

Key Note Lecture

Recent Strategy in Cardiology - How to Visualize Arrhythmias-

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Strategy in the treatment of cardiac diseases have developed greatly recently. We attempted to visualize cardiac arrhythmias by using optical mapping system. 2-dimensional subepicardial myocardium of isolated rabbit hearts were prepared by endocardial cryoablation. The preparations were stained with voltage sensitive dye Di-4-ANEPPS, and fluorescence images were obtained from the anterior side of the heart with the aid of this high-speed digital video camera. Langendorff-perfused rabbit hearts with endocardial cryoablation were stained with a voltage sensitive dye, di-4-ANEPPS (2 μ M). The hearts were illuminated by bluish-green LEDs ($\lambda=500$ nm) and fluorescence images ($\lambda=600$ nm) were recorded by a high-speed digital video camera (256 x 256 pixels, 10 bit gray scale) at a sampling rate of 1,000 frames/s). The spatial and temporal resolution of this optical mapping system is 0.12 mm and 1 ms, respectively. The hearts were paced through a pair of contiguous bipolar electrodes placed on the apex (stimuli; twice the diastolic threshold voltage, 2 ms in duration). The pacing cycle length (CL) was decreased progressively from 400 ms in steps of 50-10 ms (400, 350, 300, 270, 250, 240, 230 ms...) until VF or 2:1 block occurred. Optical action potential signals were recorded under steady-state conditions. VT were induced in 6 hearts by cross-field stimulation, and single- or double-loop spirals circulating around variable functional block lines were visualized during the VT. Nifekalant reduced VT cycle length and caused early termination in association with destabilization of the spiral dynamics (prolongation of functional block line, frequent local conduction block, and extensive meandering). These modifications of spiral-type re-entrant VT by nifekalant were prevented by addition of lidocaine. Optical mapping system is useful to visualize cardiac arrhythmias and analyze mechanisms of arrhythmias and its modulation by drug or other environmental factors.