



Artery Research

ISSN (Online): 1876-4401

ISSN (Print): 1872-9312

Journal Home Page: <https://www.atlantis-press.com/journals/artres>

3.6: THE “MARATHON PARADOX”: DECREASED INTIMA-MEDIA THICKNESS AND IMPROVED FLOW-MEDIATED DILATATION, BUT INCREASED AORTIC STIFFNESS

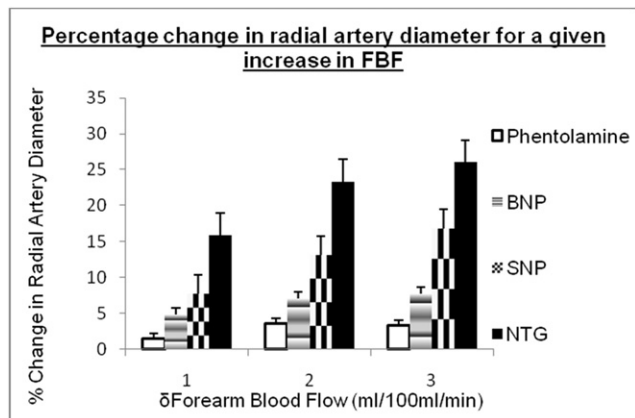
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To cite this article: D. Kardara, C. Vlachopoulos, D. Terentes-Printzios, P. Xaplanteris, N. Ioakeimidis, C. Stefanadis (2011) 3.6: THE “MARATHON PARADOX”: DECREASED INTIMA-MEDIA THICKNESS AND IMPROVED FLOW-MEDIATED DILATATION, BUT INCREASED AORTIC STIFFNESS, Artery Research 5:4, 142–142, DOI: <https://doi.org/10.1016/j.artres.2011.10.218>

To link to this article: <https://doi.org/10.1016/j.artres.2011.10.218>

Published online: 14 December 2019

efficacy of dilation of the radial artery was NTG>NP >BNP>PHT. Radial artery dilation by NTG and NP but not BNP was greater than that by PHT ($P<0.05$) and radial dilation by NTG greater than that by BNP ($P<0.05$). These results demonstrate that drugs acting on the guanylyl cyclase – cGMP pathway have differential actions on muscular conduit arteries.



3.6

THE "MARATHON PARADOX": DECREASED INTIMA-MEDIA THICKNESS AND IMPROVED FLOW-MEDIATED DILATATION, BUT INCREASED AORTIC STIFFNESS

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Background: Arterial stiffness, wave reflections, endothelial dysfunction and carotid intima-media thickness (cIMT) are predictors of cardiovascular events. Marathon running is an extremely vigorous aerobic exercise.

Methods: We enrolled 3 groups of regularly-trained marathon runners and 3 groups of matched recreationally-active controls. Aortic stiffness was evaluated with carotid-femoral pulse wave velocity (PWV), wave reflections with augmentation index (AIx), endothelial function with flow-mediated dilation (FMD) and nitroglycerine-mediated dilatation (NMD) of the brachial artery and early atherosclerosis with cIMT. PWV was studied in 49 runners (trained for 11.6 ± 9.1 years) and 46 controls. IMT was measured in 36 runners (trained for 13.1 ± 9.5 years) and 19 controls. FMD and NMD were assessed in 21 runners (trained for 14.5 ± 8.5 years) and 17 controls.

Results: Marathon runners had significantly higher systolic, diastolic, pulse (aortic and brachial) and mean pressures ($P<0.05$ for all) and higher PWV compared to controls (6.89 ± 1.0 m/s vs. 6.33 ± 1.03 m/s, $P<0.01$). Athletes exhibited lower cIMT (0.58 ± 0.10 mm vs 0.63 ± 0.80 mm, $P<0.05$) and higher FMD ($8.59\pm 4.1\%$ vs $6.25\pm 1.6\%$, $P<0.05$). AIx, AIx@75 and NMD did not differ. **Conclusion:** While marathon runners have higher FMD and decreased IMT compared to controls, indicating better endothelial function and lower subclinical atherosclerosis, they also have increased PWV. Increased aortic stiffness may be the result of elastic component damage due to excessive exercise burden; however, it may also represent an adaptive process that leads to a higher, but favorable -for this type of running- travel for waves, and possibly relates to why marathon runners reach their peak later in life compared to other athletes.

