

Optical Mapping in preclinical evaluation of antiarrhythmic drugs: current and future

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Cardiac arrhythmias often occur in association with cardiovascular diseases. Antiarrhythmic drugs play an essential role in the treatment of arrhythmia. Due to the high spatiotemporal resolution, wide sampling area, and minor damage, optical mapping technology can intuitively and dynamically display the dynamic changes in the heart's overall electrical conduction and calcium processing. It plays an important role and has many advantages in studying the mechanisms of cardiac electrophysiology and arrhythmia. Optical image simultaneously detects high-throughput myocardial membrane potential and calcium transient signals by the fluorescence changes of voltage- and calcium-sensitive dyes. The coupling relationship between membrane clock and calcium clock is essential to clarify the electrophysiological characteristics under drug intervention, which can be used for antiarrhythmic drug screening. It can analyze reentrant excitations around a functional obstacle, the major organization center of life-threatening ventricular tachycardia (VT) and ventricular fibrillation. Therefore, pharmacological regulation of such rotors is the central issue to be resolved for efficient prevention of sudden arrhythmic death. It can also be used to study antiarrhythmic drugs at different levels, single cell layer, myocardial slices, and isolated hearts. Single-cell layer mapping can also evaluate the interaction of electrical signals between cells. For these reasons, optical mapping technology has gradually occupied the leading position in cardiovascular drug research.