



PC8B SYSTEM *Wireless V.5*



Autonomic and Vascular Assessments :

- A new tool to differentiating the patient symptom causes
- Early detection of chronic diseases, such as type 2 diabetes and vascular disease.
- Early detection of complications and treatment adjustment of the underlying disease.

Patented system



PC8B SYSTEM

WHAT IS PC8B ?



INTEGRATED TECHNOLOGIES AND INTENDED USES

PC8B ASSESSMENTS

TECHNOLOGIES

SUDOMOTOR FUNCTION



SWEATC
GALVANIC SKIN RESPONSE**

BODY COMPOSITION



ES-BC
BIOIMPEDANCE ANALYSIS***

HEART RATE VARIABILITY AT REST
AND CARTs
PTG ANALYSIS TIME DOMAIN
PATENTED PTG SPECTRAL ANALYSIS



LD-OXY
PHOTOPLETHYSMOGRAPHY (PTG)

ANKLE BRACHIAL INDICES
VOLUME PLETHYSMOGRAPHY
ANALYSIS



TBL-ABI
BRACHIAL AND ANKLES'
VOLUME PLETHYSMOGRAPHY

*PC8B System Product Code OUG

** SweatC 510K# 152216Product Code GZO

*** ES-BC 510k #113264

**** LD-Oxy 510k # 160956 Product Code MWI, DQA

***** TBL-ABI 510k # 179636 Product Code JOM

Europe : EC Mark Class IIa

LD TECHNOLOGY IS ISO 13485





PC8B TESTS ANALYSIS

- HRV ANALYSIS
- BODY COMPOSITION
- SUDOMOTOR TEST
- CARDIAC AUTONOMIC REFLEX TESTS
- ANKLE BRACHIAL INDEX MEASUREMENTS
- PULSE VOLUME PLETHYSMOGRAPHY ANALYSIS
- PHOTOPLETHYSMOGRAPHY ANALYSIS



- ❖ **CARDIOMETABOLIC RISK MARKERS AND SCORE**
- ❖ **MICROVASCULAR MARKERS (ANS) AND SCORE**
- ❖ **MACROVASCULAR MARKERS AND SCORE**



**NON INVASIVE
MEASUREMENTS
IN
7-10 MINUTES**



**ANS , VASCULAR
AND LIFESTYLE
ASSESSMENTS**



**LIFESTYLE
SCORE**



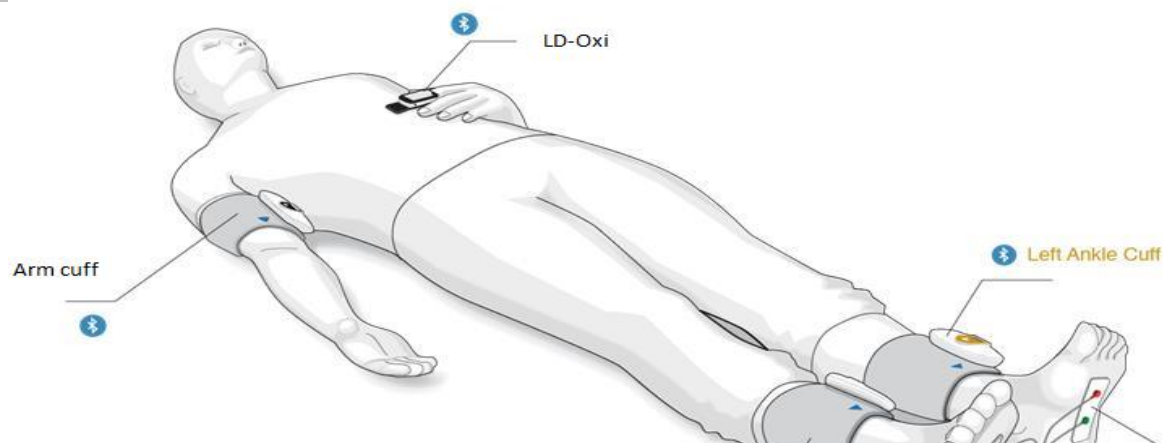
PC8B INPUT DATA: MEASUREMENT PROCEDURE AND RECORDS

PROCEDURE

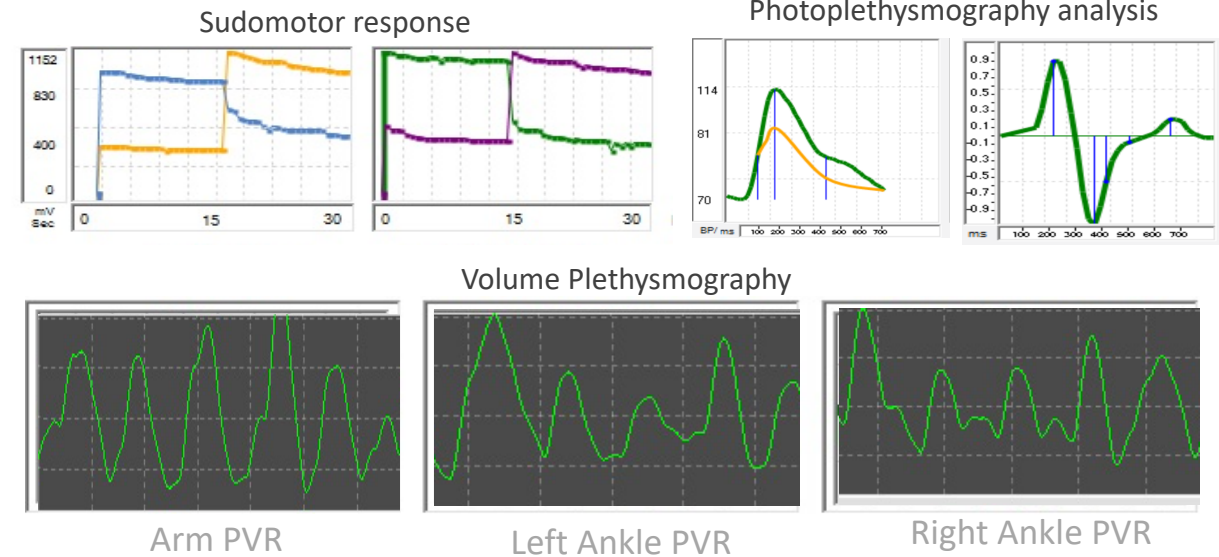
Patient is lying down and relax (at least for 5 min)

1. Enter patient info
2. Set up patient . Place the disposable electrodes on the soles of the feet, then place cuffs on the arm and ankles, and finally place pulse oximeter on the finger.
3. Checking device connections
4. Start the exam at baseline and sudomotor test
5. ABI measurements at the left arm and dorsalis pedis , and then, right arm and posterior tibial artery
6. Start the exam during the Cardiac Autonomic Reflex Tests (CARTs)

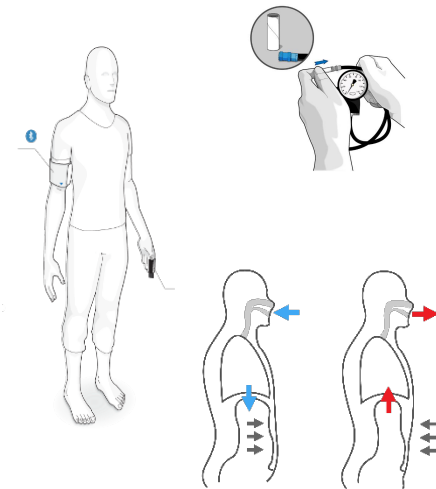
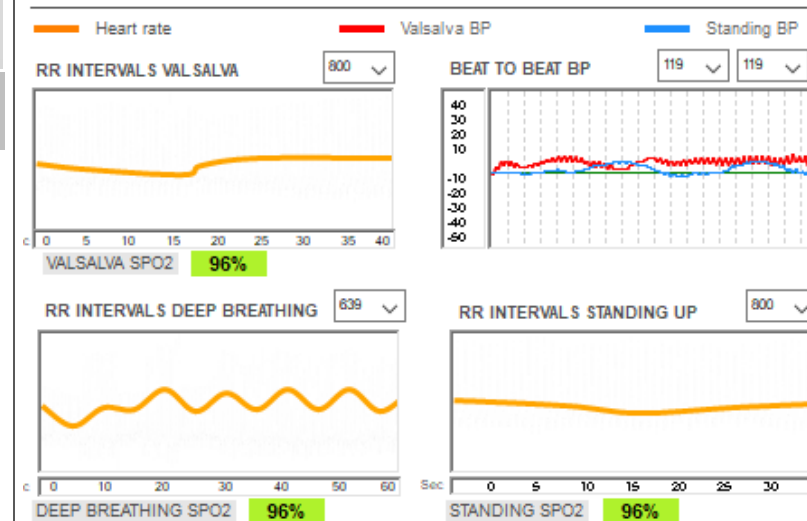
1- SETUP PATIENT



2- BASELINE RECORDS



3- CART RECORDS

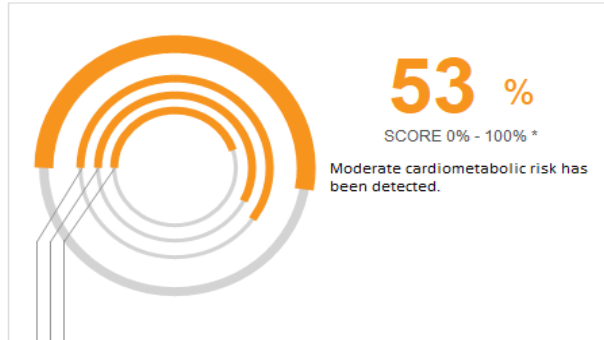




PC8B OUTPUT DATA

CARDIOMETABOLIC SCORE

= Off label use (www.lidtech.com/studies) complying with 21CFR 312.2 (b) (1).



CHARTS OVERVIEW

SCORE 0% - 40% **

18 %
AUTONOMIC SCORE

SCORE 0% - 40% **

23 %
VASCULAR SCORE

SCORE 0% - 20% ***

12 %
LIFESTYLE SCORE

(*)	(**)	(***)	
100%	40%	20%	VERY LOW RISK
90%	≥ 37%	≥ 18%	LOW RISK
80%	≥ 32%	≥ 16%	MILD RISK
60%	≥ 24%	≥ 12%	MODERATE RISK
≤ 40%	≤ 16%	≤ 08%	SEVERE RISK

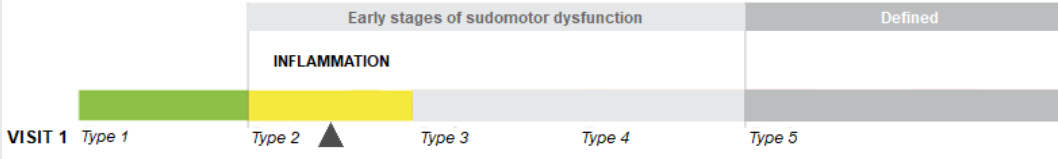


AUTONOMIC RISK CHART OVERVIEW

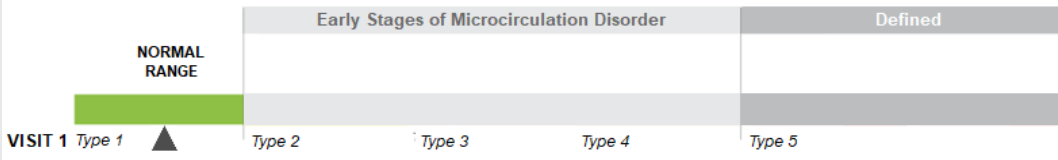
▲ CURRENT VISIT 1 12/5/2017 10:01



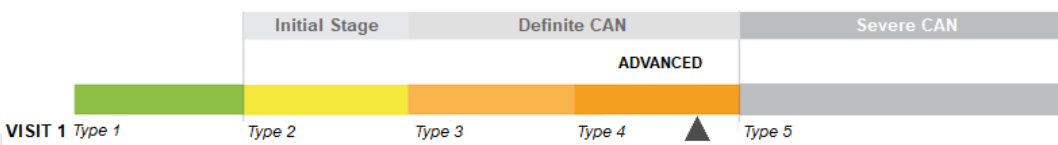
SMALL FIBER NEUROPATHY RISK CHART



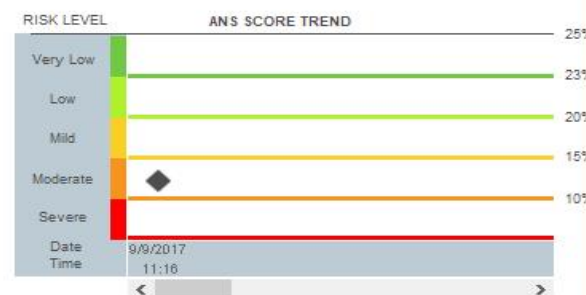
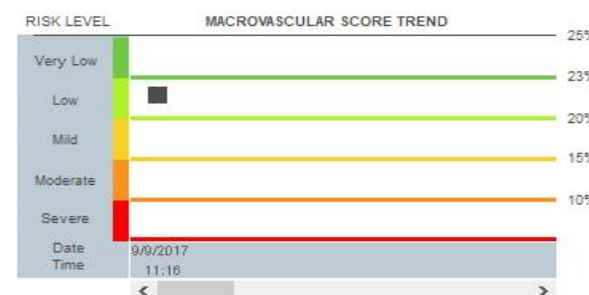
SKIN MICROCIRCULATION RISK CHART



CARDIAC AUTONOMIC NEUROPATHY (CAN) RISK



VASCULAR RISK CHART OVERVIEW



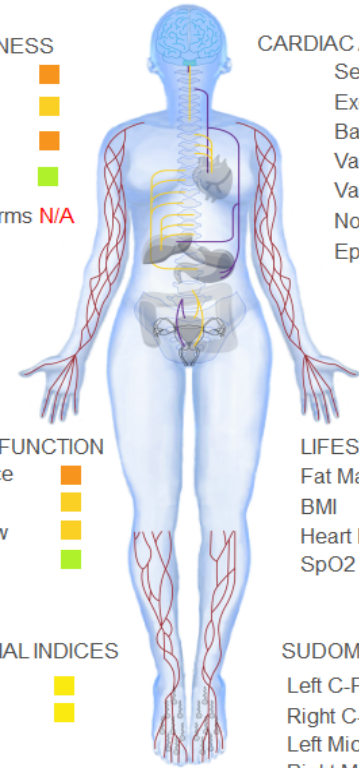
MAIN MARKERS

ARTERY STIFFNESS

- Aortic Systolic
- Aortic Stiffness
- Small Artery
- Lower Extremity
- Delta SP Both Arms N/A

CARDIAC AUTONOMIC RESPONSES

- Self Regulation
- Exercise Tolerance
- Baroreceptor
- Vagal Innervation
- Vagal Standing
- Norepinephrine N/A
- Epinephrine N/A



ENDOTHELIAL FUNCTION

- Insulin Resistance
- Inflammation
- Heart Blood Flow
- Fibrinogen

LIFESTYLE

- Fat Mass
- BMI
- Heart Rate
- SpO2 %

ANKLE BRACHIAL INDICES

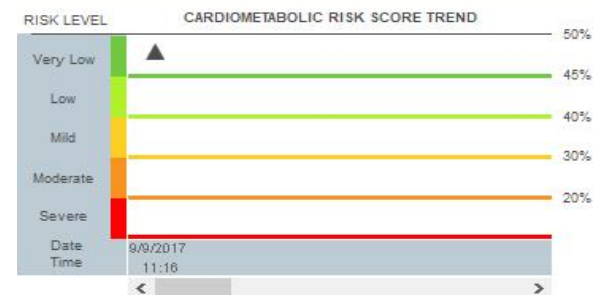
- Left ABI
- Right ABI

SUDOMOTOR RESPONSE

- Left C-Fiber
- Right C-Fiber
- Left Microcirculation
- Right Microcirculation

Normal Acceptable Borderline Abnormal Severe

SUMMARY





HOW DOES PC8B MAKE A DIFFERENCE?



