Identification of the dominant loop of a dual-loop macro-reentry left atrial flutter without prior intervention using high-density mapping technology: A case report

Yu SD et al. Identification of dominant-loop of dual-loop AFL

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Abstract

BACKGROUND
Left atrial flutter without prior cardiac interventions is uncommon, especially dual-loop macro-reentry atrial flutter. The critical step to ablate dual-loop macro-reentry atrial flutter is to identify the dominant loop and key isthmus. Although entrainment mapping could help identify the dominant loop and key isthmus, it may alter or terminate tachycardia. High-density mapping allows the generation of electroanatomic maps without altering or terminating tachycardia.

CASE SUMMARY
Here, we report a case of symptomatic left atrial flutter without prior intervention. In this case, high-density mapping revealed a dual-loop macro-reentry around the mitral annulus and central scar of the anterior wall. The propagation result showed that the dominant loop was around the mitral annulus, and the key isthmus was between the central scar and mitral annulus. The atrial flutter terminated successfully after ablation was performed.

CONCLUSION
In this case, we demonstrate that high-density mapping technology may help identify the dominant loop of dual-loop atrial flutter without entrainment, which makes ablation easier.
**Key Words:** Dual-loop atrial flutter; Macro-reentry; High-density mapping; Dominant loop; Case report

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**Core Tip:** Identification of the dominant loop of a dual-loop macro-reentry left atrial flutter without prior intervention using high-density mapping technology without entrainment.

**INTRODUCTION**
Sustained left atrial flutter is common in patients with prior cardiac interventions. However, there are few patients presenting left atrial flutter without prior cardiac interventions. Several studies have reported that the incidence of this type of atrial flutter among patients suffering from left atrial flutter undergoing radiofrequency ablation is relatively low, among 4.4%-6.7%.[1-2]. There is a subgroup of patients presenting with dual-loop macro-reentry atrial flutter. The incidence of dual-loop macro-reentry is even lower. The accurate identification of the dominant loop and key isthmus is important for ablation. Entrainment mapping can provide guidance for the identification of the dominant loop and key isthmus. However, tachycardia may be altered or terminated. **The utilization of high-density mapping technology allows for the detailed characterization of atrial arrhythmias** without altering or terminating tachycardia, which may help electrophysiologists determine the mechanisms involved in tachycardia. Here, we report a case using high-density mapping technology to identify the dominant loop of dual-loop macro-reentry left atrial flutter without prior cardiac intervention.

**CASE PRESENTATION**
Chief complaints
The chief complaint is palpitations.

History of present illness
Narrow QRS complex tachycardia.

History of past illness
The past illness are coronary heart disease, hypertension, and hyperlipidemia.

Personal and family history
Hypertension.

Imaging examinations
An echocardiogram showed an enlarged left atrium.

FINAL DIAGNOSIS
The patient was diagnosed as left atrial flutter.

TREATMENT
The patient was treated with radiofrequency ablation.

OUTCOME AND FOLLOW-UP
The atrial flutter terminated while ablation was performed. During the 1-year follow-up, the patient did not report any symptoms without antiarrhythmic drugs, and there was no electrocardiogram evidence of tachycardia.

DISCUSSION
The incidence of left atrial flutter without prior cardiac intervention is fairly low. Several studies reported that the incidence of dual-loop macro-reentry around the mitral annulus and the central scar of the anterior wall was even lower, between 0.9%-
3.1%[1]. Some researchers reported that the left atrial anterior wall low voltage zone was more frequent in perimiral atrial flutter without prior intervention. The anterior wall low voltage zone has a significant correlation with the left atrial-aorta contact area[2]. The left atrial-aorta area is thinner than other areas of the left atrium, and scarring is more frequent in this area[3]. This area is more frequently an arrhythmogenic substrate for perimiral atrial flutter without prior intervention. The mitral isthmus may be only an anatomic isthmus, not an arrhythmogenic substrate[2]. Before ablation of dual-loop macro-reentry atrial flutter, the critical step is to identify the dominant loop and key isthmus. Entrainment is widely used to identify the dominant loop and key isthmus. However, it may terminate or alter tachycardia[4]. High-density mapping may help electrophysiologists determine the mechanisms involved in tachycardia. Schaeffer et al.[1] reported a group of patients with nonfocal left atrial tachycardia without previous iatrogenic interventions. Voltage mapping showed there were low voltage areas (LVAs) in left atrial of these patients. These LVAs were arrhythmogenic, especially anterior wall LVA. Therefore, voltage mapping may give us some implications on reentry circuit through showing LVAs. In this case, voltage mapping indicated that there was a central scar in the anterior wall, and activation mapping revealed two reentry loops and common channels. Propagation results showed that the wavefront of the mitral annulus loop entered the common channel earlier than the anterior loop. Based on these results, we determined the dominant loop and key isthmus without entrainment mapping. The choice of a lesion set for ablating atrial flutter depends on a number of factors, including the length of the isthmus, catheter stability in that region, electroanatomical characteristics and potential complications[5]. Moreover, high-power (45-50 W) short-duration radiofrequency ablation can produce lesions from resistive heating rather than conductive heating, which may block the isthmus more easily[5]. In the present case, the lateral mitral isthmus might have required extensive ablation because of epicardial connections, but the anterior isthmus was short, easy to ablate and relatively safe.

CONCLUSION
In this case, we demonstrate that high-density mapping technology may help identify the dominant loop of dual-loop atrial flutter without entrainment, which makes ablation easier.

REFERENCES


Figure Legends

Figure 1 Twelve lead electrocardiogram and intracardiac electrocardiogram of tachycardia. A: 12 lead electrocardiogram, red arrows indicate P waves; B: Intracardiac electrocardiogram.
Figure 2 A: High-density mapping result. The left panel showed voltage mapping result. The voltage scale was from 0.1 mV to 0.5 mV. Red means voltage lower than 0.1 mV; violet means voltage higher than 0.5 mV. Grey zone represents no potential area. The right panel showed activation mapping result. From red to violet represent activation sequence. Solid arrow indicates the dominant loop, and dotted arrow indicates passive loop; B: The atrial flutter terminated while ablation. The ablation line was between anterior central scar and mitral annulus.
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