



## Artery Research

ISSN (Online): 1876-4401

ISSN (Print): 1872-9312

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

---

### **PO-32: DIETARY CALCIUM INTAKE AND CARDIOVASCULAR HEALTH: IS THERE ANY RELATIONSHIP?**

Shubhabrata Das, Yessica-Haydee Gomez, David Goltzman, Angel M. Ong, Yessica H. Gomez, Jessica Gorgui, Michelle Wall, Suzanne N. Morin, Stella S. Daskalopoulou

**To cite this article:** Shubhabrata Das, Yessica-Haydee Gomez, David Goltzman, Angel M. Ong, Yessica H. Gomez, Jessica Gorgui, Michelle Wall, Suzanne N. Morin, Stella S. Daskalopoulou (2016) PO-32: DIETARY CALCIUM INTAKE AND CARDIOVASCULAR HEALTH: IS THERE ANY RELATIONSHIP?, Artery Research 16:C, 97–98, DOI: <https://doi.org/10.1016/j.artres.2016.08.035>

**To link to this article:** <https://doi.org/10.1016/j.artres.2016.08.035>

Published online: 7 December 2019

arteries. Following an initial recording, the cuffs were switched and a second series of continuous waveforms were acquired. Phonocardiograms were continuously acquired to determine timing of aortic valve closure. All PWA variables were averaged across the standard- and switched-cuff configurations to minimize the impact that slight variations in cuffs may impart on recordings. Extracted PWA variables include (1) brachial form factors (bFF), (2) heart-brachial transit time (hb-TT), and (3) brachial augmentation index (bAlx).

**Results:** Paired t-test revealed no statistically significant differences in left and right pulse waveform features ( $P>0.05$  for bFF, hb-TT, bAlx). Bland-Altman analysis revealed no significant bias in extracted waveform features between each arm (mean bias [limits of agreement] = 0.3 [-3.2, 2.7]%, -2.65[-1571.1, 1041.1] msec, 0.3[-1.15, 1.21]% for bFF, hb-TT, and bAlx, respectively).

**Conclusion:** No significant systematic differences exist between left and right pulse waveforms. Despite minor differences in arterial pathways between left and right brachial arteries, we found agreement in PWA variables between both arms. The side of measurement did not influence pulse waveform analysis results in this clinical sample.

#### PO-27

#### A NEW SOFTWARE FOR DETERMINING CHANGES IN ARTERIAL DIAMETER OVER TIME

Ka Zuj <sup>1</sup>, J. Deglint <sup>2</sup>, A. Gawish <sup>2</sup>, A. Wong <sup>2</sup>, D. A. Clausi <sup>2</sup>, R. L. Hughson <sup>1</sup>

<sup>1</sup>Schlegel-University of Waterloo Research Institute for Aging, Waterloo, ON, Canada

<sup>2</sup>Department of Systems Design Engineering, University of Waterloo, Waterloo, ON, Canada

**Objectives:** The purpose was to investigate the ability of a new software, developed by our group, to provide continuous measures of arterial diameter from recorded ultrasound video.

**Methods:** Software (MAUI) was developed to assess arterial diameter using active contours to accurately detect the vessel walls in recorded ultrasound video. Ultrasound imaging was used to acquire longitudinal, B-Mode images of the common carotid artery (CCA) with videos recorded for later analysis. A single recorded 10s video was used to gain an indication of the reproducibility and repeatability of MAUI. For this assessment, two investigators (E1 and E2) each performed 10 measurements of the test video using the MAUI software. MAUI was then used to process several longer videos (~5min) to assess the ability of the software to continuously process data over longer periods of time.

**Results:** MAUI provided a measurement of vessel diameter (media to media border) for each frame of the recorded video. The ten assessments of the test video resulted in average standard deviation of  $0.002\pm0.003$ cm for E1 and  $0.003\pm0.003$ cm for E2 for each frame measurement. Overall analysis of the test video resulted in an average diameter, measured across eight cardiac cycles, of  $0.781\pm0.0005$ cm and  $0.780\pm0.0007$ cm for E1 and E2 respectively. Measures by E1 and E2 ranged from 0.781 to 0.782cm and 0.779 to 0.781cm respectively. When processing the 5min videos, MAUI was able to continuously track the vessel walls throughout the entire video.

