ESC
Working Group
Development, Anatomy
& Pathology

# AI detection of stable coronary artery disease

*Prof T.K Gunness*
*Cardiac Surgeon*
*Director Cardiac Services- CARDIAC CENTRE*
*MAURITIUS*

*7th February 2024*

# *HEART DISEASE IN MAURITIUS*

ESC Working Group Development, Anatomy & Pathology

- Heart Disease: Responsible for more than 50% of all mortality in Mauritius.
- About 12 Mauritians suffer from heart attack daily – 30% of these people die before reaching hospital, average age 40yrs.
- About 50% of our population is diabetic/pre-diabetic-- all risk factors of CHD are on the red.
- In 90% cases IHD is diagnosed by an Infarct or ACS.

ESC
Working Group
Development, Anatomy
& Pathology

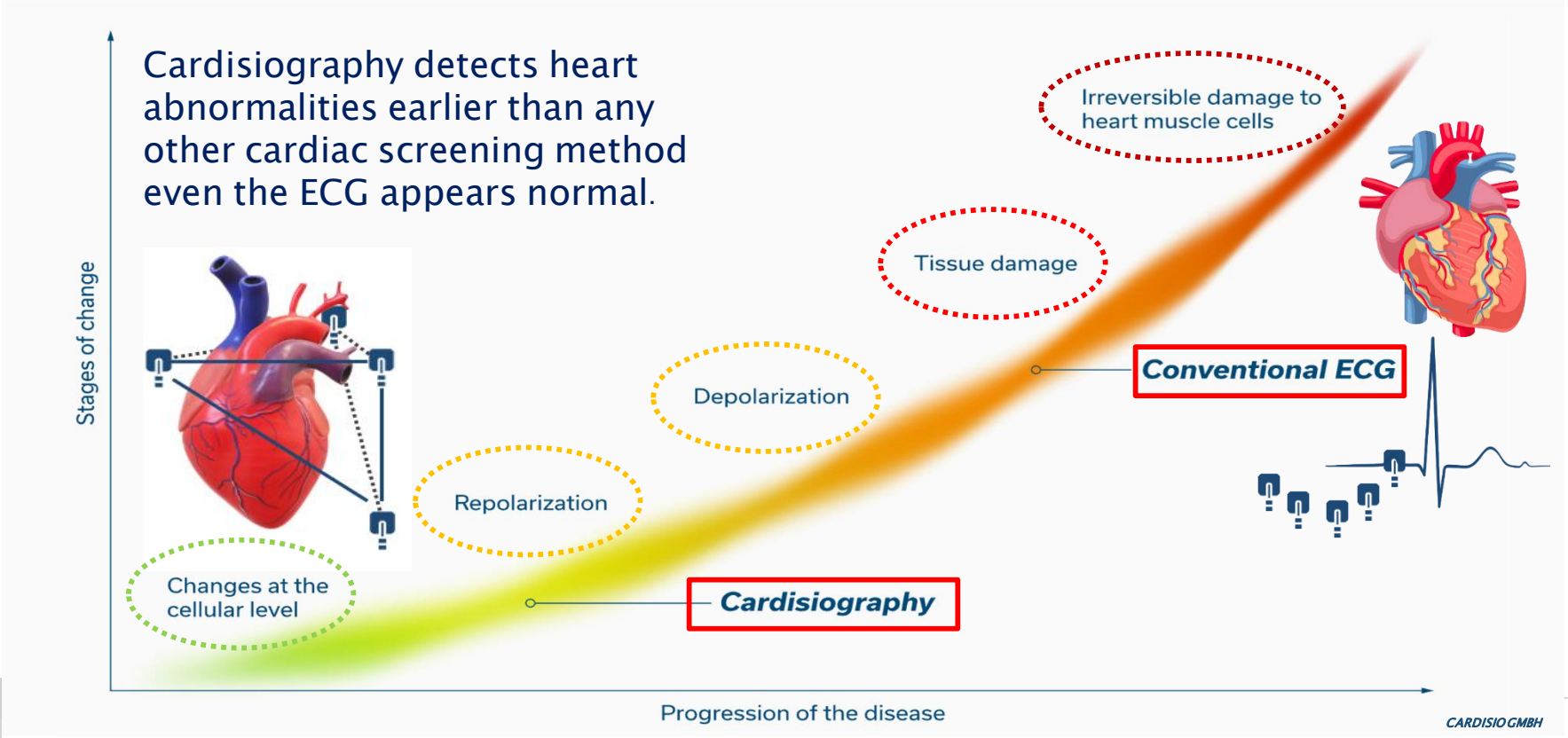
# THE

# PROBLEM

- With this very alarming situation, it is important to find a reliable non invasive user friendly examiner tool to detect CHD before a heart attack easily available in the primary care setup.
- We have found Artificial Intelligence ECG (Cardisiography) a very valuable and reliable solution.

# Closing „The Diagnostic Gap“

ESC Working Group Development, Anatomy & Pathology



# CARDISIOGRAPHY

| # of patients in study: 546 | MALE CSG | FEMALE CSG |
|---|---|---|
| SENSITIVITY | 97,2% | 90,2% |
| SPECIFICITY | 76,1% | 74,4% |
| POSITIVE PREDICTIVE VALUE (PPV) | 90,2% | 78,7% |
| NEGATIVE PREDICTIVE VALUE (NPV) | 92,2% | 87,9% |

Journal of Electrophysiology (2020) ( 100-105)

# OTHER INVESTIGATIONS

| Diagnostic | Invasiveness / Risk | Clinician Effort | Sensitivity | Specificity | ~ Costs |
|---|---|---|---|---|---|
| Stress ECG | Medium | Low | 45% - 50% | 85% - 90% | € 50 |
| Stress Echocardiography | Medium | High | 80% - 85% | 80% - 88% | € 75 |
| Cardio CT | Medium | High | 95% - 99% | 64% - 83% | € 500 |
| Coronary Angiogram | Very high | Very high | 100% | 100% | € 650 |
| ECG | low | low | 40% | 45% | € 10 |

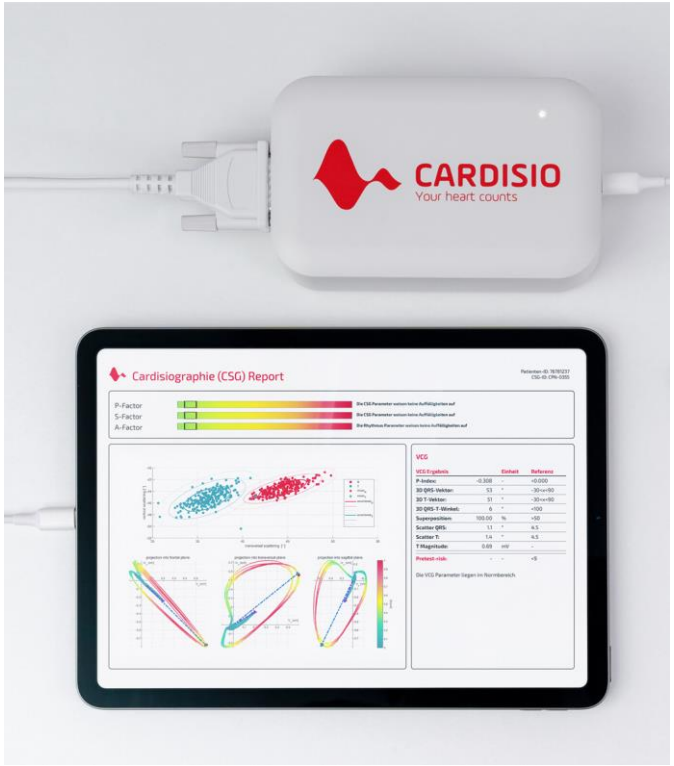
Source: Deutsche Gesellschaft für Kardiologie – Herz-und Kreislaufforschung e.V. (2014) ESC Pocket Guidelines. Management der stabilen koronaren Herzkrankheit (KHK), Version 2013. Börm Bruckmeier Verlag GmbH, Grünwald Kurzfassung der "ESC Guidelines on the management of stable coronary artery"

ESC Working Group Development, Anatomy & Pathology

Classic 12-lead ECG uses ten electrodes and plots potential difference between two electrodes in two dimensions (XY).