BENEFITS

- 1. No human error. Clear Labeling and software connection control and user guidance messages.
- 2. Fast measurements: Simultaneous Tests (HRV, PTG , sudomotor and ABI measurements)
- 3. Patented cardiometabolic risk markers and Accurate results validated by several published studies.
- 4. Clear report with different options.
- 5. Increased patient and technician comfort: Our most recent innovation includes wireless transmission. ANS and Vascular function overview helps physicians differentiate vascular from neuropathic symptoms.

Our vision is to provide physicians with new tools that simplify complex procedures, such as Ankle Brachial Index (ABI) and Autonomic Nervous Systems Assessments, recommended by US and International Medical Associations.



PC8B SYSTEM

**WHO SHOULD BE MEASURED WITH
PC8B ?**



WHO SHOULD BE MEASURED WITH PC8B ?

WHICH PATIENTS REQUIRE TESTING?

Patients having symptoms suggesting either Autonomic Neuropathy Peripheral Arterial Disease (PAD).

Main symptoms associated with Autonomic Neuropathy or PAD:

Pain, numbness, tingling or burning in the feet
Dizziness, Syncope
Leg pain after effort , claudication

American Diabetes association (ADA): Autonomic testing is recommended for all patients with type 2 diabetes at the time of the diagnosis, and 5 years after diagnosis in individuals with type 1 diabetes.

American Heart association (aha) : ABI testing is recommended for all patients over 50 with high Cardiovascular risk and everyone over 70.

ANS Testing recommendations From ADA



USA DIABETES

Over than 30 million

USA PREDIABETES

Over than 84 million

ABI Testing recommendations From AHA

50+ Population over 50 years old with cardiovascular risk factors :



70+ Everyone older than 70

Over than 45 million

Individuals with diabetes that have autonomic neuropathy have a significantly higher mortality, and higher hypoglycemia risk.

LD TECHNOLOGY



MAKING A DIFFERENCE

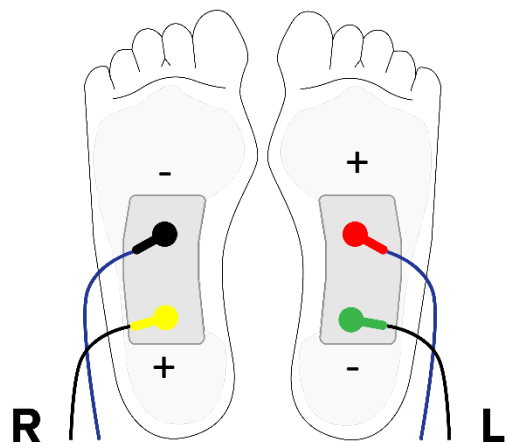
PC8B TECHNOLOGIES

SWEATC : GALVANIC SKIN RESPONSE
TECHNOLOGY

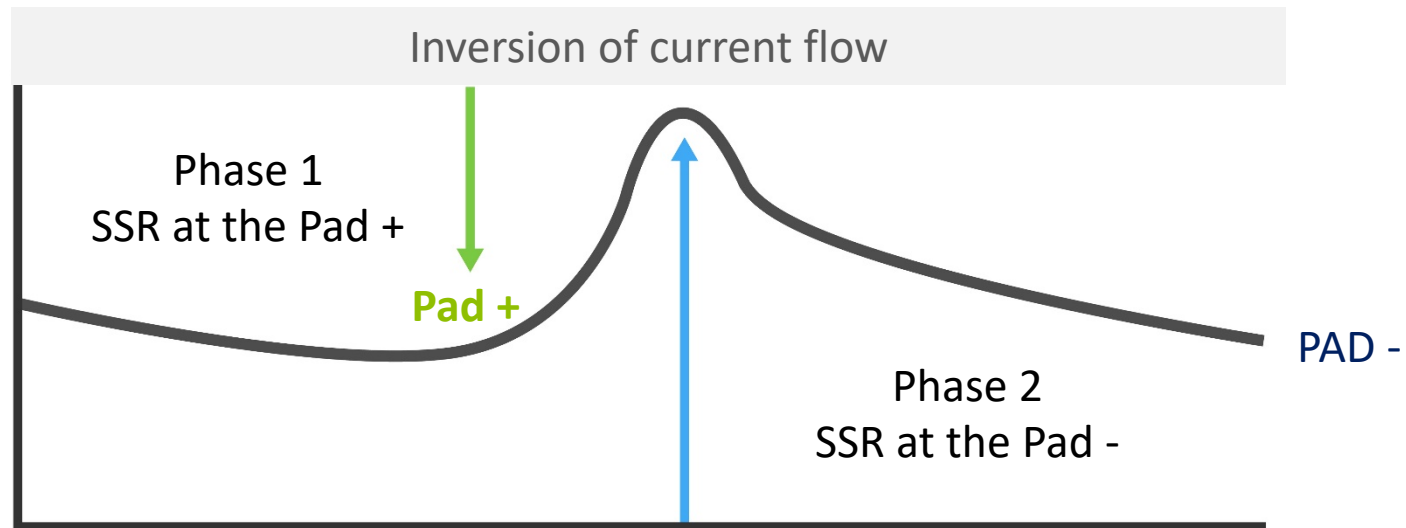
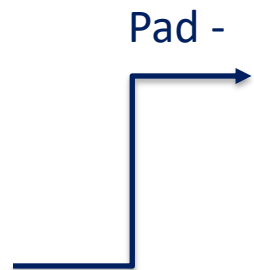


SWEATC : SUDOMOTOR TESTING PROCESS OF MEASUREMENT

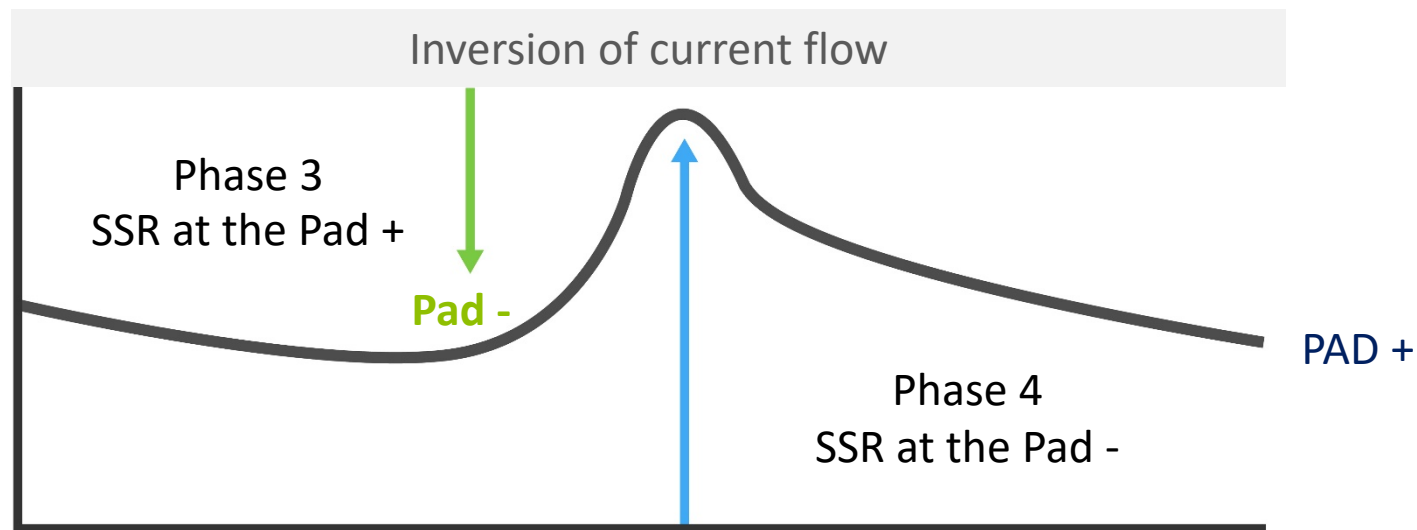
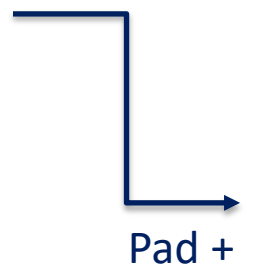
Pads positioning



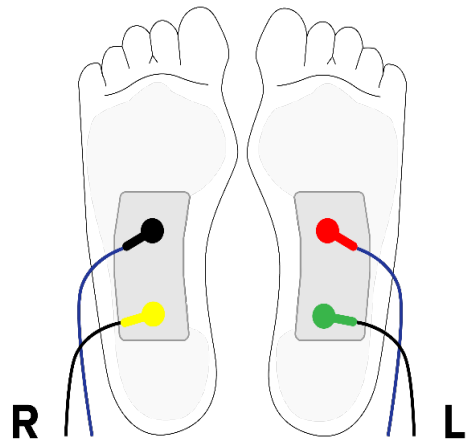
Current generate by the hardware



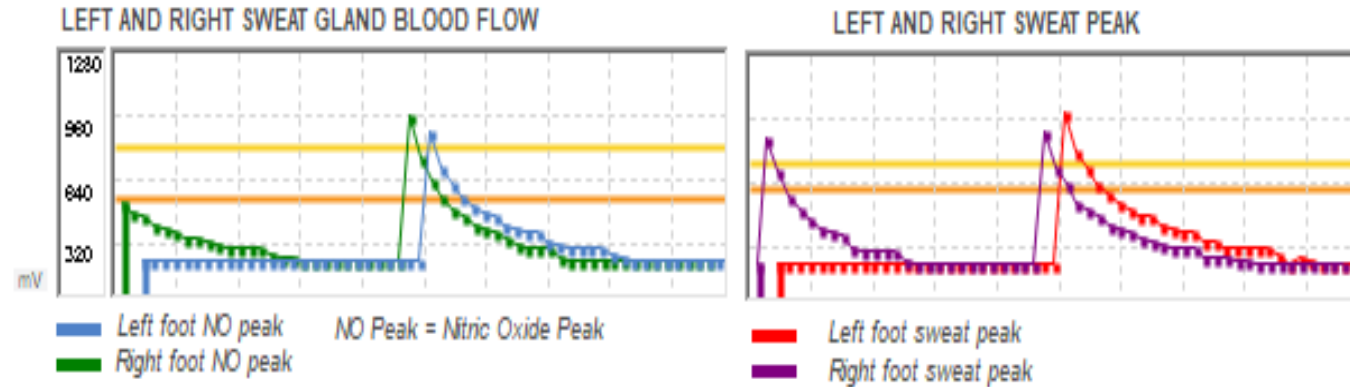
NO Sweat Peak Marker of microvascular disorders



iSweat Peak marker of cholinergic fiber (C-fiber) neuropathy



SUDOMOTOR TESTS GRAPHICS



Sudomotor testing is used in the clinical setting to evaluate and document neuropathic disturbances that may be associated with pain.

Sudomotor testing is also the only way to detect isolated damage to sudomotor nerves in a number of different disease states such as Ross Syndrome, Harlequin Syndrome, diabetes, multiple system atrophy, Parkinson's disease, autoimmune autonomic ganglionopathy, and pure autonomic failure.



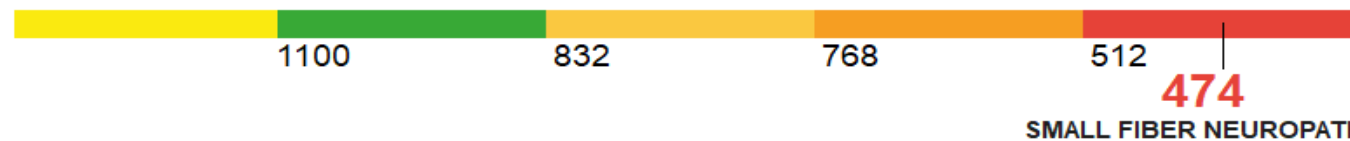
SWEATC: RESULTS AND SUDOMOTOR READING GUIDELINES

SUDOMOTOR FUNCTION MARKER

LEFT SMALL C-FIBER RESPONSE (LF SWEAT PEAK mV)



RIGHT SMALL C-FIBER RESPONSE (RF SWEAT PEAK mV)



LEFT MICROCIRCULATORY RESPONSE (LF NO PEAK mV)



RIGHT MICROCIRCULATORY RESPONSE (RF NO PEAK mV)



SUDOMOTOR GUIDELINES



According to the SweatC clinical studies.

The sudomotor function is controlled by the cholinergic sympathetic system acting by the cholinergic autonomic nervous system fibers (C-Fibers).

The Quantitative Sudomotor Reflex Test uses a constant electrical stimulation of the C-Fibers. The C-Fibers activation induces first a microcirculation dilation (Peak NO for each foot) and then, a sweat response (Sweat Peak for each foot).

NORMAL RANGE

NO Peaks greater or equal to 832 mV and LF Sweat Peaks greater or equal to 832 and lower or equal to 1100 mV.

EARLY SIGN OF MICROCIRCULATORY DISORDER.

NO Peak lower than 832 mV and greater than 768 mV.

BORDERLINE MICROCIRCULATORY DISORDER.

NO Peak lower or equal to 768 mV and greater than 640 mV.

DEFINITE MICROCIRCULATORY DISORDER.

