Molecular mechanisms of ionic remodeling in L-type voltage dependent calcium channel of age-related change in atrial of canine

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Purpose The present study aims to investigate the molecular basis of L-type voltage dependent calcium channel (LVDCC) in adult and aged canine.

Methods The action potential duration (APD_{90}), amplitude of action potential plateau, I_{Ca,L} peak current density were of LVDCC, recorded by patch clamp technique. The mRNA gene and protein expression levels of α1c subunit (CaV1.2), sarcoplasmic reticulum Ca^{2+}-ATPase (SECRA_2), Calpain-I, ryanodine receptor (RYR_2) were detected by semi-quantitative RT-PCR.

Results I_{Ca,L} Peak current density was (-14.04±0.82 pA/pF) in adult group compared with (-8.11±0.54 pA/pF, p<0.05) in the aged group and action potential duration to 90% repolarisation (APD_{90}) of aged group was significantly decreased. The mRNA gene expression levels of CaV1.2 was significantly lower in the aged dogs (0.9±0.35) than in the adult dogs (2.38±0.4, p<0.05), The mRNA gene expression levels of RYR_2 was significantly higher in the aged dogs (4.39±4.68) than in the adult dogs (1.49±1.69, p<0.05), There were not significantly different gene expression levels of SECRA_2 and Calpain-I in two groups; The protein expression levels of CaV1.2 were significantly lower in the aged dogs than in the adult dogs (0.13±0.10 vs 0.29±0.12, p<0.05), The protein expression levels of RYR_2 was significantly higher in the aged dogs than in the adult dogs (0.18±0.21 vs 0.08±0.36, p<0.05), There were not significantly different protein expression levels of SECRA_2 and Calpain-I in two groups.

Conclusion These data suggest that the change of mRNA and protein expression of CaV1.2 and RYR_2 of LVDCC may serve as the molecular basis of I_{Ca,L} remodeling respectively in aged dogs. This plays an important role in the predisposition to developing atrial fibrillation (AF) due to ageing.