Ahorrando choques con terapias de estimulación durante la carga, una terapia para taquicardias ventriculares rápidas

Saving shocks with antitachycardia pacing during charging: Treatment for fast ventricular tachycardias

Evitando choques com terapias de estimulação durante a carga, uma terapia para taquicardias ventriculares rápidas

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Resumen: Evitando choques con terapias de estimulación antitaquicardia durante la carga. Un nuevo tratamiento para taquicardias ventriculares rápidas. Se ha demostrado que las terapias de estimulación antitaquicardia en las taquicardias ventriculares rapidas pueden terminar 3 de 4 de estos episodios y comparado con los choques, terapia es segura, efectiva y produce una mejora significativa de la calidad e vida, se ha demostrado ademas que ellas tiene una baja incidencia en la aceleración de las taquicardias y en la presencia de sincopes. Este relato describe un caso en el que el uso de las terapias de ATP durante la carga de los capacitores evitó al paciente recibir choques sin ninguan demora en la entrega del mismo si hubiera sido necesario. este paciente presentaba frecuentemente taquicardias ventriculares rápidas a 240 ms de cb , por ello la posibilidad e tratarlas con terapias de ATP efectivas y no dolorosas tuvo un gran impacto psicologico en su vida diaria.

Descriptores: Taquicardia ventricular monomórfica, Terapia de estimulación antitaquicardia, Desfibriladores automáticos implantables

Abstract: *It has been demonstrated that antitachycardia pacing (ATP) for fast ventricular tachycardias may terminate 3 out of 4 of episodes and compared with shocks is safe, equally effective and significantly improves the quality of life. A low incidence of acceleration and syncope was also found. This report describes a case in which the use of antitachycardia pacing therapy while charging capacitors prevented a patient from receiving shocks without any delay in delivering a shock if needed. This patient usually has fast ventricular tachyarrhythmias at 240 ms. Hence the possibility of painless treatment has a great psychological impact on the patient.*

Keywords: *Monomorphic ventricular tachycardia, Antitachycardia pacing therapy, Implantable cardioverter defibrillators*

Resumo: *Evitando choques com terapias de estimulação anti-taquicardia durante a carga. Um novo tratamento para taquicardias ventriculares rápidas. Foi demonstrado que as terapias de estimulação anti-taquicardia nas taquicardias ventriculares rápidas podem encerrar três de quatro desses episódios e,*

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comparada aos choques, a terapia é segura, eficaz e produz uma melhora significativa da qualidade de vida. Além disso, foi demonstrado que elas têm uma baixa incidência na aceleração das taquicardias e na presença de síncopes. Este relato descreve um caso em que o uso das terapias de ATP durante a carga dos capacitores evitou que o paciente recebesse choques, sem nenhuma demora na realização dos mesmos se tivesse sido necessário. Esse paciente apresentava frequentemente taquicardias ventriculares rápidas a 240 ms de CB, por isso a possibilidade de tratá-las com terapias de ATP efetivas e não doloridas teve um grande impacto psicológico na sua vida diária.

Descritores: *Taquicardia ventricular monomórfica, Terapia de estimulação antitaquicardia, Desfibriladores automáticos implantáveis*

Introduction

Implantable cardioverter-defibrillators (ICDs) can be programmed to treat ventricular tachyarrhythmias with shocks or with antitachycardia pacing (ATP). The correlation between poor quality of life and the painful ICD shocks and the fact that more than 90% of the ventricular tachycardias can be terminated with painless therapies[1] have been decisive developing new algorithms for ICD devices.

A new and innovate feature has been developed in ICD technologies that permits an ATP sequence to be delivered during capacitor charging.[2] This can prevent the delivery of high-voltage shocks for rhythms that can be terminated by ATP. If ATP during charging is set, the device delivers a single sequence of ATP therapy at the same time that the capacitors are being charged. Thus, there is no delay in delivering a shock in cases of unsuccessful ATP therapy. If ATP before charging is set, the device delivers one sequence of ATP as soon as ventricular fibrillation (VF) is detected. If VF is detected again, the device begins charging and delivers a second ATP sequence.

In the current case, we describe an episode of rapid monomorphic ventricular tachycardia that was successfully treated with ATP during charging, in spite of the fact that the previous ATP sequence delivered before charging was unsuccessful, thus painful shocks and anxiety were avoided.

