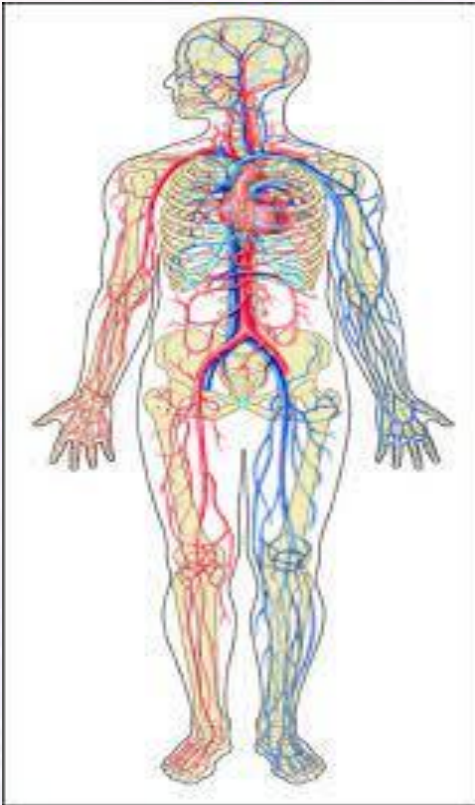


Ultrasound Scanning, Mathematical Modeling of Hemodynamic Changes and Applied Angiology of the Arteriovenous bed in a Practice of a Clinician



Authors:

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Igor Babii, Viktor Jr. Novytskyy, Ivanna Legka

Veritas Research Center (Kyiv, Ukraine)

Veritas ITMED Center for Medical Technology Transfer (Kyiv, Ukraine)

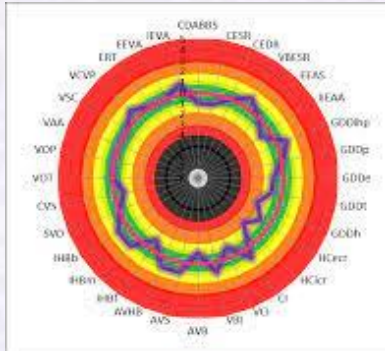
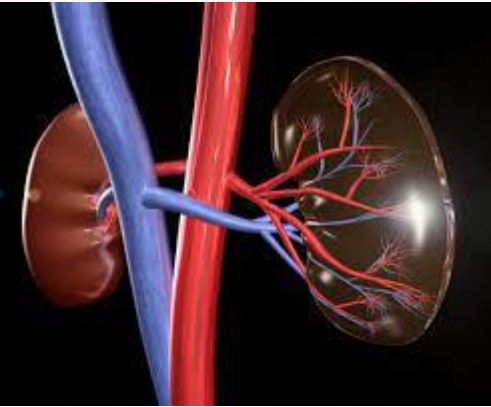
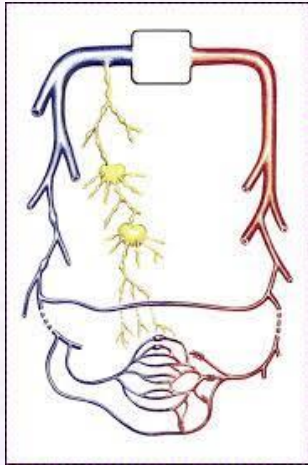
Clinic of Vascular Innovations (Kyiv, Ukraine)

Ukrainian Medical Innovations Medical Center (Ternopil, Ukraine)

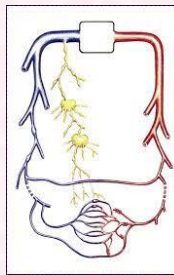


Aim

Expand the applied value of ultrasound angiology in clinical diagnosis and medical practice



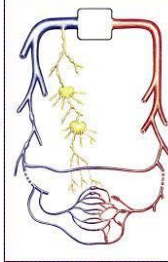
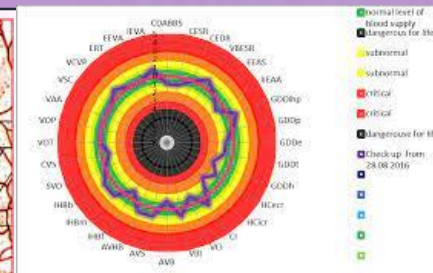
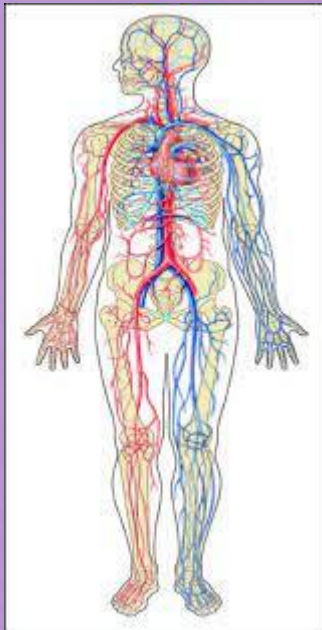
The structure of the vascular blood flow, according to its logic, provides contact laying of arteries and veins and ensures the arteriovenous balance in all regional reservoirs to provide adequate blood flow



Applied angiology through in the light of the basic principles of hemodynamics

Ideology of the vascular hemoduct MacroAngiology

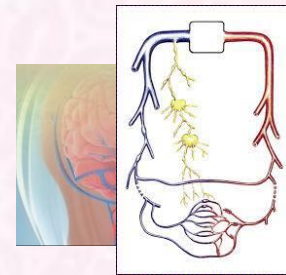
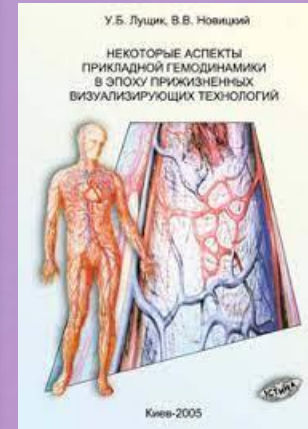
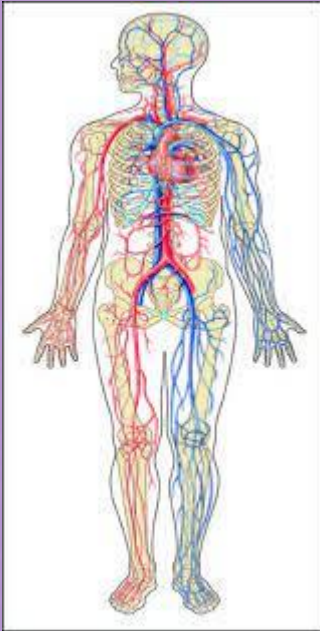
- Decreased myocardial pumping function with an expressed decrease in blood pressure in the distal segments of the arterial system, sludge phenomenon in the microvasculature.
- Violation of the elastic-tonic properties of the vascular systems of the main arteries leading to the formation of stenotic lesions of regional arteries.
- Arteriovenous-hydrodynamic imbalance in severe disorders of the functioning of the vascular system of the body.



Applied angiology through in the light of the basic principles of hemodynamics

The stage of applied analytical hemodynamics has been launched:

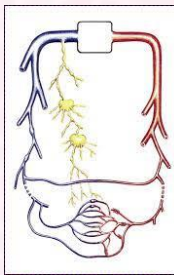
- Analytical approaches in the study of the vascular system,
- A new round of modeling hemodynamic changes in vascular systems in vivo under control of imaging diagnostic methods,
- In-depth study of the laws of hydro- and hemodynamics, ultrasound physics, principles of functioning of the arterial and venous links in different types of angioarchitectonics,
- Study of hemodynamic reserve.



Since the beginning of the application of ultrasound angiology, the focus of research has been:

- on the arterial channel,
- assessment of the speed of blood flow and its derivatives,
- assessment of the state of the intima-media complex,
- the presence of atherosclerotic plaques.

Over the almost 40-year history of using the ultrasound method in applied angiology, many visualization effects have changed in ultrasound imaging technologies.



