CASE REPORT

ELECTROANATOMIC MAPPING OF LEFT AND RIGHT VENTRICLES IN A PATIENT WITH VENTRICULAR ECTOPY USING THE CARTO 3 THREE DIMENSIONAL MAPPING SYSTEM

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ABSTRACT

We report a case of suspected right ventricle outflow tract (RVOT) ventricular ectopy and cavotricuspid isthmus (CTI) dependent clockwise atrial flutter presenting two years after surgery for removal of an implantable cardio-verter defibrillator (ICD) lead. The atrial flutter was mapped and successfully ablated using the CARTO-3 three dimensional electroanatomic mapping system. However, mapping of the ventricular ectopy revealed that it did not originate from either the left or right ventricular endocardium and instead likely came from the epicardium, which made ablation too risky to attempt in this patient.

Keywords: Electroanatomic mapping, CARTO 3-D mapping system, Ventricular ectopy.

BACKGROUND

The RVOT is the most common site of origin of ventricular ectopic beats[1]. The typical pattern on ECG is an inferior axis and left bundle branch block (LBBB) when originating from the RVOT[1]. A right bundle branch block (RBBB) morphology and inferior axis would suggest origin from the left ventricular outflow tract (LVOT)[1]. The Maximum Deflection Index is defined as the interval measured from the earliest ventricular activation to the peak of the largest amplitude deflection in each precordial lead (taking the lead with shortest time) divided by the QRS duration. An increased MDI of ≥0.55 suggests an epicardial origin of the ventricular ectopic[2-4].

CASE REPORT

A 42 year old female physician presented with palpitations and missed beats. Holter report revealed atrial flutter and premature ventricular complexes (PVCs) which demonstrated LBBB morphology and inferior axis. The ventricular ectopic burden on Holter monitoring was 21%. The patient was diagnosed as a case of peripartum cardiomyopathy in 2007 and in 2008 she underwent electrophysiological study and radio frequency ablation for PVCs which was not successful. She had an ICD implantation in 2008 due to ventricular tachycardia. In 2017 her device was removed via cardiac surgery following device related endocarditis. Her left ventricular ejection fraction was 45% on echocardiogram. The procedure was done under local anaesthesia and conscious sedation. Right femoral venous access was obtained. 7-French and 8-French sheaths were advanced using a modified Seldinger tech-nique.

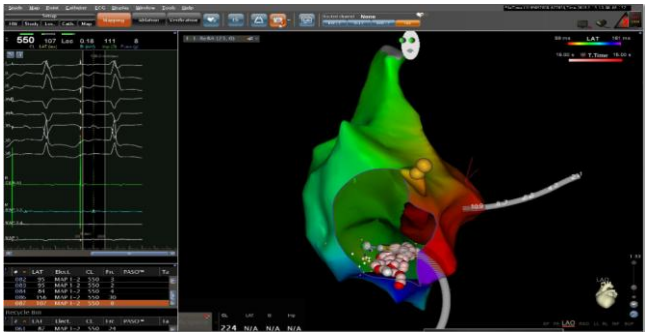

Figure-1: A left anterior oblique (LAO) image of the right atrium taken from the CARTO 3D mapping system. It shows a local activation time (LAT) map and also ablation along the CTI flutter line. The ablation points are denoted by red and white dots. The tricuspid annulus appears as cut out from the image. The curved catheter represents the Smart touch catheter and the straight catheter is the decapolar catheter in the coronary sinus. The His bundle is denoted by large yellow dots.

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A decapolar coronary sinus catheter was placed using a 7-French sheath via the left subclavian vein – this served as both a timing and impedance field reference. A Thermocool Smart touch open-irrigated catheter (Biosense Webster) collected right atrial, right ventricular and left ventricular geometry and voltage and activation maps.

QRS duration during the VPCs was 158 milliseconds and the MDI was 0.58, which was consistent with an epicardial VPC origin. During the VPCs, local left and right ventricular activation occurred 30-50 milliseconds later than the QRS complex on the surface ECG - suggesting that the ectopy did not originate from the endocardial surface of either the left or right ventricle. It was surmised that the ectopy had an epicardial origin. Epicardial ablation was not performed due to the likely significant scar burden in the epicardium, due to previous cardiac surgery, which would have made the procedure too risky.

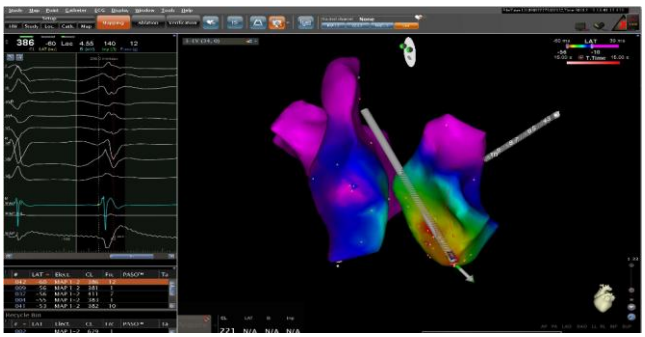

Figure-2: A left anterior oblique (LAO) image of the right ventricle (right side) and left ventricle (left side) taken from the CARTO 3D mapping system. It shows a local activation time (LAT) map of both ventricles, where no signal precedes the QRS onset in the surface electrogram.

The right atrial activation map revealed a CTI-dependent clockwise atrial flutter. Ablation was done using the Smarttouch catheter, delivered along the CTI flutter line at 30W, 48°C, 17mls /min flow. We demonstrated bidirectional block using pacing maneuvers, following ablation.

She was discharged from hospital in sinus rhythm following 24 hour Holter monitoring.

DISCUSSION

In this patient the activation maps of her left and right ventricular endocardium suggested a non-endocardial origin for her PVCs[1]. In selected patients, performing epicardial mapping and ablation aftera failed, previous endocardial ablation, increases success rate[5]. However, epicardial mapping and ablation has its own risks and the complication rate is higher than an endocardial approach.

Pericardial bleeding is the commonest complication of pericardial puncture and can be present in up to 30% of patients. Hepatic or intraabdominal bleeding may occur after accidental puncture of the liver, and injury to the coronary arteries or the phrenic nerve by nearby ablation are other complications of epicardial ablation[6,7].

Also, as in our patient, pericardial adhesions may be present in patients with prior cardiac surgery which prohibit percutaneous pericardial access and increase the risk of bleeding[2].

CONCLUSION

Epicardial origin of VPCs should be considered in patients whose Maximum Deflection Index is ≥ 0.55 and electroanatomic maps suggest non-endocardial origin.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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