**Conclusions:** Preliminary assessments suggest that MAUI software represents a viable method for the continuous assessment of arterial diameter over time with high repeatability and low interrater variability. Use of this software may be especially applicable for studies investigating acute changes in vessel dimensions as well as the study of vascular properties in health and disease.

Supported by the Canadian Space Agency and NSERC

#### PO-30

#### EFFECT OF LOW-DOSE ACETYLSALICYLIC ACID ON ARTERIAL STIFFNESS IN HIGH-RISK PREGNANCIES: AN OBSERVATIONAL LONGITUDINAL STUDY

Kim Phan <sup>1</sup>, Yessica-Haydee Gomez <sup>1</sup>, Amira El-Messidi <sup>2</sup>, Robert Gagnon <sup>2</sup>, Stella S. Daskalopoulou <sup>1</sup>

<sup>1</sup>Department of Medicine, Faculty of Medicine, McGill University, Montreal, Quebec, Canada

<sup>2</sup>Department of Obstetrics and Gynecology, Royal Victoria Hospital, McGill University, Montreal, Quebec, Canada

**Objectives:** Low-dose acetylsalicylic acid (ASA) has been shown to reduce the risk for pre-eclampsia in high-risk pregnancies when prescribed before 16 weeks of gestation. It remains unknown whether this anti-inflammatory agent has effects on arterial stiffness. Our objective was to characterize arterial stiffness indices throughout pregnancy in women with high-risk pregnancies who were and were not prescribed low-dose ASA.

**Methods:** In this prospective longitudinal study, women with high-risk singleton pregnancies were recruited from obstetrical clinics in Montreal, Canada. Arterial stiffness was measured using applanation tonometry (SphygmoCor; AtCor)

in the 1<sup>st</sup> trimester, every 4 weeks thereafter until delivery, and at 6 weeks' post-partum. Arterial stiffness was compared between women who were prescribed low-dose ASA (81 mg) before 16 weeks' gestation and women who were not prescribed any prophylactic medication for pre-eclampsia.

**Results:** Of the 152 participants who delivered in this ongoing study, 26 women were prescribed ASA. Longitudinal analyses adjusted for family history of pre-eclampsia, past history of pre-eclampsia, and development of an outcome showed no significant differences in carotid-femoral pulse wave velocity (cfPWV), carotid-radial PWV, augmentation index adjusted for a heart rate of 75 beats per minute, or start time of wave reflection (T1R) throughout pregnancy in women who were taking low-dose ASA ( $p > 0.05$ ). Additionally, 13 women developed pre-eclampsia and ASA did not confer any significant change in adjusted odds for the complication (OR: 4.85 95% CI: 0.5 – 41;  $p = 0.15$ ).

**Conclusion:** In this high-risk pregnant population, ASA before 16 weeks' gestation was not associated with differences in arterial stiffness or wave reflection throughout pregnancy and did not have an effect on the odds for developing pre-eclampsia. Our ongoing study will provide definite evidence on the association between ASA use and arterial stiffness.

#### PO-31

#### EFFECT OF POOR GLYCEMIC CONTROL ON ARTERIAL STIFFNESS IN PREGNANCY

Kim Phan <sup>1</sup>, Yessica-Haydee Gomez <sup>1</sup>, Mohamed Salah Al-azzawi <sup>1</sup>, Amira El-Messidi <sup>2</sup>, Stella S. Daskalopoulou <sup>1</sup>

<sup>1</sup>Department of Medicine, Faculty of Medicine, McGill University, Montreal, Quebec, Canada

<sup>2</sup>Department of Obstetrics and Gynecology, Royal Victoria Hospital, McGill University, Montreal, Quebec, Canada

**Objectives:** Poor glycemic control during pregnancy is associated with increased adverse perinatal outcomes. Our objective was to characterize the association between glycemic control and arterial stiffness in pregnancy.

