Prikaz slučaja / Case report

"Double fire" — rijetka, a još češće neprepoznata aritmija

"Double fire" — a rare and commonly unrecognized arrhythmia

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SAŽETAK: Dvojna fiziologija provođenja atrioventrikularnim (AV) čvorom, odnosno prisutnost tzv. sporog puta, prema raznim studijama, elektrofiziološkim ispitivanjem se može dokazati u do čak 35% ljudi. Međutim, kod samo manjeg broja on ima i klinički značaj.

Prikazujemo slučaj pacijentice s vrlo rijetkom elektrofiziološkom manifestacijom aktivnog sporog puta, dvostrukog odgovora ventrikula na jedan atrijski kompleks. Problem je uspješno rješen radiofrekventnom ablacijom.

Ovakav način provođenja AV čvorom vjerovatno je i znatno češći nego što se opisuje u literaturi, ali se na žalost rijetko prepoznaje te je uglavnom refraktoran na medikamentoznu terapiju.

KLJUČNE RIJEČI: dualna fiziologija atrioventrikulranog čvora, "double fire" fenomen, radiofrekventna ablacija.

SUMMARY: Dual atrioventricular node (AV) pathway physiology or the presence of so-called slow conduction pathway is according to various studies demonstrable in up to 35% of normal people during electrophysiology study. In only a small number of them, it has a clinical significance.

We present a case of a patient with a very rare electrophysiological manifestation of active slow pathway, double ventricular response to one atrial complex. The problem was successfully treated with radiofrequency ablation.

This form of conduction via AV node is probably much more common than it was previously described in the literature, but unfortunately it is rarely recognized and is generally refractory to medical therapy.

KEWWORDS: dual atrioventricular node physiology, "double fire" phenomenon, radiofrequency ablation.

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Prikaz slučaja

Prikazujemo slučaj 62 godišnje pacijentice naručene na invazivnu kardiološku obradu zbog učestalih palpitacija te intolerancije napora praćene opresijama u prekordiju. Od ranije se liječi zbog arterijske hipertenzije i hiperlipidemije, a zbog palpitacija u terapiji ima i propafenon 2x150 mg te verapamil 180 mg.

Već na rutinskom 12-kanalnom elektrokardiogramu kod prijema prepoznat je potencijalni uzrok tegoba. Naime, prisutni su brojni ventrikularni kompleksi koji po morfologiji odgovaraju supraventrikulnim ekstrasistolama (SVES), bez vidljive atrijske aktivnosti, a u uskoj vezi s prethodno uredno provedenim sinusnim kompleksom (**Slika 1**). U 24-satnom kontinuranom snimanju EKG zabilježeno je više od 10.000 takvih SVES. Ehokardiografski se radi o strukturno zdravom srcu očuvane sistoličke funkcije, a koronarografijom je isključena okluzivna bolest epikardijalnih arterija.

Case study

We present a case of a 62 year-old woman admitted for further evaluation because of frequent palpitations and effort intolerance accompanied by precordial oppressions. She has been treated for arterial hypertension and hyperlipidemia since earlier, and takes propafenone 2x150 mg, and verapamil 180 mg in her therapy for palpitations.

A potential cause of problems was recognized already on a routine 12-lead electrocardiogram at the time of admission. In fact, there are numerous ventricular complexes that according to their morphology correspond to supraventricular extrasystoles (SVES), with no visible atrial activity, and are closely related to the previously duly conducted sinus complex (**Figure 1**). More than 10,000 such SVES were recorded in the 24-hour continuous ECG recording. Echocardiography showed that it is a structurally normal heart with preserved systolic function, and coronary angiography excluded coronary artery disease.

