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## Induction of Sustained Ventricular Tachycardia by Programmed Stimulation through Permanent Pacemaker Generator

Programmed asynchronous stimulation of the heart to induce arrhythmias is a widely used prognostic and diagnostic tool in the invasive electrophysiology laboratory to define the approach in patients with arrhythmic substrate and suspected sustained ventricular or supraventricular arrhythmias. (1)

To perform a conventional electrophysiological study (EPS), it is necessary to take the patient to the electrophysiology or cardiac catheterization laboratory and, under local anesthesia, introduce at least one venous-access electrode-catheter connected to an external stimulator and a polygraph, with the subsequent, though minimal, risk and complications resulting from this type of puncture, in addition to the exposure of health care professionals to radiation during the procedure and the hospital system costs. (2)

Today, pacemaker (PM) generators, cardioverter defibrillators (CVD), and resynchronization devices (CRT) can follow, as EPS, different stimulation protocols, and can introduce up to three extrastimuli to induce arrhythmias and then abolish them with asynchronous burst stimulation. (3)

We report the case of an 82-year-old female patient with positive serology for Chagas, with history of permanent dual-chamber PM in February 2013 due to symptomatic 2:1 atrioventricular block (AVB) and syncope. The patient was under drug therapy with bisoprolol, amiodarone, and losartan.

In September 2015, the patient was admitted to the Department of Clinical Medicine due to syncope preceded by angina. During hospitalization, she underwent:

Electrocardiogram: It showed sinus rhythm with first-degree AV block and complete right bundle branch block, alternating with atrial regulation in AAI mode with long AV interval.

Echocardiography: It revealed mild left atrial enlargement and concentric hypertrophy, mid-anteroseptal hypokinesis, and preserved left ventricular systolic function.

24-hour Holter: It evidenced rare, isolated ventricular extrasystoles and frequent, isolated, polymorphic PEB. Frequent monomorphic and polymorphic couples and a single episode of 9 beats of nonsustained ventricular tachycardia (cycle length 300 msec) were also observed.

Coronary angiography: No angiographically significant lesions were found in LCA and the RCA could not be catheterized and targeted due to heterogeneity of coronary flow.

Due to a new syncopal episode during hospitalization, the patient was referred to the Coronary Care Unit to undergo an EPS with stimulation from the tip of the RV for induction of ventricular arrhythmia.

Given that the patient had a dual-chamber PM that could perform asynchronous and/or programmed stimulation with up to three extrastimuli (Sensia DR [Medtronic Inc], also available in models such as Altrua 60 [Boston Scientific], and Accent DR [St Jude Medical]), it was decided not to perform conventional EPS.

An induction protocol was used, with stimulation from the RV apex (PM catheter) and basal train stimulation at 600 and 500 msec, and extrastimuli at sequential and programmed decreasing coupling intervals. (4)

On sinus rhythm, with a stimulation drive (S1-S2) of 500 msec, two extrastimuli (S2=300 msec and S3=260 msec) were introduced with induction of sustained, monomorphic, ventricular tachycardia (cycle length 350 msec), symptomatic for angina and trepidation (Figure 1), which was interrupted with burst stimulation of 290 msec (Figure 2).