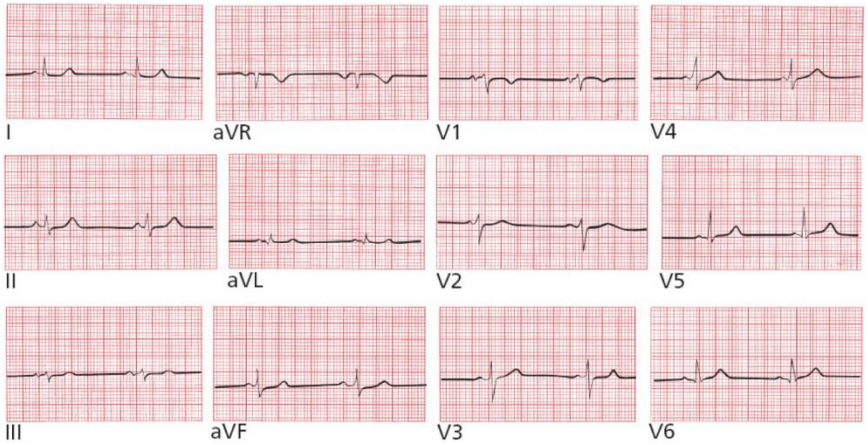
Cardisiography uses four electrodes at the front and an additional electrode at the back of the patient and plots potential difference in three dimensions (XY Z).

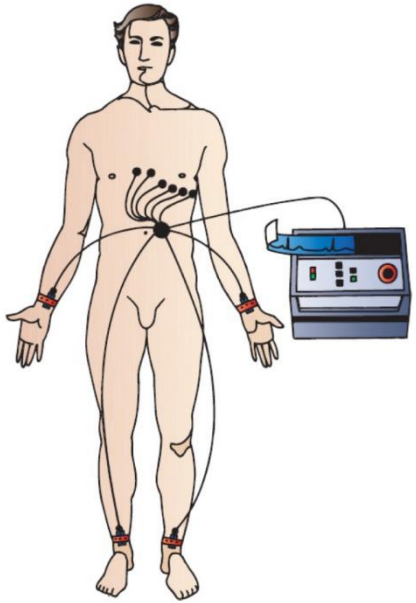
## 5L3D VCG–AI



# 12-Channel ECG

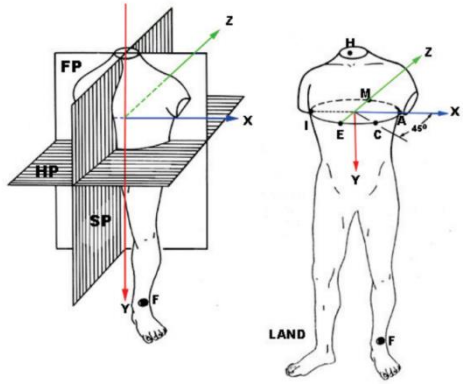
- Detailed representation of the excitation process from 12 different angles
- Enables more accurate diagnosis



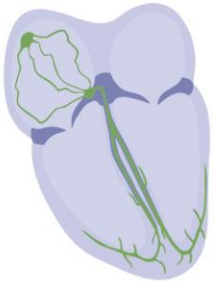



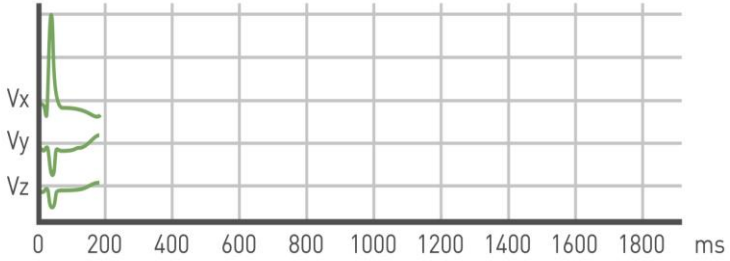
# VEKTORCARDIOGRAM

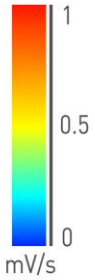
- 1 Electrode is also attached to the back
- Signal projections in the spatial coordinates x, y and z
- Thus the heart vector and its temporal course is directly displayed
- If the heart vector is displayed at any point in time, the individual characteristics of the excitation process can also be displayed
- These can then be seen in the P, QRS & T loops