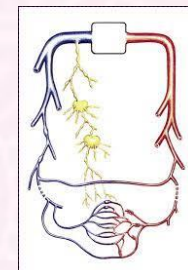
At the same time, our team has developed algorithms for the assessment of **arteriovenous balance technology**, various types of **venous blood flow disorders** and **hydro-hemodynamic balance disorders in certain regional reservoirs**, which formed a **clinical-analytical approach** to the assessment of regional hemodynamics and made it **possible to draw clinical-angiological parallels between the detected changes** and **monitor their dynamics in ultrasound monitoring mode**.



A method for ultrasound diagnostics of vessels in the brain. Patent № 10262 A dated 19.07.95



A method for assessment of the regional angioarchitectonics. Patent № 67707 A dated 31.12.03



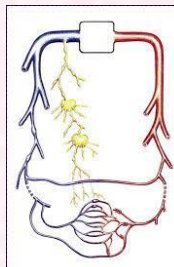
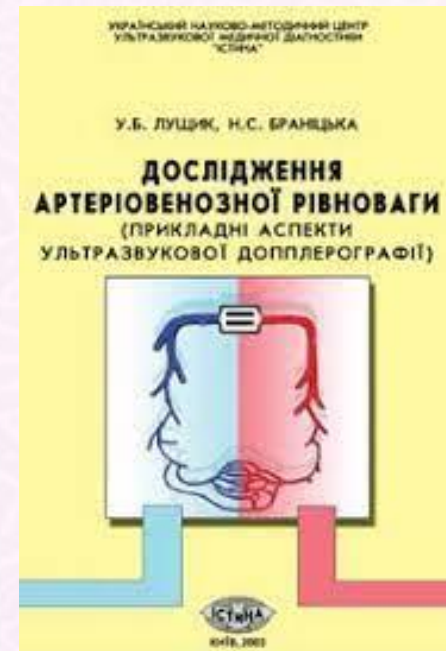
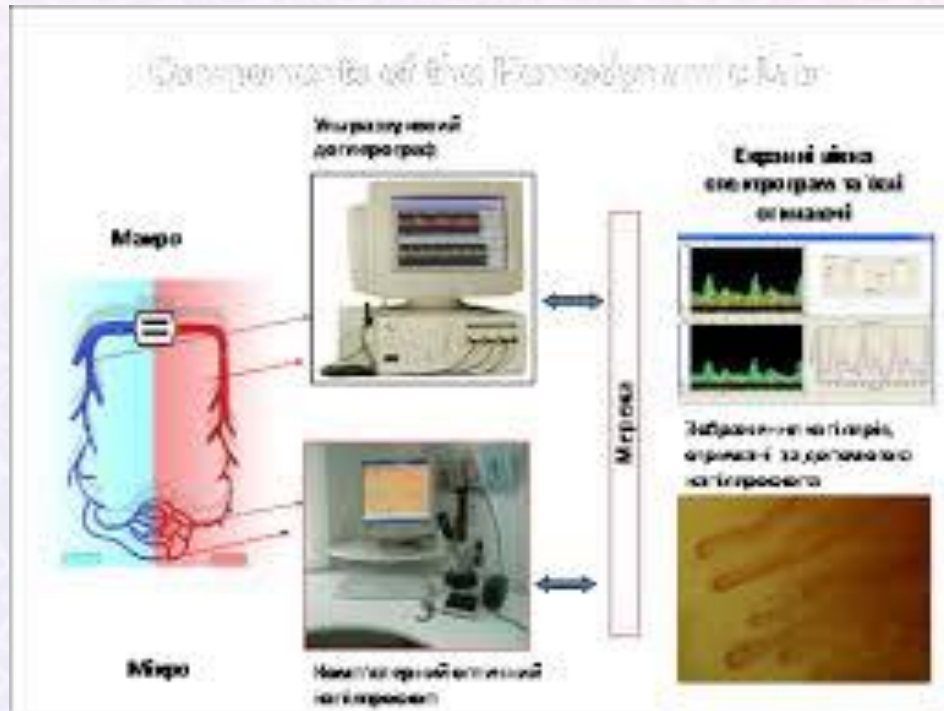
- A basic matrix

for the **assessment of arteriovenous balance**

in normal conditions

and various types of its physiological or pathological deviation in certain pathologies

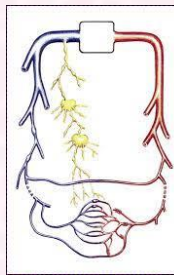
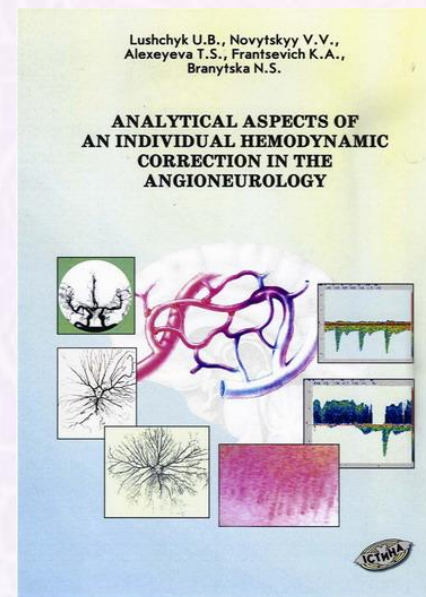
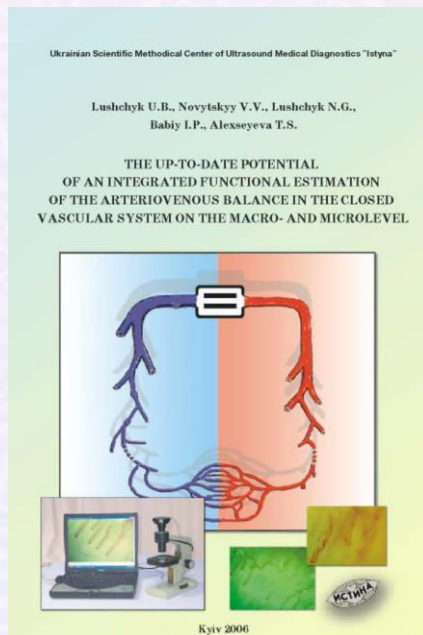
in patients of different age groups has been formed.



Up-to-date individual approaches to **Angiocorrection and Angiotherapy**

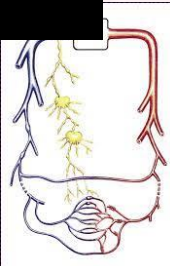
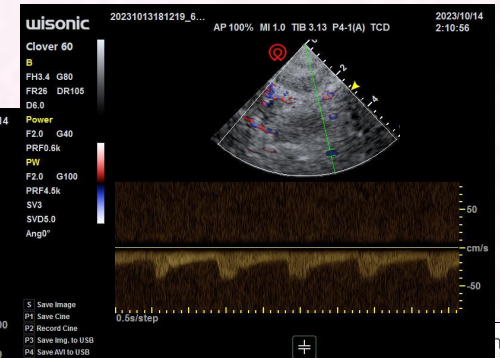
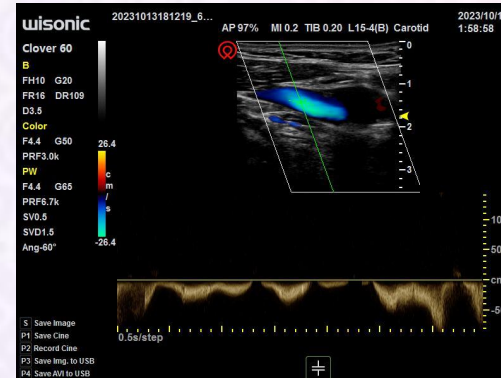
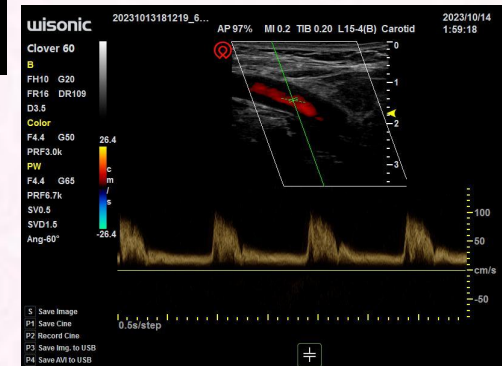
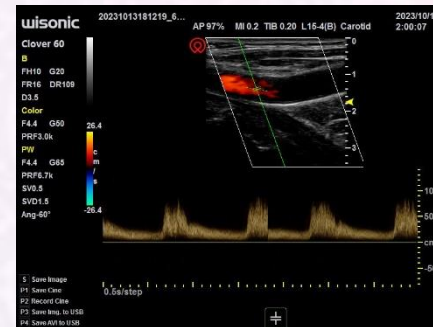
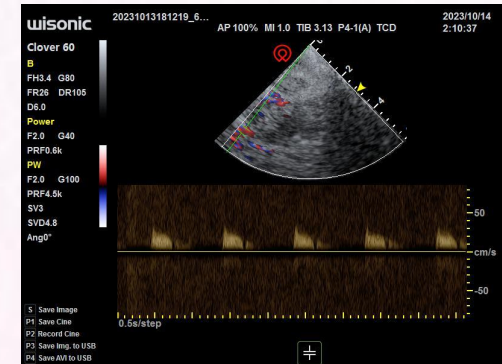
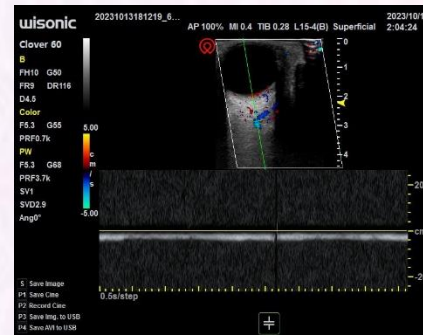
are proposed