NO Peak lower or equal to 640 mV and greater than 512 mV.

SEVERE MICROCIRCULATORY DISORDER.

NO Peak lower or equal to 512 mV:

C-FIBER INFLAMMATION

Sweat Peak test result greater than 1100 mV

BORDERLINE REDUCED C-FIBER DENSITY

Sweat Peak test result lower than 832 mV and greater than 768 mV.

DEFINITE REDUCED C-FIBER DENSITY

Sweat Peak test result lower or equal to 768 mV and greater than 512 mV

SMALL FIBER NEUROPATHY

Sweat Peak test result lower or equal to 512 mV:

■ CARDIAC AUTONOMIC RESPONSE MARKERS





PC8B SYSTEM

ANKLE BRACHIAL PRESSURE
MEASUREMENT



TBL-ABI SYTEM GENERAL FEATURES

The TBL-ABI System uses 3 Bluetooth blood pressure with a patented Pulse wave measurement to measure the Ankle Brachial Indices.

The measurement of the blood pressure is performed by Pulse wave which displays a volume Plethysmography equivalent to the bi-direction Doppler



The Ankle Brachial Index (ABI) is the highest systolic pressure at the right or left ankle, divided by the highest systolic pressure at the arms. It has been shown to be a specific and sensitive metric for the diagnosis of Peripheral Arterial Disease (PAD). Additionally, the ABI has been shown to predict mortality and adverse cardiovascular events independent of traditional CV risk factors.



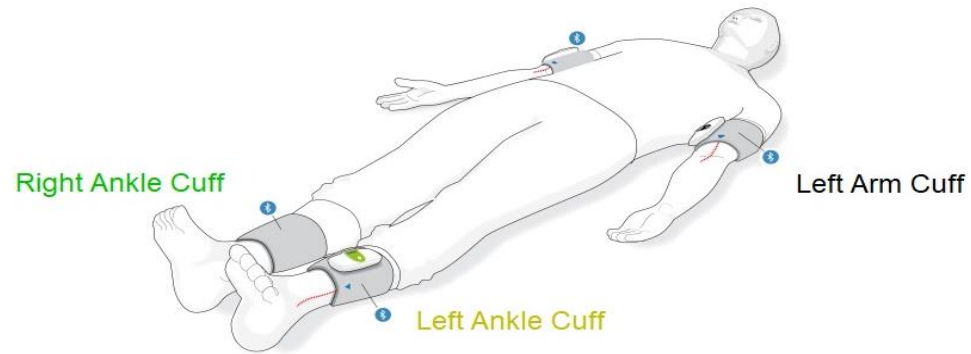
TBL-ABI PATIENT SETUP STEP 1

PATIENT SETUP STEPS

LEFT ARM AND RIGHT AND LEFT DORSALIS PEDIS ARTERY

Arm Cuff Selection

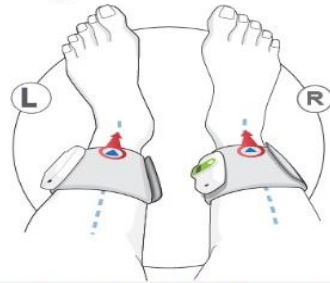
- Regular Cuff (Default)
- Large Cuff



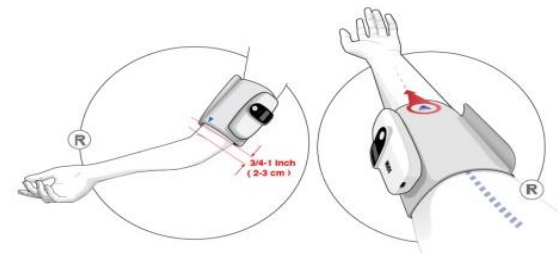
THE PATIENT IS IN RECLINED POSITION AND RELAXED

BLUETOOTH CUFF BP PAIRED

OK



The ankle cuffs are placed on the right and the left ankle according to the color and labeling. The blue arrow is pointing down towards the middle of the feet.



The arm cuff can be placed on the left arm. The blue arrow is pointing down toward the wrist.

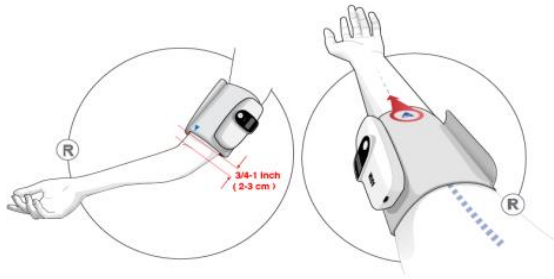
CANCEL

CONTINUE

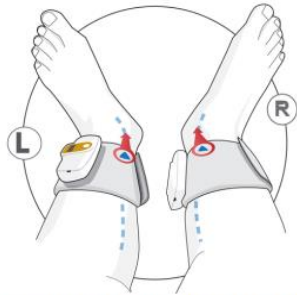


TBL-ABI PATIENT SETUP STEP 2

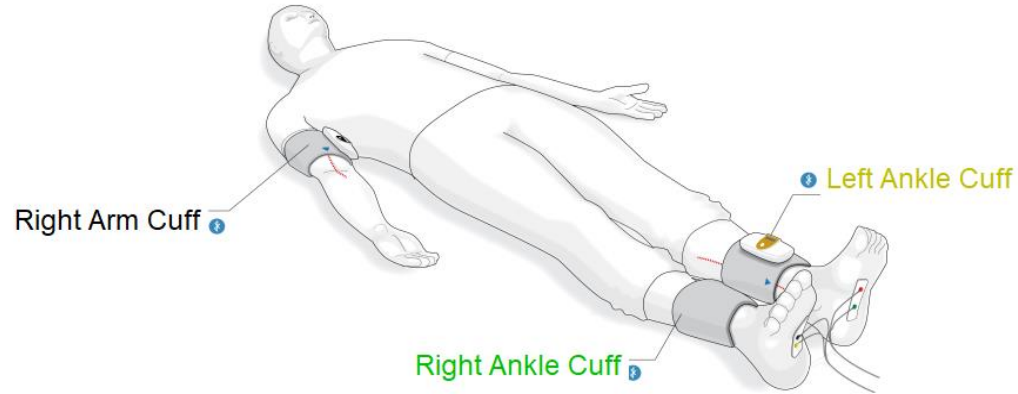
PATIENT SETUP POSTERIOR ANKLE CUFF PLACEMENT AND ARM CUFF ON RIGHT



Please move the arm cuff from the left to the right. The arm cuff can be placed on the right arm. The blue arrow is pointing down toward the wrist.



The cuffs are rotated to the inside of the ankles just above the medial malleolus, and the blue arrows must be pointing toward to the posterior tibial arteries, at the medial malleolus.



THE PATIENT IS LYING DOWN AND RELAXED

When the patient is ready click once on the white button of each BP to activate the Bluetooth. Each screen must be displaying -0- and then click on CONTINUE



NOTE! If the zero is flashing or does not appears that means the battery is low and it needs to be charged before the measurement. If the device starts manually, click twice to turn off and then, click once to turn on again.

BLUETOOTH CUFF BP PAIRED



CANCEL

CONTINUE



TM-ABI : SYMPLIFYING THE ASSESSMENT OF PERIPHERAL ARTERY

Compared to the handheld Doppler probe, TBL-ABI performs an automated ABI measurement in less than 2 minutes without tubes on the body and therefore increase the comfort of the patient.

Innovative technology enables the device to provide accurate and objective results, based on which the physicians can detect Peripheral Arterial Disease with great confidence.

	DOPPLERMETHOD	TBL-ABI	AVANTAGES
Measurement duration	30 mins	3 mins	Plethysmographic method
Interoperator coefficient	5.5%	3%	Better reproducibility
Measuring process	One extremity at a time	Simultaneous	Saving time
Accuracy	Measurements at both arms, dorsalis pedis and posterior tibial artery	Measurements at both arms, dorsalis pedis and posterior tibial artery	High correlation
Measurement report	No	Automatic via PC	For the patient record and insurance billing
Patient comfort	Tubes	No tubes	Bluetooth technology
Technicien error	Depend of the technician experience	Clear labelling and right placement of the cuffs	Low risk of human error
Calculations	Manually	Automatic	Instant left and right ABI and more accuracy



ANKLE BRACHIAL INDEX AS DIAGNOSTIC OF PERIPHERAL ARTERY DISEASE

ABI Value	Interpretation	Recommendation
Greater than 1.39	Calcification / Vessel Hardening	Refer to vascular specialist
1.0 - 1.39	Normal	None
0.91 - 0.99	Acceptable	Treat risk factors
0.81 - 0.9	Some Arterial disease	Treat risk factors and Medication acetylsalicylic low dose
0.6 - 0.8	Moderate Arterial Disease	Refer to vascular specialist
Less than 0.6	Severe arterial Disease	Refer to vascular specialist

The ankle-brachial index test is a quick, noninvasive way to check your risk of peripheral artery disease (PAD).

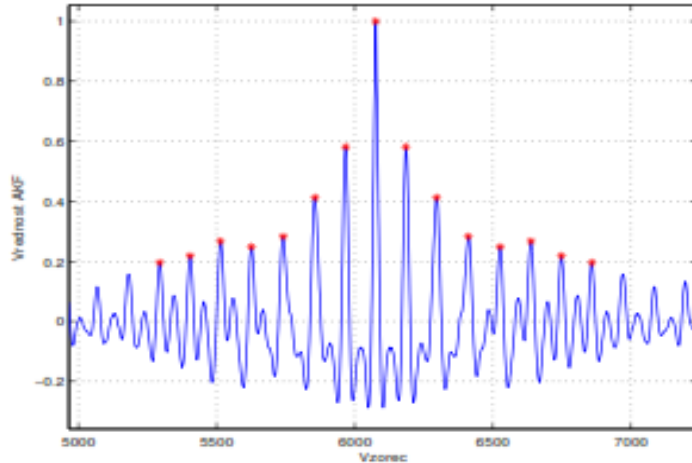
A low ankle-brachial index number can indicate narrowing or blockage of the legs arteries which increasing the risk of circulatory problems causing heart disease or stroke

A high ankle-brachial index number can indicate calcification of the legs arteries which increasing of mortality

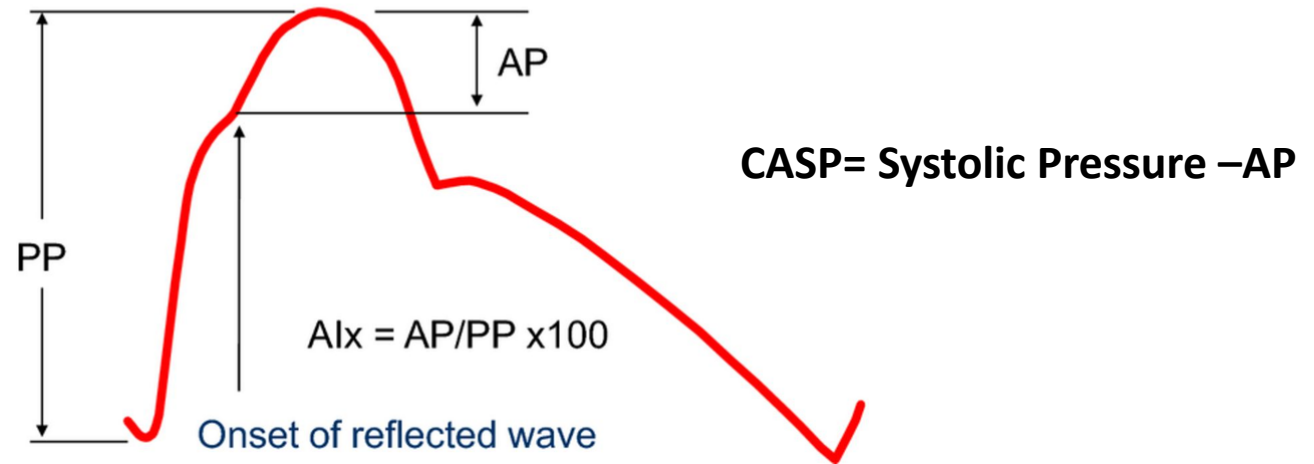
The ankle-brachial index test is recommended by AHA as part of a series of three tests, including the carotid ultrasound and abdominal ultrasound, to check for blocked or diseased arteries



TBL-ABI VOLUME PLETHYSMOGRAPHY



CENTRAL AORTIC BLOOD PRESSURE (CASP) AND PERIPHERAL AUGMENTATION INDEX (Aix) Central Aortic Pressure Waveform



Emerging evidence now suggests that central pressure is better related to future cardiovascular events than is brachial pressure. Moreover, anti-hypertensive drugs can exert differential effects on brachial and central pressure. Therefore, basing treatment decisions on central, rather than brachial pressure, is likely to have important implications for the future diagnosis and management of hypertension.



TBL-ABI ABI RESULTS AND REPORT

LOWER LARGE ARTERY



According to the "Management of Patients with Peripheral Artery Disease" published by the Journal of the American College of Cardiology.

NORMAL RANGE: ABI from 1.0 to 1.30.

An ankle-brachial index number in this range suggests that the patient probably doesn't have peripheral artery disease.

PRE-NON-COMPRESSIBLE: ABI from 1.31 to 1.39.

From 1.31 to 1.39: Pre Non-Compressible. Early stage of artery calcification.

ACCEPTABLE: ABI from 0.91 to 0.99.

From 0.91 to 0.99: Acceptable. Some narrowing of the arteries in the leg. Treat risk factors.

BORDERLINE: ABI from 0.90 to 0.81.

Moderate blockage of the ankle and leg arteries. Treat risk factors and medication acetylsalicylic acid low dose is suggested.

DEFINED: ABI from 0.80 to 0.61.

Defined Peripheral Artery Disease (PAD). Refer to cardiologist.

SEVERE: ABI 0.60 or less.

Severe Peripheral Artery Disease (PAD). Refer to cardiologist.

NON-COMPRESSIBLE: ABI greater than 1.39.

Non-Compressible artery. Possibility of artery calcification. Refer to cardiologist.

LEFT ANKLE BRACHIAL INDEX



1.14

NORMAL

RIGHT ANKLE BRACHIAL INDEX



1.30

NORMAL

RIGHT ARM
SYSTOLIC P.

136
mmHg

RIGHT PT ARTERY
SYSTOLIC P.

188
mmHg

RIGHT DP ARTERY
SYSTOLIC P.

147
mmHg

LEFT ARM
SYSTOLIC P.