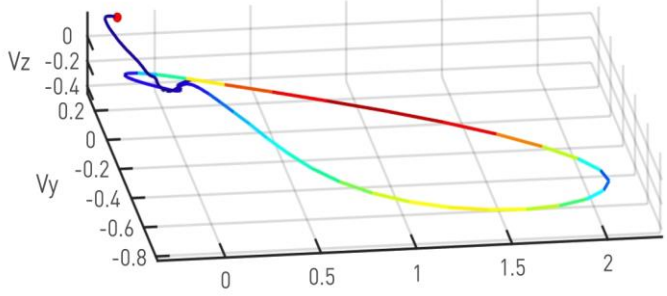


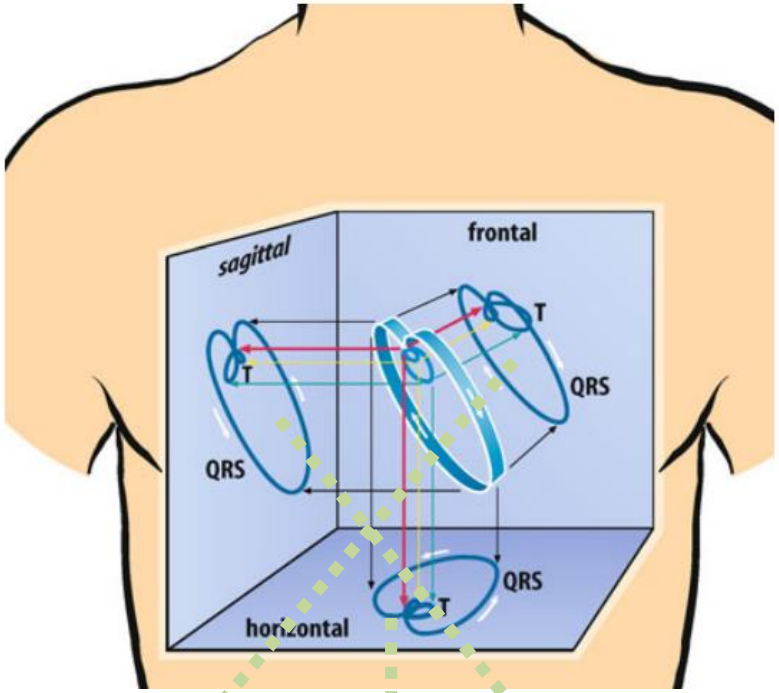
CARDISIO
Your heart counts

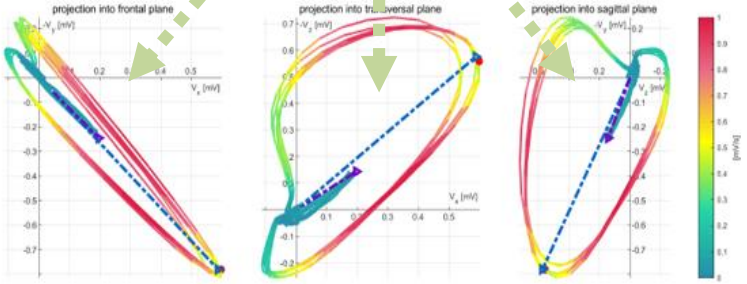




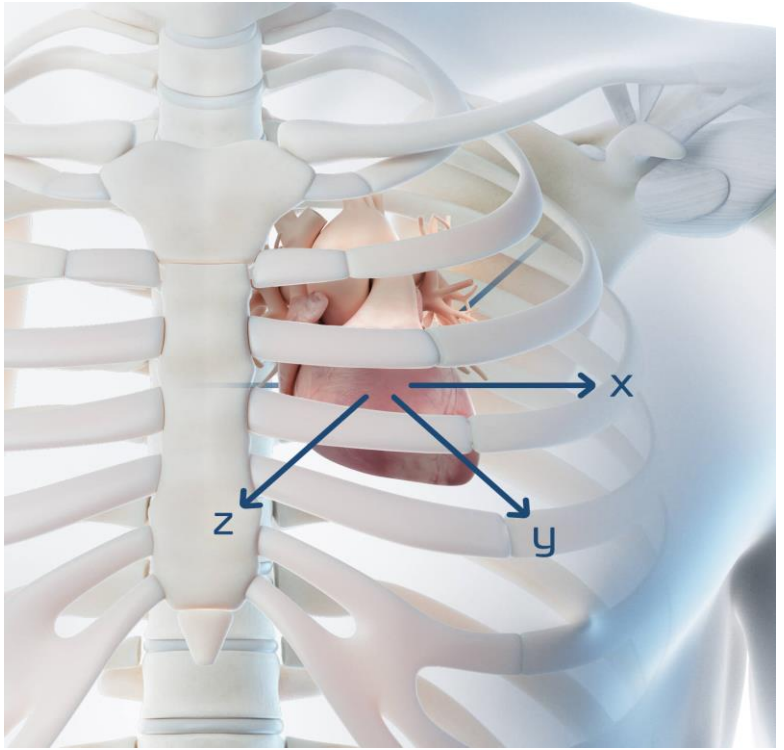




# Vector Loops

# CARDISIOGRAPHY

ESC Working Group Development, Anatomy & Pathology

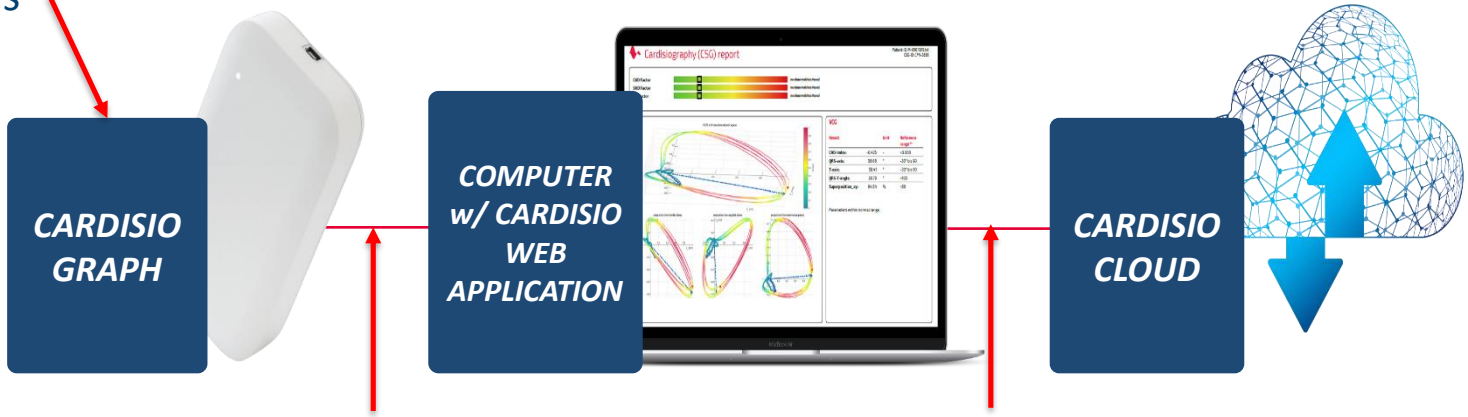
- Cardisiography performs 3-dimensional scanning of the heart and its electrical activities.
- Relies on automated analysis, eliminating room for human error in diagnosing.
- Delivers graphic representation of the electro-physical characteristics of the heart: P wave, QRS wave, and T wave become P loop, QRS loop, and T loop.
- Utilizes machine-based learning and artificial intelligence to diagnose and optimize algorithm.



# CARDISIO ECO-SYSTEM

ESC Working Group Development, Anatomy & Pathology

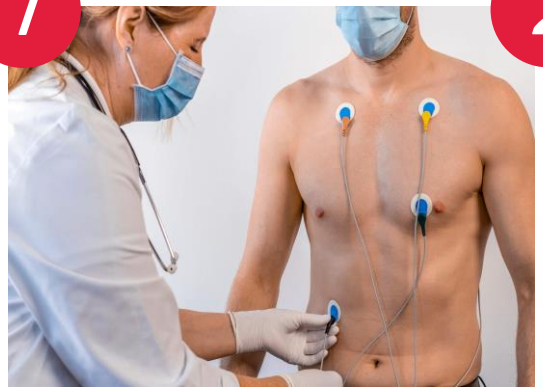
*Connected to pt by 5 electrodes*



# THE PROCEDURE

ESC Working Group Development, Anatomy & Pathology

1



## SIGNAL ACQUISITION

During the recording, five electrodes are attached to the body, similar to an ECG. The patient sits or lies as still as possible and waits. ***4 minutes*** *(approx. 240 heartbeats)*

2

## RESULTS

The recorded parameters are transmitted to the Cardisio server immediately and processed by an AI algorithm. ***5 – 8 minutes***

3

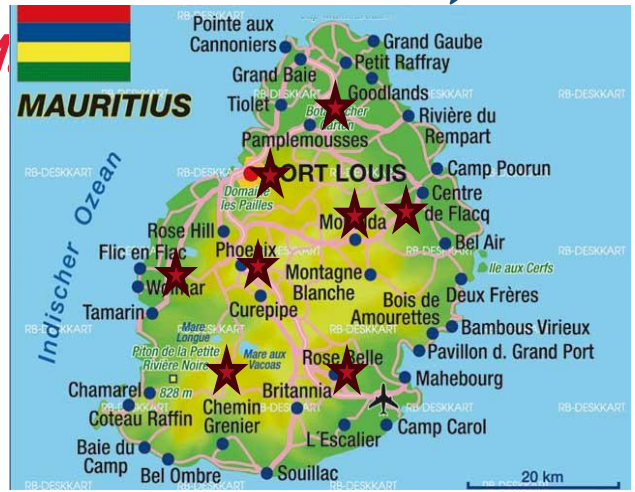
## CONSULTATION WITH A DOCTOR

A medical professional discusses the result with the patient and initiates further steps if necessary.

# Risk Score Form– Primary Setup (Mediclinics and mobile clinics)

ESC Working Group

natomy




**Ministry of Health and Wellness**

**NON COMMUNICABLE DISEASES, HEALTH PROMOTION AND RESEARCH UNIT**

*Mauritius Cardiovascular Disease (CVD) Risk Score Form*

Name : ..... Date of Birth: ...../...../..... Gender: M ☐

Address: ..... Phone Number: ..... Age: ..... F ☐

**1 Age (years)**

| | Female (Points) | Male (Points) |
|---|---|---|
| 40-44 | 0 | 0 |
| 45-49 | 3 | 3 |
| 50-54 | 6 | 6 |
| 55-59 | 8 | 8 |
| 60-64 | 10 | 10 |
| 65-69 | 12 | 11 |
| 70-74 | 14 | 12 |
| 75-79 | 16 | 13 |

Age ☐

**2 Smoker**

| Age (years) | Non-Smoker (Points) | Female Smoker/ Ex (Points) | Male Smoker / Ex (Points) |
|---|---|---|---|
| 40-49 | 0 | 7 | 5 |
| 50-59 | 0 | 4 | 3 |
| 60-69 | 0 | 2 | 1 |
| 70-79 | 0 | 1 | 1 |

Smoker ☐

**3 Systolic Blood Pressure(mmHg)**

| | Female (Points) | Male (Points) |
|---|---|---|
| 120-129 | 0 | 0 |
| 130-139 | 1 | 1 |
| 140-149 | 2 | 2 |
| 150-159 | 2 | 4 |
| 160+ | 3 | 5 |

SBP ☐

**4 Body Mass Index (BMI)**

| | (Points) |
|---|---|
| Lower than 25 kg/m2 | 0 |
| 25 ≤ 29.9 kg/m2 | 1 |
| 30 kg/m² or higher | 2 |

BMI ☐

**5 Family History**

First degree relatives developed cardiovascular disease

| | (Points) |
|---|---|
| Yes | 2 |
| No | 0 |

FH ☐

**6 Life Style**

High intake of fruits and vegetables everyday

| | (Points) |
|---|---|
| Yes | 0 |
| No | 1 |

Diet ☐

**Add up your points:**
**Total Points:** ☐

An Electrocardiogram should be carried out on persons with 12 points and above

> 12

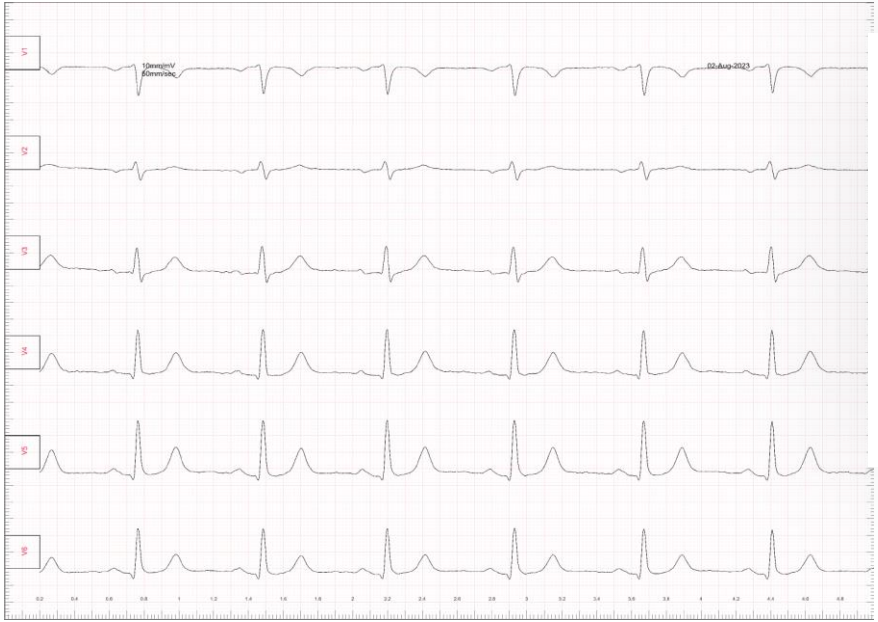
0. ECG not eligible
1. ECG done - Normal
2. ECG done - Send for further investigation
3. ECG not done -Participant didn't turn up
4. Refused

