

Comparison of Sports Activity between Ambitious Triathletes with and without Myocardial Late Gadolinium Enhancement

Sunday 1:00-1:30 PM | CA205-SD-SUB1 | CA Community, Learning Center Station #1

PURPOSE

Long-term intensive training leads to functional adaptation of the heart with increase of myocardial mass. Furthermore, myocardial fibrosis occurs in a variable frequency in competitive athletes detected by late gadolinium enhancement (LGE) cardiac MRI (CMR). The purpose of this study was to analyse the differences in sports activity between triathletes with and without LGE.

METHOD AND MATERIALS

55 competitive male triathletes (44 ±10 years) underwent a CMR study performed on a 1.5 T Achieva (Philips). CMR protocol included SSFP cine, LGE imaging as well as T1 mapping. Image analysis was performed on cvi42 (Circle Cardiovascular Imaging). CMR parameters are given as the mean of two independent observers. The parameters of physical fitness were determined by an exercise test. Triathletes reported their sports history with information about the number, distance and duration of events they participated in.

RESULTS

In 10 out of 55 triathletes (18%) a non-ischaemic myocardial fibrosis of the left ventricle (LGE+) was detected. LGE+ triathletes completed significantly longer total (5610 ±3403 vs. 2406 ±2025 km, $p < 0.001$), swimming (64 ±30 vs. 31 ±25 km, $p < 0.01$) and cycling distances (4167 ±3023 vs. 1490 ±1114 km, $p < 0.001$). The LV mass index was significantly higher in LGE+ triathletes (93 ±7 vs. 84 ±11 g/m², $p < 0.05$). Likewise, the extracellular mass index and ECV was significantly higher in LGE+ triathletes (24 ±3 vs. 21 ±3 g/m², $p < 0.01$; 26.1 ±1.8 vs. 24.4 ±2.2 %, $p < 0.05$). LGE+ triathletes had higher peak exercise systolic blood pressure compared to LGE- triathletes (215 ±23 vs. 194 ±26 mmHg, $p < 0.05$). Despite having comparable LVEF (63 ±8 vs. 63 ±5 %), LGE+ triathletes showed significantly higher nt-pro-BNP values (88 ±151 vs. 38 ±31 pg/ml, $p < 0.05$), which had a significantly negative correlation with LVEF.

CONCLUSION

There is high prevalence (18%) of non-ischaemic, myocardial fibrosis among competitive male triathletes. LGE+ triathletes completed significantly longer distances compared to LGE- triathletes in their life-time competition history suggesting that the amount of exercise has an impact on myocardial fibrosis. Further, increase of nt-pro-BNP values in LGE+ triathletes may imply an early sub-clinical impairment of the LV myocardium.

CLINICAL RELEVANCE/APPLICATION

Excess of exercise might lead to myocardial fibrosis.

Prevalence, Localization and Extent of Myocardial Fibrosis in Competitive Triathletes Detected By Late Gadolinium Enhancement

Wednesday 12:15-12:45 PM | CA238-SD-WEA1 | CA Community, Learning Center Station #1

PURPOSE

Myocardial fibrosis occurs in a variable frequency of 3-50% in competitive athletes detected by late gadolinium enhancement (LGE) cardiac MRI (CMR). The purpose of this study was to examine and analyse the prevalence, localisation and extent of myocardial fibrosis in competitive triathletes using LGE CMR.

METHOD AND MATERIALS

55 competitive male (44 ± 10 years) and 30 female triathletes (43 ± 10 years) underwent a CMR study performed on a 1.5 T scanner (Achieva, Philips). The CMR protocol included SSFP Cine and LGE imaging in short and long axis as well as T1 Mapping. CMR data were analysed using cvi42® software (Circle Cardiovascular Imaging, Calgary, Canada). For LGE quantification the threshold method with a cut-off $>5SD$ above remote normal myocardium was used. In addition, the parameters of physical fitness were determined by an exercise test.

RESULTS

CMR revealed LV myocardial fibrosis in 10 of 55 (18%) male, but none of the female triathletes. All LGE+ triathletes revealed a non-ischemic pattern of fibrosis, typically located in the basal (70%) and mid inferolateral segments of the left ventricle. Mean LGE size was 3.2 ± 2.8 %LV (range 0.5 - 9.2 %LV) and 2.7 ± 2.3 g/m² (range, 0.5 - 7.4 g/m²). The LV mass index was significantly higher in male compared to female triathletes (86 ± 11 vs. 67 ± 9 g/m², $p < 0.0001$). The extracellular volume was higher in female compared to male triathletes ($27.8 \pm 1.9\%$ vs. $24.8 \pm 2.2\%$, $p < 0.001$). The life-time competition history showed that the number of completed Iron Man triathlons (4 ± 4 vs. 1 ± 2 , $p < 0.01$) as well as the number of middle distance triathlons (5 ± 4 vs. 2 ± 2 , $p < 0.01$) was significantly higher in the male triathlete population.

CONCLUSION

There is relative high prevalence of myocardial fibrosis (18%) in competitive male triathletes, but not in female triathletes. All LGE+ triathletes revealed a non-ischaeamic pattern of myocardial fibrosis.

CLINICAL RELEVANCE/APPLICATION

The occurrence of non-ischemic LGE in the inferior and lateral LV wall suggests, that this myocardial area is prone to myocardial fibrosis under exercise. Higher sports activity in triathletes is associated with the incidence of LGE.