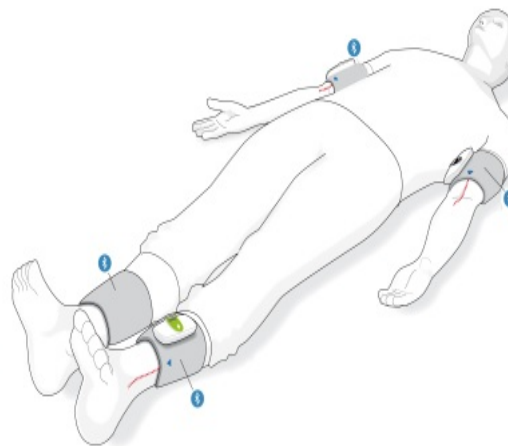
145
mmHg

LEFT PT ARTERY
SYSTOLIC P.

161
mmHg

LEFT DP ARTERY
SYSTOLIC P.

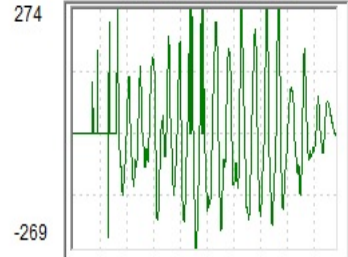
165
mmHg



P = Pressure, PT = Posterior Tibial, DP = Dorsalis Pedis.

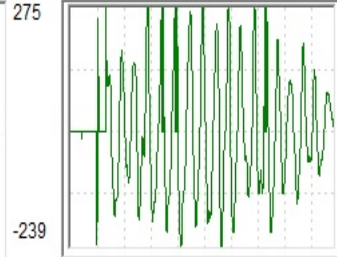
>= 1.4	1.39 - 1.30	1.29 - 1.00	0.99 - 0.91	0.90 - 0.81	0.80 - 0.61	<= 0.6
NC	PRE NC	Normal	Acceptable	Borderline	Abnormal	Severe

LEFT ARM ARTERY



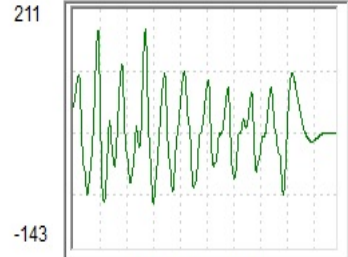
Amplitude 543

RIGHT ARM ARTERY



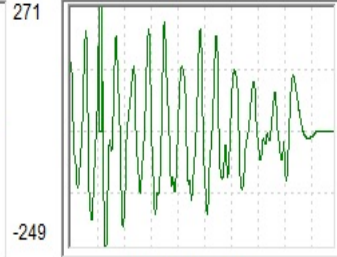
Amplitude 514

LEFT ANKLE DP ARTERY



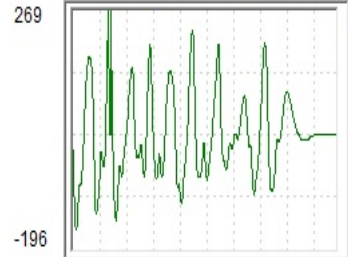
Amplitude 354

LEFT ANKLE PT ARTERY



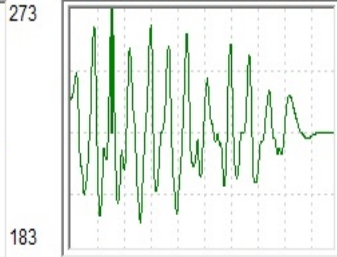
Amplitude 520

RIGHT ANKLE DP ARTERY



Amplitude 465

RIGHT ANKLE PT ARTERY





Amplitude 456






TBL-ABI ARTERIAL STIFFNESS AND CENTRAL AORTIC PRESSURE RESULTS

■ LARGE ARTERY STIFFNESS

Peripheral Aix	(%)	Aortic stiffness.	100		75	100	ABNORMAL
Left baPWV	(cm/s)	Left leg artery stiffness.	1042		1550	1800	NORMAL
Right baPWV	(cm/s)	Right leg artery stiffness.	1026		1550	1800	NORMAL

■ ARM BLOOD PRESSURE ANALYSIS

Central Aortic SP.	(mmHg)	Pressure at the aorta.	142		130	136	ABNORMAL
Cardiac Output.	(L/min)	Heart blood pumped/min	5.8		4	8	NORMAL
Delta Right / Left Arm	(mmHg)	Subclavian or axillary stenosis.	N/A		10	20	

PTG = Photoplethysmography, baPWV = Brachial Ankle Pulse Wave Velocity, SP = Systolic Pressure.



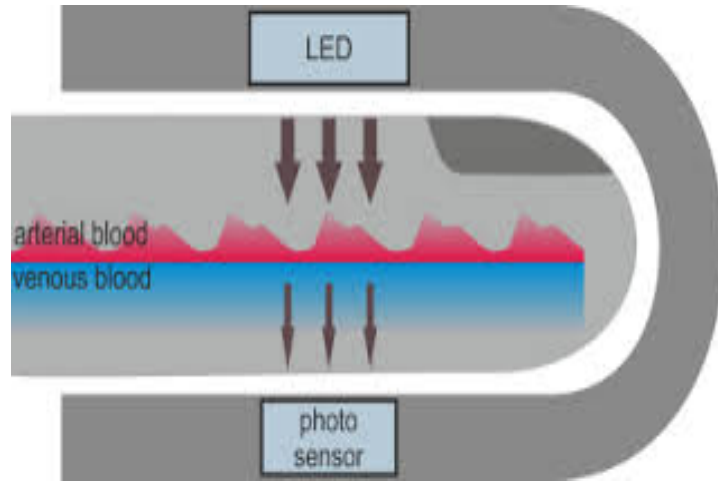
PC8B SYSTEM

LD-OXY: PHOTOPLETHYSMOGRAPHY
TECHNOLOGY



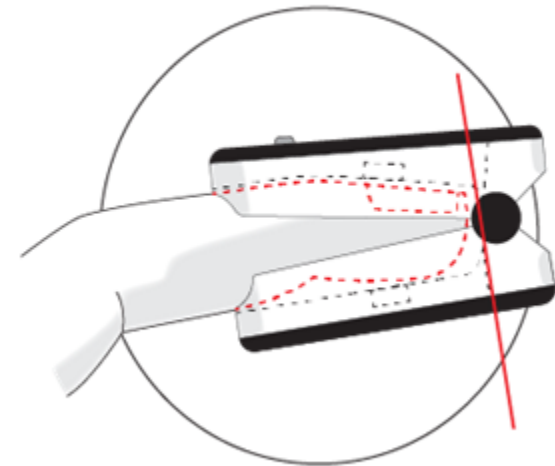
PHOTOPLETHYSMOGRAPHY

Incident Light (Red/IR)



PTG :Arterial vessel and changes in blood volume with cardiac cycle

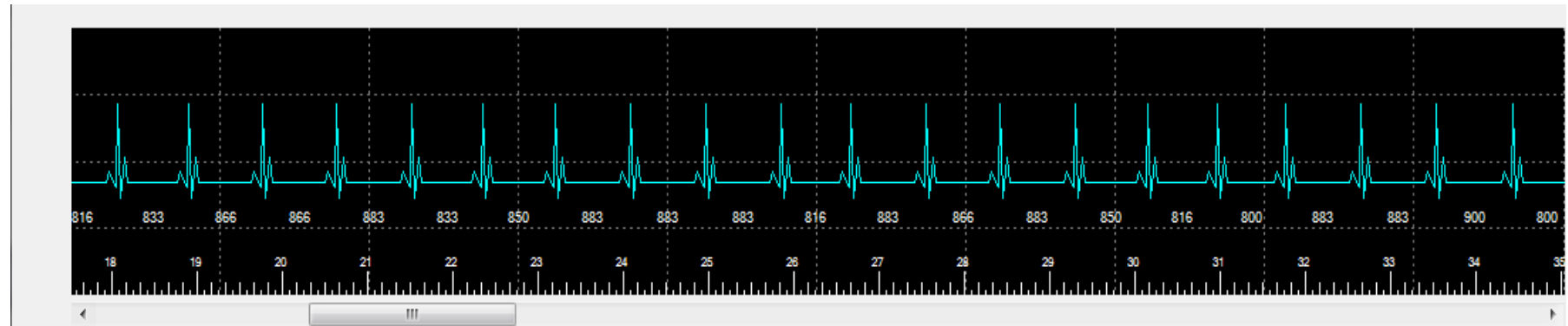
Venous vessel not affected



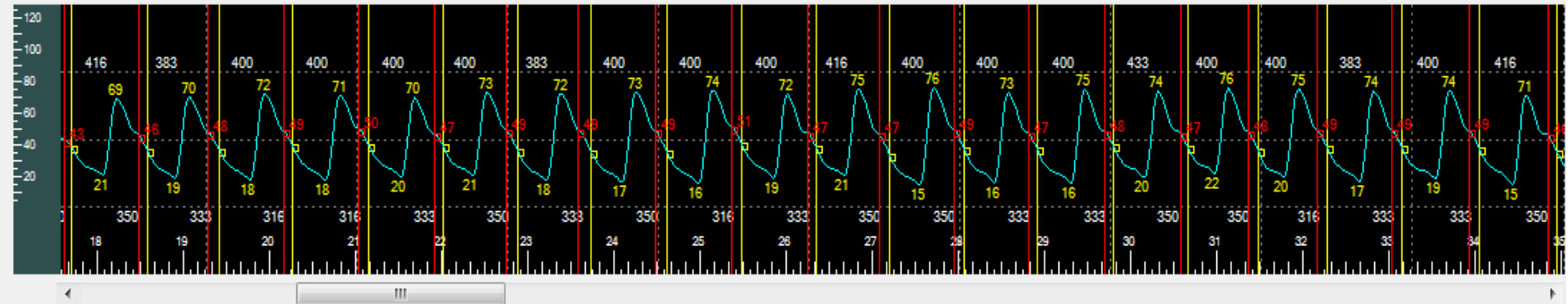


PHOTOPLETHYSMOGRAPHY (PTG) RECORDS AND ANALYSIS

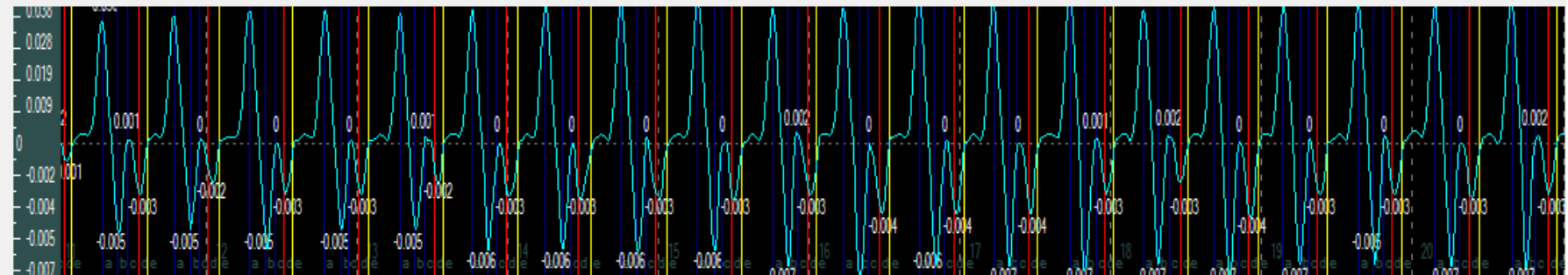
First derivative PTG
Analysis for accurate
heart rate detection. EKG
correlation 99.9%



Original PTG Analysis

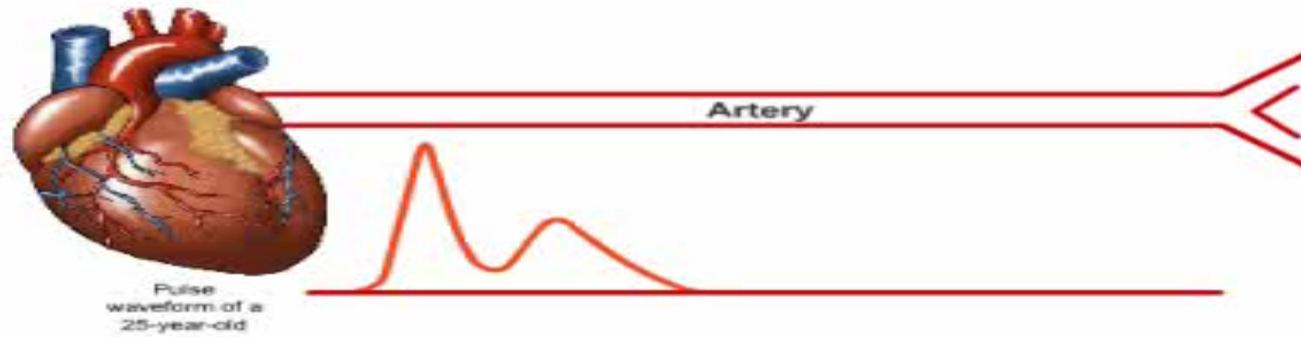
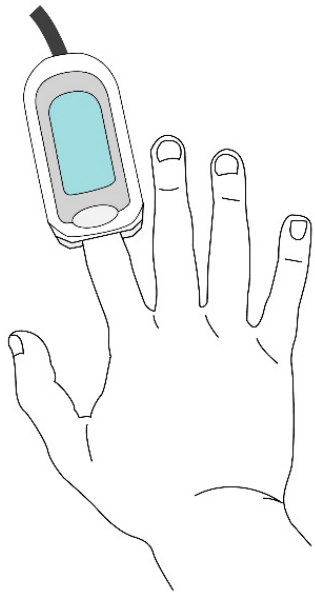


Second derivative PTG
Analysis for vascular tone
assessment





Peripheral vascular tone related to age



Pulse Waveform of a 47 year old person

With age, the arteries stiffen. Pulse wave velocity increases and the reflected wave now travels faster and gives rise to a "shouldering" at the primary wave, and occurs during systole. This effect prolongs the systolic cycle increasing the workload and oxygen requirement of the heart muscles. The poor notch also compromises the flow of the coronaries.