# *THE CARDISIOGRAPHY REPORT*

ESC Working Group Development, Anatomy & Pathology

**Contains:**

**- 12-Lead ECG**




**ECG**

| ECG Result | | Unit | Reference |
|---|---|---|---|
| HF: | 83 | 1/min | 50-100/min |
| RR: | 726 | ms | - |
| PP: | 724 | ms | - |
| P: | 98 | ms | <120 |
| PQ: | 156 | ms | 120<x<200 |
| QRS: | 84 | ms | <120 |
| Cabrera: | Normal axis | | |
| QT: | 334 | ms | < 460 |
| QTc Bazzet: | 392 | ms | < 460 |
| QTc Fridericia: | 372 | ms | < 460 |

**One or more ECG values outside normal range.**

# *THE CARDISIOGRAPHY REPORT*

ESC Working Group Development, Anatomy & Pathology

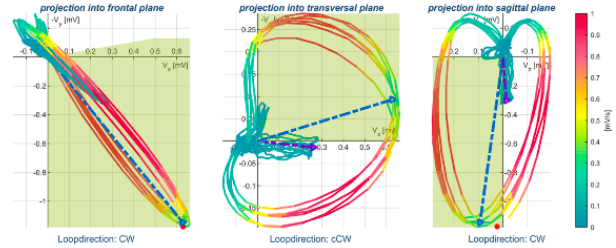
**Contains:**

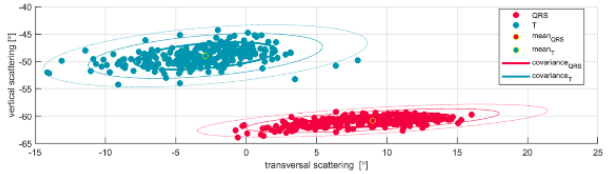
- 12-Lead ECG
- Vectocardiogram

## VECTORCARDIOGRAPHY RESULTS

Patient ID: 296096032
CSG ID: CPN-16173
Date: 13.09.2023 17:47

### Vectorcardiography




### Pretest Risk

-

### VCG

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| CSG-Index: | -0.973 | | < -0.27 |
| 3D QRS vector: | 61 | ° | -30<x<90 |
| 3D T vector: | 49 | ° | -30<x<90 |
| 3D QRS T angle: | 14 | ° | <100 |
| Superposition: | 100.00 | % | > 50 |
| T Magnitude: | 0.79 | mV | > 0.4 |

VCG parameters within normal range.

### Scatter Analysis

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| Scatter QRS: | 1.6 | ° | < 4,5 |
| Scatter T: | 2.2 | ° | < 10 |

# *THE CARDISIOGRAPHY REPORT*

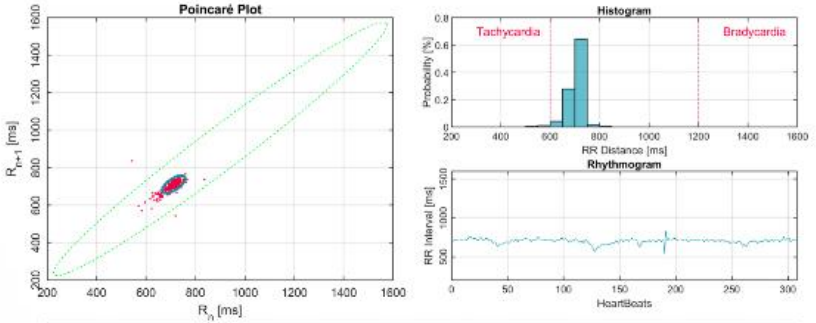
ESC Working Group Development, Anatomy & Pathology

**Contains:**

- **12-Lead ECG**
- **Vectocardiogram**
- **Rhythm analysis**

## ECG AND RHYTHM ANALYSIS

### Rhythm Analysis




| Rhythm parameters | Value | Unit | Reference |
|---|---|---|---|
| Percentage of heartbeats outside the norm | 1 | % | < 10 |

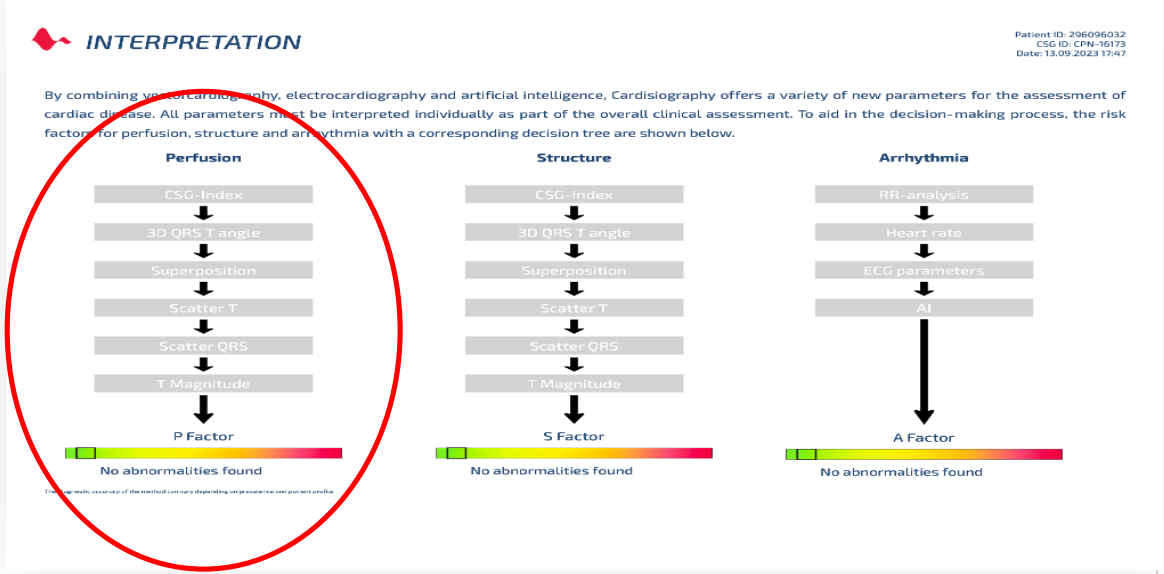
Heartbeats outside the norm can indicate extrasystoles, sinus arrhythmia, and cardiac arrhythmias such as atrial fibrillation, atrial flutter, or AV block. In combination with the clinical findings, further clarification by means of rhythm analysis in a conventional 12-lead ECG is recommended.

# *THE CARDISIOGRAPHY REPORT*

ESC Working Group Development, Anatomy & Pathology

**Contains:**

- 12-Lead ECG
- Vectocardiogram
- Rhythm analysis
- Interpretation



INTERPRETATION

Patient ID: 296096032
CSG ID: CPN-16173
Date: 13.09.2023 17:47

By combining vectorcardiography, electrocardiography and artificial intelligence, Cardisiography offers a variety of new parameters for the assessment of cardiac disease. All parameters must be interpreted individually as part of the overall clinical assessment. To aid in the decision-making process, the risk factors for perfusion, structure and arrhythmia with a corresponding decision tree are shown below.