**Methods:** In this prospective longitudinal study, women with high-risk singleton pregnancies were recruited from obstetrical clinics in Montreal, Canada. Arterial stiffness was measured in women with gestational diabetes (GDM) or pre-existing diabetes mellitus (DM) using applanation tonometry (SphygmoCor; AtCor) starting at 24 weeks' gestation (the period at which GDM screening is performed for all women according to standard clinical practice) and every 4 weeks thereafter until delivery. Arterial stiffness indices were compared between women with poor glycemic control and women with adequate glycemic control. Poor glycemic control was defined as average HbA1C > 7%, average fasting glucose > 5.3 mmol/L, average 1h post-prandial glucose > 7.8 mmol/L, insulin dosage > 30 units, large for gestational age fetus, or maximal vertical pocket > 8 cm.

**Results:** Of the 35 women who delivered in this ongoing study and had GDM ( $n=18$ ) or DM ( $n=17$ ), 12 had poor glycemic control throughout their pregnancy. Longitudinal analyses adjusted for maternal age, body mass index, and medical history, showed women with poor glycemic control had significantly increased carotid-radial pulse wave velocity (PWV) at each timepoint: 26-30 weeks: 8.4 vs. 8.0 m/s,  $p = 0.04$ ; 30-34 weeks: 8.4 vs. 8.1 m/s,  $p <0.01$ ; 34-38 weeks: 8.5 vs. 8.1 m/s,  $p = 0.02$ . No differences were found in carotid-femoral PWV, augmentation index adjusted for a heart rate of 75 beats per minute, or start time of wave reflection between these 2 cohorts.

**Conclusion:** Women who had poor glycemic control throughout pregnancy showed increased peripheral arterial stiffness from the late 2<sup>nd</sup> trimester until delivery. Our ongoing study will provide more definitive conclusions with increased population size.

#### PO-32

#### DIETARY CALCIUM INTAKE AND CARDIOVASCULAR HEALTH: IS THERE ANY RELATIONSHIP?

Shubhabrata Das <sup>1,2</sup>, Yessica-Haydee Gomez <sup>2</sup>, David Goltzman <sup>3</sup>, Angel M. Ong <sup>2,4</sup>, Yessica H. Gomez <sup>2</sup>, Jessica Gorgui <sup>5</sup>, Michelle Wall <sup>2</sup>, Suzanne N. Morin <sup>2,6</sup>, Stella S. Daskalopoulou <sup>1,2,6</sup>

<sup>1</sup>Division of Experimental Medicine, Department of Medicine, McGill University, Montreal, Canada

<sup>2</sup>Cardiovascular Health Across Lifespan Program, Research Institute of the McGill University Health Centre, McGill University Health Centre Research Institute, Montreal, Canada

<sup>3</sup>Departments of Medicine and Physiology, McGill University, Montreal, Canada

<sup>4</sup>School of Dietetics and Human Nutrition, McGill University, Sainte-Anne-de-Bellevue, Canada

<sup>5</sup>Department of Pharmaceutical Science, Faculty of Pharmacy, Université de Montréal, Montreal, Canada

<sup>6</sup>Division of Internal Medicine, Department of Medicine, McGill University, Montreal, Canada

**Introduction:** Calcium intake, recommended for osteoporosis prevention, has been associated with cardiovascular (CV) outcomes. We examined the association of dietary calcium intake (dCa) with surrogate CV markers, including carotid intima-media thickness (cIMT), arterial stiffness and hemodynamics in healthy postmenopausal women.

**Methods:** Healthy postmenopausal women without any CV risk factors, from a randomized controlled trial studying the effect of calcium supplementation vs. dietary calcium on vascular health, were recruited. Cross-sectional analyses of baseline data of the participants are presented. Peripheral systolic and diastolic blood pressures (pSBP, pDBP) were measured by BpTRU. cIMT of both common-carotid arteries was measured by B-mode ultrasonography (Philips-iU22). Arterial stiffness (carotid-to-femoral pulse wave velocity [cfPWV] and carotid-to-radial PWV), central SBP and DBP (cSBP, cDBP), mean arterial pressure (MAP), and hemodynamic parameters (pulse pressure, augmentation pressure, augmentation index corrected for 75 bpm) were obtained non-invasively (SphygmoCor). Usual dCa intake was estimated using a validated food frequency questionnaire. Measurements were compared across groups (<600, 600-1000 and >1000 mg/day of dCa) by one-way analysis of variance and covariance.

