COMPARISON OF THE OSCILLOMETRICALLY MEASURED AORTIC PULSE WAVE VELOCITY, AUGMENTATION INDEX AND CENTRAL SYSTOLIC BLOOD PRESSURE BETWEEN PATIENTS WITH ACUTE CORONARY SYNDROME AND CHRONIC CORONARY SYNDROME

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Coronary heart disease (CHD) has remained the world's biggest killer, responsible for 16% of the global mortality, with an increase in deaths by more than 2 million to 8.9 million deaths from 2000 till 2019 [1].

Despite the achievements of contemporary cardiovascular medicine, we treat already manifested coronary artery disease and related complications, while primary prevention remains the ideal [2].

Modern pharmacological and non-pharmacological strategies have proved efficacious in reducing the incidence of adverse cardiovascular events. The aim is to foresee these events for early intervention before complications have occurred [3-5].

Emerging evidence over the last two decades indicates that arterial stiffness is one of the earliest markers of arteriosclerosis, which is associated with worse cardiovascular outcomes, independent of traditional risk factors. Attention has focused on the impact of the arterial remodeling (arterial stiffness) process on the development of atherosclerosis and its progression, especially on atherosclerotic plaque vulnerability [6-22].

The term "vulnerable plaque" has been used to define a plaque prone to rupture. However, apart from rupture, the "vulnerability" includes plaque erosion and plaque calcification, as well [23].

The vulnerable plaque with a large lipid core (foam cells, apoptotic/necrotic cells, and debris) [24] is separated from the lumen by a fibrous cap (mainly comprising collagen, proteoglycans, and smooth muscle cells) [25,26]. The adverse impact of different stressors (including arterial stiffness) on the plaque results in fissuring of the fibrous cup, thrombus formation, and therefore in Acute Coronary Syndrome [27,28].

The most frequently used measure for describing arterial stiffness is the pulse wave velocity (PWV), which is the measured speed of arterial pressure waves traveling along the aorta and large arteries [29-32].

Recent studies have revealed a strong positive association between Coronary Artery Disease (CAD) severity and Pulse Wave Velocity (PWV), using carotid-femoral PWV (cfPWV) [17,33-38] or brachial-ankle PWV (baPWV).

Few studies are using oscillometrically measured Aortic Pulse Wave Velocity (aPWV) in patients with atherosclerotic cardiovascular disease (ASCVD). Böcskei et al. reported that oscillometrically PWVao proved to be an independent marker of asymptomatic carotid atherosclerosis (ACA) in a middle-aged, apparently healthy population.

Hlimonenko et al. evaluated patients with severe Coronary Heart Disease (CAD) and showed significantly increased oscillometrically measured Aortic PWV (aPWV) and Augmentation Index (Aix) in the CAD patients compared with that in the control group.

Elmenhorst et al. compared two techniques to measure PWV (ultrasound-measured local PWV (PWVβ) at the carotid artery and aortic PWV (aPWV), measured oscillometrically on the brachial artery) and showed the superiority of PWVa on PWVβ in the assessment of normal and altered vascular function.was possible with aPWV but not with PWVβ.

Mechanisms linking Pulse Wave Velocity (PWV) with atherosclerosis are unclear. It seems that increased arterial stiffness leads to hemodynamic alterations with left ventricular hypertrophy, reduced coronary perfusion, and increased permeability of the blood-brain barrier (BBB). All of these changes lead to the progression of atherosclerosis. Shared risk-factors (age, hypertension, diabetes mellitus, smoking, dyslipidemia, inflammation, etc.) with vascular remodeling, accumulation of extracellular matrix (ECM), endothelial dysfunction and oxidative stress accelerates the progression of atherosclerosis and adverse cardiovascular events [6].

The specific aim of the present study has been to compare the oscillometrically measured parameters of aortic stiffness between patients with Acute Coronary Syndrome (ACS) and patients with stable ischemic heart disease (SIHD). These findings could help assess the risk stratification and prevention of Acute Coronary Syndrome (ACS).

