



**EACPR**

European Association for  
Cardiovascular Prevention  
and Rehabilitation

A Registered Branch of the ESC

Training course: Sports Cardiology  
2nd EACPR Course on Sports Cardiology

## Athletes with coronary artery anomalies

F. Di Paolo, MD  
IMSS-CONI, Rome

IMSS-CONI, Rome

F. Di Paolo, MD

coronary artery anomalies

# N. Korean defense chief said executed for sleeping during meeting

Report says Hyon Yong Chol, who nodded off at session presided over by leader Kim Jong Un, shot dead with anti-aircraft gun

BY HYUNG-JIN KIM | May 13, 2015, 12:44 pm |

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A man watches a TV news program reporting that North Korean People's Armed Forces Minister Hyon Yong Chol was killed by anti-aircraft gunfire, at Seoul Railway Station in Seoul, South Korea, Wednesday, May 13, 2015. (Photo credit: Lee Jin-man/AP)

*I have*

*declare:*

*industry*

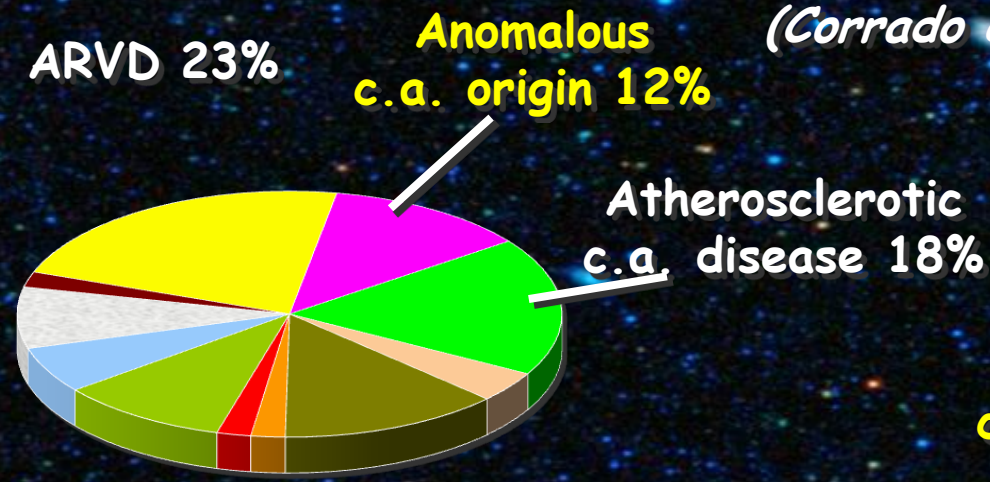
*rests to*

*rt from an*

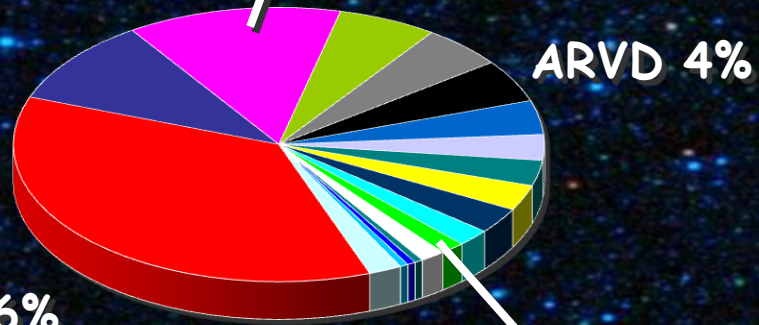
*ntation.*



*(Corrado et al. NEJM 1998)*



Anomalous  
c.a. origin 17%