**Results:** We evaluated 83 postmenopausal women (mean age  $60.4 \pm 6.3$  years; BMI  $25.6 \pm 3.8$  kg/m<sup>2</sup>). Mean dCa was  $857 \pm 333$  mg/day. Although within normal range, vascular parameters had a non-significant, U-shaped relationship with dCa. In unadjusted analyses, women with dCa >1000 mg/day had significantly higher cfPWV, pSBP, cSBP, and MAP compared to those with 600-1000 mg/day; however, significance was lost for all other parameters except for MAP after adjustment for pertinent covariates (Table).

**Conclusion:** In healthy postmenopausal women, a non-significant, U-shaped relationship of vascular parameters across the 3 dCa groups was noted; dietary calcium may have favourable effect on MAP for those consuming 600-1000 mg/day compared to >1000 mg/day intake. Of note, our population had optimal/normal BP. Our ongoing study including a larger sample-size will determine the relationship between dCa and surrogate CV markers.

### PO-33

#### STATIN THERAPY IN RHEUMATOID ARTHRITIS MAY IMPROVE ARTERIAL STIFFNESS IN WOMEN BUT NOT IN MEN: A PRELIMINARY ANALYSIS

Yessica-Haydee Gomez <sup>1</sup>, Shubhabrata Das <sup>2</sup>, Jessica Gorgui <sup>1</sup>, Ines Colmegna <sup>3</sup>, Stella S. Daskalopoulou <sup>1,2,4</sup>

<sup>1</sup>Cardiovascular Health Across Lifespan Program, Research Institute of the McGill University Health Centre, Montreal, Quebec, Canada

<sup>2</sup>Division of Experimental Medicine, Department of Medicine, Faculty of Medicine, McGill University, Montréal, Québec, Canada

<sup>3</sup>Division of Rheumatoid Arthritis, Department of Medicine, Faculty of Medicine, Research Institute of the McGill University Health Centre, Montréal, Québec, Canada

<sup>4</sup>Division of Internal Medicine, Department of Medicine, Faculty of Medicine, McGill University Health Centre, Montréal, Québec, Canada

**Objectives:** Patients with rheumatoid arthritis are at increased risk for cardiovascular disease. Statins have anti-inflammatory and immunomodulatory effects, thereby reducing cardiovascular risk. Arterial stiffness is a composite indicator of cardiovascular health and a predictor of cardiovascular risk. We assessed the effect of statin therapy on arterial stiffness and hemodynamics in subjects with rheumatoid arthritis.

**Methods:** A prospective cohort study including adults with rheumatoid arthritis and an indication for statin therapy (cases) or not (controls) is being conducted. Peripheral systolic and diastolic blood pressures were measured by BpTRU. Arterial stiffness (carotid-to-femoral pulse wave velocity [cfPWV] and carotid-to-radial PWV), central systolic and diastolic blood pressures, mean arterial pressure, and augmentation index corrected for 75 bpm were obtained non-invasively (SphygmoCor, AtCor, Australia). All measurements were performed prior to statin initiation and at 6-month post-treatment. Independent t-tests evaluated differences in changes between groups. Carotid intima-media thickness (cIMT) measurements were also performed.

**Results:** To date, 14 subjects (mean age  $61.4 \pm 9.5$  years, 9 females), have completed the study. All cases achieved recommended lipid level targets by 6 months. There were no statistical differences in patient characteristics (beyond lipid levels) at baseline or 6-months between cases and controls

among the whole cohort. In sex-specific analyses, statin therapy was associated with a significant decrease in cfPWV in women taking statins compared to women in the control group ( $-0.71 \pm 0.18$  m/s vs  $+0.96 \pm 1.13$  m/s, respectively;  $p < 0.05$ ), which was not observed in men. No other associations were observed. cIMT analyses are underway.

**Conclusion:** Our preliminary results suggest that in women with rheumatoid arthritis, statin therapy may reduce cfPWV, a predictive marker of cardiovascular disease and events, which was not observed in men. Whether sex differences in the effect of statin on arterial stiffness are sustained with a larger sample size of rheumatoid arthritis patients will be addressed in our ongoing study.

