Prospective evaluation of a novel catheter equipped with mini electrodes on a 10-mm tip for cavo-tricuspid isthmus ablation - The efficacy of a mini electrode guided ablation

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Study Principal investigators
Takamitsu Takagi
Shinsuke Miyazaki
Takayuki Niida
Takatsugu Kajiyama
Tomonori Watanabe
Shigeki Kusa
Hiroaki Nakamura
Hiroshi Taniguchi
Hitoshi Hachiya
Yoshito Iesaka
Mitsuaki Isobe
Kenzo Hirao

Performed at:

Cardiovascular Center, Tsuchiura Kyodo Hospital, Tsuchiura, Ibaraki, Japan
Department of Cardiovascular Medicine, Tokyo Medical and Dental University, Tokyo, Japan
Heart Rhythm Center, Tokyo Medical and Dental University, Tokyo, Japan

Overview

Clinical utility of large-tip ablation catheters for cavo-tricuspid isthmus (CTI) ablation has been reported, however, it is limited by the impaired near-field electrogram resolution. This study evaluated the efficiency of a novel mini-electrode (ME) equipped 10-mm tip CTI ablation catheter.[1]

> "in some cases, **creating cavo-tricuspid isthmus (CTI) block is challenging**, and multiple energy applications and prolonged procedure and fluoroscopic times are required.
> The clinical utility of a 10-mm tip ablation catheter for CTI ablation has been reported in some studies, however, an impaired nearfield electrogram resolution is an important limitation of large tip catheters. That is, the span of the distal electrode pair extends beyond the ablated lesion and introduces greater susceptibility to monitoring tissue that is not in the ablation zone as well as far field electrical activity. **To overcome this issue, a novel ablation catheter equipped with 3 radially distributed mini electrodes (MEs) on a 10-mm tip has been introduced into clinical use.**"[1]

Researchers from three main hospitals in Japan performed a prospective study, evaluating the efficiency and feasibility of a novel 10-mm tip ME catheter for CTI ablation by **comparing it with 8-mm tip and 3.5-mm irrigated tip catheters**.

Research Methods[1]

This prospective study consisted of **34 consecutive** patients undergoing CTI ablation using a novel 10-mm tip catheter equipped with MEs (**IntellaTipMiFi XP**, Boston Scientific, Boston, MA) **(Group A)**. The pin electrodes were 1mm in diameter, radially distributed at 2.5-mm intervals around the tip of the ablation catheter at 120° orientations and embedded 2-mm from the catheter tip in addition to the 3 standard ring electrodes. The study data were compared with the data of the CTI ablation using a dumbbell shaped 8-mm tip catheter (**Ablaze**, Japan-Life-Line, Tokyo) in **32 consecutive patients (Group B)** and a 3.5-mm tip irrigation catheter (**Thermocool or Surround Flow SF** Biosense-Webster, Diamond Bar, CA) in **32 consecutive patients (Group C)**.

Ablation Procedure[1]

CTI ablation was performed under pacing from the proximal CS or low lateral RA. In all groups, the ablation was performed from the ventricular aspect to the inferior vena cava by point-by-point RF applications with a duration of 30–60 s each. No steerable sheath was used in any groups. A temperature-controlled RF delivery was performed with a maximum power output of 70W, 50W, 30–35W, and temperature limit of 70 °C, 55 °C, 43 °C, in Groups A, B, and C, respectively.
In Group A, the bipolar signals recorded from the MEs were obtained throughout the procedure. Initially, RF energy was applied at the site where sharp large signals were obtained on the MEs, and the application was terminated for 40 s if a maximal ME amplitude reduction was obtained (ME guided ablation). The maximal ME electrogram attenuation is defined as the time that no further decrease in the ME electrogram amplitude is seen Fig1. In Groups B and C, the RF applications were applied with the guidance of the distal bipolar electrograms. **In Group C, a 3-D mapping system (CARTO3, Biosense-Webster) was also used**. The procedural endpoint was the creation of a persistent bidirectional CTI block as described elsewhere. In the case of a failed isthmus block, at the physician's discretion, the catheter was exchanged for another type of catheter or the procedure was discontinued.