PC8B SYSTEM

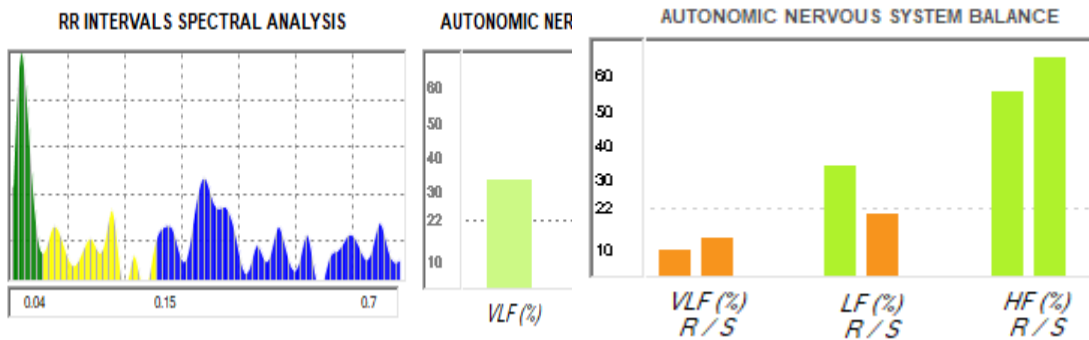
LD-OXY: CARDIAC AUTONOMIC
NERVOUS SYSTEM ASSESSMENT



RR INTERVALS ANALYSIS AND BEAT TO BEAT BLOOD PRESSURE ANALYSIS

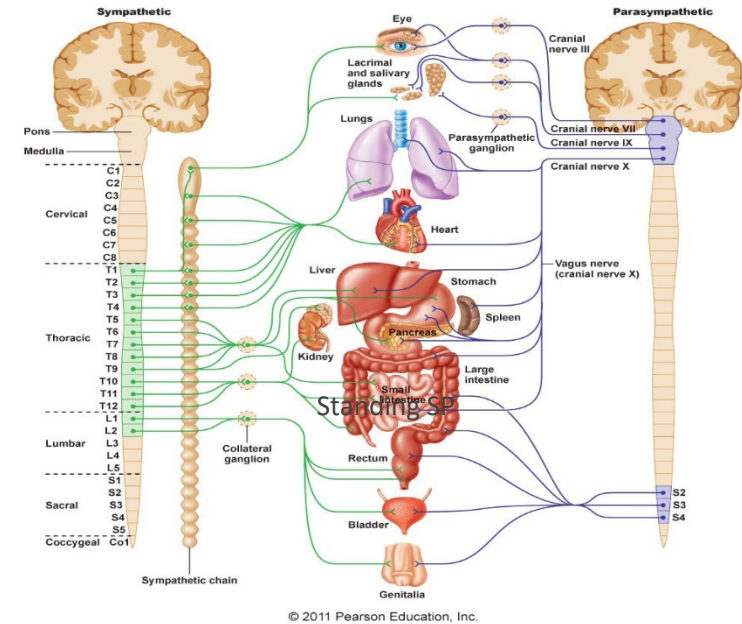
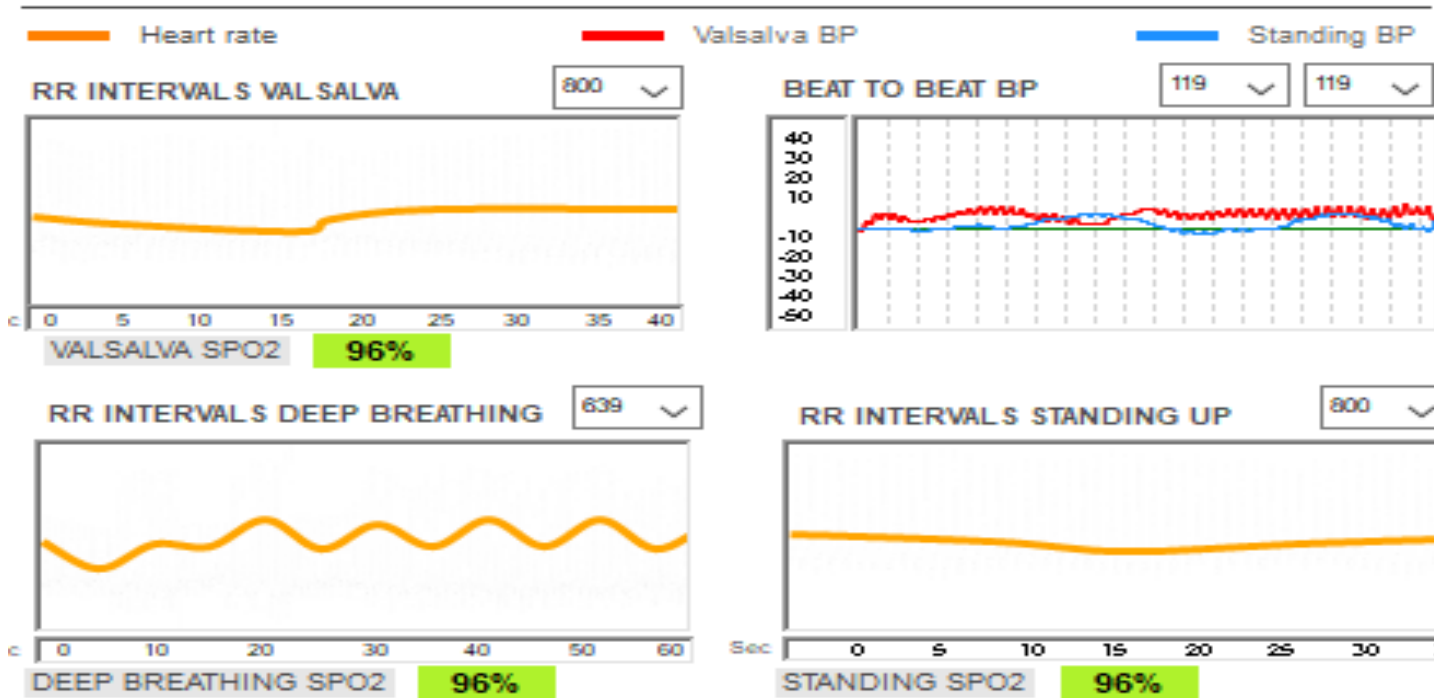
HEART RATE VARIABILITY ANALYSIS AT REST/STANDING

RR INTERVALS SPECTRAL ANALYSIS AUTONOMIC NERVOUS BALANCE



Self body Regulation
Assessment related to the
level of fitness

CARDIAC AUTONOMIC REFLEX TESTS (CARTs) ANALYSIS



Diagnostic of Cardiac Autonomic
Neuropathy (CAN)



LD-OXY: CARDIAC AUTONOMIC NEUROPATHY ASSESSMENT RESULTS AND READING GUIDELINES

In the CAN Subcommittee of the Toronto Consensus Panel statement and Ewing peer reviews are defined criteria for CAN definition and severity. The diagnosis is based on 7 tests: 5 CARTs (Valsalva, deep breathing, K30/15 , SPRS and DPRS) and HRV tests in time (SDANN) and frequency-domains (Total Power). The protocol has a sensitivity of 97.5% for detection of ANS dysfunction.

CARDIAC AUTONOMIC RESPONSE MARKERS

CAN READING GUIDELINES



In the CAN Subcommittee of the Toronto Consensus Panel statement and Ewing peer reviews are defined criteria for CAN definition and severity. The diagnosis is based on 7 tests: 5 CARTs (Valsalva, deep breathing, K30/15 , SPRS and DPRS) and HRV tests in time (SDANN) and frequency-domains (Total Power).

NORMAL RANGE:
No abnormal test result.

INITIAL STEP: early CAN diagnosis

According to the CAN Subcommittee of the Toronto Consensus Panel statement, only one abnormal result is the initial step 1 of CAN diagnosis. According to Ewing : two borderline test results or one abnormal result is the initial step 2 of CAN diagnosis. At this step, if the patient is diabetic, more intensive glycemc control is recommended according to the guidelines.

DEFINITE CAN:

2 or 3 more abnormal results or Postural Orthostatic Tachycardia Syndrome (POTS) is detected.

ADVANCED OR SEVERE CAN:

2 or 3 more abnormal results plus Systolic Pressure Response to Standing (SPRS) greater than 20 mmHg or Diastolic Pressure Response to Standing (DPRS) greater than 10 mmHg (Orthostatic Hypotension 0H diagnosis)

HRV ANALYSIS BASELINE

CORRELATED TO

RESULTS

RANGES

Total Power	(ms ²)	Frequency domain analysis. Overall ANS activity at rest.	980	500	780	NORMAL
SDANN	(ms ²)	Time domain analysis. Exercise tolerance.	38	20	30	

CARTs: PARASYMPATHETIC TESTS

Valsalva Ratio		Baroreceptor sensitivity.	1.02	1.06	1.11	ABNORMAL
Expiration / Inspiration Ratio		Cardiovascular innervation.	1.07	1.12	1.15	ABNORMAL
K30/15 Ratio		Cardiac function.	1.05	0.94	1.00	NORMAL

CARTs: SYMPATHETIC TESTS

SP Response Standing	(mmHg)	Norepinephrine response.	-2	10	30	NORMAL
DP Response Standing	(mmHg)	Epinephrine response.	2	10	20	NORMAL

HRV = Heart rate variability, CARTs = Cardiac Autonomic Reflex Tests.

SP = Systolic Pressure, DP = Diastolic Pressure, RR = RR Intervals, K30/15 = RR or SP at 30 seconds divided by RR or SP at 15 seconds

SUDOMOTOR FUNCTION MARKERS





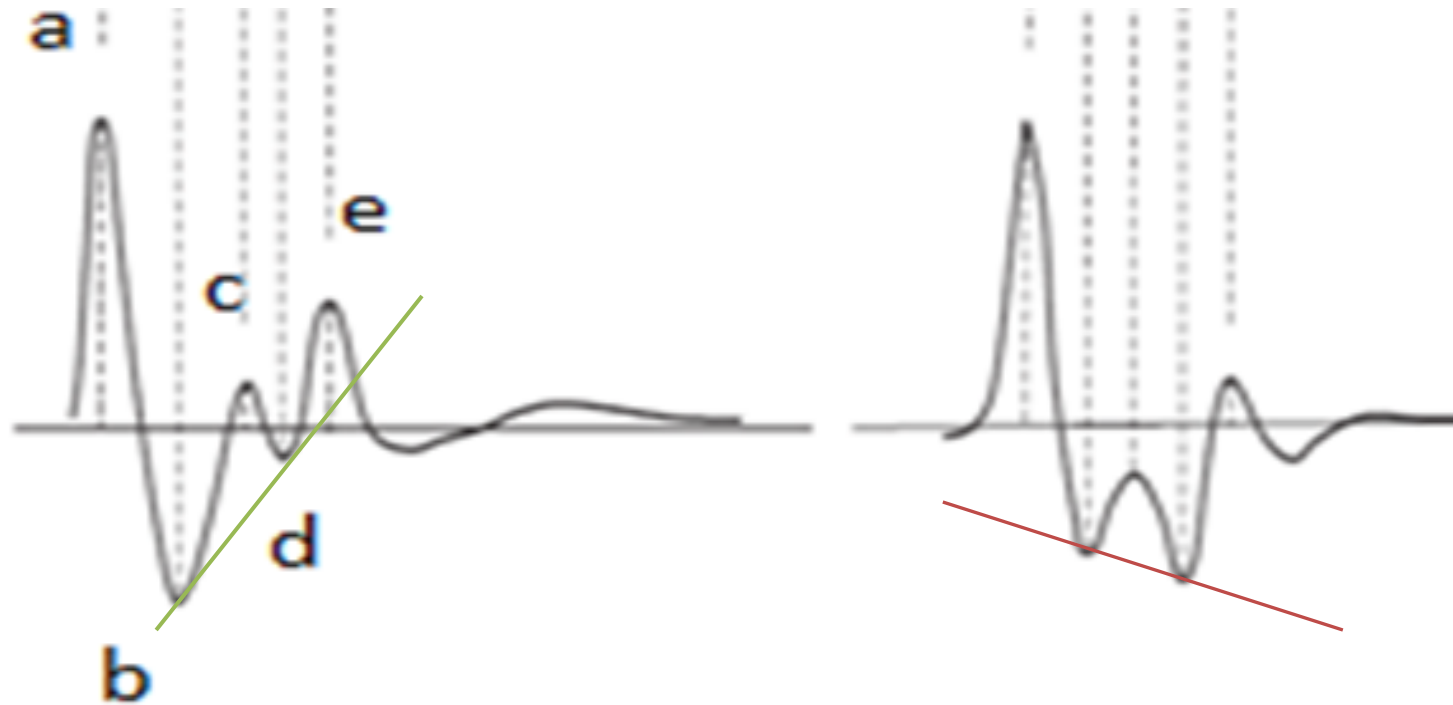
PC8B SYSTEM

LD-OXY: ENDOTHELIAL FUNCTION
ASSESSMENT



SECOND DERIVATIVE ANALYSIS

SDPTG RATIO MARKER



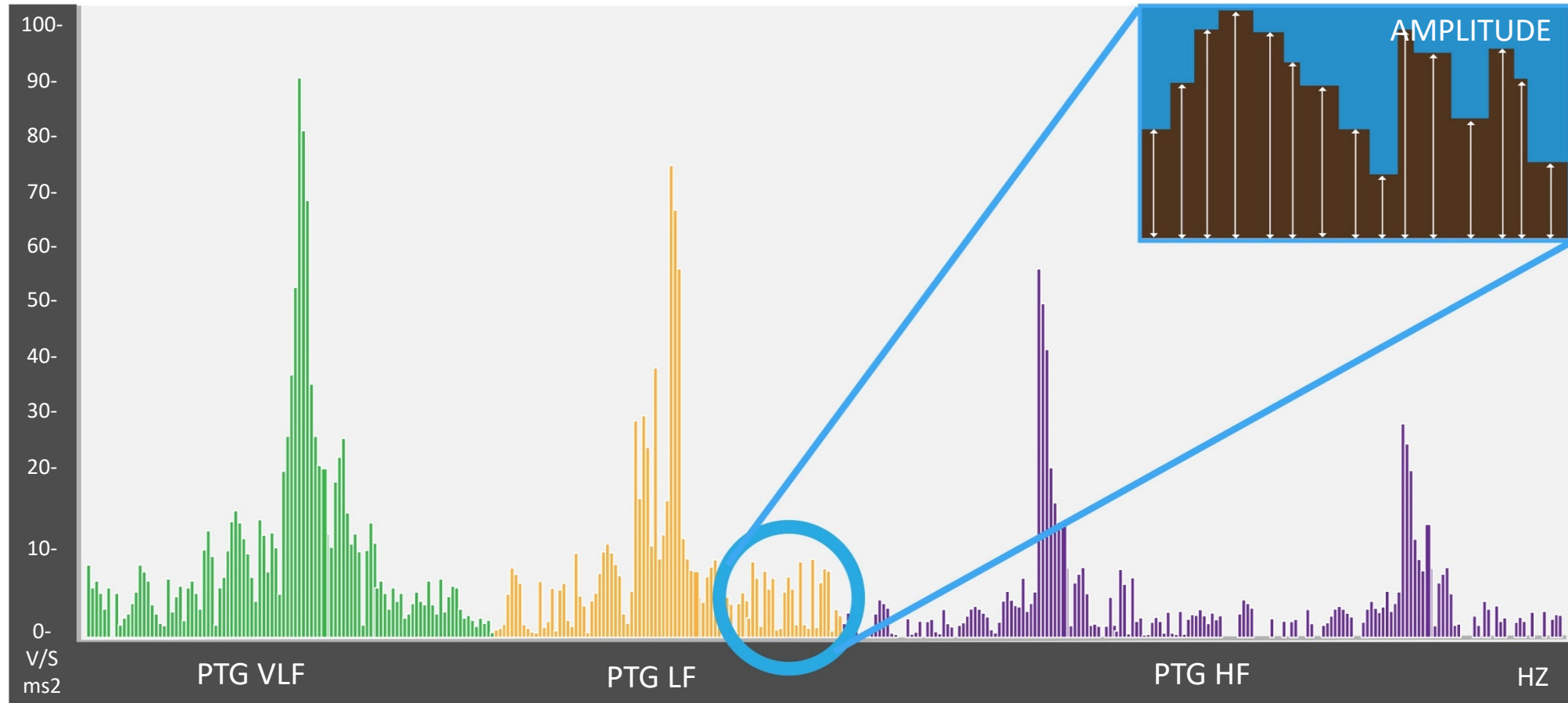
NORMAL VASCULAR TONE

ABNORMAL VASCULAR TONE

SDPTG Ratio is related to the vascular tone. It could be used to monitor the effectiveness of vasodilation agents



PATENTED PTG SPECTRAL ANALYSIS AND MARKERS



PTG TOTAL POWER (PTG-TP)

It is the area covering the 3 frequencies of the PTG spectral Analysis

PTG INDEX (PTGI)

It is the sum of amplitude between the Peaks of the Spectral analysis.