Material and methods. The study sample consisted of 191 patients who were divided into two groups: Group 1 - 100 patients with Acute Coronary Syndrome (ASC) and Group 2 -91 patients with Chronic Coronary Syndrome (CCS) admitted to the coronary care unit (CCU) of LTD Clinic-LJ (Kutaisi, Georgia) between April 2018 and June 2019, and underwent successful primary percutaneous coronary intervention (PCI). In patients with Chronic Coronary Syndrome (CCS) invasive coronary angiography with revascularization was performed in case of high clinical likelihood of obstructive coronary artery disease (OCAD) and severe symptoms refractory to optimal medical treatment, or typical angina at a low level of exercise and clinical prediction of high-risk of events, or left ventricular dysfunction suggestive of CAD.

Patients with a history of coronary revascularization, or with hemodynamically compromised severe myocardial infarction; those recovering cardiopulmonary arrest, decompensated heart failure; and those with valvular heart disease, cardiomyopathy, severe supraventricular/ventricular arrhythmias (including atrial fibrillation) and conductivity disturbances, end-stage renal disease (ESRD), chronic inflammatory conditions, active cancer, type 1 diabetes mellitus (DM) or decompensated type 2 diabetes mellitus (DM); pregnancy; those on hormone replacement therapy (HRT) or oral contraceptive assumption were excluded from the study. No corrections or changes had been made in the ongoing pharmacotherapy of patients. All essential laboratory tests and oscillometrically measurement of brachial Aortic Pulse Wave Velocity (PWVao), Central Systolic Blood Pressure (SBPao), and Aortic Augmentation Index (AIXao) were performed during the first hour of admission.

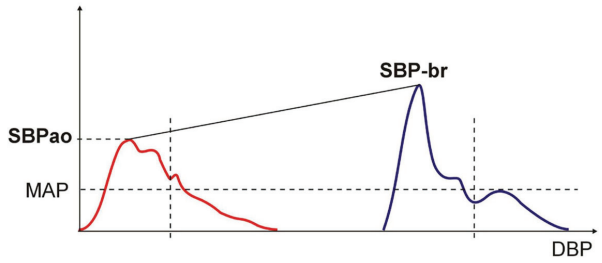
The study was approved by the ethics committee (EC) of Tbilisi State Medical University (TSMU) and local EC of LTD Clinic-LJ and written informed consent was provided by each study participant.

The oscillometric arterial stiffness measurement. The enrolled patients' arterial stiffness was assessed by oscillometrically measured complex arterial function using the TENSIOMED Arteriograph (LTD TENSIOMED, THE ARTERIOGRAPH Company, Germany. Web: www.arteriograph.de. Arteriograph Software v.3.0.0.4) automatic (user independently), non-invasive device.

The Arteriograph device provides below listed parameters based on a simple upper arm cuff measurement during 2 minutes:

- Central Systolic Blood Pressure (SBPao)

SBPao is the pressure in the aorta, result of the ejected stroke volume, dampening function of large arteries, and propagative/reflected pressure waves. The changes in SBPao (physiologically is lower than the brachial systolic blood pressure (Pic 1) have a strong predictive value independent of the corresponding peripheral (brachial) blood pressure.



Pic. 1. The central (aortic) and peripheral (brachial) systolic blood pressure waveforms

SBPao: systolic blood pressure in aorta; SBP-br: brachial systolic blood pressure; DBPL diastolic blood pressure; MAP: mean arterial pressure.

Source: https://www.tensiomed.com/parameters/central-systolic-blood-pressure/

- Aortic Pulse Wave Velocity (PWVao)

PWVao is the velocity at which blood pressure pulse propagates in the aorta. It is used clinically as a measure of arterial stiffness. The stiffer the aortic wall, the faster the aortic pulse wave velocity is [32].

Pressure variations detected by a sensor of an inflatable cuff of Arteriograph placed on the patient's upper arm and inflated 45 mmHg above the person's Systolic Blood Pressure (SBP) is transferred to a computer. PWV is acquired based on the generation of P1 and P2 systolic peaks and calculated by the following formula:

$$PWV = S\ (Jug\text{-}Sy)/RT$$

P1 results from the systolic volume ejection in the aorta, and P2 results by wave pressure reflection from peripheral arteries. Distance (S) is measured from jugular (Jug) to symphysis (Sy). Return time is the difference between the first peak (P1) and the reflected systolic peak (P2). RT is normal above 124 msec. The stiffer the aortic wall, the lower the RT is. PWVao is normal under 9.0 m/s.