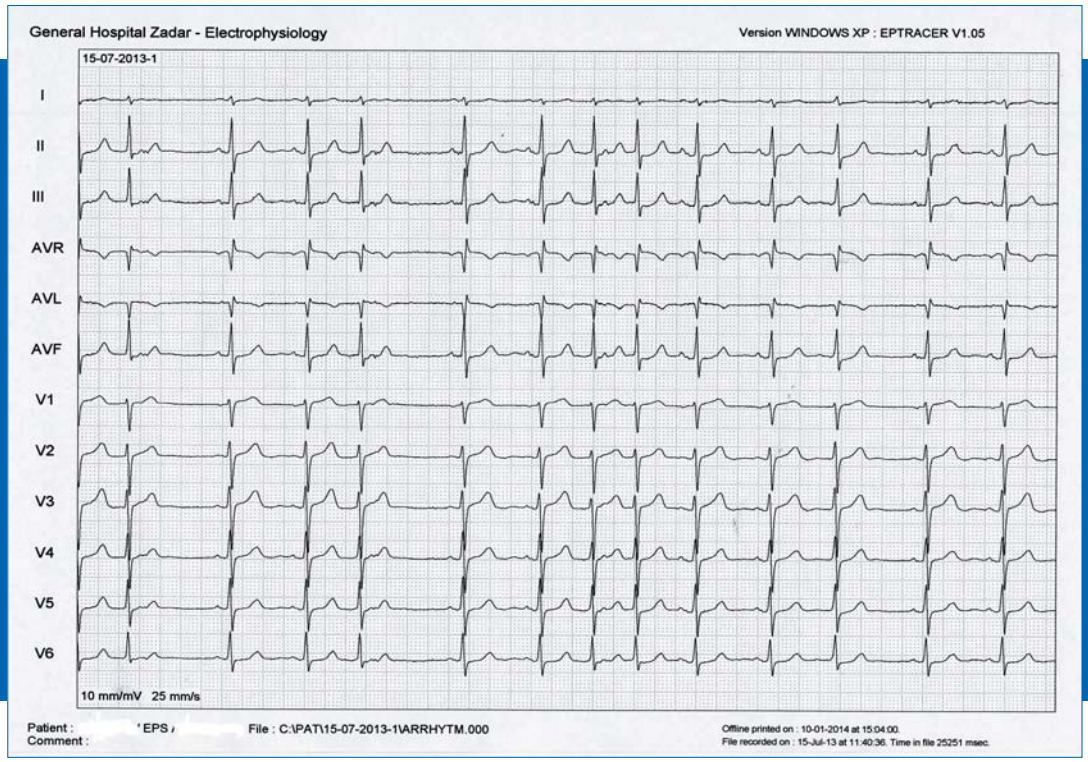

Figure 1. *Sinus rhythm with lot of narrow QRS extra beats, without preceding P wave. It is difficult to differentiate whether it is ectopic activity from the AV junction (His region) or dual conduction of one P wave through both fast and slow pathway to ventricle.*

Odlučili smo se za elektrofiziološko ispitivanje (EPS). Bazičnim intrakardijalnim elektrogramima potvrđena je sumnja da se radi o tzv. "double fire" fenomenu, odnosno dvostrukom atrioventrikularno (AV) provođenju. Na jedan atrijski kompleks dolaze dva ventrikularna od kojih je prvi proveden brzim, a drugi sporim putem (**Slika 2a** i **2b**). Standardnim EPS protokolom dokazana je dualna fiziologija AV čvora, isključeno je retrogradno provođenje, a nije inducirana tahikardija niti ev. "eho" udari. U regiju sporog puta postavljen je ablacijski kateter te se nakon nekoliko kraćih aplikacija energije u potpunosti eliminira dvojna AV fiziologija s isključivim provođenjem kroz brzi put (**Slika 3a** i **3b**). Aritmija se ne javlja niti nakon primjene izoproterenola. Otpuštena je kući bez antiaritmika.

Electrophysiology study (EPS) was performed. Basic intracardiac elektrograms confirmed the suspicion that this is the so-called "double fire" phenomenon, or dual atrioventricular (AV) conduction. Two ventricular complexes come to one atrial complex, of which the first is conducted by the fast and the second by the slow pathway (**Figure 2a** and **2b**). Standard EPS protocol proved dual AV node pathway physiology, excluded retrograde conduction, and induced no tachycardia or "echo" beats. After a few short energy applications in the region of the slow pathway, dual AV node physiology was completely eliminated, only with conduction via the fast pathway (**Figure 3a** and **3b**). Arrhythmia was not inducible even after the application of isoproterenol. She was discharged home without antiarrhythmics.