STRESS INDEX

It is the amplitude of PTG VLF

PTG VLF INDEX (PTGVFI)

It is the amplitude of VLF divided by the NO Peak of the GSR measurement



PC8B is the only device to provide different markers of the endothelial function.

Under pro-atherosclerotic conditions, endothelial cells lose the ability to produce bioactive nitric oxide and demonstrate increased expression of :

- ✓ Vasoconstrictor (PTG Second Derivative Index),
- ✓ pro-inflammatory (Stress Index),
- ✓ Heart blood flow (PTG Index) and
- ✓ pro-thrombotic factors (PTG VLF Index).
- ✓ Insulin resistance

The available evidence suggests that these alterations in endothelial phenotype contribute to the formation, progression, and rupture of atherosclerotic lesions. There currently is great interest in understanding the mechanisms and clinical relevance of these changes in endothelial cell biology, because they could lead to new approaches for the management of patients with atherosclerosis.



ENDOTHELIAL READING GUIDELINES



According to the PTG Spectral Analysis clinical studies and American Hypertension Association regarding the arterial stiffness.

Reading of Endothelial Homeostatic marker results.

They are related to the coronary atherosclerosis risk and comprise:

1. Insulin Resistance marker (PTG Total Power).
2. Blood flow marker (PTG Index).
3. Pro-thrombotic fibrinogen marker (PTG VLF Index) and
4. Pro-inflammatory (Stress Index)
5. Vascular tone (PTG SD ratio)

Each endothelial homeostatic marker can be normal , borderline or abnormal/severe.

NORMAL RANGE:

No abnormal and no borderline test results.

ACCEPTABLE:

No abnormal and 1 or more borderline test results.

INITIAL STEPS OF ENDOTHELIAL HOMEOSTATIC DYSFUNCTION

Only one abnormal and less than 2 borderline marker results (initial step 1) or one abnormal and at least 2 borderline marker results (initial step 2).

DEFINITE STEPS OF ENDOTHELIAL HOMEOSTATIC DYSFUNCTION

Only 2 abnormal marker results (definite step 1) 2 abnormal and one borderline marker results (definite step 2).

DEFINITE ENDOTHELIAL HOMEOSTATIC DYSFUNCTION

Only 2 abnormal and more than 1 borderline marker results.

ADVANCED OR SEVERE ENDOTHELIAL HOMEOSTATIC DYSFUNCTION:

Three or more abnormal results.

ENDOTHELIAL HOMEOSTATIC #		CORRELATED TO	RESULTS	RANGES
Stress Index	(%)	C-Reactive protein.	138	NORMAL 180 350
PTG Index	(Vs)	Heart artery blood flow	28.3	BORDERLINE 25 40
PTG Total Power	(ms ²)	Insulin resistance.	237	NOT DETECTED 406
PTGVLF Index	(V.s / microS)	Fibrinogen.	22	NORMAL 32 60
PTG SD Index	(ratio)	Peripheral and small artery tone.	1.08	ABNORMAL 0.42 0.55



PC8B SYSTEM

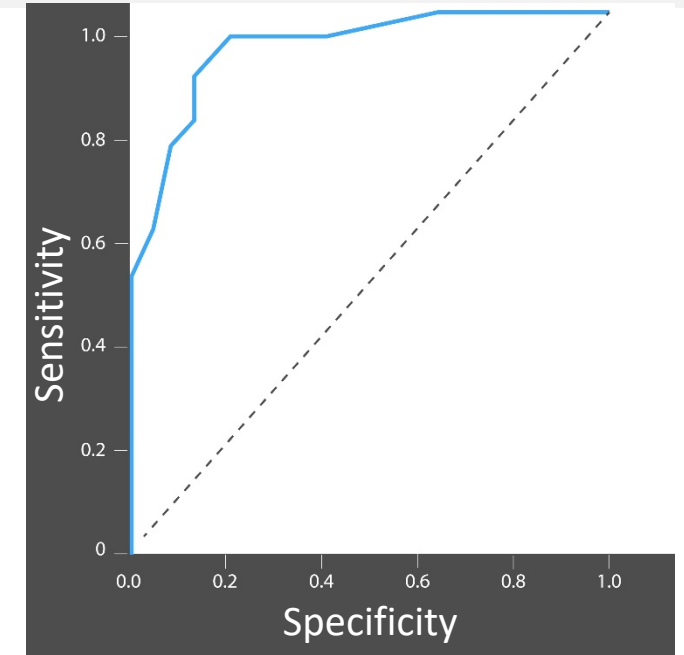
STUDIES AND CLINICAL OUTCOMES



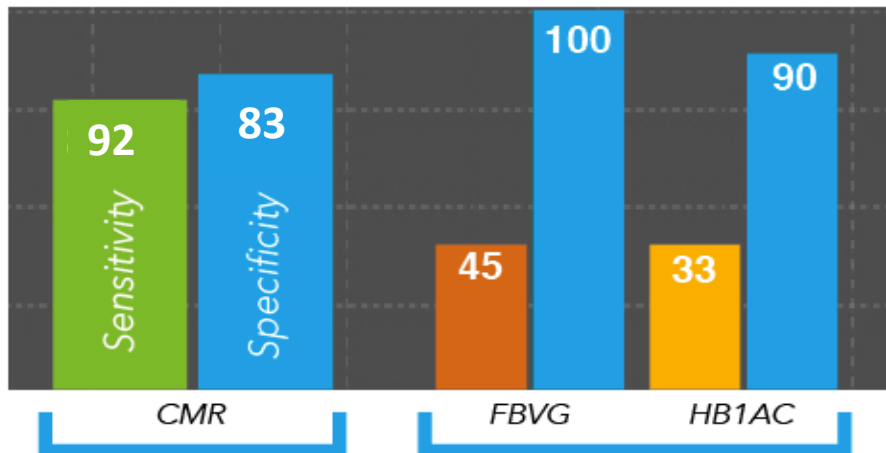
UM, Lewis et al.

A CROSS-SECTIONAL ASSESSMENT TO DETECT TYPE 2 DIABETES WITH ENDOTHELIAL AND AUTONOMIC NERVOUS SYSTEM MARKERS USING A NOVEL SYSTEM.

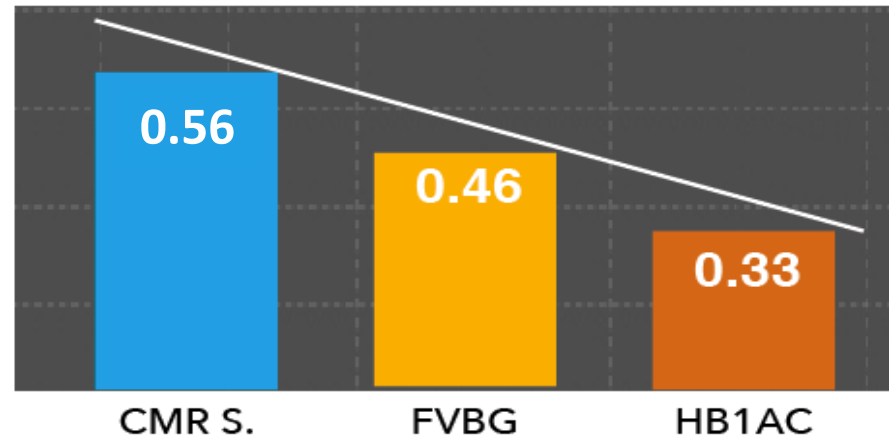
RESULTS. At 120 minutes, the correlations between the OGTT and CMRS were: $r = 0.56$ ($p = 0.004$) for glucose, $r = 0.53$ ($p = 0.006$) for insulin, and $r = 0.58$ ($p = 0.002$) for insulin C-peptide. The mean CMRS of the healthy subjects was 2.2 and of the type 2 diabetes mellitus patients was 9.4, and that difference was statistically significant ($t = 7.6$ (47), $p < 0.001$). The CMRS had a sensitivity of 92% and specificity of 83%



Diabetes detection using different tests *



Coefficient of correlation r test versus OGTT (Glucose at 120') *



* Lab test statistics come from WHO



Gandhi PG, Rao GHR.

THE SPECTRAL ANALYSIS OF THE PHOTOPLETHYSMOGRAPHY TO EVALUATE AN INDEPENDENT CARDIOVASCULAR RISK.INT J GEN MED.

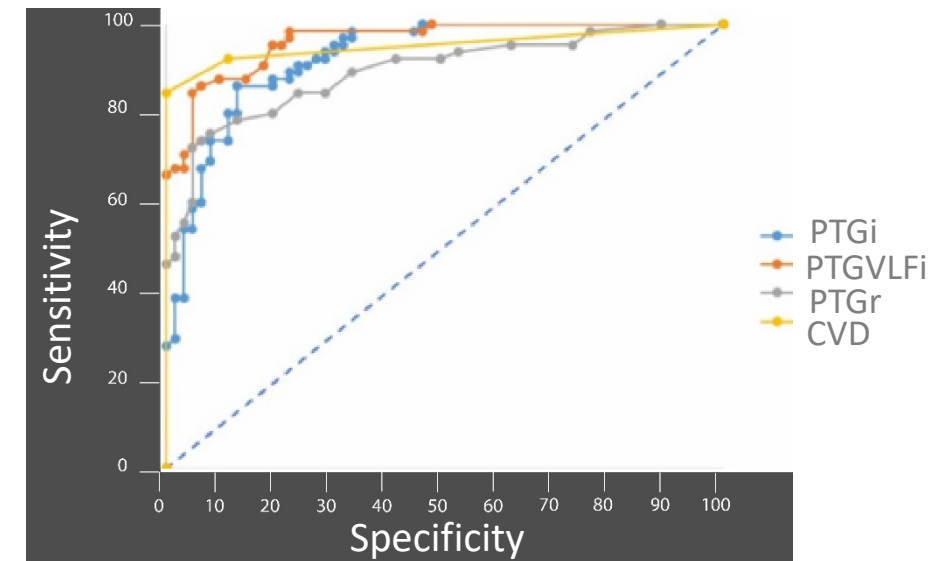
RESULTS

PTGi and PTGVLFi have respectively the same sensitivity of 86.1% and specificity of 87.3% and 93.6% ($P=0.0001$) and area under the receiver operating characteristic curve =0.967) to detect endothelial dysfunction in CAD population.

CONCLUSION

The spectral analysis techniques used on the photoplethysmogram, as outlined in this study, could be useful when used alongside conventional known cardiovascular disease risk markers.

RECEIVER OPERATING CHARACTERISTIC CURVES





Aglecio Luiz De Souza, Gisele Almeida Batista, Sarah Monte Alegre
Journal of Diabetes and its complications.