- Augmentation Index (AIx)

Augmentation index, non-invasively determined manifestation of the additional pressure caused by pulse wave reflection, is a strong, independent cardiovascular risk determinant. An elevated Augmentation Index reflects endothelial dysfunction accompanied by increased vascular resistance of the small arteries and arterioles, which is influenced by endothelial NO synthesis.

The Augmentation pressure calculation is based on the difference between the forward pressure wave generated by the left ventricular ejection and a reflected wave created by the impedance mismatch along the peripheral arteries. The augmentation index is calculated by using the following formula:

$$AIx = 100 \times ((P2\text{-}P1)/(PPao))$$

P1 results from the systolic volume ejection in the aorta, and P2 results by wave pressure reflection from peripheral arteries. PPao or Aortic Pulse Pressure is the difference between the central systolic and diastolic pressure. Aix aortic is normal under 33%.

- Aortic Pulse Pressure (PPao)

Pulse pressure is calculated as the difference between the central systolic and diastolic pressure by the formula: PPao= SBPao – DBPao, where SBPao is central (aortic) systolic blood pressure and DBPao is central (aortic) diastolic blood pressure. Pulse pressure is directly proportional to the left ventricular stroke volume and negatively correlated with the aortic elasticity. PPao is considered to be normal under 50 mmHg. High pulse pressure is an important risk factor for cardiovascular disease and low pulse pressure could be a sign of insufficient preload.

The data were analyzed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). To identify oxidative status differences between two groups with abnormal distribution nonparametric tests had been used. Odds Ratio (OR) and Relative Risk (RR) assessment had been used to quantify the strength of the association between arterial stiffness parameters and Acute Coronary Syndrome (ACS). For an assessment of sensitivity/specificity cross-tabulation analysis haw been used. The 95% confidence interval (CI) was used to estimate the precision of the OR. A p-value of 0.05 was considered significant.

Table 1. Characteristics of study population

	Group 1 (Patients with ACS) n=100	**Group 2 (Patients with CCS) n=91**	***P* value**
Age (years)	51.8±0.78	49.1±1.02	0.236
Male gender, n (%)	74 (74)	52 (57)	0.874
BMI	27.76±0.35	27.81±0.36	0.924
Hypertension, n (%)	51 (51)	41 (45)	0.413
Dyslipidemia, n (%)	62 (62)	56 (61.5)	0.948
Smoking, n (%)	52 (52)	45 (49.5)	0.726
Type 2 DM, n (%)	44 (44)	38 (41.8)	0.755
BB, n (%)	31 (31)	27 (29.7)	0.842
CCB, n (%)	36 (36)	28 (30.8)	0.446
ACEIs/ARBs, n (%)	42 (42)	38 (41.8)	0.973
Statins, n (%)	42 (42)	45 (49.5)	0.238
Nitrates, n (%)	22 (22)	42 (46.2)	<0.0001*

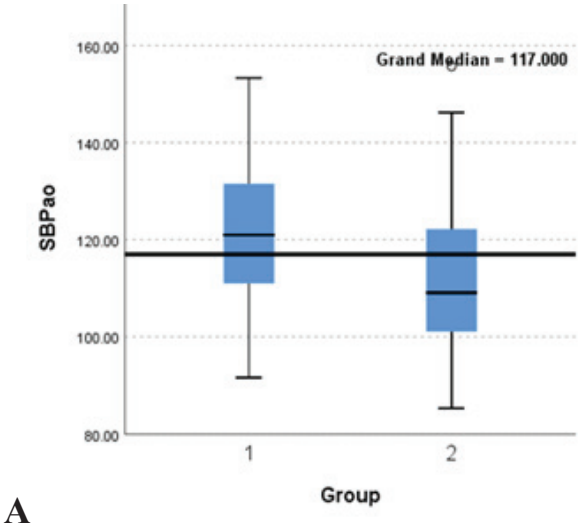
** - statistically significant difference; BMI body mass index, BB beta-blockers, CCB calcium channel blockers, ACSEIs angiotensin converting enzyme inhibitors, ARBs angiotensin receptor blockers*

