Case Report

Focal para-hisian atrial tachycardia with dual exits

M. Lawrance Jesuraja, K. Sharada, C. Sridevi, C. Narasimhan

Abstract

Focal atrial tachycardias (ATs) in the right atrium (RA) tend to cluster around the crista terminalis, coronary sinus (CS) region, tricuspid annulus, and para-hisian region. In most cases, the AT focus can be identified by careful activation mapping, and completely eliminated by radiofrequency (RF) catheter ablation. However, RF ablation near the His bundle (HB) carries a risk of inadvertent damage to the atrioventricular (AV) conduction system. Here we describe a patient with an AT originating in the vicinity of the AV node, which was successfully ablated earlier from non-coronary aortic cusp (NCC), and recurred with an exit from para-hisian location. Respiratory excursions of the catheter were associated with migration to the area of HIs. This was successfully ablated during controlled apnoea, using 3D electroanatomic mapping.

Copyright © 2013, Cardiological Society of India. All rights reserved.

1. Introduction

Focal atrial tachycardias (ATs) are commonly located in the crista terminalis, near the tricuspid and mitral annulus, within the pulmonary veins, at the ostia of the coronary sinus (CS), and at the para-hisian region. Enhanced automaticity, triggered activity, and micro-re-entry are considered as the three major mechanisms of focal ATs. RF Catheter ablation is highly effective in eliminating this tachycardia. In our patient AT was successfully ablated from non-coronary cusp (NCC) and patient was asymptomatic for a year. She had a clinical recurrence a year later. Activation mapping revealed an exit from para-hisian location. His potential was recorded during respiratory movement and controlled apnea helped us to ablate this AT without collateral damage.

2. Case report

A 59-year-old woman was admitted to our hospital for evaluation of frequent symptomatic atrial tachycardia. Patient had already undergone radiofrequency ablation for AT arising from NCC and she was asymptomatic for one year before the present episode. She had no other cardiac symptoms and clinical evaluation and echocardiographic examination were normal. The tachycardia presented during exertion with abrupt onset and offset and was refractory to beta-blockers and calcium channel blockers.

The 12-lead ECG at the time of admission was normal. An ECG recorded during the symptoms showed a narrow-complex tachycardia with long R–P interval. The P-waves were positive in lead I and aVL and negative in the inferior leads II, III, and aVF. In the precordial leads V1 and V2, P-waves were biphasic with predominantly positive (Fig. 1).
Antiarrhythmic medication was withdrawn 5 days before the electrophysiological examination. Multielectrode catheters were introduced percutaneously into the femoral veins and positioned into high RA (HRA), His bundle region (HBE), coronary sinus (CS), and right ventricular apex (RVA) and non-coronary sinus (NCC) under fluoroscopic guidance. Sustained clinical tachycardia with a cycle length of 270 ms was induced reproducibly by a single atrial extrastimulus as well as by incremental atrial pacing with 2:1 AV conduction and intermittent 1:1 AV conduction with right bundle aberrancy. The earliest activation during the tachycardia was recorded in the proximal His electrode and it was preceding the NCC activation by 14 ms (Fig. 2C). At this site, the local activation preceded the P-wave onset by 43 ms (Fig. 2B). The diagnosis of focal AT was confirmed using commonly accepted diagnostic criteria. Detailed mapping within the RA demonstrated earliest activation near the HB electrodes and NCC electrodes.

Percutaneous mapping and ablation were performed using a 3D electro-anatomic mapping system (CARTO™, Biosense Webster Inc., Diamond Bar, CA, USA) using a 7.5F catheter (NAVISTAR™, Biosense Webster, Inc., Diamond Bar, CA, USA). Irrigated catheter (Thermo cool Celsius, Biosense Webster, Inc., Diamond Bar, CA, USA) was used for mapping and ablation. Electrograms were recorded on an EP-TRACER (Cardio Tek, Maastricht, Netherlands).

Detailed 3D EAM revealed His location recording showing earliest atrial activation with good unipolar signals. NCC region recorded a far field atrial signal, which was later than the para-hisian location. Mapping catheter was stabilized using a long sheath. Despite this periodic, His potential was noticed in the catheter and catheter was radiographically unstable during respiration. Given the high risk of AV block and catheter instability during respiration we decided to maintain controlled apnea during RF delivery. Patient was electively intubated and during expiratory apnea, excellent catheter stability was achieved, RF energy was delivered for 60 s (maximum power 30 W and maximum temperature 55 °C) at this site and AT terminated abruptly within 6 s and no junctional beats were observed during the ablation (Fig. 2D). Patient’s oxygen saturation was monitored throughout the apnoeic period. Two additional lesions were consolidated in the same location with patient kept in controlled apnoea during ablation. Post ablation tachycardia was not inducible at baseline and on isoprenaline. Patient was discharged 2 days later without anti arrhythmic medications. She has had no recurrence of arrhythmias during follow-up of one year.

3. Discussion

Most ATs are amenable to curative RF ablation. However, RF ablation of an AT originating from the apical region of the triangle of Koch carries a risk of inadvertent damage to the AV nodal conduction system. It has been shown that in the vicinity of the AV node a focal AT may originate from either side of the interatrial septum. Therefore, in many cases careful
mapping of both the right and left side of the interatrial septum is crucial to decrease the risk of post-ablation AV block. NCC is adjacent to this site and provides a vantage point for catheter ablation of these arrhythmias. In a normal heart, the aortic root is adjacent to epicardial atrial myocardium and occupies a central location between the superior aspect of tricuspid and mitral annulus. Recently, there are reports of successful catheter ablation of ATs from this location.\(^4,5\) Though this tachycardia had been ablated in the past from NCC, mapping from NCC revealed unsatisfactory signals.

In the present case, the origin of the focal AT was located in the para-hisian location. During mapping it was observed that catheter was unstable during phases of respiration. A long stabilizing sheath was used and His recording was seen in the mapping catheter intermittently. Patient was electively intubated and apnea was maintained in expiratory phase with careful monitoring of oxygen saturation. Continuous apnea provided good catheter stability, and there was no evidence of His potentials in the mapping catheter. The tachycardia terminated rapidly, and no junctional beats were observed during the ablation. Likewise, no complications were observed during the follow-up.

Pecht et al reported in a series of 217 consecutive septal tachycardia substrates in young patients, apnea eliminated a mean catheter tip displacement of 5.4 ± 2.5 mm seen during respiration. No patient experienced transient or permanent complete AV block after any of the 217-substrate ablation procedures. All of the patients had normal PR intervals following ablation.\(^6\)

4. Conclusion

This report highlights the finding of altered exits of focal tachycardia. This also illustrates the value of controlled apnea

---

Fig. 2 — Three dimensional activation mapping during previous ablation, the tachycardia showing the earliest activation of −87 ms in non-coronary cuspal region compared to −57 ms in the para-hisian region. RFA in NCC terminated the tachycardia in 8 s (A). Three-dimensional activation mapping during the present tachycardia showing earliest activation of −43 ms in the para-hisian region (B). Intracardiac recording showing coronary sinus recording (PCS-DCS), and the earliest atrial activation − 14 s in the para-hisian location compared to NCC region (C). RFA in the earliest activation site in para-hisian location during controlled end expiratory apnoea (to avoid catheter movement) terminated tachycardia in 7 s (D).
to achieve catheter stability and to avoid collateral damage during ablation in para-hisian locations.

Conflicts of interest

All authors have none to declare.

REFERENCES


