Intracardiac thrombus: a good indication of ultrasound image integration system (Cartosound™) for radiofrequency ablation

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We describe the case of a young man suffering from incessant ventricular tachycardia and a chronic apical left ventricular thrombus. We performed radiofrequency ablation of this tachycardia emerging from the border zone of the septoapical aneurism, near the apical thrombus. We used Cartosound™ system to avoid manipulation of catheter in the thrombus. We demonstrate, in this case, that the technique is feasible and safe.

Clinical Case
A 52-year-old man was referred to our hospital for radiofrequency (RF) ablation of ventricular tachycardia (VT). In 2001 he presented an anterior myocardial infarction, complicated with a large antero-septal aneurysm, and an apical thrombus. In 2004 an implantable-

Figure 1
(A) Left ventricle long axis, transversal view. Soundstar™ catheter (white star) is positioned in the right ventricle. Specific software allows to underline, in the echographic image, left ventricle (green), aneurysm (brown) and thrombus (red) limits. (B) Three-dimensional reconstruction of the left ventricle obtained by integration of many different views in the Cartosound™ image integration module. (C) Specific three-dimensional map of the apical thrombus obtained by integration of many different echographic views of the thrombus (white arrows). (D) Spontaneous VT occurred during the procedure. (E) Emerging point with good entrainment with concealed fusion Criteria (green point on the panel G). (F) RF energy delivery on this point end the tachycardia and restore sinusual rhythm. (G) Three-dimensional (top) and two-dimensional (bottom) image of the left ventricle where the point of interest (green point) was tagged. On the two-dimensional image, we clearly see that the thrombus is absent of the slice, as it was located more superior in the left ventricle. The RF was applied reasonably far from it. (H) Intracardiac view of the left ventricle (long axis). Ultrasound catheter is positioned in the right ventricle. During ablation, RF catheter is coming from the LVOT, and curved to apply energy on the border zone, in the septoapical portion of the aneurysm (green star). RF, radiofrequency; VT, ventricular tachycardia; LVOT, left ventricle outflow tract; LV, left ventricle; IVS, interventricular septum; LVPW, left ventricle posterior wall; MV, mitral valve; LA, left atrium.
cardioverter defibrillator was implanted after a first episode of bad tolerated VT. In the past year, he was hospitalized several times for appropriate shocks, including two episodes of electrical storm, leading to RF ablation indication. Predominant VT morphology was well tolerated and incessant (Figure 1D). According to the presence of chronic left apical thrombus, we decided to perform three-dimensional ventricular mapping and RF ablation using intracardiac echography image integration system (Cartosound™ system). This allowed us to clearly individualize apical thrombus in the scar zone, and thus to perform an independent three-dimensional map of it (Figure 1A–C).

During electrophysiological study, many episodes of spontaneous and sustained VT occurred (Figure 1D), allowing an intracardiac mapping of the tachycardia. An emerging point with good entrainment and concealed fusion criteria was then identified (Figure 1E, G, green point). RF ablation of a border, septoapical zone, of the aneurysm reduced tachycardia, and then non-inducibility confirmed successful VT ablation (Figure 1F, G, green point). RF ablation was performed under live control of catheter position, to avoid manipulation of catheter in the apical thrombus (Figure 1H).

Cartosound™ is a new system of image integration using intracardiac echography (ICE). The use of the specific ICE catheter Soundstar™ allows integration of the ICE images in the Carto™ system, and thus a three-dimensional ‘non-invasive’ reconstruction of the chamber anatomy. Furthermore, soundstar catheter tip contains both a navigation sensor (same as Carto™), and ultrasound phased array probe (same as in the Acunav™ catheter) for visualization of the catheter in the Carto™ system.

Thanks to this ‘non-invasive’ anatomical mapping, we obtained a fast and precise three-dimensional anatomy of the left ventricle, including scar and thrombus (which would be impossible to obtain with ‘conventional’ mapping). This was safe because anatomical mapping did not require to move catheter in the apical thrombus.

In addition, live control of the catheters during RF ablation enhanced security of the procedure, by limiting RF ablation, and catheter manipulation in the apical thrombus.

It is important to note, however, that the technique cannot totally avoid thrombus manipulation during RF ablation phase, because all the catheters and specially the RF catheter tip cannot be fully visualized during all the procedure. In this case, thrombus was present already in 2004, and thus may have been organized, so we hypothesized that the risk of fragmentation was low. We have to emphasize the isolated nature of this procedure, and the potential risk of catheter manipulation in a fresh and/or mobile thrombus.

Conclusion
This case underlines a good indication of Cartosound system™ in VT ablation. Indeed, even if this system demonstrated safety and efficacy in VT ablation,1 cost of the procedure, including expensive and single use intracardiac two-dimensional ultrasound catheter (Soundstar™) limits indications. Hence, in some cases where manipulation catheters in the chambers could be dangerous (such as intracardiac thrombus, or left appendage tachycardia for example), use of Cartosound system™ might be a good solution.

Conflict of interest: None to declare.

Reference

CASE REPORT

Idiopathic left ventricular tachycardia with dual electrocardiogram morphologies in a single patient

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A 29-year-old female with a documented ventricular tachycardia exhibiting two different electrocardiogram (ECG) morphologies in the precordial leads was referred for catheter ablation. We describe the mechanism of the dual ECG morphologies in this case.