Table 2. Central Systolic Blood Pressure (SBPao), Aortic Pulse Wave Velocity (PWVao) and Augmentation Index (AIx) baseline measurements in ACS and CCS groups (Mean±SD)

	Central Systolic Blood Pressure SBPao (mmHg)	Aortic Pulse Wave Velocity PWVao (m/s)	Augmentation Index AIx (%)
Group 1. Patients with Acute Coronary Syndrome (ACS)	122.1±13.96	10.25±1.92	31.1±14.51
Group 2. Patients with Chronic Coronary Syndrome (CCS)	111.5±14.17	8.30±1.38	21.84±11.66
p-value	<0.0001	<0.0001	<0.0001

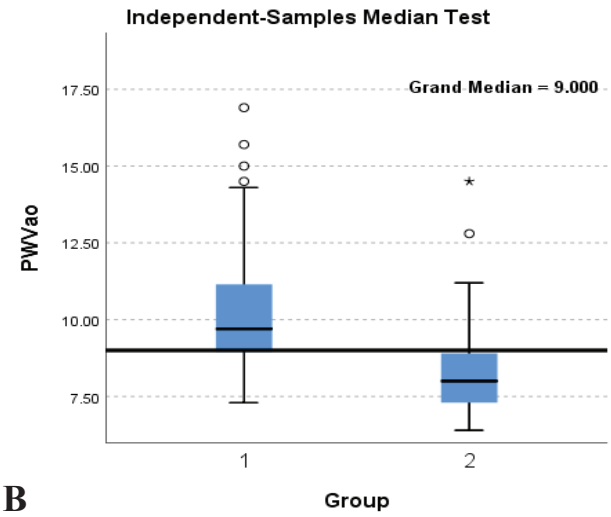
Table 3. The strength of the association between the arterial stiffness parameters and acute coronary syndrome

	Central Systolic Blood Pressure SBPao (mmHg)	**Aortic Pulse Wave Velocity PWVao (m/s)**	**Augmentation Index AIx (%)**
Odds Ratio (OR); 95% CI	3.15; 95% CI (1.63, 6.1)	9.41; 95% CI (4.86, 18.2)	5.11; 95% CI (2.65, 9.86)
Risk Ratio (RR)	2.25	3.10	1.17



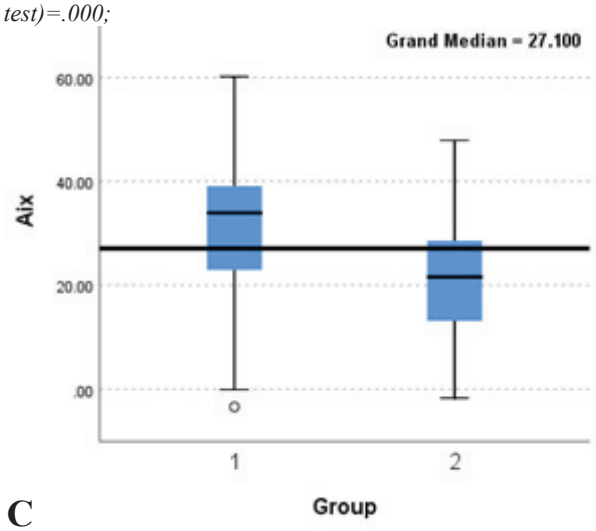
A

(A) Distribution of SBPao, Central Systolic Blood Pressure (mmHg) across groups: Total number=191; Median=117.000; Test statistic=19.690; Degree of freedom=1; Asymptotic sig. (2-sided test)=.000; Yates's continuity correction: Chi-square=18.424; Degree of freedom =1; Asymptotic sig (2-sided test)=.000;