Case Report

The patient is a 20-year-old male with Becker´s muscular dystrophy. Three years ago he developed a badly tolerated monomorphic ventricular tachyarrhythmia (similar to ventricular flutter). Echocardiography showed left ventricular dysfunction (ejection fraction of 30%). The 12-lead electrocardiogram (EGC) (Figure 1) recorded during the episode showed tachyarrhythmia with a cycle length of 290 ms and a QRS complex of 200 ms. An electrophysiologic Study (EPS) was performed. A wide complex VT was induced with a cycle length of 250 ms and ventricular flutter with negative morphology in the inferior leads (Figure 2). The ECG during induced VT showed a complete right bundle branch block (RBBB) morphology present in V1 with the same morphology as the clinic tachyarrhythmia. This was poorly tolerated and was not sustained twice. After the EPS an ICD was indicated and implanted in addition to medical treatment (Carvedilol - 50 mg per day, and Enalapril - 10 mg per day). In May 2005, the device was substituted because of the elective replacement indicator. The patient had had a great number of shocks that was leading to increased anxiety. The replacement ICD model was an EnTrust (Medtronic, Inc, Minneapolis, MN). This defibrillator has the new feature, the possibility of ATP during charging in combination with ATP before charging.

In the current case, a rapid monomorphic ventricular tachycardia was detected with a cycle length of 240 ms. The tachycardia was regular with a similar cycle length as the one clinically induced in the EPS. As soon as the fast ventricular tachycardia (FVT) was detected (FVT via VF) a sequence of ATP (8-pulse burst pacing train at 88% of the FVT cycle length) was delivered (Figure 3 A1). As it was unsuccessful, FVT via VF was redetected and another sequence of ATP (8-pulse burst pacing train at 88% of the FVT cycle length minus 10 ms) was given while charging the capacitors. This therapy terminated the arrhythmia (Figure 3 A2). When the charge ended, the device confirmed that the episode has finished and aborted the shock.

Figure 1: Clinical ventricular tachycardia of the patient (12-lead electrocardiogram)

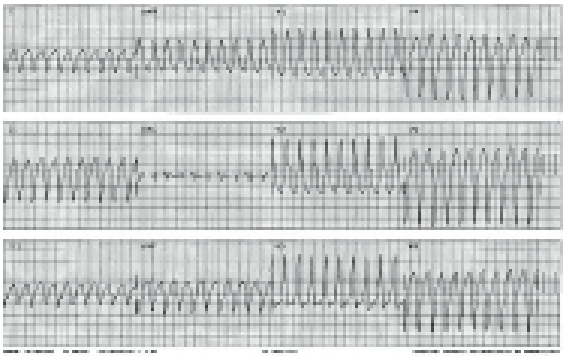

Figure 2: Induced Ventricular Tachycardia in the electrophysiologic Study

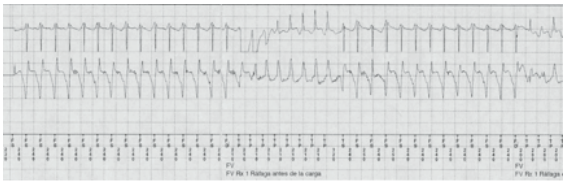

Figure 3 - A1: FVT treated with ATP before charging without success

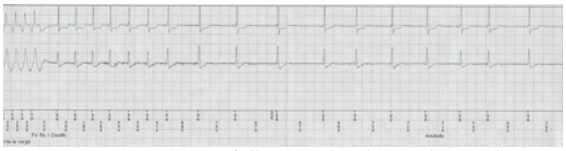

Figure 3 - A2: FVT successfully treated with ATP during charging

Discussion

After this, the patient has experienced 7 other episodes of fast ventricular tachycardia with the same morphology as the one induced in the EPS all with an average cycle length of 240 ms. Five episodes were ended with ATP therapies and only two needed shocks. This means that ATP in this patient was effective in 75% of cases. The EnTrust device avoided him five shocks which have reduced his anxiety and improved his quality of life significantly.