for the purpose of hydrohemodynamic correction
of detected angiopathology



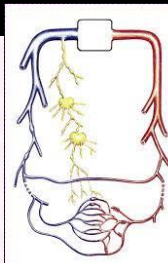
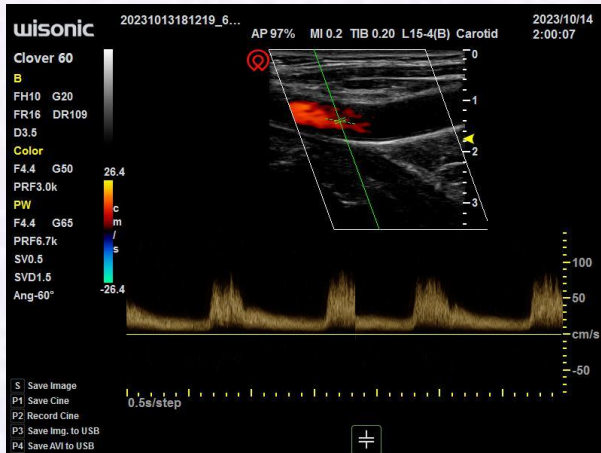
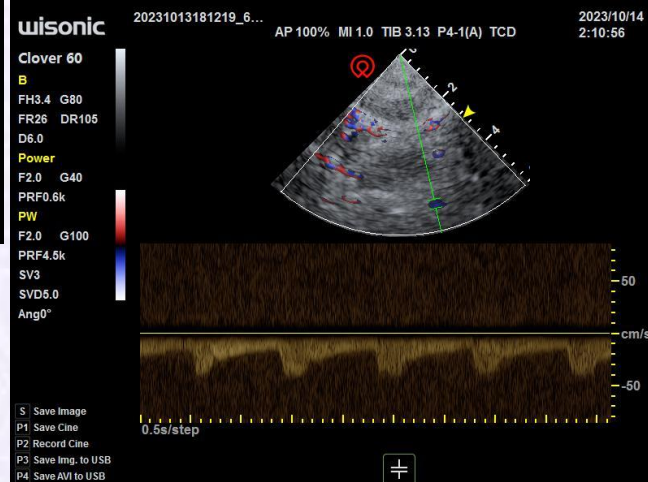
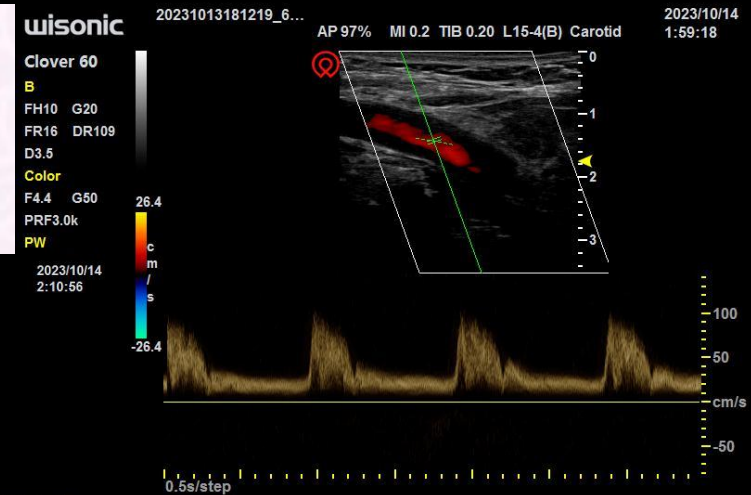
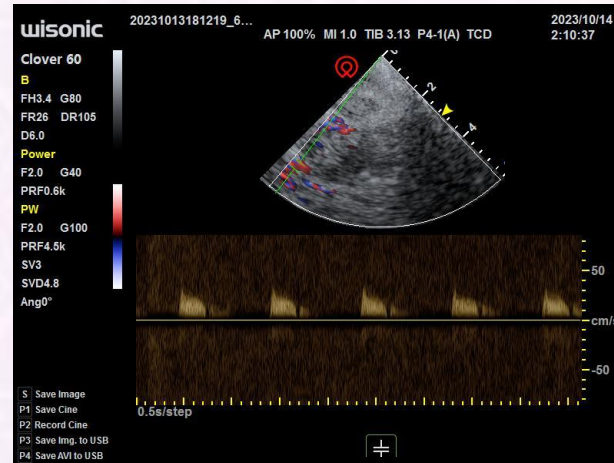
Multi-Vector Investigation of Vascular System

- *Linear blood flow velocity*
- *Vessel lumen*
- *Pressure*
- *Tonus*
- *Elasticity of vascular wall*
- *Angioarchitectonics*
- *Linear blood flow velocity*
- *Vessel lumen*
- *Pressure*
- *Tonus*
- *Elasticity of vessel wall*
- *Angioarchitectonics*
- *Valve apparatus condition*
- *Arteriovenous balance*



