

# IMEDOS TECHNOLOGY-FOR VASCULAR HEALTH

# Static Vessel Analysis

- Non-invasive and contact-free examination high patient tolerance
- Efficient and optimised workflow within seconds
- Interdisciplinary use cardiology, neurology
- From preventive diagnostics to monitoring the success of therapy
- High-precision optics and analysis features Innovation Made in Germany

## **Static Vessel Analysis**

The eye as a unique approach to microcirculation provides essential information on subclinical changes in the smallest vessels of the entire body. Through this "mirror image", Retinal Vessel Analysis provides information about the holistic vascular health of patients. It enables important conclusions to be drawn about systemic diseases and the development of end organ damage.

Static Vessel Analysis is an innovative method for non-invasive and contact-free examination of the state of microvessels. For this purpose, the retinal vessels are recorded using a fundus camera, and vessel parameters are determined and analysed. These parameters are valid biomarkers that can be used as risk factors or prognosis indicators for vascular diseases and vascular events in the eye and other organs. Static vessel analysis is therefore ideal for use in clinical routine as well as scientific examinations and provides important information about the individual patient risk, e.g. for:

- Risk assessment for vascular diseases
- Estimating and predicting progression
- Testing therapeutic approaches
- Monitoring therapy progress
- Motivating patients through early progress monitoring

#### A supplement to standard diagnostics, for example, in:



**Cardiology** Coronary heart diseases Heart attack Heart failure



#### **Cardiometabolic prevention**

Cardiovascular events (Heart attack, stroke) Cardiovascular diseases (Angina Pectoris, PAD)



**Ophthalmology** Glaucoma Retinal vascular occlusion Diabetic retinopathy

Alzheimer's, dementia, stroke



**Metabolic diseases** Diabetes Obesity Cholesterol



Nephrology Renal insufficiency



#### Rheumatology

Neurology





### Powerful technology – Innovation Made in Germany

The static vessel analysis is available as an innovative solution in the form of a:

- Complete system, the combination of fundus imaging system & the excellent VesselMap analysis software
- Software module, for adding already existing device systems.

	Complete system	Software module
Scope of delivery	Imedos Static Analyzer (ISA) consisting of: fundus camera, table, computer, monitor, VesselMap analysis software & license dongle	VesselMap analysis software & license dongle
Additional modules	Server solution, practice system connection, research module	Server solution, practice system connection, research module
Camera type	iCare DRSplus	Compatibility check as a prerequisite for software integration.
Image capture	Automatic alignment, focusing, exposure and capture	Depending on an existing device system
Examination	Non-mydriatic with automatic pre-selection of vessels	Depending on an existing device system

#### Examination procedure – within seconds

- 1. At least one standardised image of the retina is taken with the imaging system.
- 2. The digitized retinal image is evaluated using ring-shaped markers centred on the position of the optic disc.
- 3. The software automatically preselects all arterial and venous vessels with a diameter of more than 40  $\mu m.$
- **4.** From this, a vessel diameter averaged over the location is automatically determined for each connected vessel section.
- 5. The last step is automatic calculation of the Vessel parameters using the formulas described by Hubbard for the ARIC protocol<sup>1</sup>.

Note: Steps 2-4 are applied via automatic preselection of the software.



Static vessel analysis according to the ARIC study protocol

<sup>1</sup>Hubbard, Larry D., et al. "Methods for evaluation of retinal microvascular abnormalities associated with hypertension/sclerosis in the Atherosclerosis Risk in Communities Study. Ophthalmology 106.12 (1999): 2269–2280.

### **Biomarkers**

CRAE - Central Retinal Arteriolar Equivalent: Arterial model vessel diameter

CRVE - Central Retinal Venular Equivalent: Venous model vessel diameter

AVR - Arteriolar-to-Venular Ratio: The CRAE/CRVE ratio

The central equivalents CRAE and CRVE describe model vessel diameters for characterising the central vessels. These model vessel diameters take into account all arterial and venous vessels carrying blood to and from the retina, according to a geometric haemodynamic weighting.

## Study protocol



To illustrate the examination results, they are classified in norm data according to age. The individual vascular age of each patient, as well as the relative risks for the development of various symptoms and vascular events, can be determined from this representation. The risk is classified on the basis of large studies.

# Example of integration in everyday practice



Concept for future clinical implementation with modifications based on suggestions from (Kullo and Malik, 2007)

# Technical data – ISA system

Instrument table	Height-adjustable from 70 cm - 95 cm
Dimensions   weight of iCare DRSplus	30 cm x 45 cm x 65 cm (W x D x H) 11 kg
Ambient conditions	Temperature: +10 °C to +35 °C Rel. humidity: 30 % – 75 % non-condensing
Storage conditions	Temperature: -10 °C to +55 °C Rel. humidity: 10 % – 90 % non-condensing
Accessories	Instrument table with computer unit and power supply
Dimensions   weight of instrument table	100 cm x 70 cm x 70-95 cm (W x D x H) 38 kg
Permitted load of instrument table	max. 80 kg
Monitor	27 inches

# **Electrical specifications**

Retina Camera – iCare DRSplus				
Powersupply	25 VA max.			
Supply voltage	100 – 240 VAC			
Electrical power consumption	60 W			
Electrical protection class	IEC 60601-1 Class 1			
Degree of protection	IPX0			
Applied part	Туре В			

Comfort Workstation - instrument table with computer unit			
Supplyvoltage	230 VAC		
Electrical power consumption	Hub: 2A; Device sockets: 6.3 A		
Electrical protection class	Protection class 1 DIN EN 60601-1-2		
Degree of protection	IP20		
Applied part	Туре В		

# **Optical specifications**

Resolution on the retina	10 megapixels
Field of view angle	40° – 83°
Magnification	4.3 μm / Pixel
Refractive error compensation	-15 D to +15 D
Illumination	White / infrared
Working distance (front lens to patient eye)	25 mm

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