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Case Report

Catheter ablation of ventricular tachycardia related to a septo-apical left ventricular aneurysm

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Abstract: A 60-year-old male patient with previous myocardial infarction (30 years ago) presented to our cardiology department for sustained monomorphic ventricular tachycardia. The patient presented multiple episodes of tachycardia treated by his internal cardiac defibrillator. Radiofrequency ablation was proposed as curative treatment. The mechanism of the ventricular tachycardia was demonstrated by electrophysiological study using three-dimensional mapping system: Carto 3 (Biosense Webster). Ventricular tachycardia was induced either mechanically or by programmed ventricular stimulation. The tachycardia cycle length was 380 msec. The voltage map confirmed the presence of the septo-apical aneurysm with a local voltage < 0.5 mV. Activation mapping revealed a figure-in-8 circuit of VT with the entrance point inside the dense scar and the exit point at the border zone (between the aneurysm and the healthy tissue of the left ventricular septo-apical region). Radiofrequency energy was delivered at the isthmus of the tachycardia rendering it uniducible by programmed ventricular stimulation.

Keywords: Catheter ablation, three dimensional mapping, ventricular tachycardia, aneurysm, defibrillator

Case presentation

A 60-year-old patient with previous myocardial infarction, 30 years ago presented to our cardiology department for multiple episodes of sustained monomorphic ventricular tachycardia (**Figure 1**). He had palpitations and dizziness with a blood pressure of 90/50 mmHg during episodes of VT and a heart rate of 150 bpm. Intravenous Amiodarone and Lidocaine were uneffective in stopping the arrhythmia, so electrical cardioversion was performed.

Investigations

Lab test showed normal blood count, normal liver function and renal function, normal electrolytes and normal coagulation. Echocardiography showed a non-dilated left ventricle of 53/35 mm, with moderate systolic dysfunction: EF was 30% with hypokinesia of the septum and anterior wall. An apical aneurysm was also present, without thrombus. Coronary angiography showed a patent stent on the proximal left anterior descending artery.

An internal unicameral Saint Jude defibrillator was implanted. As the patient presented multiple episodes of ventricular tachycardia requiring antitachycardic therapy (burst and ramp) and multiple electric shocks, we proposed him radiofrequency ablation.

Electrophysiological study

The mechanism of the VT was demonstrated by electrophysiological study using the three-dimensional mapping system Carto 3 (Biosense Webster). This mapping system creates heart chamber geometry and displays the ablation catheter position inside the left ventricle. During the procedure the VT was induced easily either mechanically or by ventricular stimulation. The cycle of VT was 380 msec. The anatomical map revealed a septo-apical aneurysm of 33.2 cm^2 (12,6% of the total left ventricular area). The voltage map confirmed the presence of this aneurysm with a local voltage < 0.5 mV. Activation mapping revealed a figure-in-8 circuit of VT with the entrance point inside the dense