B

(B) Distribution of PWVao, Aortic Pulse Wave Velocity (m/s) across groups: Total number=191; Median=9.000; Test statistic=49.646; Degree of freedom=1; Asymptotic sig. (2-sided test)=.000; Yates's continuity correction: Chi-square=47.624; Degree of freedom =1; Asymptotic sig (2-sided test)=.000;



C

(C) Distribution of AIx, Aortic Pulse Wave Velocity (m/s) across groups: Total number=191; Median=27.100; Test statistic=29.634; Degree of freedom=1; Asymptotic sig. (2-sided test)=.000; Yates's continuity correction: Chi-square=28.078; Degree of freedom =1; Asymptotic sig (2-sided test)=.000

Fig. 1. Distribution of admission parameters of aortic stiffness by Independent-Samples Median test. Group 1, patients with Acute Coronary Syndrome (ASC). Group 2, patients with Chronic Coronary Syndrome (CCS)

Table 4. The sensitivity and specificity of an oscillometrically measured arterial stiffness parameters

	Central Systolic Blood Pressure SBPao (mmHg)	Aortic Pulse Wave Velocity PWVao (m/s)	Augmentation Index AIx (%)
Sensitivity (%)	42	75	54
Specificity (%)	81.3	75.8	81.3

Results and discussion. *Study population characteristics*

There was no statistically significant difference between the study population characteristics, such as age, male gender, BMI, hypertension, dyslipidemia, ongoing smoking, type 2 DM, and medications, such as beta-blockers, calcium channel blockers, ACEIs or ARBs, and statins. Nitrates consumption was much higher (p value < 0.0001) in patients with Chronic Coronary Syndrome (Table 1).

Admission parameters of aortic stiffness. The enrolled patients' arterial stiffness parameters measured in the comparator groups were as follows: Central Systolic Blood Pressure (SBPao) 122.1±13.96 mmHg in patients with ACS and 111.5±14.17 (p<0.0001) in patients with CCS. Aortic Pulse Wave Velocity (PWVao) in Group 1 and Group 2 were 10.25 ± 1.92 m/s and 8.30±1.38 m/s, respectively (p=0.0001). The mean Augmentation Index (AIx) was 31.13±14.51 in patients with ACS, and was 21.84±11.66 in patients with CCS (p<0.0001) (Table 2).

The results of measurement of Odds Ratio (OR) with 95% Confidential Interval and Risk Ratio (RR) between an exposure (Central Systolic Blood Pressure, Aortic Pulse Wave Velocity, and Augmentation Index) and outcome (Acute Coronary Syndrome) are shown in Table 3.

Fig. 1 depicts the independent-samples median test of arterial stiffness parameters across groups of patients with ACS and CCS. The difference between all parameters was statistically significant (p<0.0001).

A cross-tabulation analysis was run to an assessment of sensitivity and specificity for arterial stiffness parameters in the case of patients with Acute Coronary Syndrome with the following results: (i) for Central Systolic Blood Pressure, SBPao: sensitivity of 42% and specificity of 81.3%; (ii) for Aortic Pulse Wave Velocity, PWVao: sensitivity of 75% and specificity of 75.8%, and (iii) for Augmentation Index, AIx: sensitivity of 54% and specificity of 81.3% (Table 4).

An arterial remodeling (arterial stiffness) is an independent risk factor of atherosclerosis and its progression, especially atherosclerotic plaque vulnerability [6-22].

Recent studies have revealed a strong association between Coronary Artery Disease (CAD) severity and Pulse Wave Velocity (PWV), mainly using carotid-femoral PWV (cfPWV)17 [33-38], or brachial-ankle PWV (baPWV).

Few studies are using oscillometrically measured Aortic Pulse Wave Velocity (aPWV) in such patients, whereas, emerging data have indicated that oscillometrically PWVao proved to be an independent marker of atherosclerotic cardiovascular disease (ASCVD), with the positive correlation between the severity of Coronary Heart Disease (CAD) and oscillometrically measured Aortic PWV (aPWV) and Augmentation Index (Aix).

The main goal of the present study has been to compare the oscillometrically measured parameters of aortic stiffness between patients with Acute Coronary Syndrome (ACS) and patients with stable ischemic heart disease (SIHD). These findings may be useful in terms of risk stratification and prevention of Acute Coronary Syndrome (ACS).