**Perfusion**

CSG-Index
3D QRS T angle
Superposition
Scatter T
Scatter QRS
T Magnitude
P Factor
No abnormalities found

**Structure**

CSG-Index
3D QRS T angle
Superposition
Scatter T
Scatter QRS
T Magnitude
S Factor
No abnormalities found

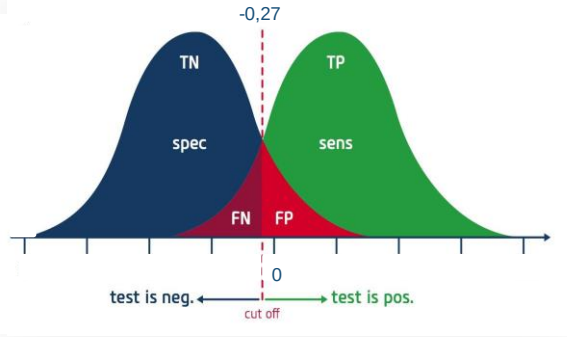
**Arrhythmia**

RR-analysis
Heart rate
ECG parameters
AI
A Factor
No abnormalities found

# CSG INDEX

**VCG**

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| CSG-Index: | -0.973 | | < -0.27 |
| 3D QRS vector: | 61 | ° | -30<x<90 |
| 3D T vector: | 49 | ° | -30<x<90 |
| 3D QRS T angle: | 14 | ° | <100 |
| Superposition: | 100.00 | % | > 50 |
| T Magnitude: | 0.79 | mV | > 0.4 |




## *CSG - INDEX*

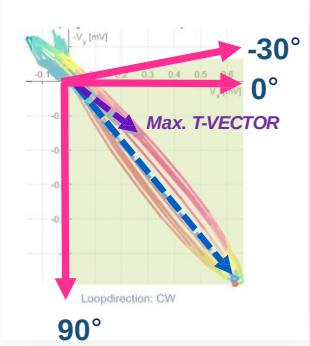
*-- Represents the AI based cardisio Algorithm (290 different parametres)*

*-- Cut off value is -0,27*

*-- More than -0,27: Test is positive for reduced perfusion.*

# ALIGNMENT OF THE VECTORS OF QRS AND T

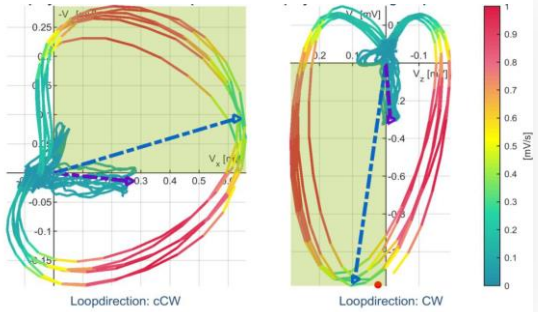





Frontal-Plane

**VCG**

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| CSG-Index: | -0.973 | | < -0.27 |
| 3D QRS vector: | 61 | ° | -30<x<90 |
| 3D T vector: | 49 | ° | -30<x<90 |
| 3D QRS T angle: | 14 | ° | <100 |
| Superposition: | 100.00 | % | > 50 |
| T Magnitude: | 0.79 | mV | > 0.4 |




Transversal-Plane Sagittal-Plane

*3D QRS Vector : Change in position is in favour of depolarisation disorder.*

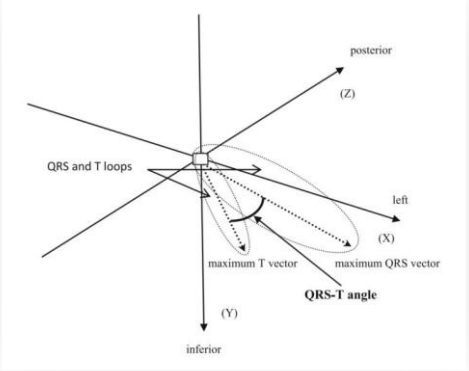
*3D T Vector: Change in position is in favour of repolarisation disturbance*.

# 3D QRS-T-ANGLE

ESC Working Group Development, Anatomy & Pathology

**VCG**

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| CSG-Index: | -0.973 | | < -0.27 |
| 3D QRS vector: | 61 | ° | -30<x<90 |
| 3D T vector: | 49 | ° | -30<x<90 |
| 3D QRS T angle: | 14 | ° | <100 |
| Superposition: | 100.00 | % | > 50 |
| T Magnitude: | 0.79 | mV | > 0.4 |




QRS-T Angle in space determined between max. T vector and max. QRS vector

(Fig. from Jaroszyński, et al., 2019)

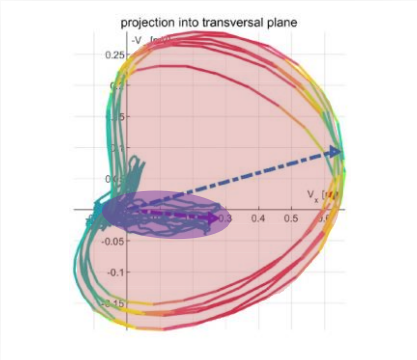
## 3D QRS-T ANGLE –

*Strong and independent predictor of mortality*

# SUPERPOSITION

**VCG**

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| CSG-Index: | -0.973 | | < -0.27 |
| 3D QRS vector: | 61 | ° | -30<x<90 |
| 3D T vector: | 49 | ° | -30<x<90 |
| 3D QRS T angle: | 14 | ° | <100 |
| Superposition: | 100.00 | % | > 50 |
| T Magnitude: | 0.79 | mV | > 0.4 |

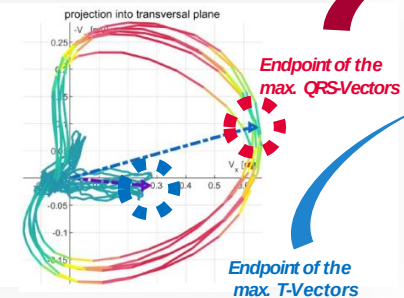


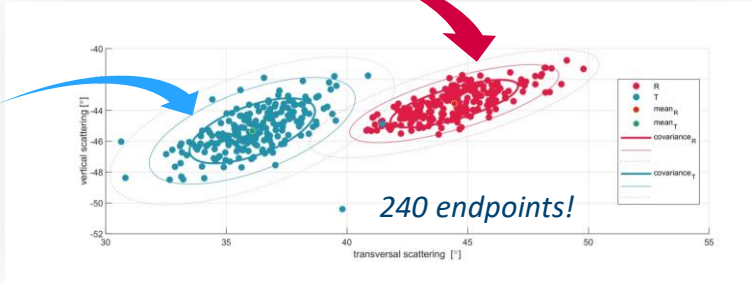

Superposition/overlap of the area of the T-loop (purple) with the area of the QRS-loop (pink) in the transverse plane (here 100%).

## SUPERPOSITION

*In the transversal plane, the overlap/superposition (in percent) of the two areas forming the QRS loop and the T-loop is indicated. A value of less than 50% often correlates with perfusion disorders and should be evaluated accordingly in the context of other abnormalities.*

# SCATTER



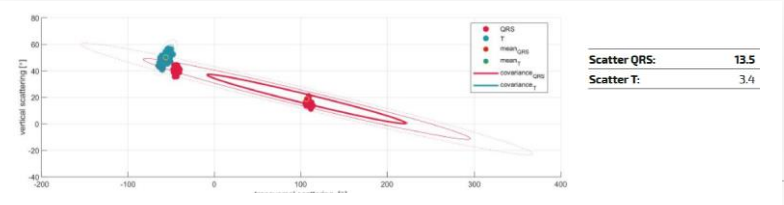

**Scatter Analysis**

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| Scatter QRS: | 1.6 | ° | < 4,5 |
| Scatter T: | 2.2 | ° | < 10 |

## SCATTER-GRAPH: SCATTER OF QRS AND T VECTORS

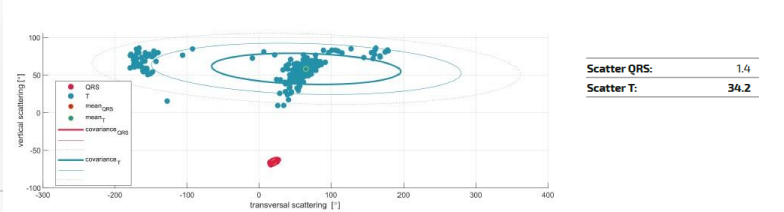
- *Scatter QRS : Disturbance of depolarisation (Usually ireversible/ scar tissue) (< 4.5)*
- *Scatter T: Disturbance of repolirisation (Usually reversible) (< 10)*