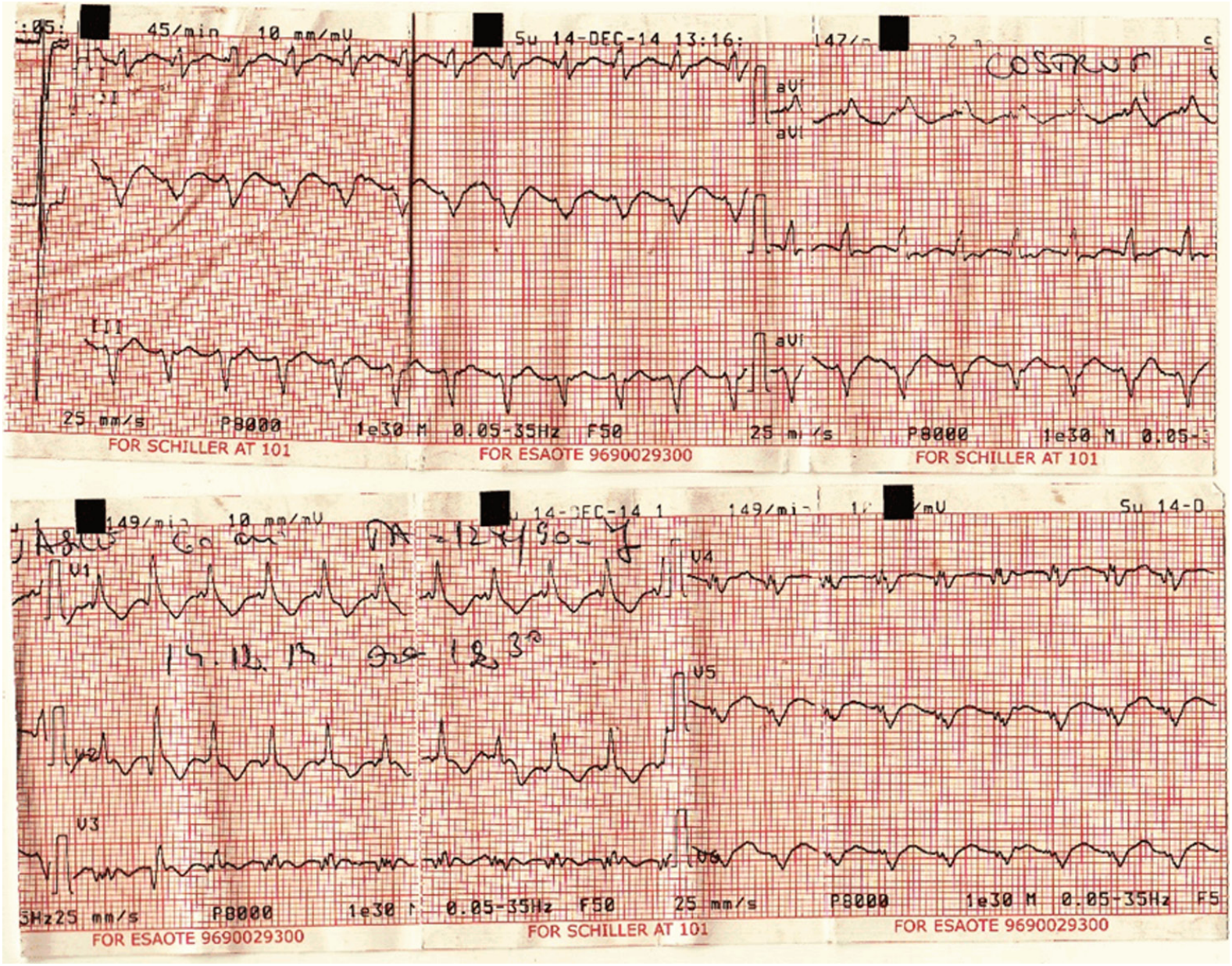

Figure 1. Twelve lead ECG during an episode of palpitations. The image shows a wide-QRS tachycardia with a RBBB morphology in V1 and negative complex in the inferior leads. Precordial transition is at lead V3. Overall the image is suggestive of a LV ventricular tachycardia with an exit point situated in the septo-apical region of the LV.