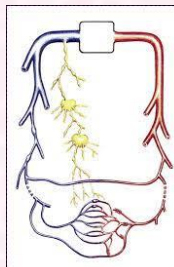
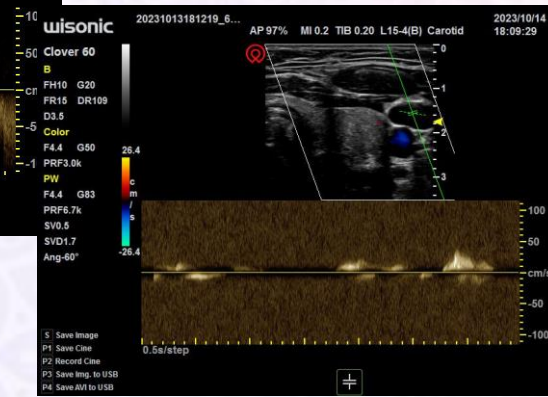
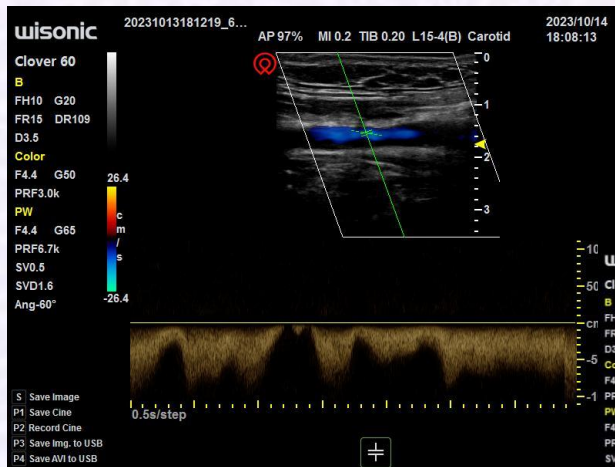
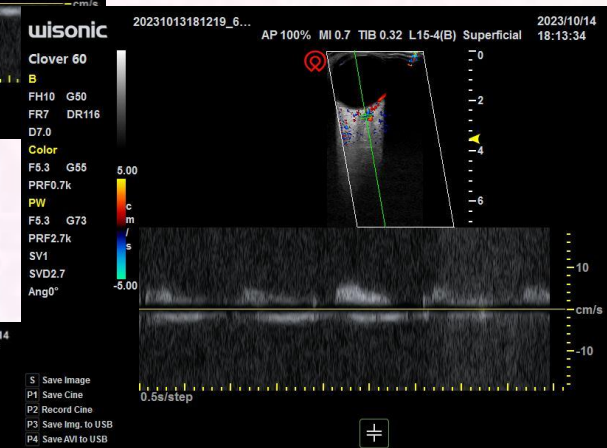
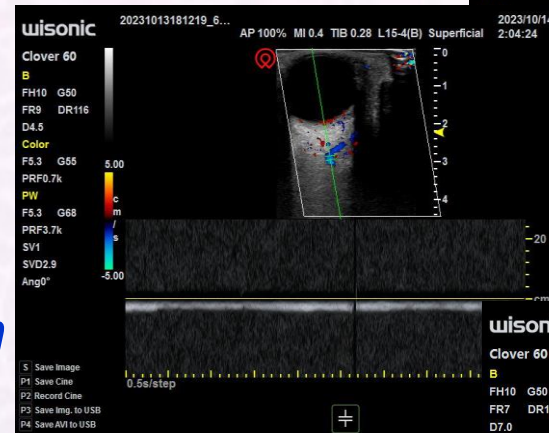
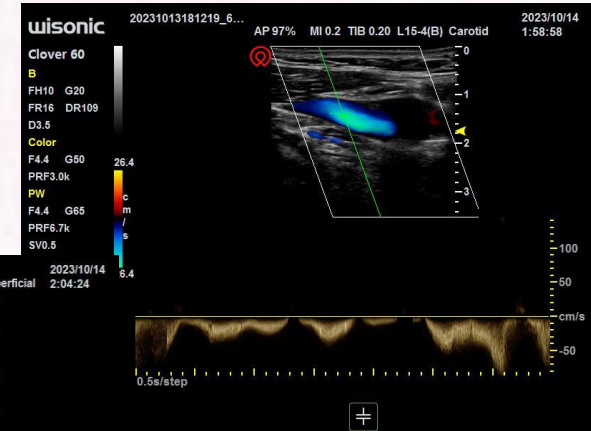
Multi-Vector Investigation of Vascular System

- *Linear blood flow velocity*
- *Vessel lumen*
- *Pressure*
- *Tonus*
- *Elasticity of vascular wall*
- *Angioarchitectonics*



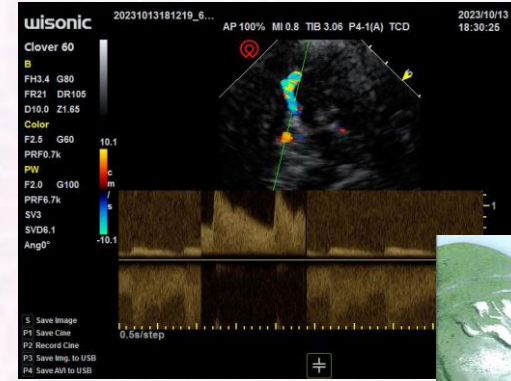
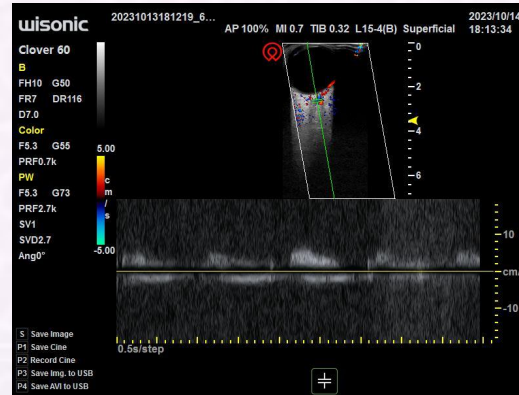
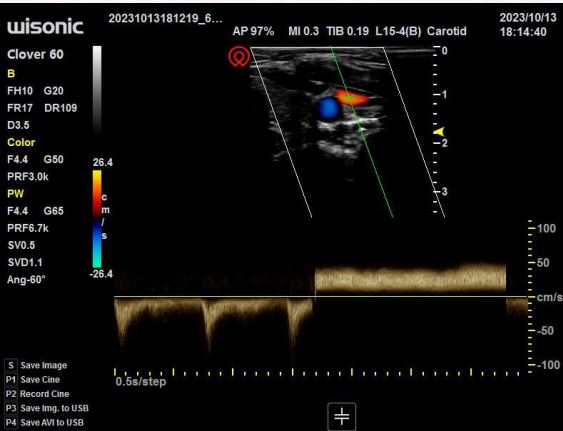
Multi-Vector Investigation of Vascular System

- *Linear blood flow velocity*
- *Vessel lumen*
- *Pressure*
- *Tonus*
- *Elasticity of vessel wall*
- *Angioarchitectonics*
- *Valve apparatus condition*