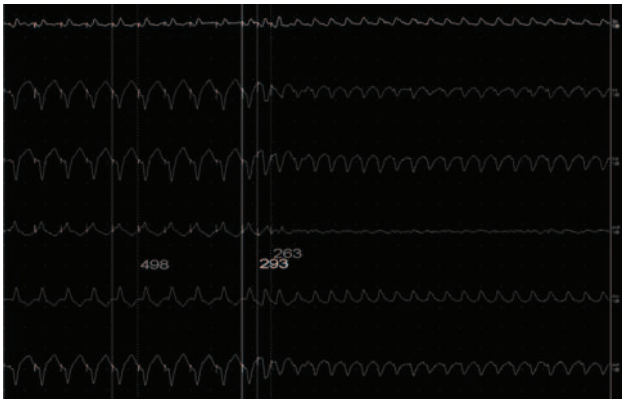


**Fig. 1.** Induction of sustained ventricular tachycardia with programmed stimulation using two extrastimuli.

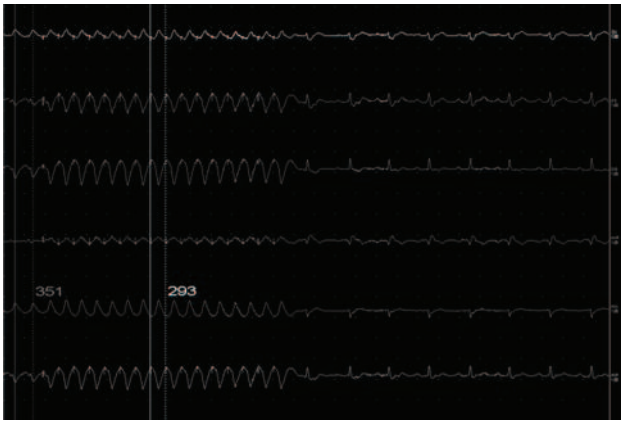


**Fig. 2.** Termination of sustained ventricular tachycardia with burst stimulation of 290 msec.

Since the test was positive, upgrade to dual-chamber ICD (5) was successfully implanted on the following days.

The patient was asymptomatic at follow-up, and presented isolated episodes of monomorphic ventricular tachycardia during ICD control, which reversed with ATP.

In these cases, programmed stimulation can be performed from the site where the ventricular lead is implanted, so a conventional EPS with stimulation from the right ventricular outflow tract has to be performed in cases of non-induced arrhythmia from the RV apex.

The timely use of resources available in our daily practice will help us provide adequate follow-up to our patients, with the safest and most appropriate diagnostic and therapeutic options, always by experienced operators.

In addition to its safety and reliability, inductive telemetry completely rules out any complication associated with the puncture site, and avoids radiation exposure received during any invasive method.

Induction of complex and sustained arrhythmias should be performed in the coronary care unit with all the necessary resources to manage possible complications.

In addition to induction of sustained arrhythmias, asynchronous and/or programmed stimulation from implantable devices can be very useful as diagnostic tool, even for the evaluation of the permanent programming mode. Through this means, we can:

- Determine the Wenckebach point in those patients with preferential atrial stimulation (MVP, AAIsafeR, etc.).
- Determine sinus node recovery time to assess sinus function, and consider (or not) the frequency response sensor activation.
- Measure antegrade conduction refractory periods.

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## High-Sensitivity Troponin for Prediction of Myocardial Infarct Size in Patients with ST Segment Elevation

The assessment of myocardial lesion size after acute ST-segment elevation myocardial infarction (STEMI) has significant prognostic and therapeutic implications. (1) Different imaging and lab techniques can be used, echocardiography being the most widely employed. High-sensitivity troponin T (hs-Tn) has recently been available in clinical practice, and to date, the information regarding its correlation with infarct size has been discordant. (2, 3)

The purpose of this report is to correlate the level of echocardiographic involvement, measured with the wall motion score index (WMSI), and ejection fraction (EF), with hs-Tn values obtained during the first hours of STEMI.

For this purpose, a retrospective analysis was conducted, including 67 patients admitted for STEMI from May 2012 to January 2013. Patients with previous infarction that could alter WMSI were excluded. STEMI definition was taken from the clinical practice guidelines of the European Society of Cardiology, in its third universal definition of infarction. (4) Infarction was confirmed with hs-Tnl >14 ng measured by the Roche method with a 2010 Elecsys® analyzer. Blood was systematically withdrawn for lab tests on admission and between 6 and 12 hours. Spearman's test was used to correlate troponin with WMSI.

Mean age was 59±10.1 years, and 91% were male patients (Table 1). The mean pain-to-balloon time was 221 (110-311) minutes and, on admission, 91% were in Killip class A or B.

The main culprit vessel was the anterior descending artery in 44.6% of cases, but significant lesions in two or more vessels were found in 71% of patients.

Median hs-Tn on admission was 241 ng/L (27.5-1,350) and 1,965 ng/L (655.2-6,770) at 6-12 hours, with a median EF of 50% (41.5-57.5). When the relationship with WMSI was analyzed, we found that hs-Tn at 6-12 hours had a moderate but significant correlation ($r=0.54$, $p=0.005$) (Figure 1). In turn, correlation between hs-Tn on admission and 6-12 h and EF was not significant ($p=0.545$ and $p=0.253$, respectively).

Lack of correlation with EF could be explained because several factors are involved in its assessment after STEMI: compensatory mechanism of normal tissue, affected myocardial mass, location, level