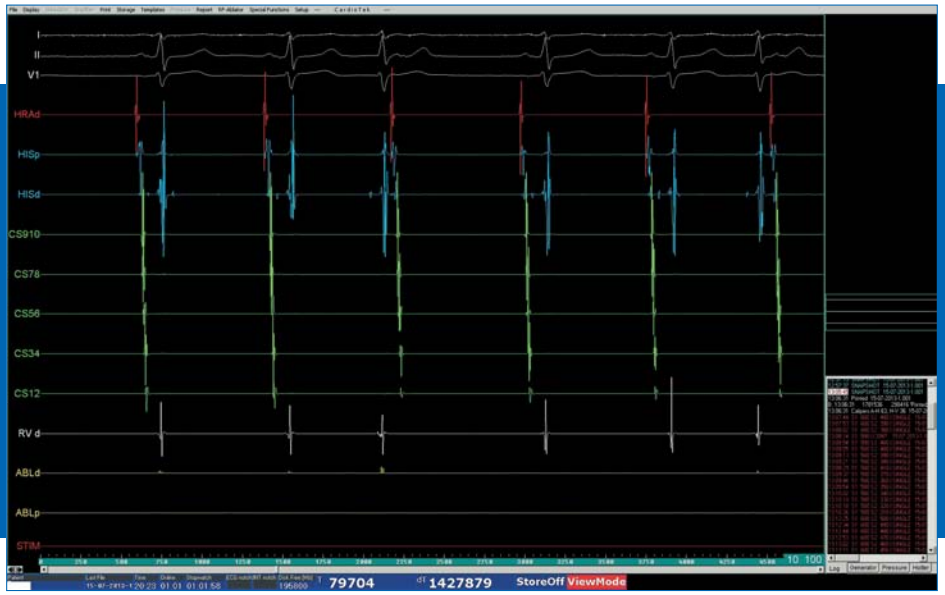

Figure 2a.
Intracardiac recording during electrophysiology study.

Figure 2b. *Schematic presentation of pulse propagation from atrium to ventricle: First atrial (sinus) impulse is conducted through both fast and slow pathway to the region of His, and down to the ventricle (1:2 conduction). Second atrial stimulus is blocked in the atrioventricular node which is still refractory from the previous depolarization by slow pathway. Third atrial impulse is conducted only by fast pathway. (HRAd — high right atrium; HISd — region of His with its potential; RVd — apex of the right ventricle).*

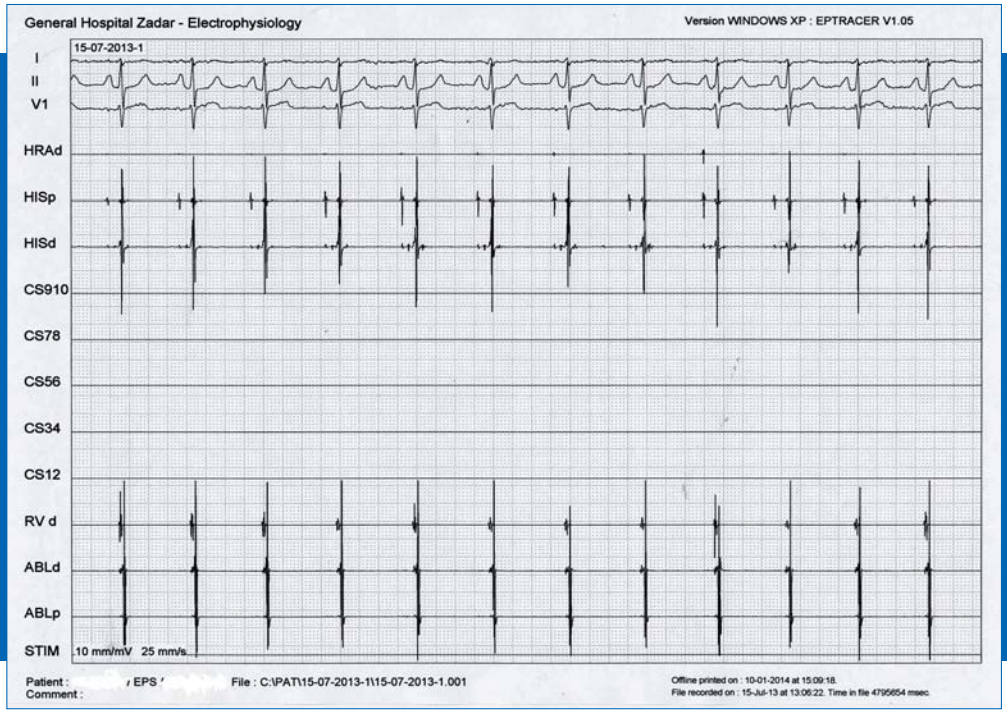

Figure 3a.
ECG after successful ablation in the slow pathway region — intracardiac recording.