### PO-35

#### FIRST IN MAN MEASUREMENT OF ARTERIAL STIFFNESS USING A CONNECTED BATHROOM SCALE: CALIBRATION AGAINST SPHYGMOCOR

Pierre Boutouyrie, Hakim Khettab, David Campo, Roger Yu, Nadine Buard AP-HP, Pharmacology Unit, Hôpital Européen Georges Pompidou, INSERM, U970, Paris Cardiovascular Research Center—PARCC, University Paris Descartes, Sorbonne Paris Cité, Paris, Withings, Issy le Moulineaux, France

**Background:** Measurement of arterial stiffness (AS) is still considered difficult. We developed a non-invasive technique to assess AS from a connected bathroom scale, based on ballistocardiography (BCG) and impedance plethysmography (IPG).

**Methods:** We included 192 subjects and patients, 106 for calibration study (cal), 86 for validation study (val), 33% hypertensives, mean age  $48 \pm 17$  years, 48% women. The scale pulse transit time (WS-PTT) was calculated as the difference between BCG systolic signals and IPG blood flow in the foot. Distance was estimated from body height and PWV was calculated. Carotid to femoral transit time (CF-PTT) was measured using SphygmoCor. Spearman and robust multivariate regressions were used.

**Results:** The WS-PTT correlated well with CF-PTT with  $R = 0.73$  in pooled population (cal 0.79, val 0.66). WS-PWV correlated with CF-PWV with  $R = 0.76$  (cal 0.80, val 0.70). The standard deviation of difference was 1.39 m/s with a bias of 0.25 m/s compared with CF-PWV. Correlations of WS-PWV with age and blood pressure were similar ( $R = 0.72$  and 0.59, resp.) to those of CF-PWV ( $R = 0.67$  and 0.61, resp.). These good correlations were non-trivial given the differences in wave paths, the fact that measurements are made in orthostatic position and totally investigator-free.

**Conclusion:** We show in two distinct populations that a simple user-oriented instrument such as a connected bathroom scale can estimate arterial stiffness with accuracy close to healthcare-oriented systems. Because these devices will be used by the general population, the availability of arterial stiffness data on very large, non-medicalized populations will change our management of well-being and health.

### PO-36

#### EFFECTS OF FIXED VERSUS AUTO-TITRATING CONTINUOUS POSITIVE AIRWAY PRESSURE ON VASCULAR FUNCTION IN PATIENTS WITH RESISTANT HYPERTENSION AND OBSTRUCTIVE SLEEP APNEA

Karen Tran <sup>1</sup>, R. J. Kimoff <sup>2,3</sup>, S. S. Daskalopoulou <sup>2</sup>

<sup>1</sup>Department of Medicine, University of British Columbia, Vancouver, British Columbia, Canada

<sup>2</sup>Department of Medicine, Faculty of Medicine, McGill University, Montréal, Québec, Canada

<sup>3</sup>Respiratory Division and Sleep Laboratory, McGill University Health Centre, Montréal, Quebec, Canada

**Introduction:** Obstructive sleep apnea (OSA) is a common cause of resistant hypertension. We investigated the effects of 2 modalities of positive airway pressure; fixed continuous airway pressure (fCPAP) versus auto-titrating positive airway pressure (APAP) on arterial function in subjects with resistant hypertension and severe OSA.

**Objective:** To assess in participants with resistant hypertension and OSA the effects of fCPAP vs. APAP on 24h ambulatory blood pressure monitoring (ABPM), as well as sleep indices, heart rate variability (HRV), and arterial stiffness.

**Methods:** We randomized 14 subjects ( $56 \pm 11$  years, baseline SBP and DBP  $137 \pm 10$  and  $77 \pm 12$  mm Hg, respectively, apnea-hypopnea index [AHI]  $58 \pm 31$  events/h, Epworth sleepiness scale  $7 \pm 5$ ) to fCPAP or APAP for 6 weeks, followed by crossover to the other modality for another 6 weeks. Overnight polysomnography, 24h ABPM, HRV, and carotid-femoral pulse wave velocity (cfPWV, arterial stiffness 'gold-