T val "oversensing" za vrijeme monomorfne ventrikulske tahikardije kao uzrok neadekvatnog ICD šoka

T-wave oversensing during monomorphic ventricular tachycardia as a cause of inappropriate ICD shock

Vedran Velagić*,
Richard Matasić,
Mislav Puljević,
Borka Pezo-Nikolić,
Martina Lovrić Benčić,
Davor Puljević,
Davor Miličić

Medicinski fakultet Sveučilišta
u Zagrebu, Klinički bolnički
centar Zagreb, Zagreb,
Hrvatska

University of Zagreb School of
Medicine, University Hospital
Centre Zagreb, Zagreb, Croatia

KLJUČNE RIJEČI: ugrađeni kardioverter defibrilator, ventrikulska tahikardija, neadekvatni šok.

KEYWORDS: implantable cardioverter defibrillator, ventricular tachycardia, inadequate shock.

CITATION: Cardiol Croat. 2016;11(10-11):438. | **DOI:** <http://dx.doi.org/10.15836/ccar2016.438>

***ADDRESS FOR CORRESPONDENCE:** Vedran Velagić, Klinički bolnički centar Zagreb, Kišpatičeva 12,
HR-10000 Zagreb, Croatia. / Phone: +385-91-792-9284 / E-mail: vvelagic@gmail.com

ORCID: Vedran Velagić, <http://orcid.org/0000-0001-5425-5840> • Richard Matasić, <http://orcid.org/0000-0003-1289-1704>
Mislav Puljević, <http://orcid.org/0000-0003-1477-2581> • Borka Pezo-Nikolić, <http://orcid.org/0000-0002-0504-5238>
Martina Lovrić Benčić, <http://orcid.org/0000-0001-8446-6120> • Davor Puljević, <http://orcid.org/0000-0003-3603-2242>
Davor Miličić, <http://orcid.org/0000-0001-9101-1570>

Uvod: T val „oversensing“ razmjerno je učestala pojava koja može dovesti do neadekvatnih šokova u nosioca kardioverter defibrilatora (ICD). Najčešći uzroci ove pojave su niske amplitude R vala, no hiperglikemija, hiperkalemija, Brugada sindrom, itd. mogu također biti odgovorni¹⁻³. Ovdje prikazujemo slučaj gdje se T val „oversensing“ javio isključivo za vrijeme monomorfne ventrikulske tahikardije.

Prikaz slučaja: Pedeset-trogodišnji bolesnik javio se u hitnu službu zbog uključivanja ugrađenog ICD uređaja (elektrokardioverzija). U podlozi je bila ishemijska kardiomiopatija nakon preboljelog inferiornog infarkta miokarda. Ehokardiografski je zaostala aneurizma dijelova inferoposteriorne stijenke te umjereno reducirana sistolička funkcija lijeve klijetke. Kasnije je Holter monitoringom verificirana postojana, monomorfna, hemodinamski stabilna ventrikulska tahikardija (VT) frekvencije 180/min zbog čega je bolesniku ugrađen jednokomorski ICD. Tijekom dužeg praćenja u više navrata u memoriji ICD-a bilježe se identične VT koje su uvijek uspješno prekidane jednim „overdriveom“. Svi parametri funkcije ICD-a bili su granicama normale. Uz optimalnu medikamentoznu terapiju za srčano zatajivanje bolesnik je bio u dobrom funkcijskom statusu (NYHA I-II). Od antiaritmike profilakse primao je amiodaron i bisoprolol. Uvidom u memoriju uređaja verificirana je monomorfna VT, ciklusa 330-350 ms koja je adekvatno prepoznata od strane uređaja. Ubrzo dolazi do T val „oversensinga“ tijekom VT-a, što producira vrlo kratke RR intervale od 120-180 ms. Navedeni intervali pripadaju zoni ventrikulske fibrilacije koji su bili prekratki za isporučivanje prije uspješne „overdrive“ terapije. Dolazi do isporučivanja elektrokardioverzije u prisvjesnog bolesnika, koja uspješno prekida aritmiju. Da bi se izbjegli daljnji neadekvatni šokovi promijenjen je „sensing“ vektor ICD uređaja. U daljnjem praćenju više nije bilo neadekvatnih šokova.

Zaključak: Monomorfna ventrikulska tahikardija može biti interpretirana kao ventrikulska fibrilacija od strane ICD-a zbog T val „oversensinga“ što može biti uzrok neadekvatnog šoka. Navedeno se može izbjeći programiranjem drugačijeg „sensing“ vektora uređaja. Prema našim saznanjima do sada nije opisan ovakav uzrok neadekvatne terapije ICD-a.

Introduction: T wave „oversensing“ is a relatively common phenomenon that can lead to inappropriate shocks in cardioverter-defibrillator (ICD) carriers. The most common cause of this phenomenon is the low R wave sensing amplitude, but hyperglycemia, hyperkalemia, Brugada syndrome, etc. could also be the culprit¹⁻³. Here, we present a case where the T wave oversensing occurred exclusively during monomorphic ventricular tachycardia.

Case report: 53-years-old patient was admitted into the emergency room because of the ICD shock. The underlying condition was ischemic cardiomyopathy due to inferior myocardial infarction. Echocardiography revealed aneurysmal parts of inferior and posterior wall and moderately reduced systolic function of the left ventricle. Later on, during the disease course, the Holter monitoring detected sustained, monomorphic, hemodynamically stable ventricular tachycardia (VT) with the heart rate of 180/min. Therefore, single chamber ICD was implanted. The ICD follow-up revealed the same VT-s that were repeatedly successfully terminated by a single overdrive. All parameters of the ICD function were within normal limits. Patient received optimal medical therapy for heart failure and was in good functional status (NYHA class I-II). Antiarrhythmic therapy consisted of amiodarone and bisoprolol. Interrogation of the device revealed monomorphic VT, cycle length of 330-350 ms, which was adequately diagnosed in VT zone 1. Soon, T wave oversensing occurred, which produced a very short RR intervals of 120-180 ms. These intervals belong to the ventricular fibrillation zone that was too short for the anti-tachycardia pacing delivery which was previously always effective. In awake patient, DC shock delivery occurred, which successfully terminated the arrhythmia. In order to avoid further inappropriate shocks, sensing vector was changed in the ICD programming. In further follow-up there were no more inappropriate shocks.

Conclusion: Monomorphic ventricular tachycardia can be interpreted as ventricular fibrillation by the ICD due to T wave oversensing which may be the cause of inadequate shock. This can be avoided by programming different sensing vector of the device. To our knowledge, this cause of inadequate ICD therapy has not been previously described.

LITERATURE

1. Francis J. T Wave Oversensing. Indian Pacing Electrophysiol J. 2010;10(6):236-8. **PubMed:** <https://www.ncbi.nlm.nih.gov/pubmed/20552058>
2. Krishen A, Shepard RK, Leffler JA, Wood MA, Ellenbogen KA. Implantable cardioverter defibrillator T wave oversensing caused by hyperglycemia. Pacing Clin Electrophysiol. 2001;24(11):1701-3. **DOI:** <http://dx.doi.org/10.1046/j.1460-9592.2001.01701.x>
3. Srivathsan K, Scott LR, Altemose GT. T-wave oversensing and inappropriate shocks: a case report. Europace. 2008;10(5):552-5. **DOI:** <http://dx.doi.org/10.1093/europace/eun083>

RECEIVED:
September 25, 2016

ACCEPTED:
October 10, 2016