Zaključak

Dvojna fiziologija provođenja AV čvorom, odnosno prisutnost tzv. sporog puta, prema raznim studijama, elektrofiziološkim ispitivanjem se može dokazati u do čak 35% ljudi[1-2].

Fenomen dvostrukog ventrikularnog odgovora na jedan atrijski kompleks prvi je opisao Csapo 1979. godine i nazvao

Conclusion

Dual AV node pathway physiology or the presence of so-called slow conduction pathway is according to various studies present in up to 35% of people during EPS[1-2].

The phenomenon of dual ventricular response to a single atrial complex was first described by Csapo in 1979 and cal-

Figure 3b. *ECG after successful ablation in the slow pathway region — standard 12-lead ECG.*

ga je "double fire" ili "non-reentrant" tahikardija[3]. Rijedak je jer zahtjeva posebne karakteristike oba puta — anterogradnu provodljivost i retrogradni blok, a spori put mora biti dovoljno spor da dopusti His-Purkinjeovom tkivu da oporavi podražljivost nakon prethodne stimulacije[4-6]. Zbog toga fenomen provodljivosti 1:2 nije konstantan, AV čvor se neujednačeno depolarizira, pa su često prisutni i različiti oblici funkcionalnog AV bloka (PR prolongacija ili Wenckebach). Na vanjskom elektrokardiogramu to se manifestira nepravilnim ventrikularnim ritmom, a odnos s P valom je ponekad teško pratiti. Zato i nije neobično da se ova aritmija teško prepozna, a kod brže frekvencije i niže voltaže P vala lako zamjeni za npr. fibrilaciju atrija. Dominantan simptom su palpitacije, a u literaturi su opisani slučajevi tahikardiomiopatije uzrokovani ovom aritmijom, uspješno rješeni ablacijom sporog puta[7-9]. Ovi pacijenti u pravilu nemaju kružne tahikardije koje su tipične za aktivni spori put, kao što je atrioventrikularna nodalna kružna tahikardija.

Loš odgovor na medikamentoznu terapiju (zbog rezistencije sporog puta na većinu klasičnih antiaritmika) i mogućnost izlječenja radiofrekventnom ablacijom, nameće potrebu da razmišljamo o ovom tipu aritmije koja se može prepoznati već iz standardnog 12-kanalnog elektrokardiograma. Naravno, za dokaz je ipak potrebna elektrofiziološka studija.

led it a "double fire" or "non-reentrant" tachycardia[3]. It is rare because it requires special characteristics of the both pathways — anterograde conduction and retrograde block, while the slow pathway must be slow enough to allow the His-Purkinje tissue to recover excitability after previous stimulation[4-6]. For this reason, the conductivity phenomenon 1:2 is not constant, the AV node is inconsistently depolarized, so different forms of functional AV block (PR prolongation or Wenckebach) are often present. It is manifested by irregular ventricular rhythm on the external electrocardiogram, and the relation with the P wave is sometimes hard to follow. So it was not surprising that this arrhythmia is hard to recognize, and at faster frequency and low voltage of the P wave it can be easily confused for e.g. atrial fibrillation. The dominant symptom are palpitations, and literature has described the cases of tachycardiomyopathy caused by this arrhythmia, successfully treated with radiofrequency (RF) ablation of the slow pathway[7-9]. These patients typically have no reentrant tachycardia typical for active slow pathway, such as atrioventricular nodal reentrant tachycardia (AVNRT).

A poor response to medical therapy (due to resistance of the slow pathway to most classic antiarrhythmics) and the possibility of the treatment with RF ablation, forces us to think about this type of arrhythmia that can be recognized already from the standard 12-lead electrocardiogram. Of course, electrophysiology study is required to prove it.

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