Oral Session 5

Free Oral Communications

In association with 'Pulse of Asia'

5.1

COMMON CAROTID ARTERY PROPERTIES ARE RELATED TO SYMPATHETIC OUTFLOW AND CARDIOVASCULAR VARIABILITY

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Objective: The relationship between sympathetic activity and common carotid artery (CCA) properties is unknown. We therefore tested the

hypothesis that mechanical properties of arterial wall are independently linked to muscle sympathetic nerve activity (MSNA) and cardiovascular variability.

Design and Methods: We measured MSNA (microneurography), heart rate (ecg), arterial pressure (Finapres) and CCA properties (ART.LAB system) in 20 subjects with high normal blood pressure and newly detected stage 1 hypertension (18 males, age 36 ± 2 years, BMI 27 ± 1 kg/m², mean \pm SEM). SBP and RR-interval variabilities were defined as the standard deviation of the means.

Results: MSNA averaged 27 ± 3 bursts/min., mean CCA intima-media thickness (IMT) was 0.57 ± 0.03 mm, carotid distension was 499 ± 27 μ m, systolic (S) Carotid Wall Stress (CWS) was 119 ± 6 kPa, pulsatile (P) CWS was 46 ± 3 kPa. CCA IMT was related to MSNA ($r=0.54$; $P<0.01$), and SCWS ($r=-0.84$; $P<0.0001$), but not to variability of SBP ($r=-0.27$; $P=NS$) or RR-interval ($r=-0.26$; $P=NS$). MSNA was associated with reduction in carotid distension waveform ($r=-0.54$; $P<0.01$), SCWS ($r=-0.45$; $P<0.05$) and PCWS ($r=-0.57$; $P<0.01$). CWS was not linked to variability of SBP or RR-interval. Changes in CCA diameter were positively related to RR-variability ($r=0.49$; $P<0.05$), but not to variability of SBP ($r=0.3$; $P=NS$). The correlations between MSNA and CCA properties remained significant after adjustment for age, body mass index and blood pressure.

Conclusions: (1) Distension of the common carotid artery is related to muscle sympathetic nerve activity and cardiovascular variability. (2) Intima-media thickening and carotid wall stress are linked to sympathetic activation, but not to altered cardiovascular variability.

5.2

ARTERIAL STIFFNESS IS A MAJOR INDEPENDENT DETERMINANT OF VISIT-TO-VISIT VARIABILITY IN SBP: A 9.1 YEAR FOLLOW-UP IN TREATED HYPERTENSIVES

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Objective and background: Aortic stiffening, which favours the wave propagation generated by changes in cardiac output, and exaggerates the early return of wave reflection generated by changes in vasomotor tone, can increase the variability in SBP.

Methods: Aortic stiffness was determined through carotid-femoral pulse wave velocity (PWV) in 95 patients (age 62.9 ± 10.8 years) who attended the outpatient hypertension clinic at Pompidou hospital during a total follow-up of 9.1 ± 3.6 yrs. PWV was determined after 5.5 ± 2.7 yrs. Visit-to-visit variability in office SBP was expressed as standard deviation (SD) of measurements and SD/mean, and calculated during the entire follow-up (FU). 8.5 ± 4.8 visits occurred before PWV measurements, and 6.4 ± 5.4 visits after.

Results: SD of SBP was 13.5 ± 4.3 mmHg during FU. PWV was 11.4 ± 2.7 m/s. In univariate analysis, SD-SBP during FU was significantly related to PWV ($P=0.0007$), age ($P=0.021$), SBP ($P=0.033$), MBP ($P=0.0016$) and diabetes ($P=0.045$). In multivariate robust regression analysis, PWV was a major determinant of SD-SBP ($P=0.018$) during FU, explaining 11.2% of SD-SBP variance (and 51% of explained variance), independently of age, gender, SBP, HR, BMI, diabetes, and dyslipidemia, which were not significantly associated with SD-SBP. Similar findings were observed when SD/mean of SBP was used instead of SD-SBP.

Conclusion: Aortic stiffness was a strong independent determinant of visit-to-visit variability in SBP, whereas no classical CV risk factor was associated with SD-SBP in multivariate models. These results suggest that antihypertensive treatment should aim at normalizing aortic stiffness to better reduce visit-to-visit SBP variability.

5.3

DISTANCE MEASUREMENT FOR PULSE WAVE VELOCITY CALCULATION – COMPARISON WITH INVASIVE FINDINGS

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Background: A more simple yet accurate method for assessing travel distance (TD) for calculation of carotid-femoral pulse wave velocity (cfPWV) is desirable to improve acceptance of the method in clinical routine.

Methods: We compared the following methods for assessment of TD, as performed during non-invasive measurement of cfPWV with the SphygmoCor