Prediction of Distribution of Late Potentials for Ventricular Tachycardia Ablation with Tc-99m Scintigram Scar

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Introduction: Substrate mapping is the important strategy of the radiofrequency ablation for ventricular tachycardia (VT). Late potential (LP) is one of the VT substrate which indicates the isthmus of VT in the low voltage area. Efficacy of enhanced MRI or CT for prediction of the VT substrate was reported. On the other hands, according to the prior report, Tc-99m scintigram could determinate the viability of ventricular myocardium and could discriminated the low viability area. In this study, we evaluated that we could predict the distribution of LPs with Tc-99m scintigram. Moreover, we evaluated the characteristics of the area where LPs existed.

Methods: In seven patients (age, 66.7 ±8.9 years; 7 male; left ventricular (LV) ejection fraction, 25.5±9.2%; LV volume, 275 ±105ml) with ischemic cardiomyopathy and VT, LV electroanatomical map (EAM) and Tc-99m scintigram were obtained and were divided into twenty segments. LPs were determined as continuous fragmented activities or isolated potentials after the QRS and were evaluated in EAM. The relation between LPs and scintigrafic characteristics were evaluated in total of 140 segments (Figure A).

Result: LPs were recorded in 51 segments. According to the Tc-99m uptake rate, cut off value 34% was set for the prediction of the distribution of LPs with ROC curve (FigureB). LPs were observed in the lower scintigram perfusion segments with ≤34% uptake rate (n=51) more than the segments with >34% uptake rate (n=89) with statistical significance (76.4% vs 13.4% p<0.0001). Especially, in lower scintigram perfusion segments with ≤34% uptake rate (n=51), the mean uptake rate of LPs recorded segments was significantly lower than LPs non-recorded area (20.8% vs 28.2% p=0.0012). Moreover, enhanced cardiac CT was performed in three patients before ablation. The merged 3D images with CT and Tc-99m Scintigram were available. Figure C showed the well coexistence between LP recorded area and low viability area with ≤34% uptake area.

Conclusion: Lower perfusion area of Tc-99m scintigram could be utilized to predict VT substrate location in ICM patients and make the mapping procedure more simple.