**Example 1:** increased scattering of the QRS vectors (you can see 2 point clouds)



| | |
|---|---|
| Scatter QRS: | 13.5 |
| Scatter T: | 3.4 |

**Example 2:** *increased* scattering of T-vectors (again 2 separate piles).



| | |
|---|---|
| Scatter QRS: | 1.4 |
| Scatter T: | 34.2 |

# T MAGNITUDE

ESC Working Group Development, Anatomy & Pathology

**VCG**

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| CSG-Index: | -0.973 | | < -0.27 |
| 3D QRS vector: | 61 | ° | -30<x<90 |
| 3D T vector: | 49 | ° | -30<x<90 |
| 3D QRS T angle: | 14 | ° | <100 |
| Superposition: | 100.00 | % | > 50 |
| T Magnitude: | 0.79 | mV | > 0.4 |

***T MAGNITUDE***

***T wave: Measurable expression of intact myocardium. (> 0.4)***

***If myocardium is disturbed due to an insufficient supply (ischemia, Hypoxia, Infection) there will be a decrease in amplitude.***

***A decreased T wave magnitude is often associated with increase T wave scatter.***

***An increase in T magnitude and decrease in scatter T over time indicates an improvement in cardiac outcome***

# CASE 1

ESC Working Group Development, Anatomy & Pathology

Gender: **Male, 40**

## *Current cardiopulmonary symptoms:*

- Typical chest pain and dyspnoea on exertion

## *Cardiovascular risk factors*

- Hyperlipidaemia , Smoking (30 pys)
- BMI: 28,9

## *PROCAM Score*

- low (43 points)

## Past cardiovascular and other relevant diagnoses:

- No known Coronary Heart Disease (CHD)
- No chronic renal insufficiency
- Troponin: normal
- NT-pro BNP: normal

## 12–lead ECG

- Sinus rhythm, HR 84/min., electrical axis normal, t waves negative in V4-V6, ST segments normal.

## Transthoracic echocardiography (TTE)

- Normal sized left ventricle without hypertrophy and good LV function (LVEF=60%) without wall motion abnormalities. Right heart cavities of normal size. Mild mitral regurgitation. No pericardial effusion.

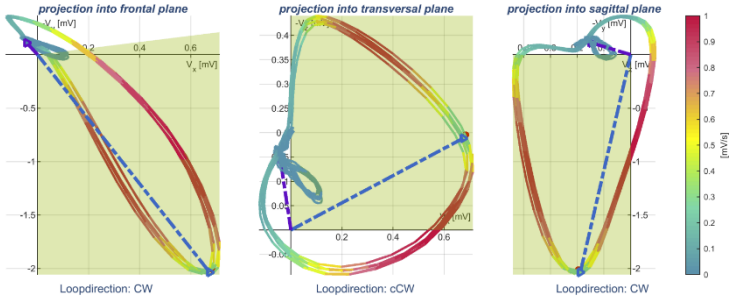
Cardisiography

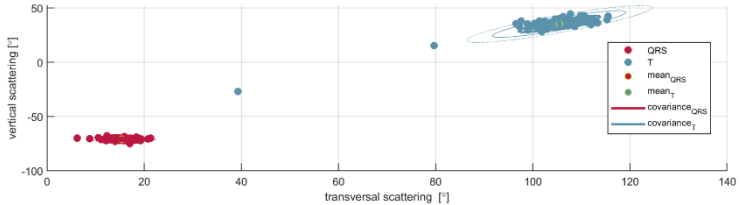
- Positive for IHD

# DIAGNOSTICS

ESC Working Group Development, Anatomy & Pathology

## Vectorcardiography




## VCG

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| CSG-Index: | **0.244** | | < -0.27 |
| 3D QRS vector: | 72 | ° | -30 — 90 |
| 3D T vector: | **-111** | ° | -30 — 90 |
| 3D QRS T angle: | **123** | ° | < 100 |
| Superposition: | 98.08 | % | > 50 |
| T Magnitude: | **0.38** | mV | > 0.4 |

**One or more VCG values outside normal range.**

- T- axis deviation unconformable T- wave; repolarisation abnormality
- Unconformity of depolarisation and repolarisation

## Scatter Analysis

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| Scatter QRS: | 1.3 | ° | < 4,5 |
| Scatter T: | 3.6 | ° | < 10 |

# DIAGNOSTICS & MANAGEMENT

ESC Working Group Development, Anatomy & Pathology

## INVASIVE CORONARY ANGIOGRAPHY

- LMS: normal
- LAD : Proximal LAD critical stenosis
- LCX: normal
- RCA: normal

## MANAGEMENT

- PCI for LAD lesion was uneventfully performed

# CASE 2

ESC Working Group Development, Anatomy & Pathology

Gender: **Male**, 63

## *Current cardiopulmonary symptoms:*

- Atypical Chest pain

## *Cardiovascular risk factors*

- **BMI: 25.5**

## *PROCAM Score*

- low (38 points)

## Past cardiovascular and other relevant diagnoses:

- No known Coronary Heart Disease (CHD)
- Blood Tests: Within Normal Limits.

## 12-lead ECG

- Sinus rhythm, HR 76/min., electrical axis normal,, ST segments normal.

## Transthoracic echocardiography (TTE)

- Good LV function
- EF > 70%
- No Valvulopathy
- No RWMA

Cardisiography

- Positive for IHD

ESC
Working Group
Development, Anatomy
& Pathology

# Cardiosiography (CSG) Report

## VCG

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| CSG-Index: | **-0.197** | | < -0.27 |
| 3D QRS vector: | **-62** | ° | -30 – 90 |
| 3D T vector: | 75 | ° | -30 – 90 |
| 3D QRS T angle: | **130** | ° | < 100 |
| Superposition: | 84.32 | % | > 50 |
| T Magnitude: | 0.89 | mV | > 0.4 |

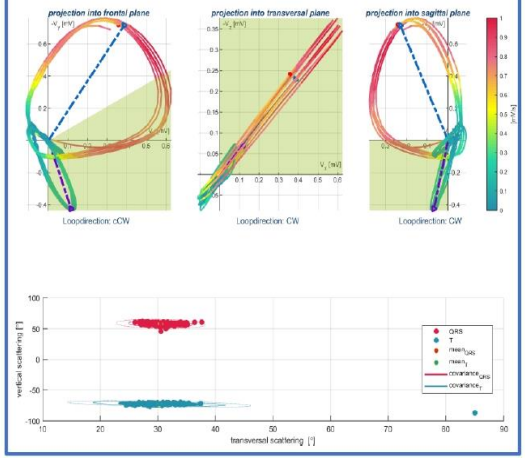
**One or more VCG values outside normal range.**

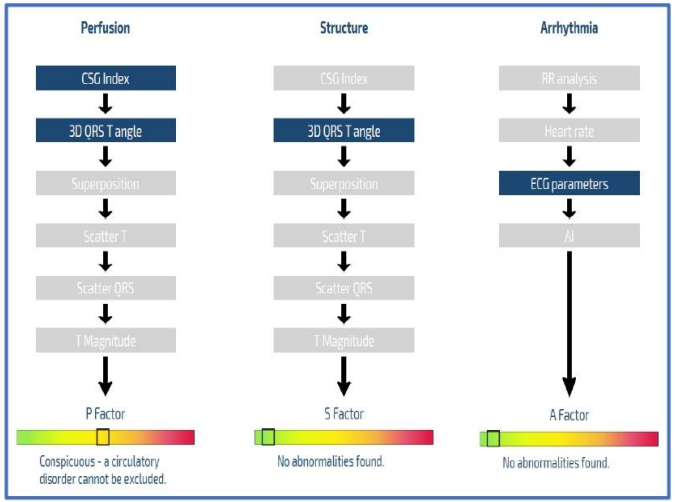
- Left QRS axis deviation
- Unconformity of depolarisation and repolarisation

## Scatter Analysis

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| Scatter QRS: | 2.2 | ° | < 4,5 |
| Scatter T: | 2.4 | ° | < 10 |

