different morphology and frequency occurred. It was terminated by the ICD-derived antitachycardia pacing. The patient was discharged home four days after ablation.

Case 2

A 46-year-old man with post-myocardial infarction HF, a history of bypass surgery at the age of 29 years, and implanted cardiac resynchronisation therapy defibrillator (CRT-D), was referred to our clinic from another facility with signs

Address for correspondence:
Andrzej Przybylski, MD, PhD, Department of Cardiology, KSW No. 2, ul. Lwowska 60, 35–302 Rzeszów, Poland, tel: +48 17 866 4880, fax: +48 17 866 4881, e-mail: a_przybylski-65@wp.pl
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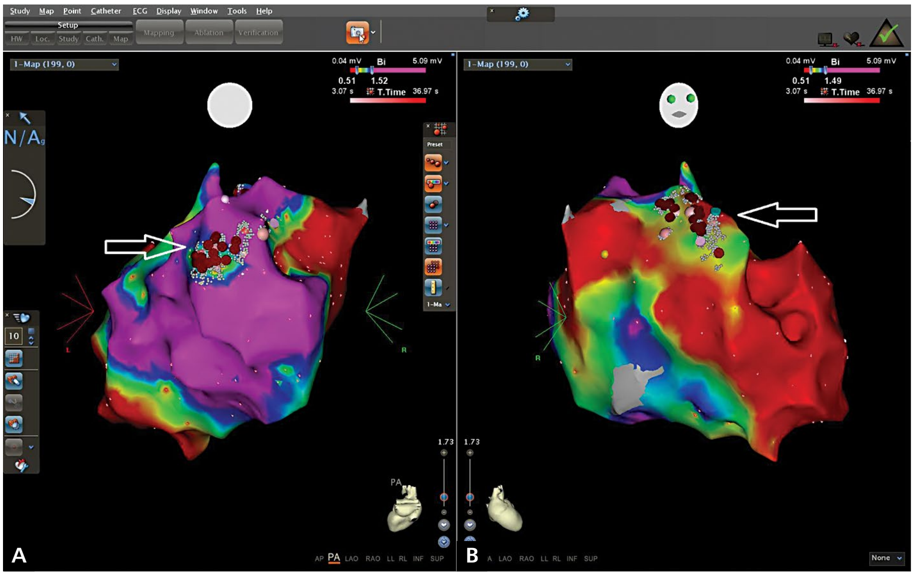

Figure 1. **A. B.** Potential mapping revealed diffusion low potential areas (< 1.5 mV) or scar (< 0.5 mV) located on the apical and medial segments of the left ventricle. See text for discussion

of cardiogenic shock. On admission he presented with severe hypotonia and clinical signs of pulmonary oedema. Electrocardiogram revealed VT with a rate of 110 bpm. The diagnosis was confirmed by intracardiac electrograms from the previously implanted CRT-D. Neither burst pacing nor intravenous infusion of lidocaine was successful. The arrhythmia was suppressed with the overdrive pacing (115–120 bpm). Atrial pacing at the rate of 100 bpm was more effective in IVT suppression than biventricular stimulation. Nevertheless, the arrhythmia recurred each time the pacing rate was slowed down. Attempts to prevent IVT recurrences with intravenous amiodarone and oral metoprolol (up to 250 mg) failed. Due to the patient's poor status, extremely dilated left ventricle (left ventricular end-diastolic dimension, 98 mm), and the presence of thrombus in the left ventricle, he was not found to be eligible for catheter ablation. Utilising the same technique as described above, right SGB was performed. The block suppressed IVT for about 5 h. Due to the IVT recurrence, left SGB was executed. The second procedure suppressed IVT completely. During the next two weeks only a few episodes of non-sustained VT were recorded. The symptoms of HF improved gradually. Coronarography revealed patent grafts. The patient was placed on a heart transplant waiting list and discharged home on the 15th day after admission.

DISCUSSION

We report two patients with severely depressed left ventricular function presenting with IVT refractory to both conventional pharmacotherapy and overdrive pacing, treated with SGB. Although there are some reports on the utilisation and efficacy of SGB in patients with recurrent VT/ventricular fibrillation, we did not find any description of percutaneous SGB in the literature in patients with end-stage HF and IVT.

There is increasing interest in the modulation of the autonomic nerve system (ANS) in the treatment of ventricular arrhythmias [1, 7–11]. The simplest and the most commonly used method of ANS modulation is β-blocker administration [1, 8]. Despite their clinical efficacy, β-blocking agents have several limitations related to difficulties in reaching the target dose. Moreover, β-blockers affect only the noradrenaline-mediated neurotransmission, while their effect on other neurotransmitters remains unchanged.

Thus, the techniques that modify autonomic system functions attract a great deal of interest. There are many reports on the effectiveness of surgical sympathectomy in patients with long QT syndrome. One randomised study reported its beneficial effect in patients after myocardial infarction [12]. Nevertheless, its usefulness as emergency therapy in patients with HF and electrical storm is limited due to the patient's haemodynamic status and low availability of skilled surgical teams [11]. On the other hand, percutaneous SGB is a routinely performed procedure in chronic pain management, even in outpatient settings. Furthermore, implementation of SGB into the arsenal of antiarrhythmic treatment methods seems to be reasonable. However, its use is limited by the lack of randomised studies or multicentre registries [13]. Moreover, there is no established technique of SGB. Usually left SGB is preferred, although some papers report on bilateral or right-sided SGB. Since there is an asymmetry in the innervation of the heart, that means the left and right sympathetic nerves affect different areas of the heart and impose different functional effect as well, the optimal side of

SGB may depend on underlying disease, type of arrhythmia and its origin [11, 13]. In the presented cases both left- and right-sided SGBs were effective, but the beneficial effect of right-sided SGB lasted for less time, although this may have been an accidental finding.

In the recently published meta-analysis on SGB, bupivacaine and ropivacaine were the most frequently used local anaesthetics, but lidocaine was used as well [10].

In conclusion, percutaneous SGB should be considered as an emergency therapy for IVT in HF patients in order to suppress arrhythmia and improve haemodynamic status before catheter ablation or heart transplantation. Nowadays, however, SGB should be also considered if other therapies fail or are unavailable. There is an urgent need for further studies that will determine the value of SGB in emergency settings.

Conflict of interest: *none declared*

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