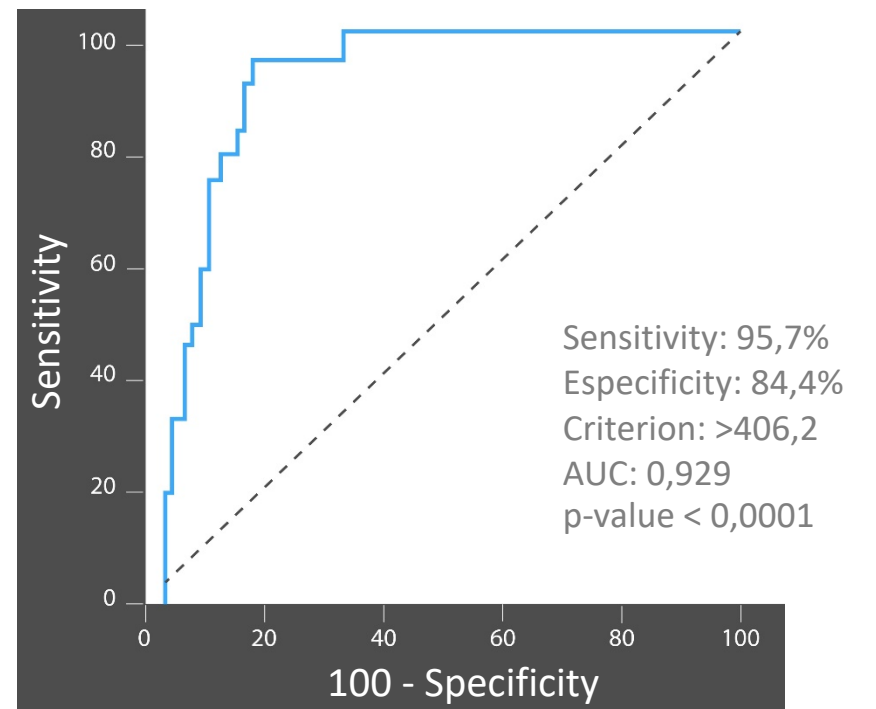
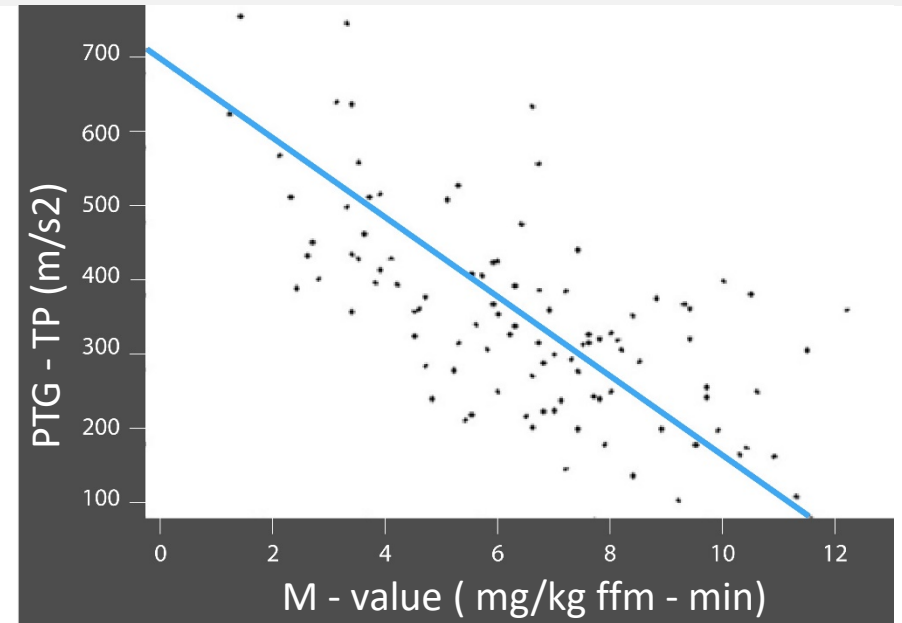
ASSESSMENT OF INSULIN SENSITIVITY BY THE HYPERINSULINEMIC EUGLYCEMIC CLAMP: COMPARISON WITH THE SPECTRAL ANALYSIS OF PHOTOPLETHYSMOGRAPHY

RESULTS

Correlation between insulin sensitivity (M-value) and PTG-TP ($r = -0.64$, $p < 0.0001$). PTG-TP had a sensitivity = 95.7%, specificity = 84.4% and the area under the ROC curve (AUC) = 0.929 for identifying insulin resistance. ($p < 0.0001$).

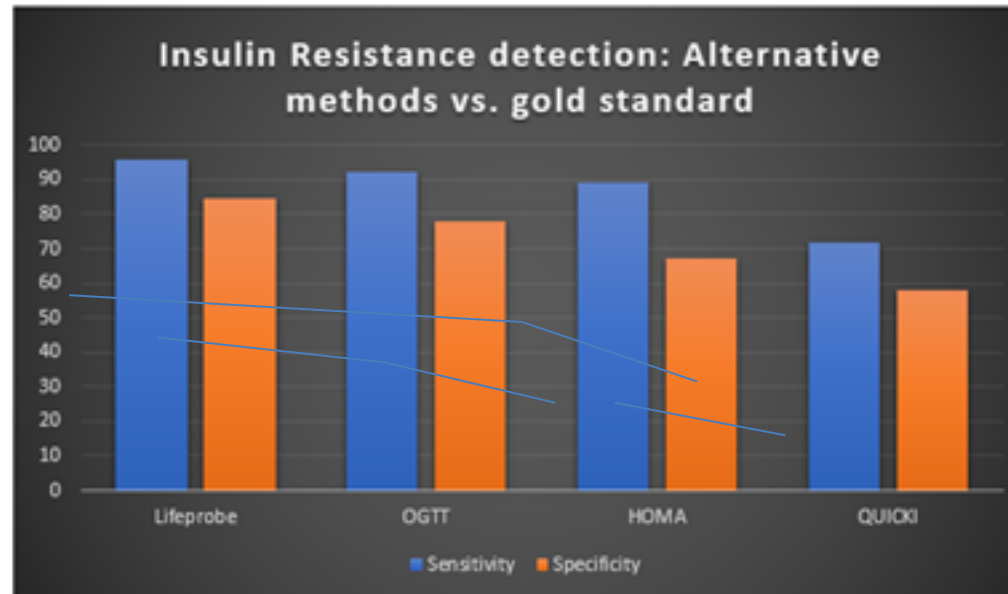
CONCLUSION

The use of the PTG-TP marker measured from the PTG spectral analysis is a useful tool in screening and follow up of Insulin Resistance (IR)





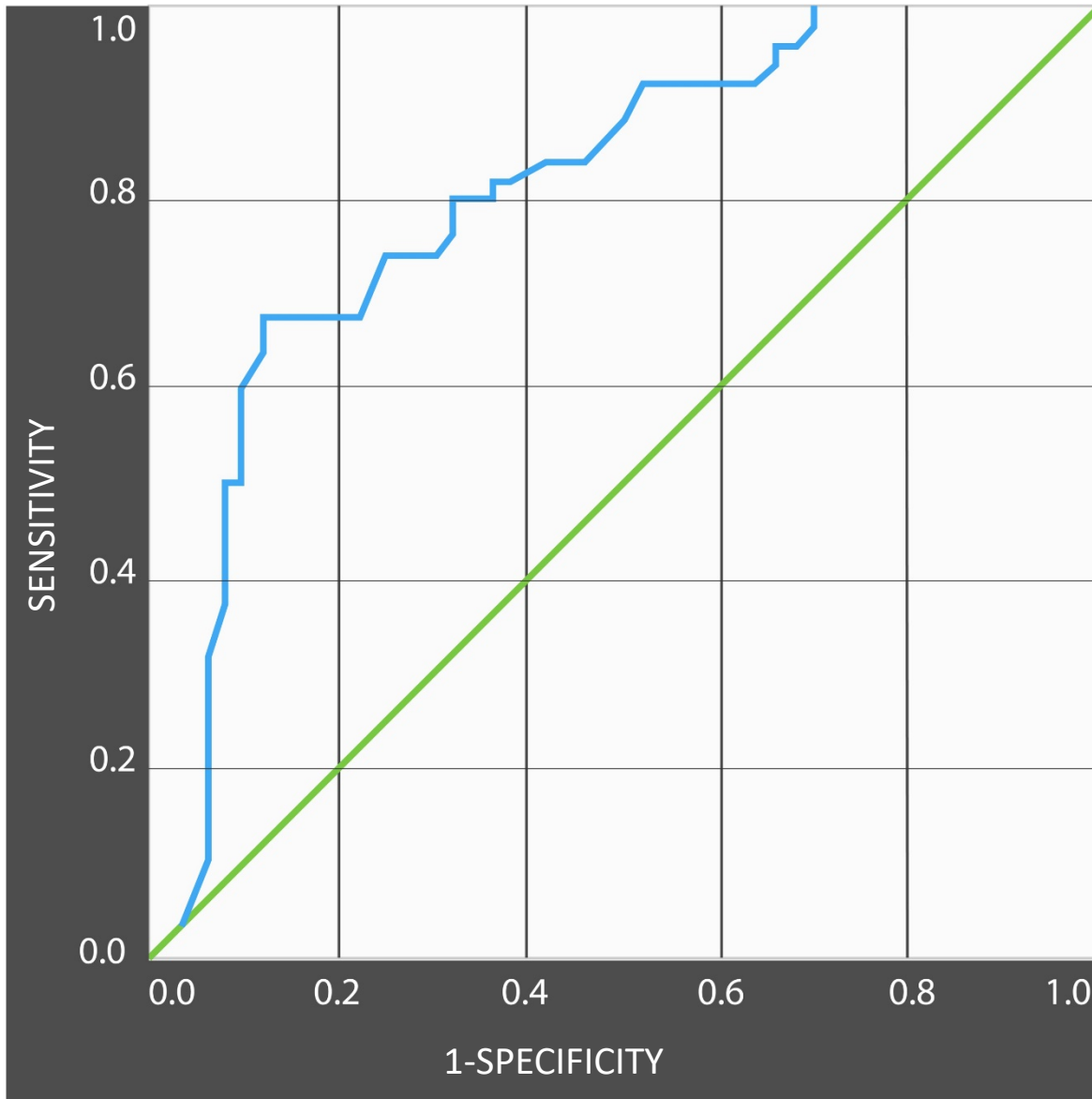
Insulin resistance detection marker (PTG-TP) vs. Gold standard and other alternative blood tests and algorithms



DE SOUZA ET AL. Assessment of insulin sensitivity by the hyperinsulinemic euglycemic clamp: Comparison with the spectral analysis of Photoplethysmography. Journal of Diabetes and its complications. Volume 31, (2017) 128–133



ROC Curve FOR NO Sweat Peak



NO SWEAT PEAK MARKER OF MICROVASCULAR DISORDERS :

NO Sweat Peak inversely correlated with :

Lab tests:

BUN (Spearman $\rho=-0.41$, $p<0.0001$)

Homocysteine (Spearman $\rho=-0.44$, $p<0.0001$)

Fibrinogen (Spearman $\rho=-0.41$, $p<0.0001$)

Neuropathy (vascular disease)

CAN score (Spearman $\rho=-0.68$, $p<0.0001$)

HRV Total Power (Spearman $\rho=-0.57$, $p<0.0001$)

Marker of endothelial function:

PTGi (Spearman $\rho=0.53$ $p<0.0001$)

NO Sweat Peak had a sensitivity of 88% and specificity of 68% to detect retinopathy (microvascular disease)

ISWEAT PEAK MARKER OF PERIPHERAL NEUROPATHY

iSweat Peak inversely correlated with the severity of symptoms on the peripheral neuropathy scale (Spearman $\rho=-0.56$, $p<0.0001$).

University of Miami study . J. Lewis et al. 2017



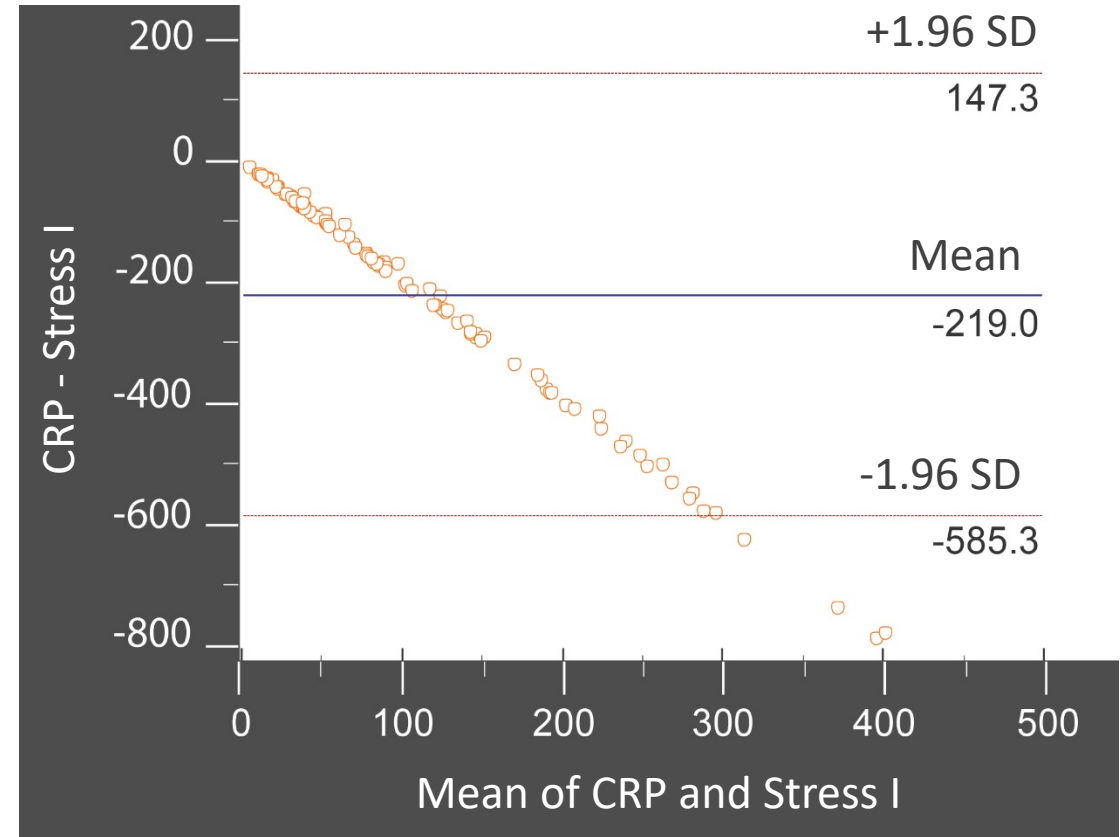
UM, Lewis et al. 2017

A NEW METHOD OF SUDOMOTOR FUNCTION MEASUREMENT TO DETECT MICROVASCULAR DISEASE AND SWEAT GLAND NERVE OR UNMYELINATED C FIBER DYSFUNCTION IN ADULTS WITH RETINOPATHY.