## Vektorkardiographie



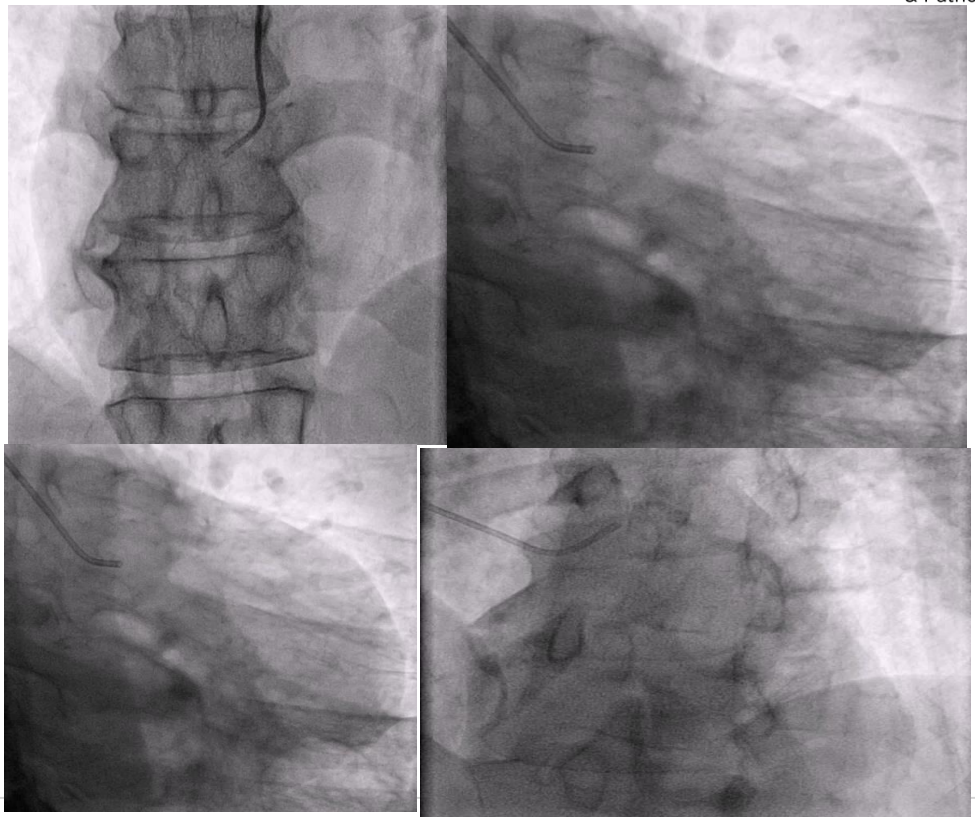
# DIAGNOSTICS & MANAGEMENT

ESC Working Group Development, Anatomy & Pathology

## Invasive coronary Angiography

- ***LMS: Normal***
- ***LAD: 100% occluded, occuded d1, x-fills***
- ***LCX: Normal***
- ***RCA: tight mid segment 95% discrete lesion***

- MANAGEMENT:
- CABGX4



# CASE 3

ESC Working Group Development, Anatomy & Pathology

Gender: **Male, 66**

## *Current cardiopulmonary symptoms:*

- Atypical chest pain and dyspnoea on exertion

## *Cardiovascular risk factors*

- Hyperlipidaemia ,
- BMI: 31,3

## *PROCAM Score*

- low (35 points)

## Past cardiovascular and other relevant diagnoses:

- No known Coronary Heart Disease (CHD)
- No chronic renal insufficiency
- Troponin: normal
- NT-pro BNP: normal

## 12–lead ECG

- Sinus rhythm, HR 65/min., electrical axis normal, No ST-T changes

## Transthoracic echocardiography (TTE)

- Normal sized left ventricle and Satisfactory LV function (LVEF=45%) Hypokinetic posterior wall.
- Trivial mitral regurgitation. No pericardial effusion.

Cardisiography

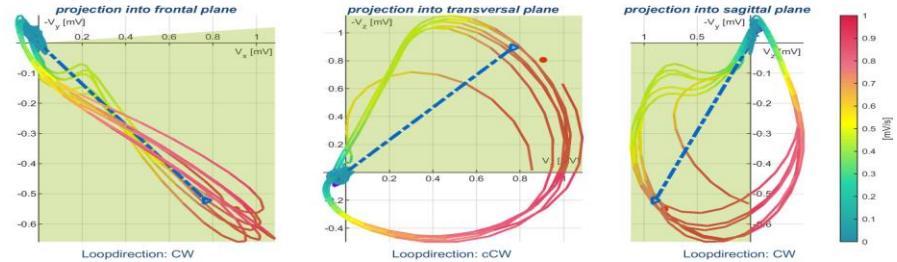
- Positive for IHD

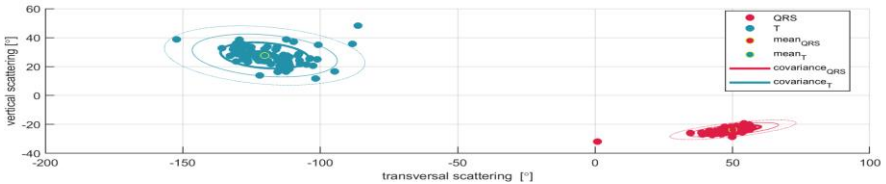
ESC Working Group Development, Anatomy & Pathology

Patient ID: Lai fak yu p. johm
CSG ID: Test-096946
Date: 18.11.2023 12:26

# VECTORCARDIOGRAPHY RESULTS

## Vectorcardiography




## Pretest Risk

## VCG

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| CSG-Index: | **0.712** | | < -0.27 |
| 3D QRS vector: | 34 | ° | -30<x<90 |
| 3D T vector: | **-134** | ° | -30<x<90 |
| 3D QRS T angle: | **167** | ° | <100 |
| Superposition: | 94.03 | % | > 50 |
| T Magnitude: | **0.20** | mV | > 0.4 |

**One or more VCG values outside normal range.**

- T- axis deviation unconformable T- wave; repolarisation abnormality
- Unconformity of depolarisation and repolarisation

## Scatter Analysis

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| Scatter QRS: | 3.1 | ° | < 4,5 |
| Scatter T: | 7.8 | ° | < 10 |

# DIAGNOSTICS & MANAGEMENT

ESC Working Group Development, Anatomy & Pathology

## Invasive coronary Angiography

LMS: Normal

LAD: Tight long Mid Segment 90% Lesion

LCX: Tight long mid segment lesion 95%.

RCA: 100% occluded proximally- x-fills from lad

Management

X3 Bypass

# CASE 4

ESC Working Group Development, Anatomy & Pathology

Gender: **Male, 59**

## *Current cardiopulmonary symptoms:*

- Effort Dyspnea

## *Cardiovascular risk factors*

- Hyperlipidaemia , Smoking (30 pys)
- BMI: 23,9

## *PROCAM Score*

- low (48 points)

## Past cardiovascular and other relevant diagnoses:

- No known Coronary Heart Disease (CHD)
- No chronic renal insufficiency
- Troponin: normal
- NT-pro BNP: normal

## 12–lead ECG

- Sinus rhythm, HR 78/min., No Significant ST-T changes

## Transthoracic echocardiography (TTE)

- Normal sized left ventricle and decreased LV function (LVEF=45%) with hypokinetic anterior wall. Mildly calcified Mitral Valve leaflets- No PHT

Cardisiography

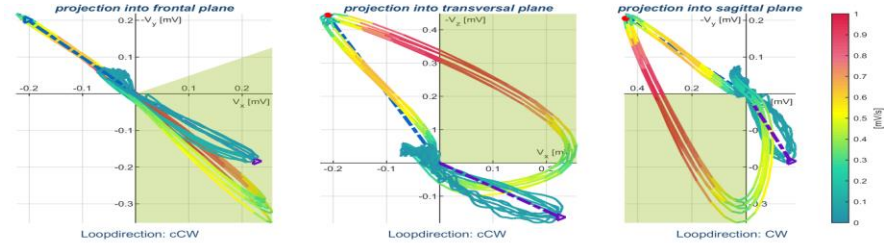
- Positive for IHD

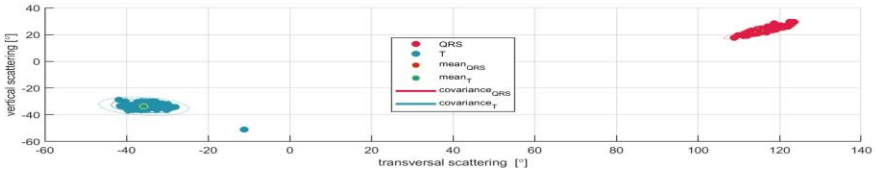
ESC Working Group Development, Anatomy & Pathology

# VECTORCARDIOGRAPHY RESULTS

Patient ID: Leung kow herve
CSG ID: Test-096936
Date: 18.11.2023 11:19

## Vectorcardiography




## Pretest Risk

## VCG

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| CSG-Index: | **0.105** | | < -0.27 |
| 3D QRS vector: | **-135** | ° | -30<x<90 |
| 3D T vector: | 39 | ° | -30<x<90 |
| 3D QRS T angle: | **153** | ° | <100 |
| Superposition: | **29.66** | % | > 50 |
| T Magnitude: | 0.67 | mV | > 0.4 |