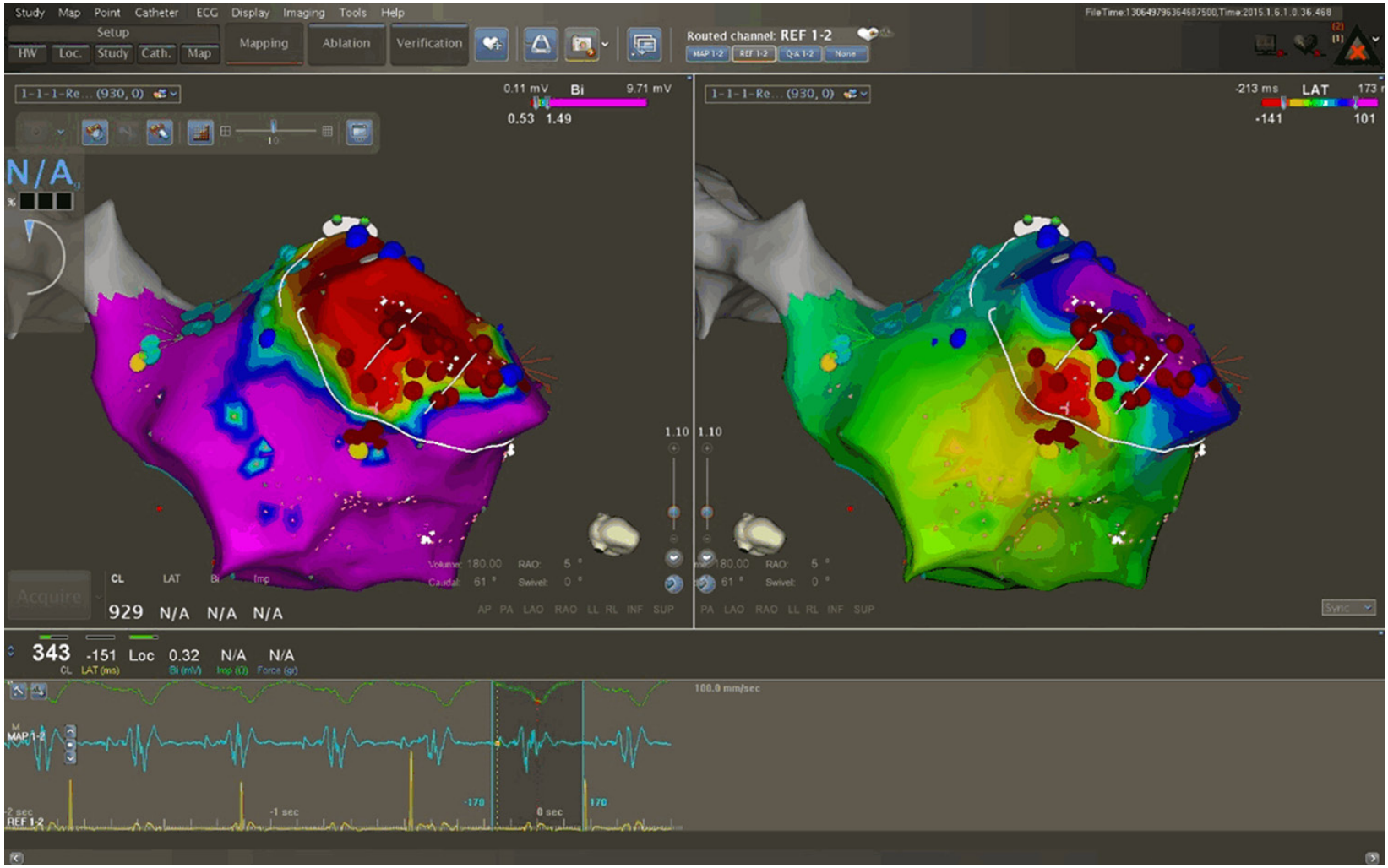

Figure 2. Three dimensional voltage map and activation map created with the help of the Carto 3 system. Left image: voltage map shows with purple healthy myocardium having a voltage of > 1.5 mV and with red the scar with a voltage of < 0.5 mV corresponding to a large LV aneurysm. Right image: activation map shows the exit point from the re-entry circuit with red, the entrance point in the re-entry circuit with purple; between the entrance and exit point lies the VT isthmus. RF points at the VT isthmus are marked with red dots.