RESULTS

The marker Stress Index correlated with C-Reactive Protein (Spearman $\rho=0.40$, $p<0.0001$)

The marker PTGVLFi correlated with Fibrinogen lab test (Spearman $\rho=0.40$, $p<0.0001$)





TM-ABI VS. DOPPLER PROBE CLINICAL EVALUATION

TM-ABI CLINICAL STUDY RESULTS:

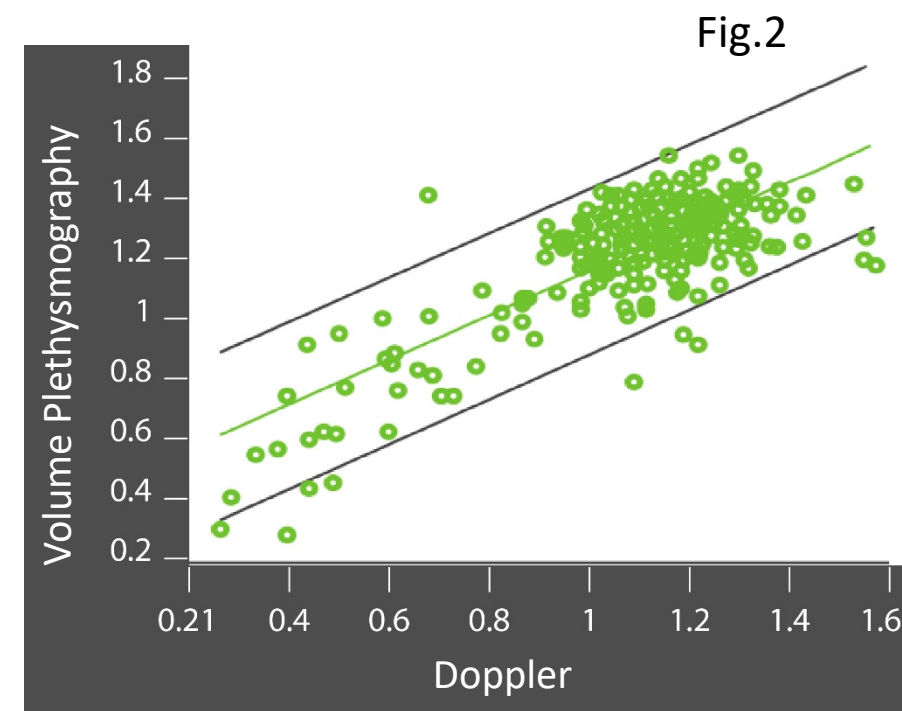
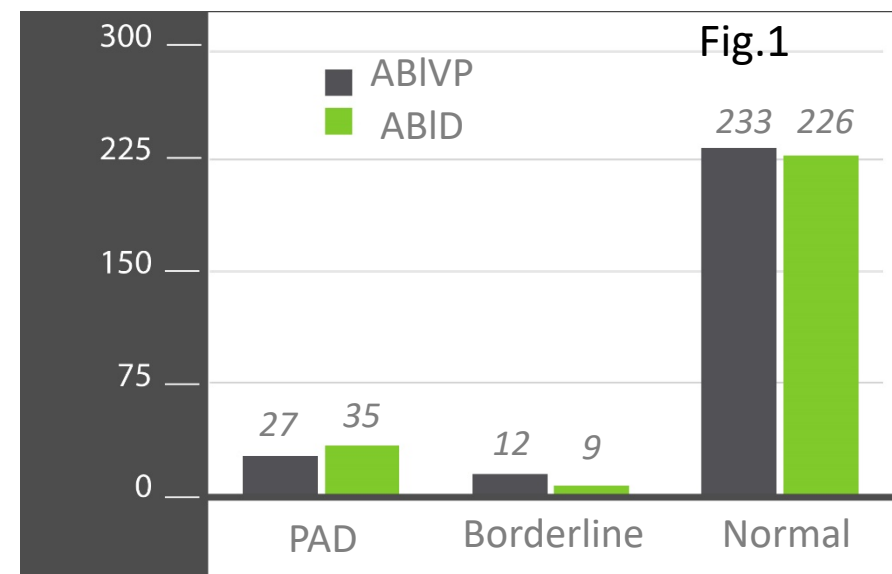
When comparing ABI measurements obtained by Volume Plethysmography (VP) and Doppler (D) methods it was evident that VP measurements were more precise than Doppler probe measurements; 17% vs.19% respectively.

Bland Altman plot showed bias of +0.06 and scatter diagram showed good correlation (slope: 0.75).

In VP method analysis percentage error was 0.26. Furthermore, assessment of the concordance index revealed a very good agreement between both methods in terms of clinical relevance: concordance index of 0.88 (95% CI: from 0.76 to 0.97). VP measurements were completed three times faster than Doppler probe measurements.

FIG1: Agreement of ABIVP and ABID in respect to clinical for level of PAD.

FIG2: Scatter diagram, correlation (green line) and 95 % confidence interval for ABI obtained by both methods

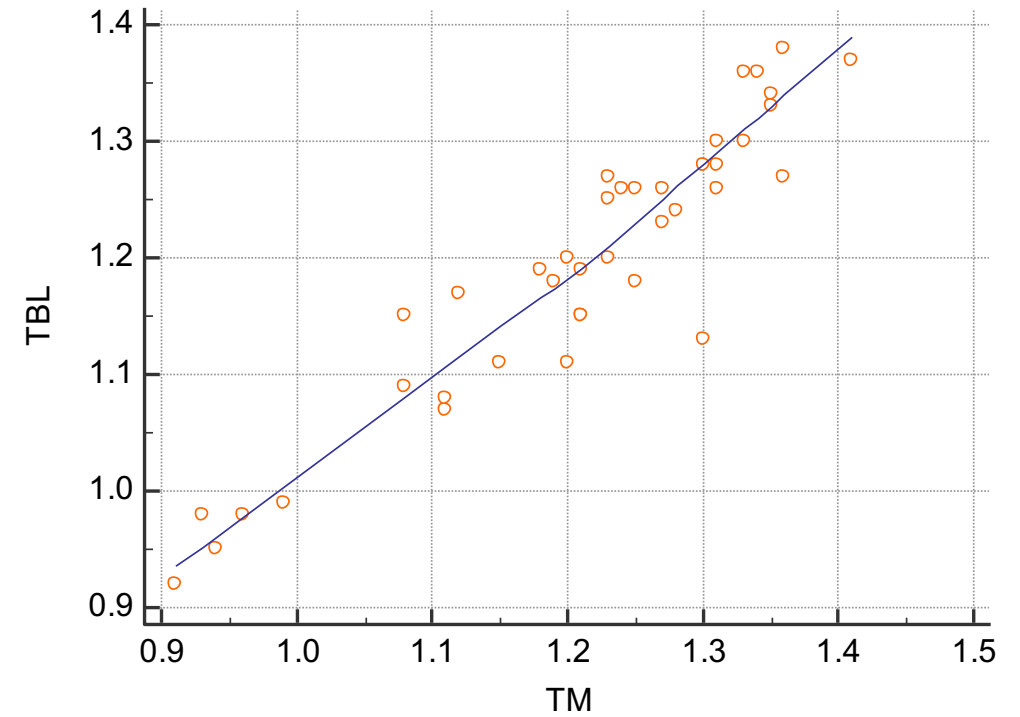




TBL-ABI CLINICAL STUDY RESULTS VS TM-ABI:

Pearson coefficient of correlation Left and right ABI comparing TBL-ABI and TM-ABI

Variable Y	TBLABI	
Variable X	TMABI	
Sample size		40
Correlation coefficient r		0.9382
Significance level		P<0.0001
95% Confidence interval for r		0.8855 to 0.9671





PC8B SYSTEM

GENERAL GUIDANCE



Scenario 1: The patient has symptom (s) of neuropathy or vascular disorders (i.e. Pain, numbness, tingling or burning in the feet, Leg pain after effort , claudication, Dizziness, Syncope...) and diagnosis for chronic disease has not yet been established by lab tests or other conventional exams.

The results help the physician for:

- ✓ Differentiating vascular from neuropathic disorders which can be difficult. It is imperative to distinguish between autonomic neuropathy and vascular disease because the treatments are quite different.
- ✓ Early detection of insulin resistance and impaired glucose tolerance help the physician to:
 1. Prescribe a metabolic panel lab test
 2. Start a wellness program or treatment option as soon as possible in order to delay or reverse the metabolic syndrome risk.



Scenario 2: The patient has symptom (s) of neuropathy or vascular disorders and diagnosed as diabetic. He is undergoing a treatment.

The cardiometabolic risk markers will help improve the efficiency of the physician's treatment:

1. by motivating the patient to adjust & improve their diet and fitness level.
2. to adjust and improve the patient's treatment plan.
 - The PTG TP marker has a high specificity and sensitivity to detect insulin resistance
Therefore, the physician can follow the effectiveness of treatment acting on insulin resistance (i.e. metformin)
 - Adjust the Hb1AC result according to the cardiometabolic score or PTGi (correlated to IGT) or Sympathetic score (risk of hypoglycemia)
3. Early detection of macrovascular and ANS complications which would allow the physician to quickly refer a patient to a specialist who could rapidly respond and delay the symptoms and severity related to those complications.



PC8B SYSTEM

SUGGESTED CPT CODE AND
DISCLAIMERS



PTG-TP: Increased

Insulin resistance detected

- If fasting glucose < 126 mg/dL (7 mmol/L) and Hb1Ac < 6.5: Diet with low carbs diet, progressive increased of the level activity and supplements such as Chromium or Cinnamon are suggested.
- If Fasting glucose > 126 mg/dL (7 mmol/L) and Hb1Ac > 6.5: Metformin is suggested.

PTG INDEX: Decreased

Impaired Heart blood flow. Omega-3 supplements are suggested

PTG VLFi: Increased

Increased Fibrinogen detected. Daily low dose aspirin is suggested

STRESS INDEX: Decreased Inflammation response detected. High docosahexaenoic acid fish oil, grape seed oil extract and pycnogenol are suggested. Reducing the ratio Omega 6/ Omega 3 will be helpful.

PTG SD RATIO : Increased. Vascular tone disorder. Supplements such as Niacin, Fish Oil and Policosanol are suggested.



SUDOMOTOR MARKERS AND SUGGESTED TREATMENTS

SWEAT PEAK . Increased. C-Fiber inflammation detected.

if symptoms : Anti-inflammatory cream is suggested

If no symptoms: Preliminary research suggests alpha-lipoic acid may be helpful in slowing or even reversing neuropathy.

SWEAT PEAK. Mildly to moderately Decreased value for Sweat Peak Marker (≥ 512 mV): C-Fiber density decreased.

Treatment of any underlying causative etiology is likely to be the most effective treatment when possible.

If symptoms: Capsaicin cream may be helpful.

SWEAT PEAK. No sudomotor response (< 512 mV): C-Fiber damage detected.

Treatment of any underlying causative etiology of a small fiber neuropathy is likely to be the most effective treatment when possible. Symptomatic medications : Refer to Neurologist. Gabapentin frequently is utilized as a first-line treatment of neuropathic pain.

NO PEAK . Decreased. Microcirculatory disorders detected

If no contraindications, B12 is suggested and/or Pycnogenol.

Supplementary exams for Kidney and Eyes are suggested.



Blood glucose optimization is the essential treatment for CAN. However, sympathetic failure increases the risk of unawareness hypoglycemia

NON PHARMACOLOGICAL TREATMENTS

Total Power can be improve by Vitamin D supplement and increased activity level.

Reduce or discontinue drugs that potentially induce orthostatic hypotension (i.e. Beta-Blockers)

Avoid hot environment, carbohydrates- rich meals, alcohol.

Avoid prolonged recumbence during the daytime.

Sit on the edge of the bed for some minutes after recumbence.

Take at least 8g of salt daily

Drink water from 2 to 2.5 l/day

Sleep with elevated bed head (20-30 cm)

At the onset of the pre-synpocal symptoms

Make the following maneuver: leg crossing with tension to the thigh, buttock and calf muscle-party position- bending over forward, squatting.

Drink water.

PHARMACOLOGICAL TREATMENTS

Drugs that increase intravascular volume:

Fludrocortisone acetate 0.1-0.2 mg/day

Erythropoleitin 25-75U per kilo 3 times a week

Desmopressin acetate nasal spray (10-40 µg/day) or per os (100-800 µg/day)

Pressor agents:

Milodrine 2.5-10 mg t.i.d

Yohimbine 5.4 mg/day

Pseudoephedrine 30mg t.i.d

Ergotamine/ caffeine 1 mg/100 mg/day

Before a meal

Droxidopa 600 mg t.i.d



***Suggested CPT Coding 95923: SweatC Testing: Sudomotor Function**

The appropriate code for galvanic skin response is 95923 (Testing of autonomic nervous system function; sudomotor, including one or more of the following: quantitative sudomotor axon reflex test [QSART], silastic sweat imprint, thermoregulatory sweat test, and changes in sympathetic skin potential). Only a single unit of 95923 regardless of the number of limbs the doctor tests should be billed.

***Suggested CPT Coding 95921: LD-OXI Testing: Autonomic Nervous System (ANS) Function**

Cardiovagal innervation – a test that provides a standardized quantitative evaluation of vagal innervation to parasympathetic function of the heart. Responses are based on the interpretation of changes in continuous heart recordings in response to standardized maneuvers and include heart rate response to deep breathing, Valsalva ratio, and 30:15 ratio heart rate responses to standing.

***Suggested CPT Coding 93922: TBL-ABI Testing: Vascular extremities**

Limited bilateral noninvasive physiologic studies of upper or lower extremity arteries, (eg, for lower extremity: ankle/brachial indices at distal posterior tibial and anterior tibial/dorsalis pedis arteries plus bidirectional, doppler waveform recording and analysis at 1-2 levels, or ankle/brachial indices at distal posterior tibial and anterior tibial/dorsalis pedis arteries plus volume plethysmography at 1-2 levels, or ankle/brachial indices at distal posterior tibial and anterior tibial/dorsalis pedis arteries with, transcutaneous oxygen tension measurement at 1-2 levels)

**The above check list of CPT Codes and corresponding ICD-10's are only suggested according to the intended use of each LD Technology product. The practitioner is solely responsible for compliance in the use of CPT codes and ICD-10's according to the guidelines established by the AMA (American Medical Association) and CMS (Center for Medicare and Medicaid Services) Central Office. LD TECHNOLOGY shall not be liable for any damages or injury resulting from the suggested CPT and ICD-10 codes in case of practitioner's Audit. It is the Physicians sole responsibility to ensure that they have the knowledge, training, expertise, and accreditation to perform these tests. The accreditation requirements are provided by CMS.*



PC8B ANS RESULTS AND DISCLAIMERS

ANS testing is considered medically necessary when used as a diagnostic tool to evaluate symptoms indicative of vasomotor instability and the ANS testing is directed at establishing a more accurate or definitive diagnosis or contributing to clinically useful and relevant medical decision making for one of the following indications:

- To diagnose the presence of autonomic neuropathy in a patient with signs or symptoms suggesting a progressive autonomic neuropathy.
- To evaluate the severity and distribution of a diagnosed progressive autonomic neuropathy.
- To differentiate the diagnosis between certain complicated variants of syncope from other causes of loss of consciousness.
- To evaluate inadequate response to beta blockade in vasodepressor syncope.
- To evaluate distressing symptoms in a patient with a clinical picture suspicious for distal small fiber neuropathy in order to diagnose the condition.
- To differentiate the cause of postural tachycardia syndrome.
- To evaluate change in type, distribution or severity of autonomic deficits in patients with autonomic failure.
- To evaluate the response to treatment in patients with autonomic failure who demonstrate a change in clinical exam.
- To diagnose axonal neuropathy or suspected autonomic neuropathy in the symptomatic patient.
- To evaluate and treat patients with recurrent unexplained syncope or demonstrate autonomic failure, after more common causes have been excluded by other standard testing.

Interpretation of the ANS results should be performed by an individual with expertise and training in ANS testing.
PC8B is NOT an automated device with interpretation.

The PC8B provides the results of the battery of tests with a scoring system for helping the reading of the report.