EP CASE REPORT

Electrical injury-triggered ventricular arrhythmia in a patient with a pacemaker: highlighting the importance of cardiac monitoring

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A 46-year-old man with a history of Hodgkin lymphoma treated with chemotherapy and radiotherapy in 2003 had dual-chamber pacemaker implantation in December 2018, for recurrent episodes of syncope with documented paroxysmal complete atrioventricular block. Left ventricular ejection fraction was normal, and no other anomaly was observed on echocardiography.

One month after pacemaker implantation, the patient presented with an electrical shock while using his hairdryer followed by a brief loss of consciousness. He immediately stopped using his hairdryer but did not seek urgent medical attention and had a pacemaker interrogation 3 weeks later. Multiple episodes ($n = 16$) of non-sustained polymorphic ventricular tachycardia were recorded by the pacemaker in the hours following electrical injury (*Figure 1A*), the last one occurring 4 h after the event. The duration of the longest episode was 7 s, with the shortest cycle length around 200 ms (300 b.p.m.) that terminated spontaneously (*Figure 1B*). After discussion, considering that these episodes were most likely triggered by the electrical injury, a course of simple surveillance with telemonitoring was decided upon. After 1 year of follow-up, the patient had no recurrence of arrhythmia.

A

Type	ATP Seq	Success	ID#	Date	Time hh:mm	Duration hh:mm:ss	Avg bpm A/V
VT-NS			1021	23-Jan-2019	22:38	:01	63/200
VT-NS			1020	23-Jan-2019	22:37	<:01	62/231
VT-NS			1019	23-Jan-2019	22:37	<:01	126/245
VT-NS			1017	23-Jan-2019	21:37	:03	126/226
VT-NS			1013	23-Jan-2019	21:10	:01	124/222
VT-NS			1011	23-Jan-2019	20:46	:01	120/218
VT-NS			1009	23-Jan-2019	20:30	:01	118/214
VT-NS			1008	23-Jan-2019	20:26	:01	126/250
VT-NS			1007	23-Jan-2019	20:26	:01	128/207
VT-NS			1006	23-Jan-2019	20:26	<:01	125/245
VT-NS			1000	23-Jan-2019	19:41	:02	120/224
VT-NS			999	23-Jan-2019	19:32	<:01	113/240
VT-Mon			990	23-Jan-2019	18:24	:07	87/133
VT-NS			989	23-Jan-2019	18:24	<:01	---/279
VT-NS			988	23-Jan-2019	18:24	:02	81/286
VT-NS			987	23-Jan-2019	18:23	:01	133/245

B

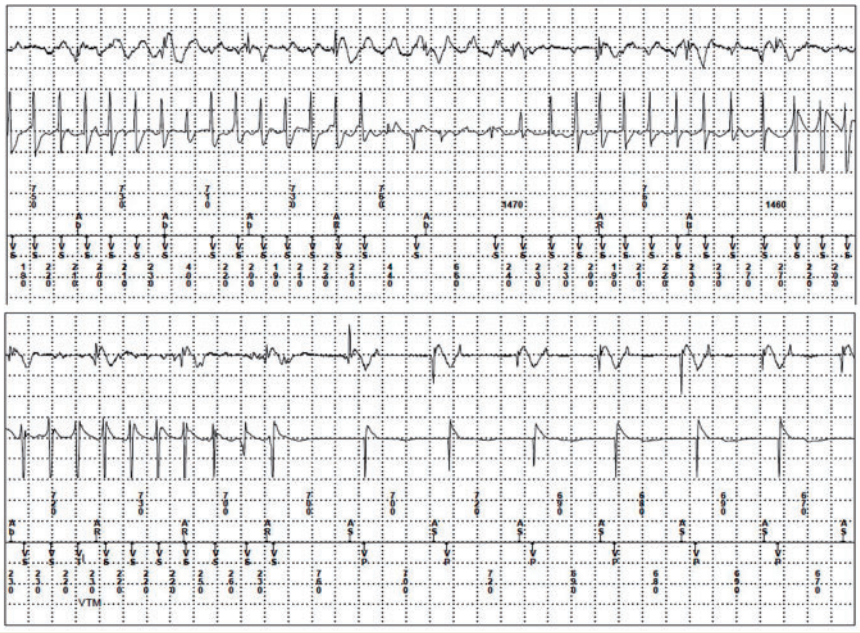

Figure 1 Illustration from 'Elektroschutz in 132 Bildern', with the kind permission of Dr Jellinek. The syncope is likely related to the longest episode (7 s) with shortest cycle length around 200 ms (300 b.p.m.). The mean ventricular rate of 133 b.p.m. presented in the pacemaker interrogation summary corresponding to this episode is due to transient ventricular undersensing.

In apparently healthy patients after electrical injuries, the main feared risk, albeit rare, is sudden death. This case perfectly illustrates how electrical injuries may trigger potentially life-threatening ventricular arrhythmias with a clear

temporal link. Although the level of evidence is low, 24 h cardiac monitoring is recommended in patients with (i) documented arrhythmias or other electrocardiographic anomalies, (ii) high-voltage injury $\geq$ 1000 V, (iii) significant troponin release, and/or (iv) loss of consciousness. Other patients can be discharged home from the emergency room in the absence of extracardiac injuries requiring hospitalization.[1] The frequency of 50–60 Hz, used in most household electrical sources, increases the likelihood of cardiac exposure during the vulnerable phase of the cardiac cycle.[2] Post-injury stress/sympathetic activation may also play a role in triggering an arrhythmia. Although it is commonly thought that the vast majority of life-threatening events occur immediately after an electric shock, delayed ventricular arrhythmias have been reported (up to 12 h after the incident, with low as well as high-voltage shocks).[3]

Conflict of interest: none declared.

References

1. Waldmann V, Narayanan K, Combes N, Jost D, Jouven X, Marijon E. Electrical cardiac injuries: current concepts and management. *Eur Heart J* 2018;**39**:1459–65.
2. Waldmann V, Narayanan K, Combes N, Marijon E. Electrical injury. *BMJ*. 2017.
3. Jensen PJ, Thomsen PE, Bagger JP, Nørgaard A, Baandrup U. Electrical injury causing ventricular arrhythmias. *Br Heart J* 1987;**57**:279–83.