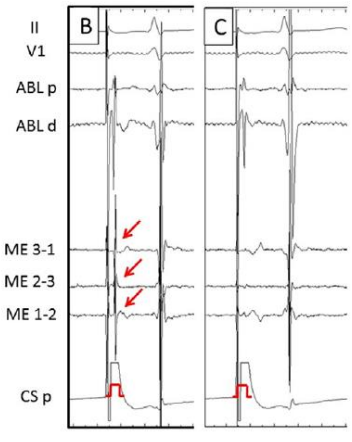


Fig 1 - B, C. Discrepancy of the amplitude of the atrial electrograms recorded by the MEs and conventional bipolar configurations of an ablation catheter during pacing from the proximal CS at the ventricular edge of the CTI. The conventional electrodes recorded high-amplitude ventricular and low-amplitude atrial electrograms (C), suggesting an optimal site to initiate the deployment of the linear lesion. However, the mini-electrodes display only ventricular electrograms, suggesting that the tip of the ablation catheter is situated in the right ventricle. Sharp atrial electrograms could be recorded by dragging the catheter towards the atrium (B, red arrows), suggesting an optimal ablation site to initiate CTI ablation. Please also note that the atrial and ventricular electrograms recorded on the MEs are sharper than those recorded on the conventional electrodes.

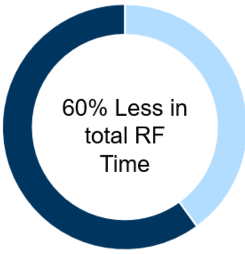
Conclusion[1]

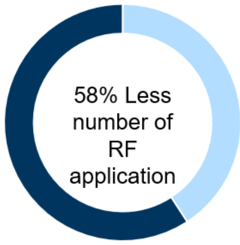
The ME guided ablation using a novel 10-mm tip ablation catheter equipped with additional MEs was feasible for a CTI ablation. Further, bidirectional CTI block could be created with a shorter RF time and fewer number of RF applications when compared to 8-mm tip and 3.5-mmtip irrigated catheters.

Main Finding[1]**:**

- The use of a **10-mmtip RF ablation catheter has been demonstrated to reduce the ablation time** as compared to irrigated tip and 8-mm tip ablation catheters. Total **RF time was significantly shorter and the number of RF applications to create CTI block was significantly smaller for the ME catheter** than the others, suggesting that the ME catheter could avoid an inadvertent delivery during clinical use. The **similar procedure and fluoroscopy times between** Group A and C could be explained by the detailed mapping to obtain sharp potentials on the MEs.

	IntellaTip MiFi XP	Thermocool or Thermocool SF
Number of RF applications (n)	6,9 +/- 3,6	12 +/- 7,1
RF Time to initial block	222 +/- 159	396 +/- 211
Total RF Time (s)	358 +/- 197	566 +/- 265
Fluoroscopic time (Min)	6,9 +/- 7,1	6,1 +/- 5,6





- The enhanced spatial localization of the catheter tip by integrating information derived by the **MEs allow for the identification of small conduction gaps in linear lesions and precise ablation targeting** (Fig. 2A, B). This advantage is attributable to an improved discrimination of viable versus ablated tissue based on electrophysiological criteria

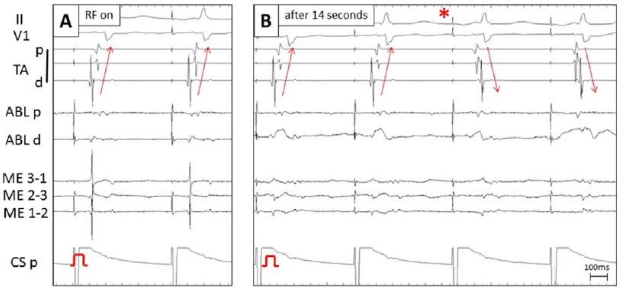
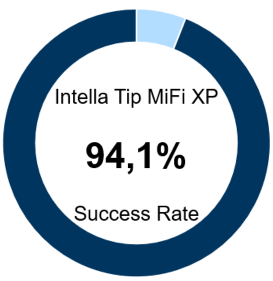
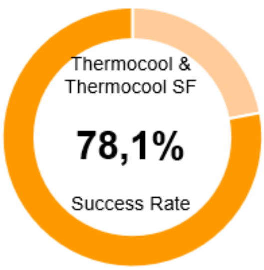


Fig 2 ME guided ablation. An RF application was delivered to the final gap of the CTI linear lesion where sharp atrial electrograms were recorded on theMEs but not on the conventional electrodes (A). After a 14 s RF application, CTI block was created (asterisk) following an attenuation of the amplitude of the atrial electrograms on the MEs (B).

- **The success rate was significantly lower in Group C than in group A**. We assumed that there were more potential gaps in Group C, because an **overlap between the lesions was more frequent** due to the smaller tip





1) Prospective evaluation of a novel catheter equipped with mini electrodes on a 10-mm tip for cavo-tricuspid isthmus ablation - The efficacy of a mini electrode guided ablation, Takagi et al International Journal of Cardiology 240 (2017) 203–207, http://dx.doi.org/10.1016/j.ijcard.2017.03.128