In 100 patients with Acute Coronary Syndrome (Group 1) and 91 patients with Cronic Coronary Syndrome (Group 2) arterial stiffness was assessed by oscillometrically measured complex arterial function using the TENSIOMED Arteriograph (LTD TENSIOMED, THE ARTERIOGRAPH Company, Germany. Web: www.arteriograph.de. Arteriograph Software v.3.0.0.4) automatic (user independently), non-invasive device. There was no statistically significant difference between the study population characteristics, except nitrates consumption, which was much higher (p<0.0001) in patients with Chronic Coronary Syndrome (Table 1).

All three measured parameters of arterial stiffness (Mean±SD) were statistically higher in Group 1 of patients with acute coronary syndrome compared to Group 2 of patients with Chronic Coronary Syndrome: for Central Systolic Blood Pressure, SBPao: 122.1±13.96 mmHg vs 111.5±14.17 mmHg (p<0.0001), for Aortic Pulse Wave Velocity, PWVao: 10.25±1.92 m/s vs 8.30±1.38 m/s (p<0.0001), and for Augmentation Index, AIx: 31.13±14.51 % vs 21.84±11.66 % (p<0.0001), respectively (Table 2). The same distribution of admission parameters of aortic stiffness was revealed by the Independent-Samples Median test (Fig. 1).

The highest strength of the association between the arterial stiffness parameters and the acute coronary syndrome was revealed for Aortic Pulse Wave Velocity, PWVao (m/s) with Odds Ratio (OR) of 9.41; 95% CI (4.86, 18.2). Next was Augmentation Index, AIx (%) with OR=5.11; 95% CI (2.65, 9.86), and last Central Systolic Blood Pressure SBPao (mmHg) with OR=3.15; 95% CI (1.63, 6.1) (Table 3).

Above mentioned data coincide with the results of several studies that consider Aortic Pulse Wave Velocity, PWVao (m/s) as an independent risk factor of atherosclerosis. Because of relatively low sensitivity and specificity (Table 4) of measured parameters in the case of Acute Coronary Syndrome (ACS), Aortic Pulse Wave Velocity (PWVao), Augmentation Index (AIx), and Central Systolic Blood Pressure (SBPao) can only be applied in complex with other traditional or novel markers of acute coronary adverse events.

Conclusion. An oscillometrically measured parameters of arterial stiffness, such as Aortic Pulse Wave Velocity (PWVao), Augmentation Index (AIx), and Central Systolic Blood Pressure (SBPao) may be useful in terms of early risk stratification and prevention of Acute Coronary Syndrome (ACS).

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SUMMARY

COMPARISON OF THE OSCILLOMETRICALLY MEASURED AORTIC PULSE WAVE VELOCITY, AUGMENTATION INDEX AND CENTRAL SYSTOLIC BLOOD PRESSURE BETWEEN PATIENTS WITH ACUTE CORONARY SYNDROME AND CHRONIC CORONARY SYNDROME

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Recent studies have revealed a strong association between Coronary Artery Disease (CAD) severity and arterial stiffness parameters, such as Pulse Wave Velocity (PWV). The majority of studies mainly using carotid-femoral PWV (cfPWV) or brachial-ankle PWV (baPWV). The emerging data have indicated that oscillometrically PWVao proved to be an independent marker of atherosclerotic cardiovascular disease (ASCVD), as well. The main goal of the present study has been to compare the oscillometrically measured parameters of aortic stiffness between patients with Acute Coronary Syndrome (ACS) and patients with stable ischemic heart disease (SIHD).

In 100 patients with Acute Coronary Syndrome (Group 1) and 91 patients with Chronic Coronary Syndrome (Group 2) arterial stiffness was assessed by oscillometrically measured complex arterial function.

The highest strength of the association revealed between Aortic Pulse Wave Velocity, PWVao (m/s), and incidence of Acute Coronary Syndrome (ACS) with Odds Ratio (OR) of 9.41; 95% CI (4.86, 18.2). Next was Augmentation Index, AIx (%) with OR=5.11; 95% CI (2.65, 9.86), and last Central Systolic Blood Pressure SBPao (mmHg) with OR=3.15; 95% CI (1.63, 6.1).

