Investigation of cardiac morphological and electrophysiological changes of dogs after long time intensive exercise

Authors:
A Polyak¹, A Farkas¹, N Morvay², G Agoston³, A Varga³, I Lepran², I Baczko², A Varro², AS Farkas¹,
¹University of Szeged, 2nd Department of Medicine and Cardiology Centre, Faculty of Medicine - Szeged - Hungary,
²University of Szeged, Department of Pharmacology and Pharmacotherapy, Faculty of Medicine - Szeged - Hungary,
³University of Szeged, Institute of Family Medicine - Szeged - Hungary,

Topic(s):
Basic Science - Cardiac Biology and Physiology: Ion Channels, Electrophysiology

Citation:
Cardiovascular Research (2018) 114 (Supplement 1), S114

Funding Acknowledgements:
This work was supported by the UNKP-17- 4 New National Excellence Program of the Ministry of Human Capacities.

Background: Several tragic sudden deaths involving young athletes have been reported in the recent years. In some of cases the exact cause remains unclear. Apart from the structural disorders, functional remodeling might also lead to life-threatening ventricular arrhythmias under certain circumstances (e.g. altered myocardial repolarization).

Objectives: The effect of long-term strenuous exercise on cardiac morphology and electrical activity was assessed in dogs during treadmill running.

Methods: Body size-matched adult mongrel dogs were randomized into ‘sedentary’, ‘exercised’ and ‘doping’
groups (n=2) that were treated with testosterone-undecanoate on every fourth week (14.3 mg/ttkg).
‘Exercised’ and ‘doping’ groups were trained during a 16-week long treadmill-running protocol.
Echocardiography and resting ECG recording were performed. Proarrhythmic sensitivity was tested (35 µg/kg
dofetilide iv) and the autonomic alterations were examined by a pharmacological parasympathetic inhibition
(0.04 mg/kg atropine-sulfate iv).

Results: Echocardiography presented no difference between the groups compared to the initial measurements.
The length and the variability parameters of the RR intervals were greater in the trained groups. Dofetilide
administration tended to increase the QTc in greater extent both in ‘exercised’ and ‘doping’ groups compared
to ‘sedentary’ group (252.8±13.2 and 251.8±14.6 vs. 221.8±0.8ms). Atropine treatment resulted in moderate
heart frequency increase in the ‘exercised’ and ‘doping’ animals (127.6±11.9 and 135.9±0.9 vs. 166.1±13.5).

Conclusions: The lengthened RR intervals, the increased heart rate variability are the signs of the increased
parasympathetic tone and are characteristics of the exercise-induced autonomic changes. Repolarization
changes may indicate the sensibility of the hearts to arrhythmia, however, further investigations with higher ‘n’
numbers are warranted.