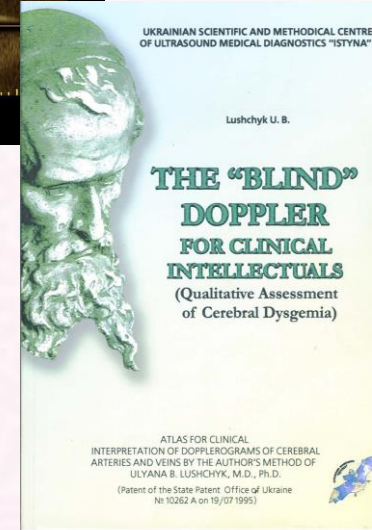


Multi-Vector Investigation of Vascular System

• Arteriovenous balance

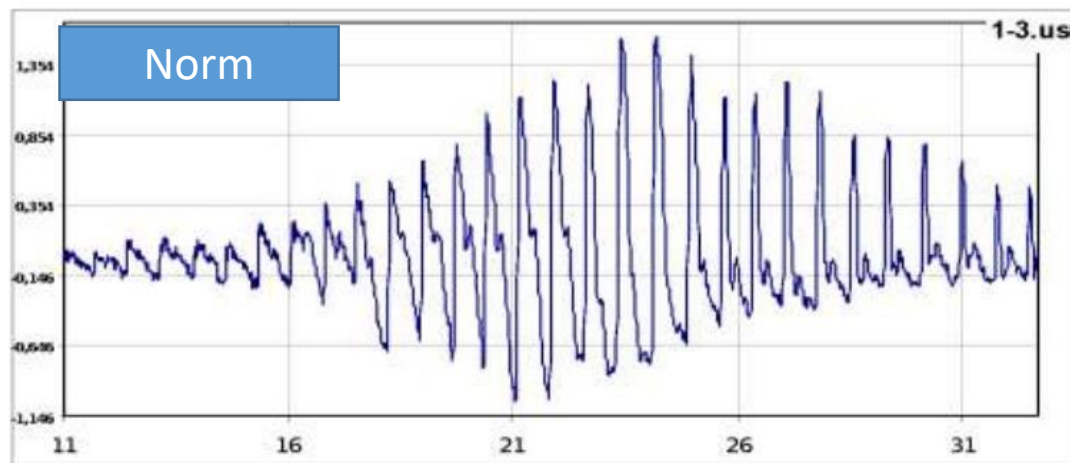
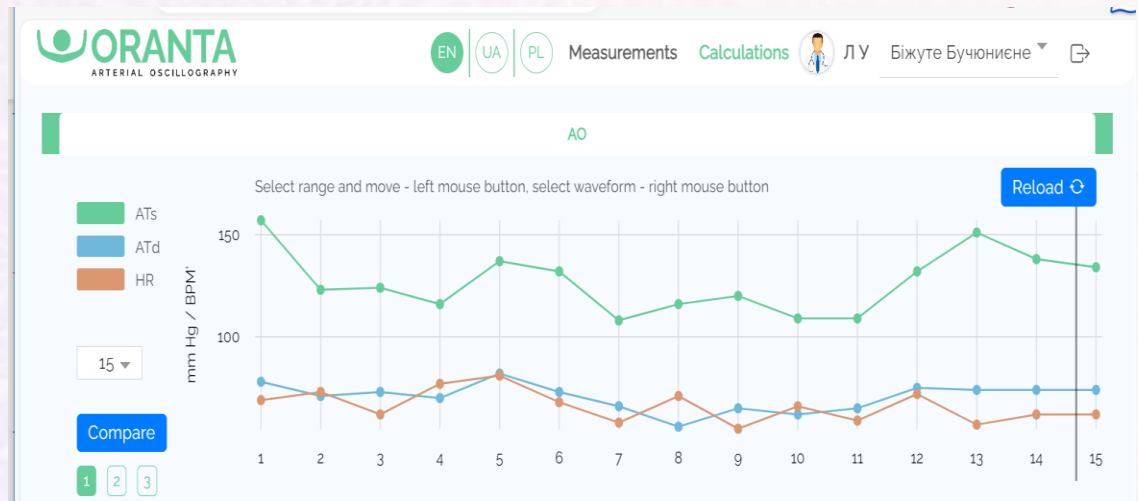
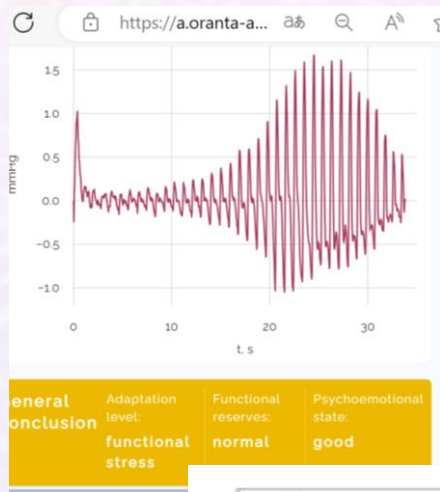


The pathological arteriovenous balance is displaced to the side of venous normotensive hypertension with an expressed deficiency of blood supply to the visual nerve and the bilateral PCA, which causes the clinical picture of congenital blindness. The level of the vision analyzer can be discussed only after checking the arteriovenous balance and the identification of physiological parameters of the cerebral blood flow.

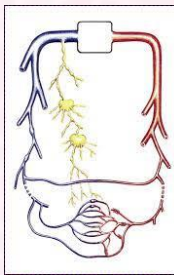


Smart tonometry

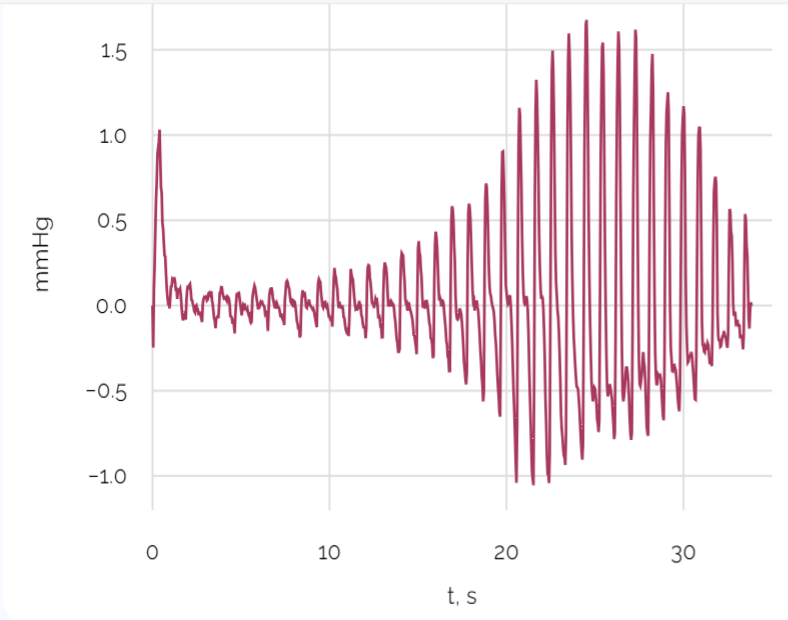
Smart tonometry enables to generally assess the imbalance of the cardiovascular system based on the dynamics of changes in blood pressure oscillations during an increasing compression test. Component of the histograms: systemic hemodynamics, vascular hemodynamics, muscle background, psychoemotional background.



Report



Smart tonometry



Probable disease

Based on machine learning methods

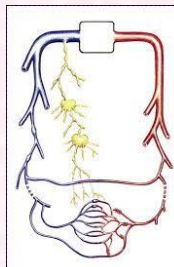
Name	Probability
Cardiovascular disease	6%
Diseases of the pulmonary system	10%
Mental (neurological) diseases	18%
Hypertension status	Prehypertension
Rhythmic disorders	0%

ATs	ATd	HR
125	76	65

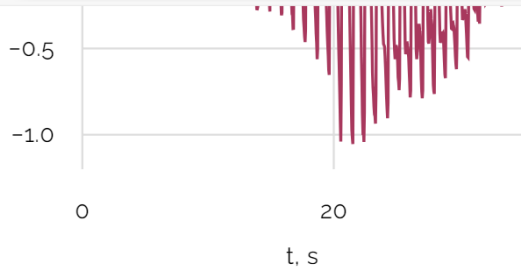
PARS-AOI
3. Moderate functional stress

IFVP
1.86. Donosological condition-1. Moderate functional stress.

General conclusion	Adaptation level:	Functional reserves:	Psychoemotional state:
	functional stress	normal	good



Smart tonometry



Diseases of the pulmonary system	10%
Mental (neurological) diseases	18%

IFVP
1.86. Donosological condition-1. Moderate functional stress.

Prehypertension	
Hypertension status	
Rhythmic disorders	0%

General conclusion

Adaptation level:	Functional reserves:	Psychoemotional state:
functional stress	normal	good