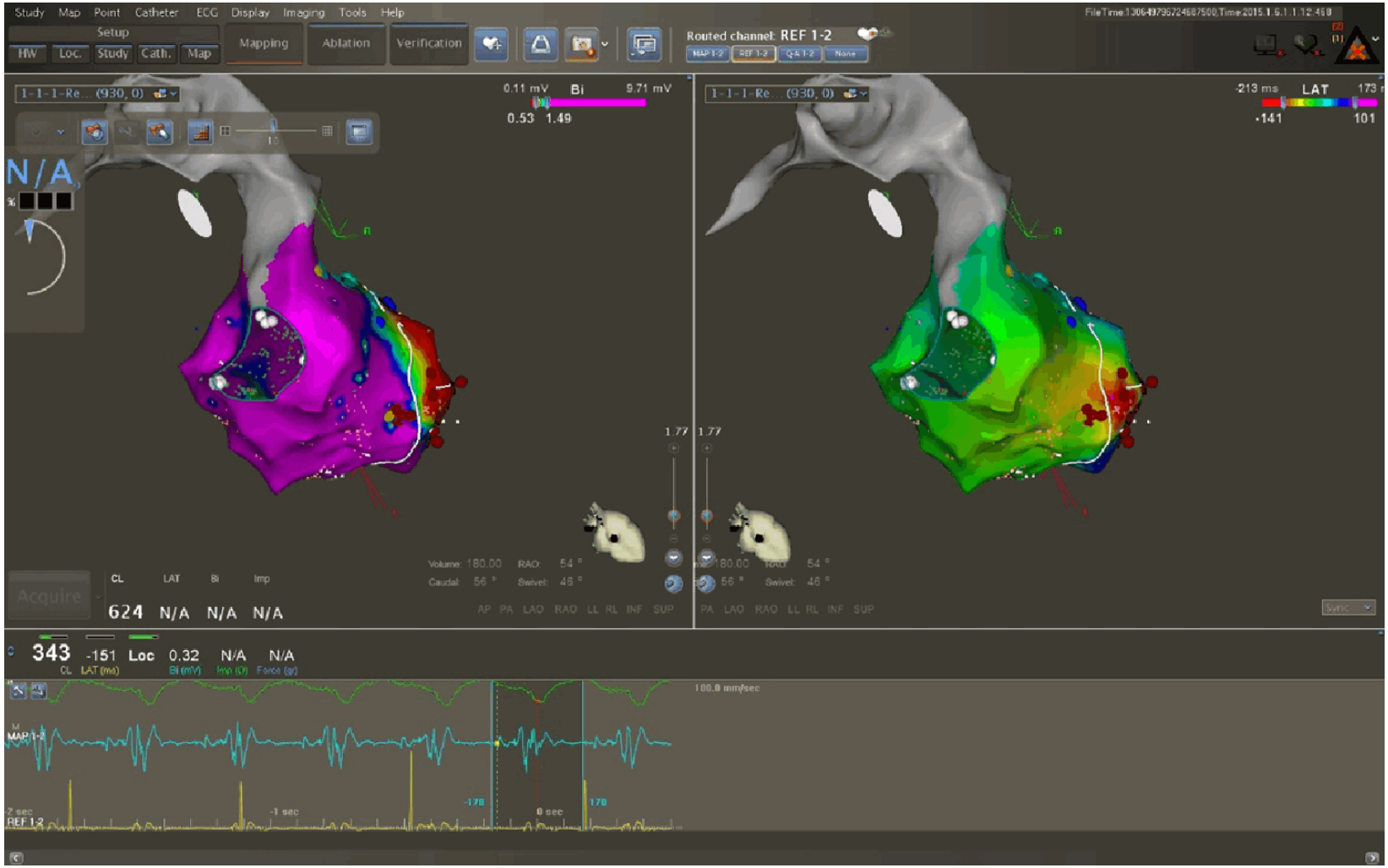

Figure 3. Three dimensional voltage map and activation map. Similar to **Figure 2** but another incidence of view from behind the left ventricle. Both voltage map and activation map are shown. The reentry circuit is located in the septo-apical region of the left ventricle.

scar and the exit point at the border zone with the healthy tissue of the LV septo-apical region (**Figures 2**, **3**).

Treatment

As we demonstrated, the mechanism of this VT being a scar-dependent re-entry, localized at the border zone between the scar and the septo-apical LV wall, radiofrequency ablation was proposed. RF energy was delivered at the VT isthmus 55°, 45 W for 60 seconds, creating a line perpendicular on the VT isthmus.

Outcome

Ablation of the VT isthmus rendered the tachycardia uninducible by programmed ventricular stimulation. Other very fast VTs were induced by aggressive stimulation, but the clinical VT (with a cycle of 380 msec, responsible for the electrical shocks received by the patient) was uninducible. At 1 month, 6 months and 1 year follow-up there was no episode of VT at ICD interrogation.

Discussion

ICDs became the treatment of choice in patients with ischemic VT. In case of frequent arrhythmia episodes catheter ablation is an important adjunctive therapy to lower the number of electrical shocks. It can act on the re-entry mechanism of the arrhythmia, and it can stop the circuit responsible for the VT.

Bhima Shankar et al. [1] described a case with apical aneurysm that presented frequent episodes of VT. Three dimensional mapping using Carto system found an apical LV aneurysm with the border zone localized to the neck of the aneurysm. After circumferential ablation of the neck of the aneurysm VT was uninducible.

In our case we demonstrated the circuit of the VT using activation mapping, so we created a limited lesion intersecting the isthmus of the re-entry circuit.

Yamada et al. [2] described a case with left ventricular aneurysm and multiple episodes of VT. Endocardial mapping demonstrated no endocardial scar inside the aneurysm. Catheter ablation at the epicardium eliminated the VT.

Our patient had a clear endocardial scar and the entire circuit of the VT was demonstrated to be localized at the endocardial level, so ablation from the endocardial site was possible.

Chinusi et al. [3] also presented a case of electrical storm with a re-entrant circuit localized inside an aneurysm. Three RF applications to the central segment of the re-entry circuit made the VT uninducible and eliminated electrical storms. Their patient's VT was non-ischemic and the aneurysm had a biventricular location.

Conclusions

This case is important because it sheds light on the mechanism of ischemic ventricular tachycardia related to the presence of a left ventricular aneurysm. The mechanism was demonstrated to be a re-entry at the border zone with the healthy tissue. The circuit was a figure-in-eight type of reentry with an isthmus, an entrance point situated inside the aneurysm and an exit-point situated in the septo-apical healthy region. Figure-in-eight re-entry circuits can be blocked by making an ablation line perpendicular on the isthmus.

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Disclosure of conflict of interest

None.

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References

[1] Bhima Shankar PR, Hygriv Rao B, Jaishankar S, Narasimban C. Substrate map based electrical isoation of an apical aneurysm-a strategy for ablation in ischemic scar ventricular tachycadia. Indian Heart J 2010; 62: 346-7.

[2] Yamada T, Doppalapudi H, McElderry HT, Kay GN. Epicardial macroreentrant ventricular tachycardia associated with a left ventricular aneurysm. Pacing Clin Electrophysiol 2012; 35: e13-6.

[3] Chinushi M, Izumi D, Furushima H, Aizawa Y. Catheter ablation of ventricular tachycardias due to forward and reverse propagation across a reentrant circuit inside a nonischemic biventricular aneurysm. J Cardiovasc Electrophysiol 2011; 22: 467-71.