

Comparison of cardiac biomarker fluctuation in runners of marathons, semi-marathons and untrained runners

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Objectives:

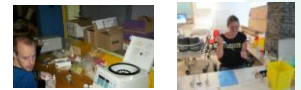
Regular exercise like running is one important part of the prevention program of cardiovascular disease. There are several studies on biomarker changes during marathons especially cardiac biomarkers have been studied and mild to moderate elevations have been described as a results of a running exercise. Exact underlying mechanism for these biomarker elevations reflecting physiological or even pathobiological changes is unknown and less trained athletes might exhibit a higher risk compared to well trained.

Aim of the study:

The aim of our study was to compare three cardiac biomarkers for ischemic condition (Troponin), cardiac stretch (natriuretic peptides) and fibrotic processes (Galectin-3) were tested in different type of runners, trained marathon and semi-marathon runners and untrained runners before, directly after and 3 hours after the running exercise.

Materials and Methods:

- 23 marathon runners(mean age :41± 8.8 yo)
- 15 semi-marathon runners(mean age: 44.1±8.4yo)
- 17 healthy sedentary subjects (mean age: 37± 4.4 yo) (race of 10 km, <2h of sport/week)



Blood samples were taken just before (T0), just after (T1) and 3 hours (T3) after the race, centrifuged, aliquoted and stored frozen at -80C before further analysis. The study was approved by the Ethical Committee of our University Hospital.

The analyses were performed on the Abbott ARCHITECT I2000_{SR} (Abbott Laboratories, Germany) for the hs cTnI, BNP and Gal-3 and on the C8000 (Roche Diagnostics, Switzerland) for hs-cTnT and NT-proBNP according to the manufacturer's instructions for use.

Results:

In all 3 running groups there is an increase of cardiac biomarkers (Table 1) Troponin I (Fig 1) and T (Fig 2), BNP (Fig 3), NT-ProBNP (Fig 4) and Galectine-3 (Fig 5) after completion of the physical exercise. Biomarkers increase is depending on the intensity and duration of the exercise and is higher in long distance marathon and semi-marathon runners compared to the control group with a 1 hour run.

Cardiac biomarker levels between trained marathon and semi-marathon runners were not statistically different in the pre-exercise baseline samples for BNP, NT-Pro-BNP and Galectin-3. Compared to untrained runners only Troponin I levels were higher in baseline sample of marathon runners (hs-cTnI, p<0.03) when compared to controls, cardiac Troponin T (hs-cTnT, p<0.29) was less significant.

Figure 1: TnI kinetic

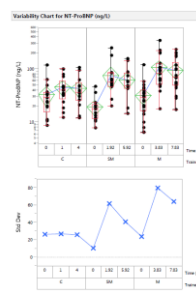


Figure 2: TnT kinetic

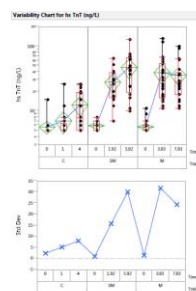


Figure 3: BNP kinetic

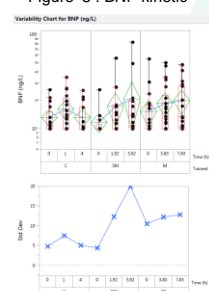


Figure 4: NT-ProBNP kinetic

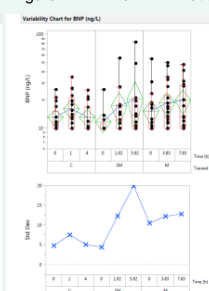


Figure 5: Gal 3 kinetic

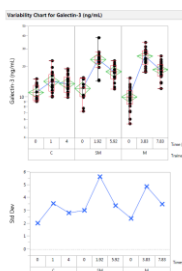


Table 1: Evolution of the different cardiac biomarkers

Time	Runner	hs TnI > 99thile (ng/L) (ICR)	hs TnI Median (ng/L) (ICR)	hs TnT > 99thile (ng/L) (ICR)	hs TnT Median (ng/L) (ICR)	BNP > 25 ng/L (ng/L) (ICR)	BNP Median (ng/L) (ICR)	NT-ProBNP > 125 ng/L (pg/L) (ICR)	NT-ProBNP Median (pg/L) (ICR)	Gal-3 > 97.5 In (25 Tng/L) (ng/L) (ICR)	Gal-3 Median (ng/L) (ICR)
Before exercise	Marathon	1119	4.9 (2.7-6)	2023	<5.0	120	10 (0-18)	923	30 (20-37)	0/20	10 (9-12)
		1119	48.2 (25.81-67)	2023	30.0 (17.0-43.0)*	200	13 (0-21)	623	63 (41-88)*	11/20	27 (22-29)*
		1919	58.5 (31.7-81.3)*	1923	30.0 (18.0-38.0)*	200	13 (0-21)	523	70 (51-88)*	0/20	10 (9-24)*
Directly after exercise	Marathon	2112	3.5 (1.8-7.0)	1915	6.0 (3.0-7.0)	195	10 (0-16)	915	16 (7-21)	0/14	12 (0-16)
		2112	10.2 (6.0-23.0)*	1915	20.0 (10.0-30.0)*	195	12 (0-18)	315	50 (40-70)*	4/14	23 (22-26)*
		9112	36.4 (21.0-61.0)*	1415	45.0 (18.0-68.0)*	315	14 (0-20)	315	49 (43-88)*	0/14	10 (5-24)*
3 hours after end of exercise	Semi-Marathon	0116	2.5 (1.9-3.9)	014	<5.0	017	11 (0-15)	017	29 (19-36)	0/17	10 (9-13)
		0116	43.0 (23.5-71)	014	53.0 (30-81)	017	13 (0-20)	017	45 (25-69)	0/17	14 (12-16)
		1116	10.4 (6.8-17.0)	014	8.0 (5.0-15.0)*	017	10 (0-17)	017	37 (27-48)	0/17	13 (11-15)
Before exercise	Untrained	0116	2.5 (1.9-3.9)	014	<5.0	017	11 (0-15)	017	29 (19-36)	0/17	10 (9-13)
		0116	43.0 (23.5-71)	014	53.0 (30-81)	017	13 (0-20)	017	45 (25-69)	0/17	14 (12-16)
		1116	10.4 (6.8-17.0)	014	8.0 (5.0-15.0)*	017	10 (0-17)	017	37 (27-48)	0/17	13 (11-15)

Conclusions: Our study demonstrates that exercises of different intensity can be associated with biochemical abnormalities that may reflect adverse consequences on the heart like possible micro necrosis, oxidative stress, fibrosis and myocardial stretch.