Recommended: adjust your lifestyle

Probable disease

Based on machine learning methods

Name	Probability
------	-------------

Cardiovascular disease	6%
------------------------	----

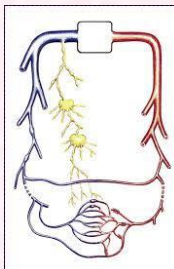
Diseases of the pulmonary system	10%
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Mental (neurological) diseases	18%
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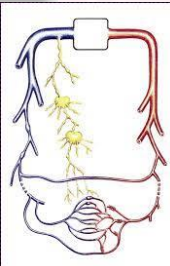
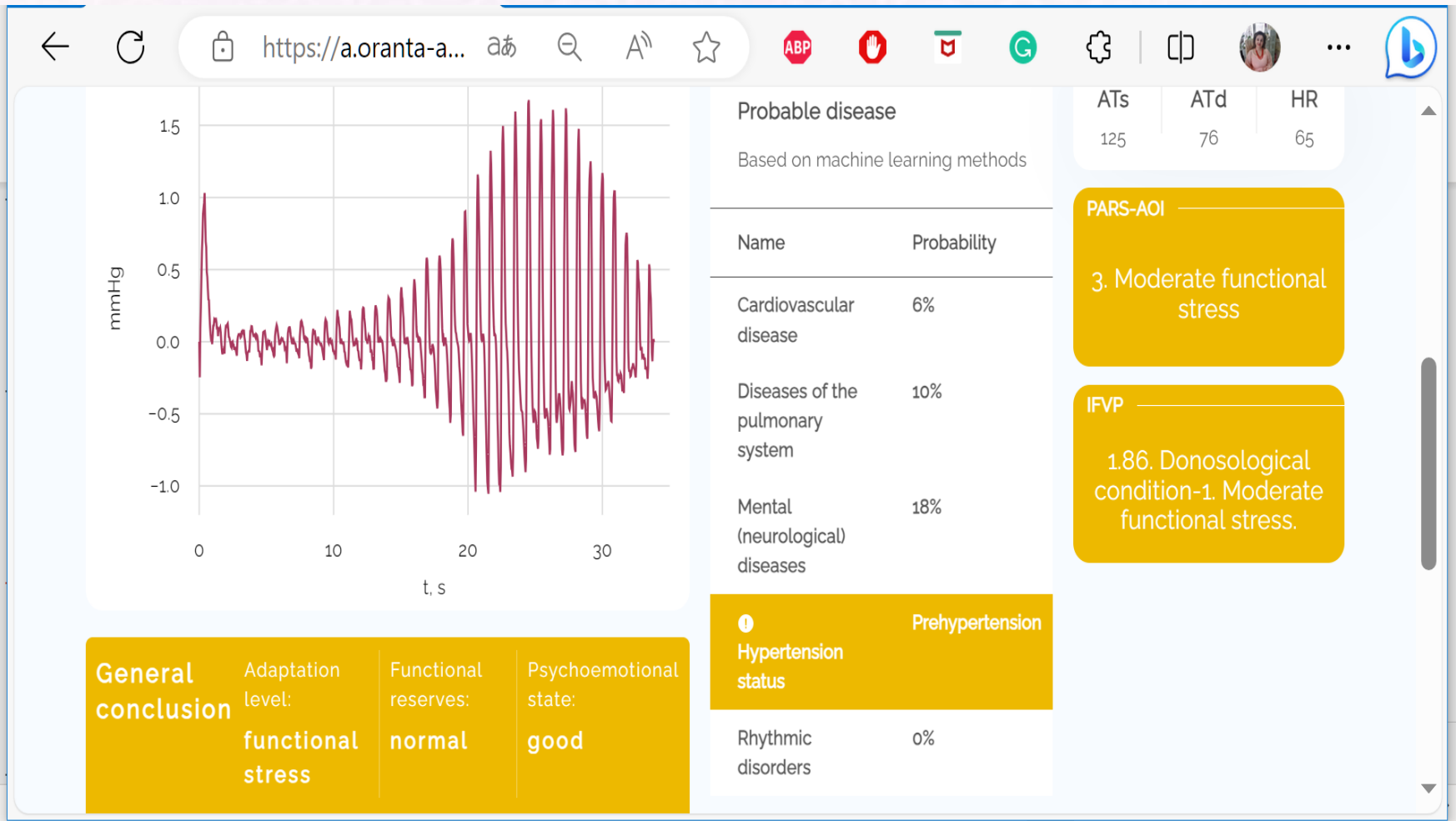
ATs	ATd	HR
125	76	65

PARS-AOI
3. Moderate functional stress

IFVP
1.86. Donosological condition-1. Moderate functional stress.

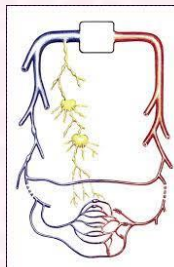
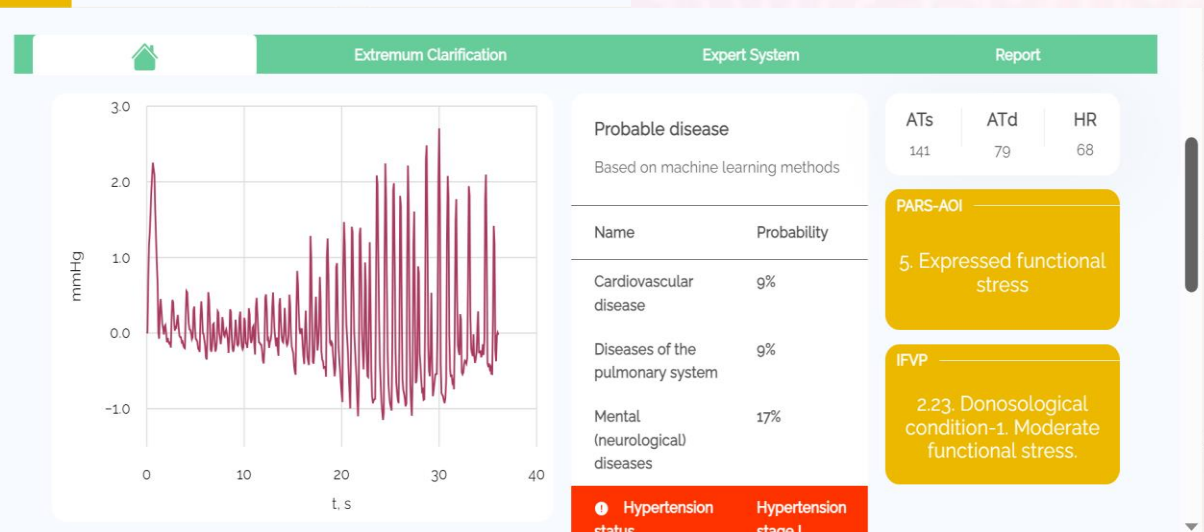
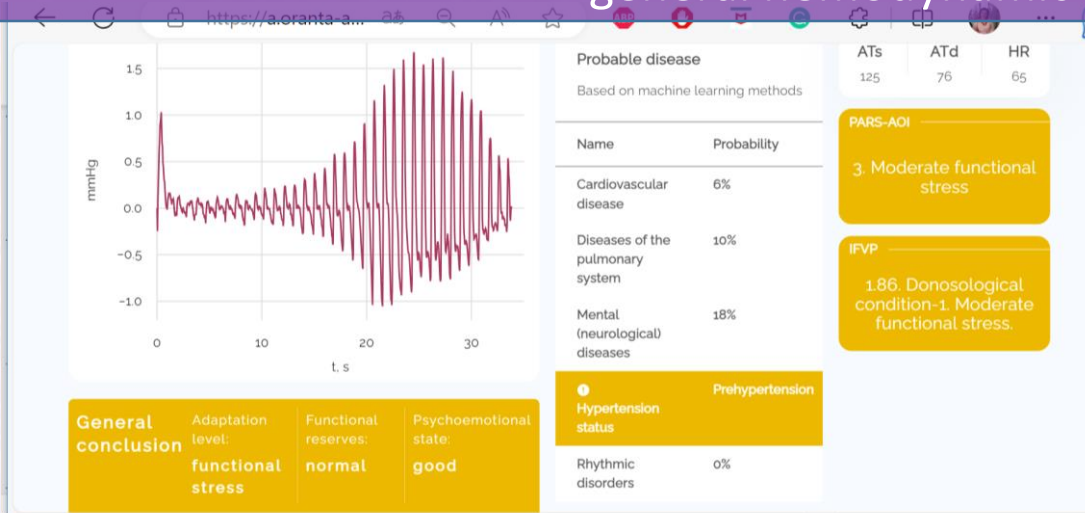


Smart tonometry



Smart tonometry

Smart tonometry assists ultrasound systemically to look at the problem of imbalance in the cardiovascular system, including identifying psychosomatic effects on the general hemodynamic picture



Smart tonometry

The screenshot displays the Angio Smart web application interface. At the top, there is a navigation bar with a home icon, 'Extremum Clarification', 'Expert System', and 'Report' tabs. The main content area is divided into three sections:

- Waveform:** A line graph showing pressure in mmHg (y-axis, -0.5 to 1.0) over time in seconds (x-axis, 0 to 30). The waveform shows a steady increase in amplitude and frequency over time, indicating a rising pulse.
- Probable disease:** A table listing diseases and their probabilities based on machine learning methods.

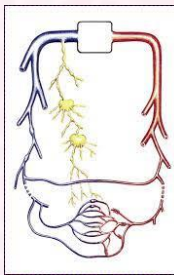
Name	Probability
Cardiovascular disease	11%
Diseases of the pulmonary system	7%
Mental (neurological) diseases	17%
Hypertension status	Not registered
Rhythmic disorders	30%
- Summary Metrics:** A table showing key metrics.

