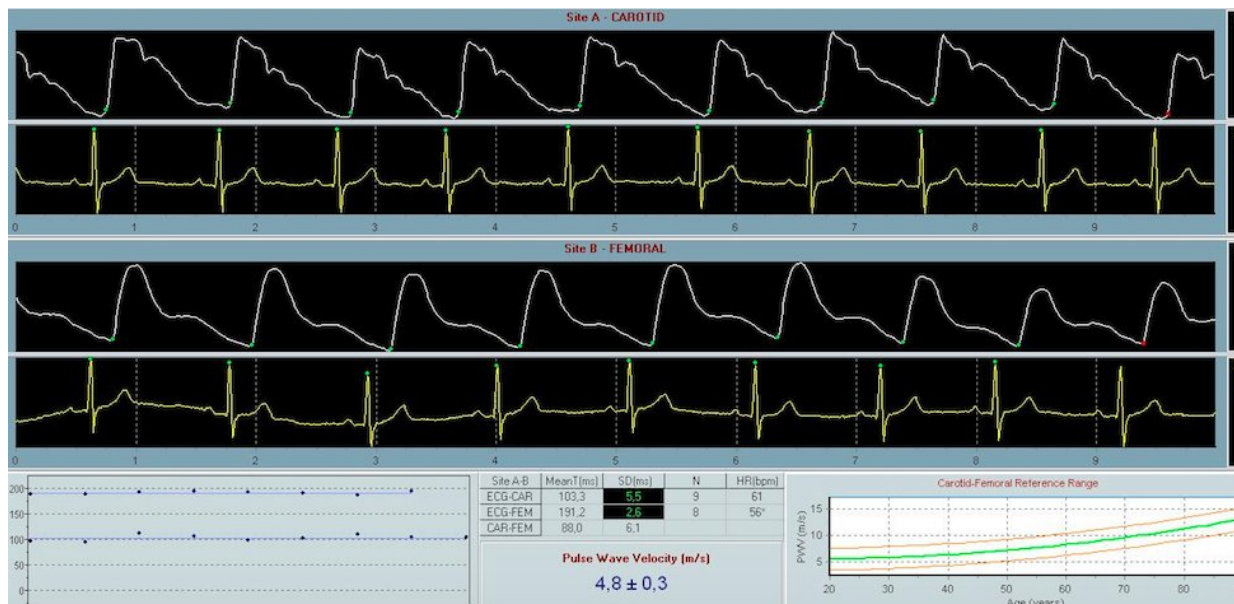


# Cardiologists study new aspects of vascular ageing

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Screenshot of CF-RWV measurement. The system measures pulse wave velocity between the carotid artery (CAROTID) to the femoral artery (FEMORAL).

Credit: Elena Troitskaya

A team of scientists from the Medical Institute of RUDN University compared two factors of vascular aging—CF-PWV and CAVI. Both of these parameters determine arterial stiffness, the main indicator of vascular aging, with high precision. However, they are influenced by age and certain metabolism abnormalities in different ways. The study is expected to help cardiologists find effective diagnostic methods for

individual patients. The results of the work were published in the *Journal of Hypertension*.