An oscillometrically measured parameters of arterial stiffness, such as Aortic Pulse Wave Velocity (PWVao), Augmentation Index (AIx), and Central Systolic Blood Pressure (SBPao) may be useful in terms of early risk stratification and prevention of Acute Coronary Syndrome (ACS).

Keywords: Acute Coronary Syndrome (ACS), Chronic Coronary Syndrome (CCS), Arterial Stiffness, Central Systolic Blood Pressure (SBPao), Aortic Pulse Wave Velocity (PWVao), Augmentation Index (AIx), Vulnerable Plaque, Plaque Rupture.

РЕЗЮМЕ

СРАВНЕНИЕ ОСЦИЛЛОМЕТРИЧЕСКИ ИЗМЕРЕННОЙ СКОРОСТИ ПУЛЬСОВОЙ ВОЛНЫ АОРТЫ, ИНДЕКСА УВЕЛИЧЕНИЯ И ЦЕНТРАЛЬНОГО СИСТОЛИЧЕСКОГО АРТЕРИАЛЬНОГО ДАВЛЕНИЯ У ПАЦИЕНТОВ С ОСТРЫМ КОРОНАРНЫМ СИНДРОМОМ И ХРОНИЧЕСКИМ КОРОНАРНЫМ СИНДРОМОМ

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Недавние исследования показали достоверную связь между тяжестью ишемической болезни сердца (CAD) и таким параметром артериальной жесткости, как скорость пульсовой волны (PWV). В большинстве исследований использованы параметры сонно-бедреной (cfPWV) или плечево-голеностопной скорости пульсовой волны (cfPWV и baPWV, соответственно). Данные показали, что осциллометрическая скорость пульсовой волны в аорте является независимым маркером атеросклеротических сердечно-сосудистых заболеваний (ASCVD).

Целью исследования явилось сравнение осциллометрически измеренных параметров жесткости аорты у пациентов с острым коронарным синдромом и пациентов со стабильной ишемической болезнью сердца.

У 100 пациентов с острым коронарным синдромом (группа 1) и 91 пациента с хроническим коронарным синдромом (группа 2) оценка артериальной жесткости проведена осциллометрическим методом.

Наибольшая связь выявлена между скоростью аортальной пульсовой волны, PWVao (м/с) и частотой возникновения острого коронарного синдрома (ACS) с отношением шансов (OR) 9,41; 95% CI (4,86, 18,2). Следующим по силе ассоциации был индекс увеличения, AIx (%) с OR = 5,11; 95% CI (2,65, 9,86) и последним - центральное систолическое кровяное давление SBPao (мм рт.ст.) с OR = 3,15; 95% CI (1,63, 6,1). Измеренные осциллометрическим методом параметры артериальной жесткости: скорость аортальной пульсовой волны (PWVao), индекс увеличения (AIx) и центральное систолическое артериальное давление (SBPao) полезны с точки зрения ранней стратификации риска и профилактики острого коронарного синдрома (ACS).

რეზიუმე

ოსცილომეტრიით განსაზღვრული აორტის პულსური ტალღის სიჩქარის, გაძლიერების ინდექსის და აორტაში სისხლის ცენტრალური წნევის მაჩვენებლების შედარება პაციენტებში მწვავე და ქრონიკული კორონარული სინდრომით

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ბოლო პერიოდის კვლევებით გამოვლინდა მძლავრი ასოციაცია კორონარული არტერიების დაავადებასა და არტერიული რიგიდობის ისეთ მაჩვენებელს შორის, როგორიცაა აორტის პულსური ტალღის სიჩქარე (PWV). კვლევების აბსოლუტურ უმრავლესობაში გამოყენებულია არტერიული რიგიდობის შეფასების ისეთი მეთოდები, როგორებიცაა: კაროტიდულ-ფემორალური PWV (cfPWV) ან მხარ-წვივის PWV (baPWV). რამდენიმე კვლევამ გამოავლინა ოსცილომეტრული პულსური ტალღის სიჩქარის, როგორც ათეროსკლეროზული კარდიოვასკულური დაავადების დამოუკიდებელი მარკერის როლი.