The PainFREE Rx study demonstrated that fast ventricular tachycardia is common in ICD patients and that ATP can terminate 3 out of 4 of these episodes with low incidences of acceleration and syncope and may safely reduce the morbidity of painful shocks.[3] The PainFREE Rx II trial demonstrated that compared to shocks, empirical ATP for FVT is highly effective, equally safe, and improves quality of life.[4] None of the PainFREE Rx studies have demonstrated any added value of delivering an ATP sequence while charging capacitors and the possibility of having another sequence before charging thereby reducing the number of shocks and the load on the battery without any risk of delay if a defibrillation shock is needed.

Jiménez-Candil et al. state that a single, short ATP burst is efficient and safe for FVT treatment and reduce the necessity of high-energy shocks and that ATP appears to reduce the incidence of syncope/near-syncope associated with episodes of FVT.[5]

An important fact that has to be mentioned is the psychological impact of ICDs on patients. The "Assessing the Psychosocial Impact of the ICD" study reported that 10-20% of ICD recipients experienced worse emotional functioning and strained family relationships. Healthcare professionals report that the greatest concerns of most ICD recipients are those related with ICD shocks and depression.[6] The most psychological symptoms experienced are muscle tension, sweating and increased heart and respiratory rates. Between 13% and 38% of patients suffer significant levels of anxiety and depression. Also recipients have fears concerning the experience of shocks and the malfunctioning of devices. The highest risk for psychological distress is experienced by young people and these are the patients that receive a greater percentage of shocks.[7]

In the current case, we demonstrate that ATP therapies (in particular, a single ATP sequence) may terminate FVT therefore averting a significant number of shocks. ATP during charging may combine the high success rates of ATP and the high efficacy and safety of defibrillation without prolonging the time to terminate the FVT. On the other hand, these results have a great clinical implication as the patient is very young: up to sixty shocks had been delivered by the previous device. The reduction in the number of shocks and consequently the anxiety will improve the quality of life of this patient. Even the longevity of the device will be greater, which is very important in this case as young patients need several replacements.

References

1. Sweeney MO, Wathen MS, Volosin K, Abdalla I, DeGroot PJ, Otterness MF, et al. Appropriate and inappropriate ventricular therapies, quality of life, and mortality among primary and secondary prevention implantable cardioverter defibrillator patients: results from the Pacing Fast VT REduces Shock ThErapies (PainFREE Rx II) trial. Circulation. 2005;111(22):2898-905.

2. Weber M, Block M, Bänsch D, Castrucci M, Gradaus R, Schriever C, et al. Antitachycardia pacing for rapid VT during ICD charging: a method to prevent ICD shocks. Pacing Clin Electrophysiol. 2001;24(3):345-51

3. Wathen MS, Sweeney MO, DeGroot PJ, Stark AJ, Koehler JL, Chisner MB, Machado C, Adkisson WO; PainFREE Investigators. Shock reduction using antitachycardia pacing for spontaneous rapid ventricular tachycardia in patients with coronary artery disease. Circulati on.2001;104(7):796-801.

4. Wathen MS, DeGroot PJ, Sweeney MO, Stark AJ, Otterness MF, Adkisson WO, Canby RC, Khalighi K, Machado C, Rubenstein DS, Volosin KJ; PainFREE Rx II Investigators. Prospective randomized multicenter trial of empirical antitachycardia pacing versus shocks for spontaneous rapid ventricular tachycardia in patients with implantable cardioverter-defibrillators: Pacing Fast Ventricular Tachycardia Reduces Shock Therapies (PainFREE Rx II) trial results. Circulation. 2004;110(17):2591-6. Comment in: Evid Based Cardiovasc Med. 2005;9(1):86-8.

5. Jiménez-Candil J, Arenal A, García-Alberola A, Ortiz M, del Castillo S, Fernández-Portales J, et al. Fast ventricular tachycardias in patients with implantable cardioverter-defibrillators: efficacy and safety of antitachycardia pacing. A prospective and randomized study. J Am Coll Cardiol. 2005;45(3):460-1.

6. Sears SF, Todaro J, Urizar G, Lewis TS, Sirois B, Wallace R, et al. Assessing the psychosocial impact of the ICD: a national survey of implantable cardioverter defibrillator health care providers. Pacing Clin Electrophysiol. 2000;23(6):939-45. Comment in: Pacing Clin Electrophysiol. 2000;23(6):931-3.

7. Sears SF Jr, Shea JB, Conti JB. Cardiology patient page. How to respond to an implantable cardioverter-defibrillator shock. Circulation. 2005;111(23):e380-2.