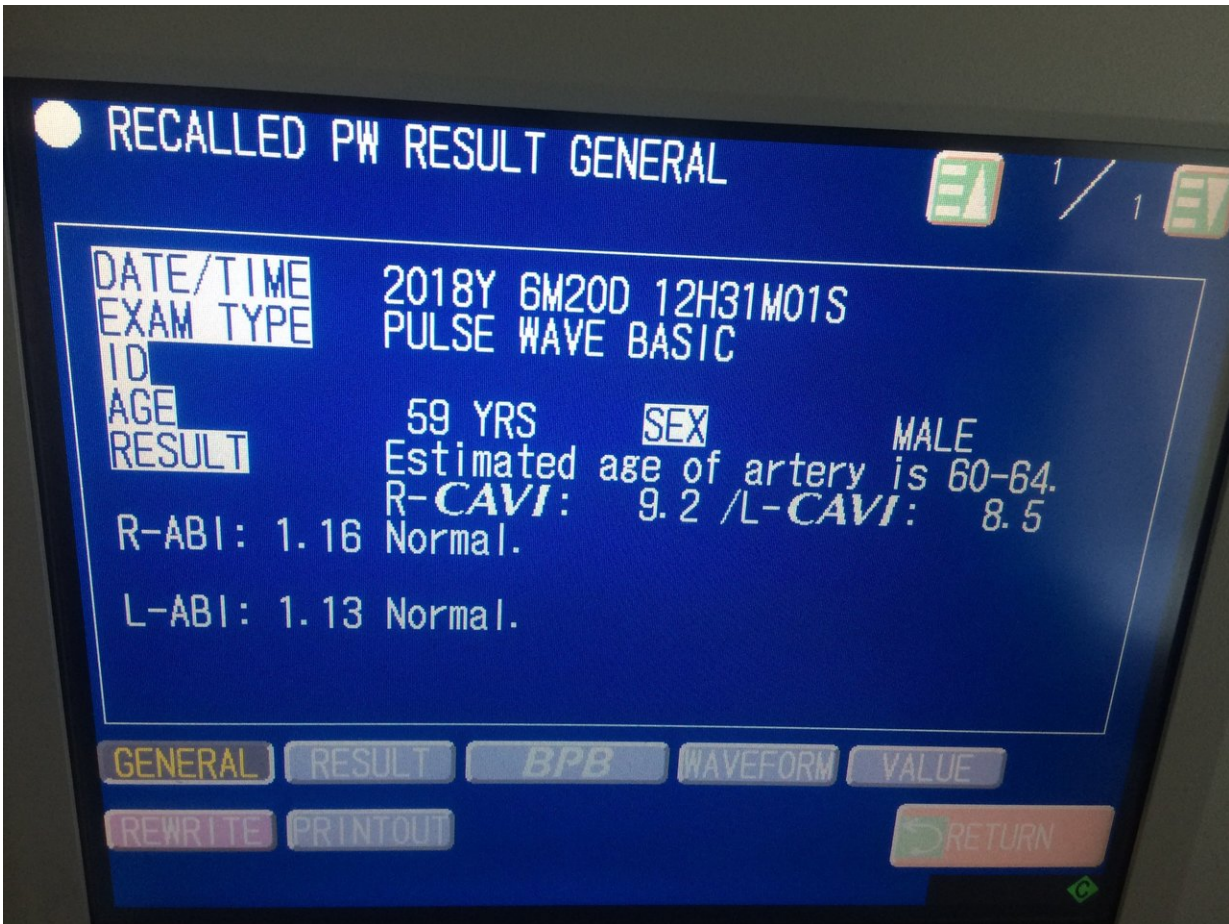
In young people, large vessels such as the aorta and its main branches normally have elastic walls. With aging, the walls of the arteries accumulate [collagen](#), which increases their stiffness—one of the key indicators of vascular aging. Stiff vessel walls, unlike the elastic walls of young arteries, do not stretch and fail to slow down the flow of blood from the heart. Arterial pressure builds up, and the shock wave from blood burst damages both the arteries and small vessels that transfer blood to the most important internal organs, including the kidneys and the brain. Therefore, increased [arterial stiffness](#) is associated with high risk of death from cardiovascular diseases.

In real practice, arteries often age too quickly. For example, the "vascular age" of a 40-year-old patient may be 55 or even 60 years. It's important to find effective methods for determining vascular age in order to understand what makes arteries age prematurely, and to determine who falls into the high-risk group. A team of scientists from 32 clinical and research medical centers, including RUDN-based cardiologists, will monitor 2224 patients that are 40+ years of age and have had cardiovascular diseases for five years. Each patient will undergo three complex examinations throughout the study—the initial ones, described in the article, occurred at two and five years. The examination includes general medical examination, electrocardiography, a check-up for metabolic disorders, [blood pressure](#) measurement, and most importantly, the assessment of arterial stiffness using two parameters –CF-PWV (a traditional one) and CAVI (a new one).

