EP CASE REPORT

Stepwise delayed potential ablation using simultaneous three-dimensional delayed potential and voltage mapping in a patient with epicardial ventricular tachycardias from a left ventricular aneurysm

Kohki Nakamura*, Shigeto Naito, and Shigeru Oshima

Division of Cardiology, Gunma Prefectural Cardiovascular Center, 3-12 Kameizumi-machi, Maebashi City, Gunma 371-0004, Japan

* Corresponding author. Tel: +81 27 269 7455; fax: +81 27 269 1492. *E-mail address*: kohkinakamura@yahoo.co.jp

Delayed potentials (DPs) recorded during substrate mapping can be targeted for scar-related ventricular tachycardia (VT) ablation. We describe a case of epicardial VTs originating from a left ventricular aneurysm successfully treated with a stepwise ablation targeting DP areas in a descending order of delay of the potentials, using a three-dimensional DP map created simultaneously during voltage mapping.

Case presentation

A 77-year-old man with an idiopathic left ventricular posterolateral wall aneurysm was referred to our institute for catheter ablation of sustained ventricular tachycardias (VTs). During the first ablation procedure, endocardial substrate mapping using the CARTO 3 System (Biosense Webster) identified an extremely small low-voltage area (<1.5 mV) in the aneurysm, but no dense scar (<0.5 mV) or delayed potentials (DPs). Endocardial ablation targeting the earliest activation during the VTs and low-voltage areas in the aneurysm failed to eliminate the VTs. Epicardial mapping was then performed during the second procedure and two forms of VT (*Figure 1A and B*)

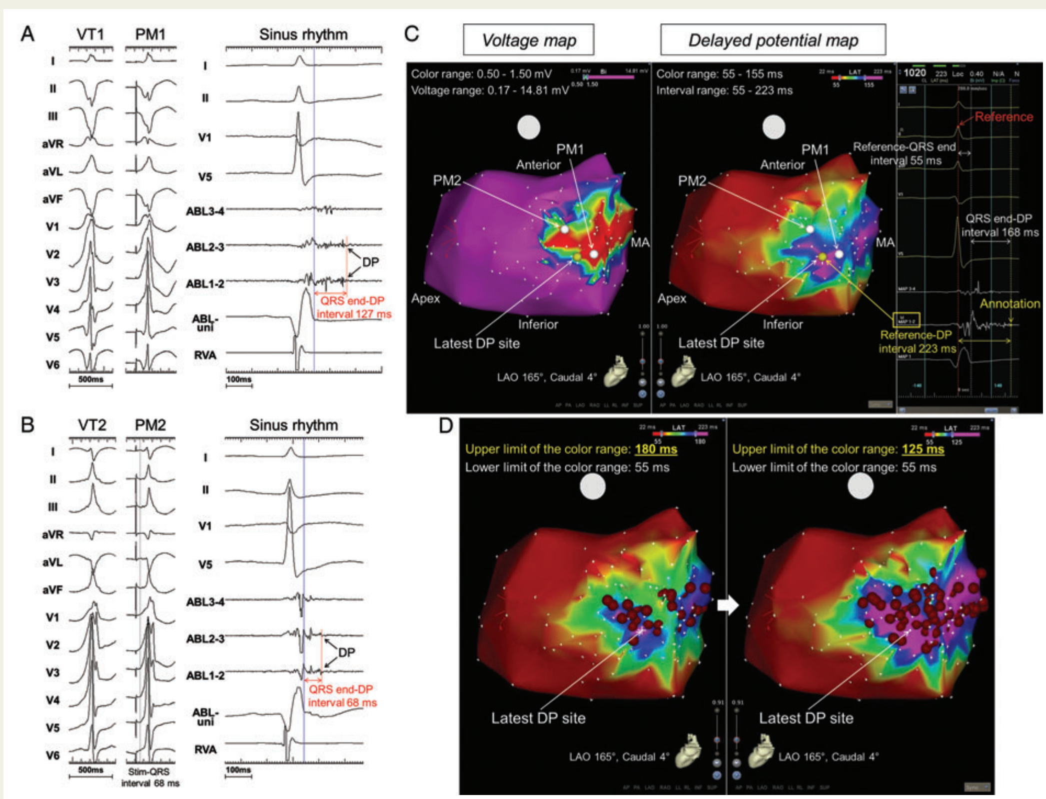

Figure 1 (*A*) Twelve-lead electrocardiograms of clinical VT1 and pace mapping at PM1, and intracardiac electrograms at PM1 during sinus rhythm exhibiting the latest DP component 127 ms behind the QRS end. (*B*) Twelve-lead electrocardiograms of clinical VT2 and pace mapping at PM2, and intracardiac electrograms at PM2 during sinus rhythm exhibiting the latest DP component 68 ms behind the QRS end. (*C*) Simultaneous epicardial voltage and DP mapping. The degree of delay of the potentials was colour-coded from latest (purple) to progressively earlier (blue, green, and yellow), and the site is displayed in red when the reference-latest local electrogram interval is shorter than the reference-QRS end interval (55 ms in this case). (*D*) Stepwise DP-guided ablation. The latest DP site was displayed in purple by setting the upper limit of the range to the maximum value of the reference-DP interval (223 ms in this case). The purple areas were expanded by gradually moving the upper limit towards the lower (55 ms) and were ablated stepwise, as from the left towards the right map. The red tags represent the epicardial ablation points.

could be induced, but detailed mapping during the VTs could not be completed because both VTs were haemodynamically unstable under general anaesthesia. During epicardial substrate mapping with 139 mapping points, a three-dimensional DP map was created by consistently annotating the latest component of the local ventricular electrogram acquired at the same time that a voltage map was created in sinus rhythm (*Figure 1C*). Pace mapping near the latest DP sites (PM1 and PM2) produced QRS configurations quite similar to those of VT1 and VT2, respectively. According to the DP map, epicardial ablation during sinus rhythm was first commenced from the latest DP site. Then, the DP sites were ablated stepwise in a descending order of delay of the potentials as the colour range setting of the DP map altered gradually as in *Figure 1D*. A total of 35 epicardial radiofrequency applications using a 3.5 mm tip external-irrigated ablation catheter, each for 40–60 s with a power of up to 40 W, were finally delivered at the DP areas with a delay of >57 ms from the QRS end, and neither of the VTs could further be induced.

Discussion

Recent studies reported that an ablation strategy targeting fractionated, delayed, or isolated potentials[1–3] was associated with more favourable outcomes of scar-related VT ablation. Hsia *et al.*[4] demonstrated that the interval from the QRS onset to the latest component of the local potentials during substrate mapping was significantly longer near the entrance and isthmus compared with the exit sites of the VT circuit. Therefore, we used a stepwise ablation strategy with a mapping method to simply and three-dimensionally display the degree of delay of the potentials, on the grounds that the critical isthmus may be located in areas with a greater degree of delay of the potentials during sinus rhythm. This report suggests a simple and practical way to serially target DPs for the treatment of scar-related VT. However, our description here is based on a single successful case, understanding the long-term clinical effectiveness of this technique will require investigation in a larger number of patients.

Conflict of interest: none declared.

References

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