ATs	ATd	HR
111	71	40

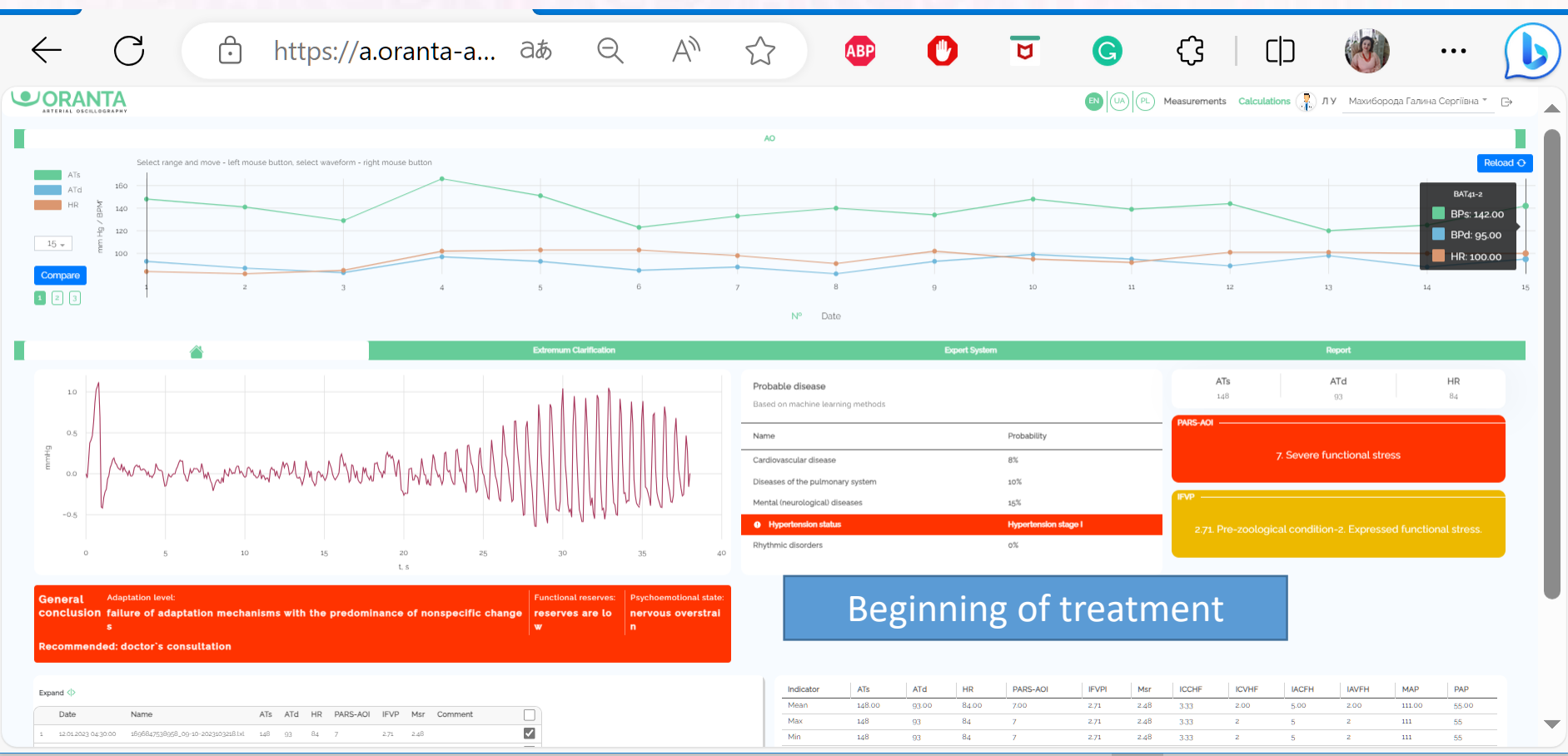
Below the metrics, there are two yellow boxes with diagnostic findings:

- PARS-AOI:** 5. Expressed functional stress
- IFVP:** 2.43. Donosological condition-1. Moderate functional stress.

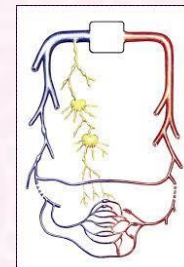
A red banner at the bottom left of the interface contains the text: "It is recommended to repeat the measurement, try not".



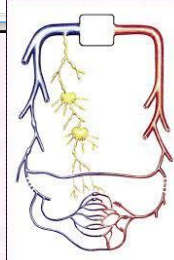
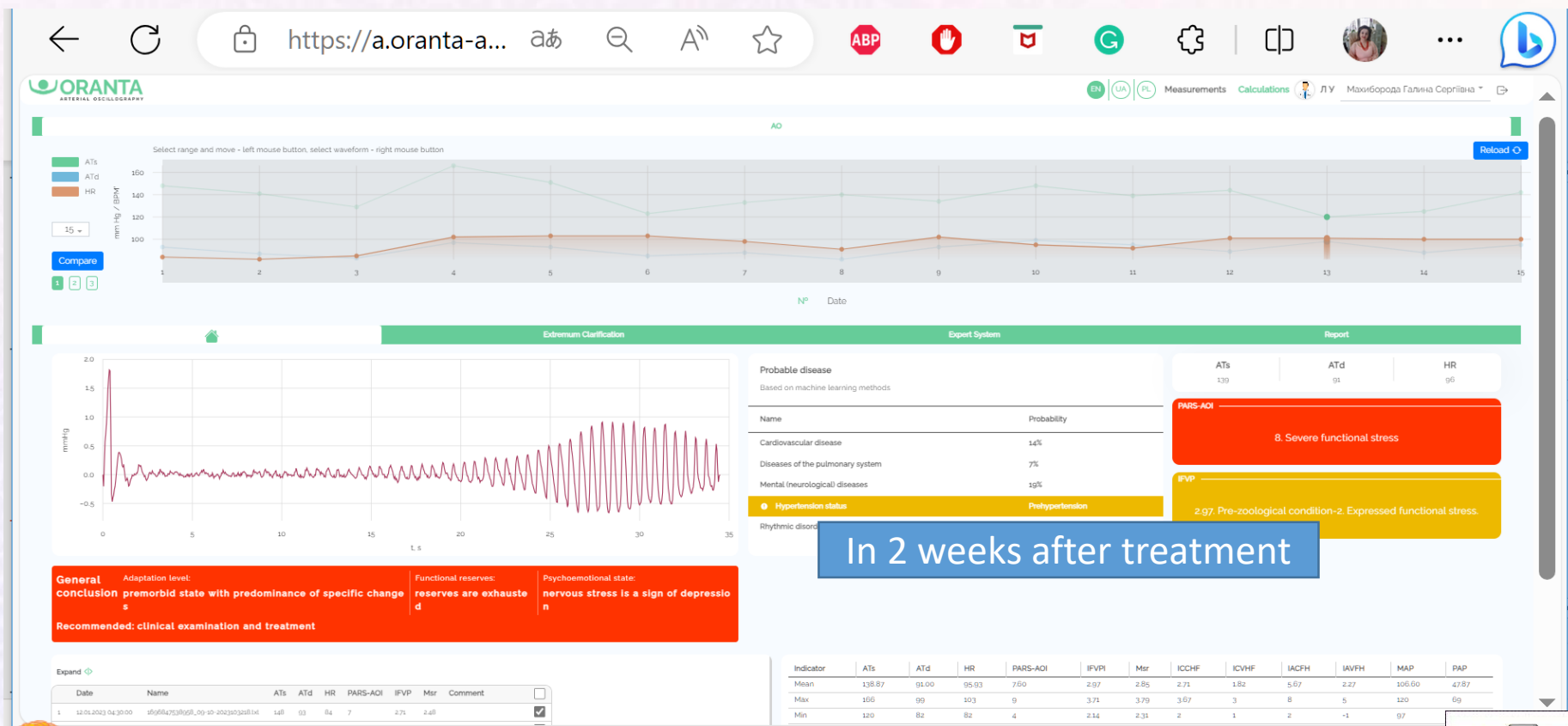
Smart tonometry



