Best Abstract Award – Third Prize

Topic: Arrhythmia (Basic), Electrophysiology

3D Ultrastructure of the “Arrhythmogenic” Purkinje Fibre-ventricular Junction in Rabbit Hearts

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Introduction

Ventricular arrhythmias are often associated with advanced heart failure and cardiomyopathies, and potentially originated from the Purkinje-ventricular (PV) junction where fast electric conduction is transferred to functional working myocardium. Despite its well-known electrophysiological property, *in situ* ultrastructure of the PV junction has not yet been studied. Here we analyse 3D nano-architecture of the PV junction in rabbit hearts using Gatan 3View, a serial block face-scanning electron microscopy (SEM).

Methods and Results

Small pieces of the PV junctions were dissected from rabbit hearts in oxygenised Tyrode solution and processed with a modified method for standard SEM preparations. Up to 4,000 consecutive images per resin block were acquired in 3View. IMOD software

was used for segmentation and image processing. Free running Purkinje fibres were spindle-shaped, longitudinally arranged, and formed a bundle enveloped with connective tissue. Mitochondria and myofilaments were not packed but longitudinally aligned. The PV junction was made up of thin layers containing two different cell types. Type I junctional cells were characterised by thick and long column-shaped, whereas type II cells were wide and flat-shaped. PV cells in the both types were exhibited t-tubules, more organised mitochondria and myofilaments, and greater cell volume compared with Purkinje fibres. The junctional cells contacted some ventricular myocytes situated in the deeper layer.

Conclusion

These findings correspond with unique functional features to trigger contraction of large mass of the ventricular myocytes. ■