**One or more VCG values outside normal range.**

- Left QRS axis deviation
- Unconformity of depolarisation and repolarisation

## Scatter Analysis

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| Scatter QRS: | 14 | ° | < 4,5 |
| Scatter T: | 2.5 | ° | < 10 |

# DIAGNOSTICS AND MANAGEMENT

ESC Working Group Development, Anatomy & Pathology

## Invasive Coronary Angiography

LMS: NORMAL

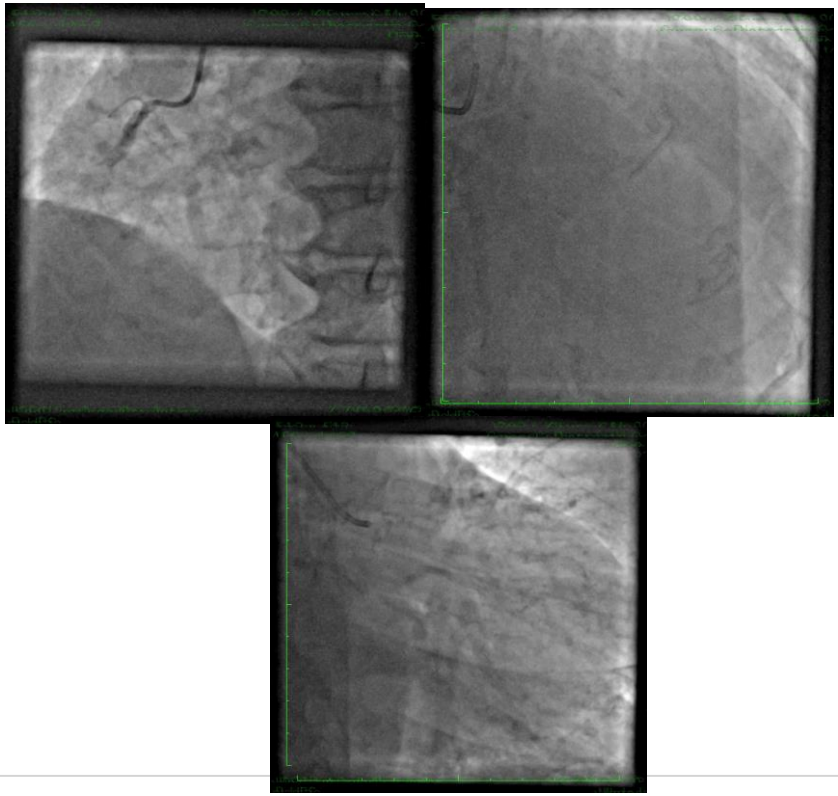
LAD: TIGHT PROXIMAL AND MID SEGMENT LESION 90%

LCX: 90% PROXIMAL SEGMENT LESION

RCA: MID SEGMENT SUB OCCLUSIVE 95% LESION

MANAGEMENT

X 3 BYPASS



# CASE 5

ESC Working Group Development, Anatomy & Pathology

Gender: **Female, 59**

## *Current cardiopulmonary symptoms:*

- Effort Angina

## *Cardiovascular risk factors*

- Hyperlipidaemia , BMI: 21,9

## *PROCAM Score*

- low (13 points)

## Past cardiovascular and other relevant diagnoses:

- No known Coronary Heart Disease (CHD)
- No chronic renal insufficiency
- Troponin: not done

## 12-lead ECG

- Sinus rhythm, HR 68/min.,No Significant ST-T changes

## Transthoracic echocardiography (TTE)

- Normal sized left ventricle and good LV function EF 65%- no PHT- Valves ok

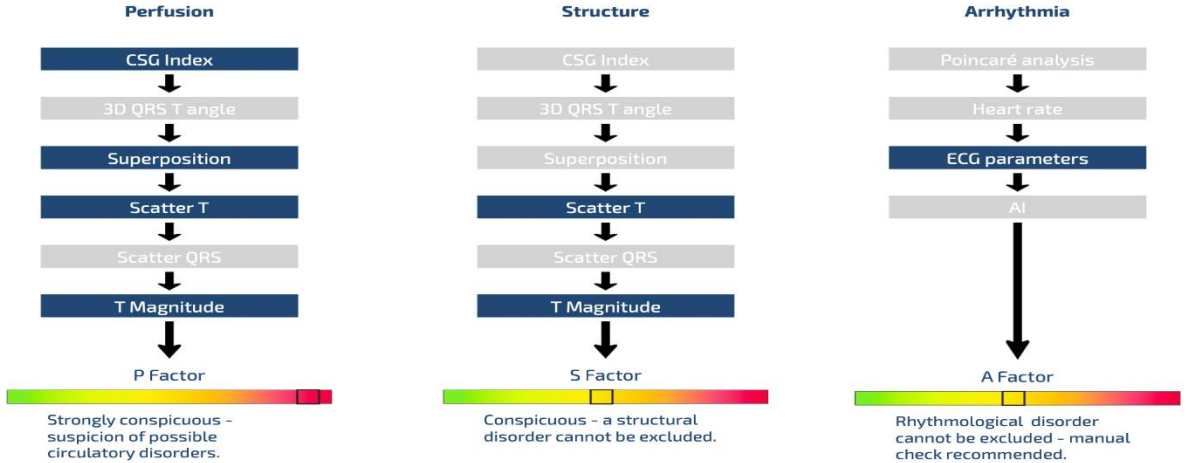
Cardisiography

- Positive for IHD- awaiting Angio

# CARDISIOGRAPHY

Patient ID: Yong chen yin
CSG ID: Test-120727
Date: 03.02.2024 12:52

By combining vectorcardiography, electrocardiography and artificial intelligence Cardisiography offers a variety of new parameters for the assessment of cardiac disease. All parameters must be interpreted individually as part of the overall clinical assessment. To aid in the decision-making process, the risk factors for perfusion, structure and arrhythmia with a corresponding decision tree are shown below.




The diagnostic accuracy of the method can vary depending on prevalence and patient profile.

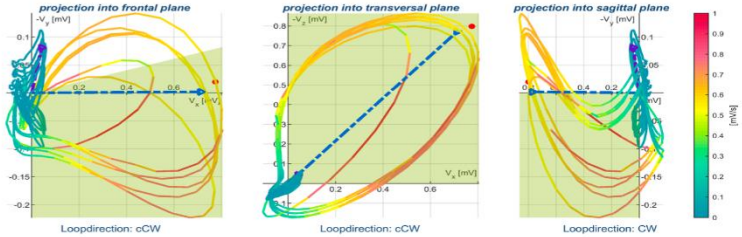
Preview File Edit View Go Tools Window Help 48% Wed 7 Feb 09:42

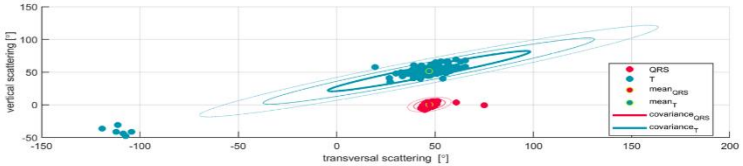
Yong chen yin.pdf
Page 1 of 6

# CARDISIOGRAPHY

Patient ID: Yong chen yin
CSG ID: Test-120727
Date: 03.02.2024 12:52

## Vectorcardiography




## Pretest Risk

## VCG results

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| CSG-Index: | -0.006 | | < -0.27 |
| 3D QRS vector: | -0 | ° | -30<x<90 |
| 3D T vector: | -62 | ° | -30<x<90 |
| 3D QRS T angle: | 53 | ° | <100 |
| Superposition: | 42.81 | % | > 50 |
| T Magnitude: | 0.22 | mV | > 0.4 |

**One or more VCG values outside normal range.**

- T- axis deviation unconformable T- wave; repolarisation abnormality

## Scatter Analysis

| Parameter | Value | Unit | Reference |
|---|---|---|---|
| Scatter QRS: | 3.1 | ° | < 4,5 |
| Scatter T: | 13.8 | ° | < 10 |

# *CONCLUSION*

ESC Working Group Development, Anatomy & Pathology

- 5L-3D-VCG-AI
- Sitting position
- Impact on the management of IHD
- Primary set up
- Prioritise referral to secondary or tertiary set up.
- Detection of IHD before Infarct.

ESC
Working Group
Development, Anatomy
& Pathology

# *THANK YOU!*