Pulse wave velocity (PWV) is the gold standard of arterial stiffness measurement. It is determined along the distance from the common carotid artery to the femoral artery. The higher the PWV, the stiffer the aorta. The main disadvantage of this method is that it is dependent on

the blood pressure levels, and therefore may be distorted by fluctuations. Cardio-ankle vascular index (CAVI) has no such limitations. This index is relatively independent from the level of blood pressure and allows researchers to assess stiffness of a more general territory than CF-PWV. Another advantage of this method is its simplicity.

"Even experienced physicians find it difficult to measure CF-PWV without additional training. Pulse wave velocity sensor is attached to certain points of the body, and anatomic peculiarities of the patients may influence the quality of measurements," comments Elena Troitskaya, associate professor in the department of internal diseases with additional course in cardiology and functional diagnostics of RUDN University. "In order to measure CAVI, one only has to put four cuffs over a patient's shoulders and ankles."



Screenshot of CAVI measurement. Except for the index itself, the system also calculates the vascular age and ankle-brachial index (the ratio between blood pressure on the ankle and the arm) for the right and left sides. Therefore this method gives additional information about the state of the vascular wall. Credit: Elena Troitskaya

The scientists compared two parameters in the participants, and found that CAVI provides additional information on the state of vessel walls. Therefore, the new parameter may be used in clinical practice along with CF-PWV.

Another important goal of the work was to assess the influence of age

and [metabolic syndrome](#) on the CAVI and CF-PWV readings. Metabolic syndrome is a very important issue in public health care. It is diagnosed when abdominal obesity (with fat deposits around the abdomen and waist) is combined with increased blood pressure and high levels of cholesterol, triglycerides and blood sugar. These four symptoms (obesity, hypertension, dyslipidemia and impaired glucose levels) have been known as the "the deadly four." Together, they significantly increase the risk of cardiovascular diseases and death.

Metabolic syndrome was observed in 1,560 out of 2,224 patients during the initial examination. Apparently, this diagnosis is associated with increase in CF-PWV levels: Its average value was 8.65 m/s in the group without metabolic syndrome, and 9.57 m/s in the patients with it. It confirms that the combination of metabolic issues makes the main arteries older and leads to faster blood flow. This result met the expectations of the researchers. At the same time, CAVI levels showed no difference, with 8.34 m/s in metabolic syndrome and 8.29 m/s in the group without it. The team assumes this has something to do with the complexity of the parameter. The symptoms of metabolic syndrome influence the calculated rates in the formula of the index in a different way. While CF-PWV goes up in the presence of any component of metabolic syndrome, CAVI is increased only when the levels of blood pressure and blood glucose are high.

During the next stages of the study, the scientists expect to find out why metabolic syndrome can change these indicators of arterial stiffness in a different way and to determine the practical value of these changes. Still, the results of the work have already opened new horizons for understanding the concept of vascular aging and selecting optimal methods of its assessment in different patients.

"Accelerated vascular aging is one of the key risk factors for cardiovascular diseases. There are different techniques to identify early



vascular aging by evaluating arterial stiffness and the age of the arteries. An optimal method can be selected for each patient to monitor the changes," says Zhanna D. Kobalava, a co-author of the work, head of the department of internal diseases at RUDN University. "Vessels age prematurely due to arterial hypertension, abdominal obesity, and impairment of lipid and glucose levels. If we learn about these changes in time, we could develop efficient treatment and prevent serious complications."

**More information:** Jirar Topouchian et al. Effects of metabolic syndrome on arterial function in different age groups, *Journal of Hypertension* (2018). [DOI: 10.1097/HJH.0000000000001631](https://doi.org/10.1097/HJH.0000000000001631)

Provided by RUDN University

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