წინამდებარე კვლევის მიზანს წარმოადგენდა არტერიული რიგიდობის მაჩვენებლების შედარება მწვავე კორონარული სინდრომის და გულის სტაბილური იშემიური დაავადების მქონე პაციენტებში.

მწვავე კორონარული სინდრომით 100 პაციენტში (ჯგუფი 1) და ქრონიკული კორონარული სინდრომით 91 პაციენტში (ჯგუფი 2) ოსცილომეტრული მეთოდით შეფასებული იყო არტერიული რიგიდობის პარამეტრები.

მძლავრი ასოციაცია გამოვლინდა აორტის პულსური წნევის სიჩქარესა (PWVao) და მწვავე კორონარული სინდრომის ინციდენტობას შორის [OR=9.41; 95% CI (4.86, 18.2)]. გაძლიერების ინდქსისთვის (Aix) და აორტაში სისხლის ცენტრალური სისტოლური წნევისთვის ასოციაციის ხარისხი განაწილდა შემდეგნაირად: OR=5.11; 95% CI (2.65, 9.86) და OR =3.15; 95% CI (1.63, 6.1), შესაბამისად.

არტერიული რიგიდობის ოსცილომეტრიით განსაზღვრული ისეთი პარამეტრები, როგორებიცაა: აორტის პულსური წნევის სიჩქარე (PWVao), გაძლიერების ინდექსი (AIx) და სისხლის ცენტრალური სისტოლური წნევა (SBPao) შეიძლება გამოყენებული იყოს მწვავე კორონარული სინდრომის რისკის ადრეული სტრატიფიკაციისა და პრევენციისთვის.

BONE FORMATION MARKERS (N-TERMINAL PROPEPTIDE TYPE I ROCOLLAGEN, OSTEOCALCIN AND VITAMIN D) AS EARLY PREDICTORS OF OSTEOPOROSIS IN PATIENTS SUFFERING FROM CHRONIC OBSTRUCTIVE LUNG DISEASE

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According to the Global Initiative for Chronic Obstructive Lung Disease (GOLD), chronic obstructive lung disease (COLD) is characterized by multiple extrapulmonary manifestations which in most patients result in the extended hospitalization period as well as constitute risk factors regarding unfavourable short-term and long-term prognosis and increased mortality [2, 8, 12]. According to the concept of syntropic pathology, the most common diseases and pathological conditions in patients suffering from COPD are cardiovascular diseases, skeletal muscle dysfunction, metabolic syndrome, osteoporosis, depression and lung cancer [6, 8, 12].

Interest in the comorbidity of COPD and osteoporosis is not accidental as both diseases are among the most common human diseases. In Europe, the USA and Japan, osteoporosis affects about 75 million people [29]. Thus, according to Povorozniuk V.V., Ukraine has passed the limit of 3 million patients suffering osteoporosis, i.e. every second adult citizen of Ukraine has osteopenia and every fourth person suffers from osteoporosis [20, 29].

COPD affects about 251 million people [17]. Prevalence of COPD fluctuates in different countries ranging from 7.8 to 19.7%, increases with the age of patients and reaches a peak at the age of over 60 years [8].

At the same time, osteoporosis is one of the most common comorbidities in patients suffering from COPD. According to various authors, the prevalence rate ranges from 4 to 59% [18, 31], 22% - 44% [37] in the population. According to our information, an increase in the incidence of osteoporosis and osteopenia along with an increasing severity of COPD has been established: it ranges from 10.1% and 49.3% respectively, in patients with GOLD I up to 50.0% and 27.7% in patients with GOLD IV [24].

Comorbidity between COPD and osteoporosis can be predictable not only due to the widespread prevalence of both pathologies, but also due to the presence of similar etiopathogenetic and risk factors as well as individual elements of such mechanisms [20]. Systemic inflammation can be a potential mechanism in COPD. Thus, the flow of anti-inflammatory cy-