Beginning of treatment



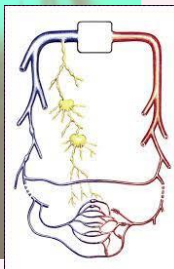
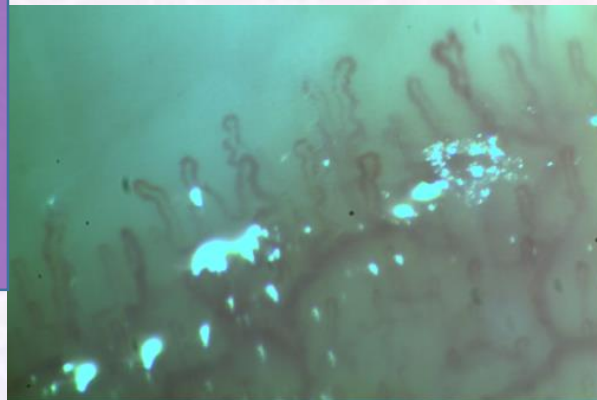
The cardiovascular system is in the process of establishing the synchronization of organs and systems



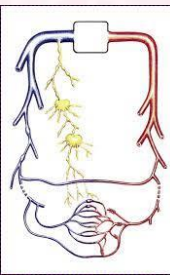
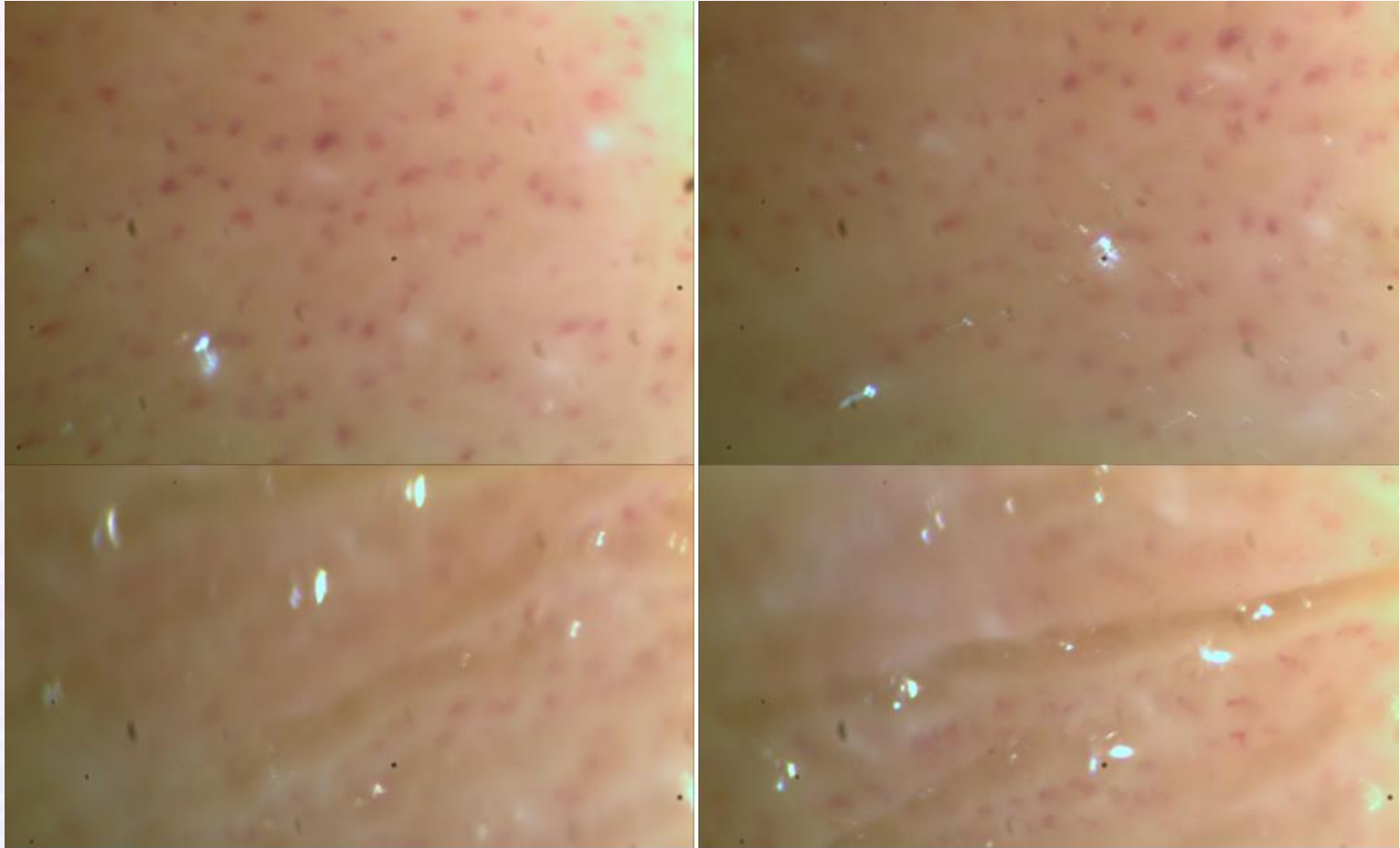
Vascular screening technology

Microcirculation, as the most remote segment of the cardiovascular system, reflects the quality of the entire cardiovascular blood flow.

Capillaries is an arbiter of cardiovascular well-being.



Vascular screening technology



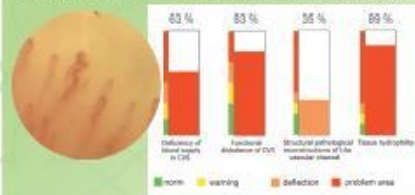
- **Ultrasound methodology enables not only to determine angiopathology,**
- **but also to compare the condition in different regional reservoirs,**
- **analyze the displacement of arteriovenous balance**
- **and timely redistribute blood flows in the human body with adequate exposure of all hemodynamic parameters.**



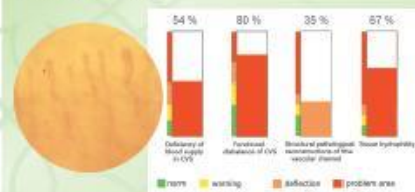
USD-angiography as evidence-based medicine for the treatment process

PEPEP Angiotherapy: from chaos in functioning in the cardiovascular system to normalization of parameters of blood supply for organs and systems for half-year intensive treatment under control of vascular innovative technologies

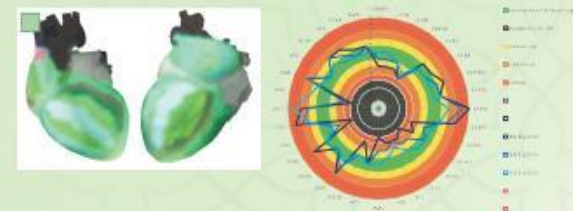
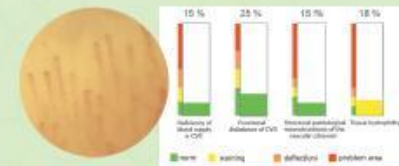
Objectivisation of 1st and 2nd month course with slight positive changes



2nd monthcourse



Objectivisation of 3 and 4 courses of treatment with considerable positive changes. The state is near to complete recovery.



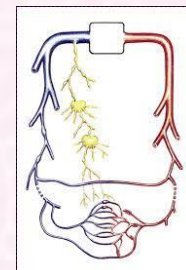
A patient has the opportunity to look after the heart state in the process of diagnostics and treatment.

A doctor gets an evident guidance to the action in the process of diagnostics and treatment.

Angiotherapy by the copyrighted technologies of Ulyana Lushchyk, MD, academician of ATS.



TRANSFORMATION OF PATHOLOGICAL REACTIONS OF VESSELS IN SANOGENIC AUTOREGULATORY CAN BE POSSIBLE ONLY DUE TO SMART TECHNOLOGIES - VASCULAR INNOVATIONS





**Thank you for
your attention!**

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Veritasangio@gmail.com