*(Maron et al. Circulation 2009)*



- Congenital Coronary Artery Anomalies

- Congenital Coronary Artery Anomalies

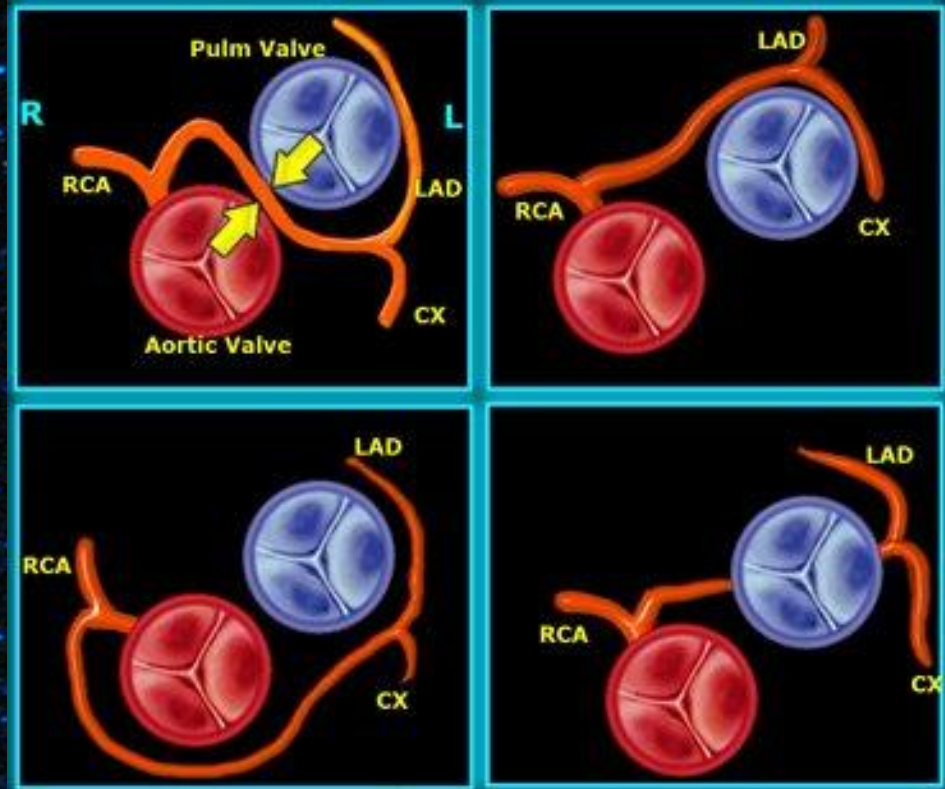


## Most frequent congenital coronary artery anomalies

The illustration in the left upper corner is the most common and clinically significant anomaly.

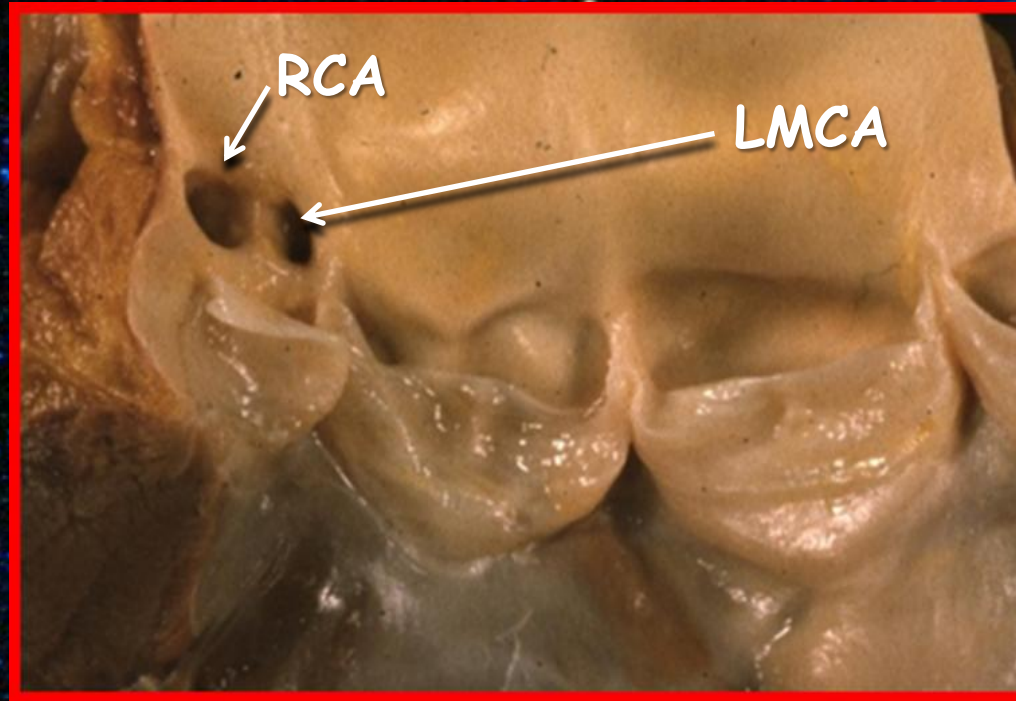
There is an anomalous origin of the LCA from the right sinus of Valsalva and the LCA courses between the aorta and pulmonary artery.

This interarterial course can lead to compression of the LCA (yellow arrows) resulting in myocardial ischemia.





## Anomalous origin of the left main coronary artery from the right sinus



## CLINICAL CASE

### Judo player, 30 years-old male

- Negative family history for CV diseases.
- Negative personal history for cardiac symptoms.
- Height 184cm, Weight 90Kg
- PA 125/85 mmHg
- Normal physical examination (no murmur)
- Training schedule: 3-5 hours per day





10 Paziente: F100

Data di nascita 28/12/1983

Altezza \_\_\_\_\_ Peso \_\_\_\_\_

Sesso: M

PAS/PAD \_\_\_\_/\_\_\_\_ mmHg

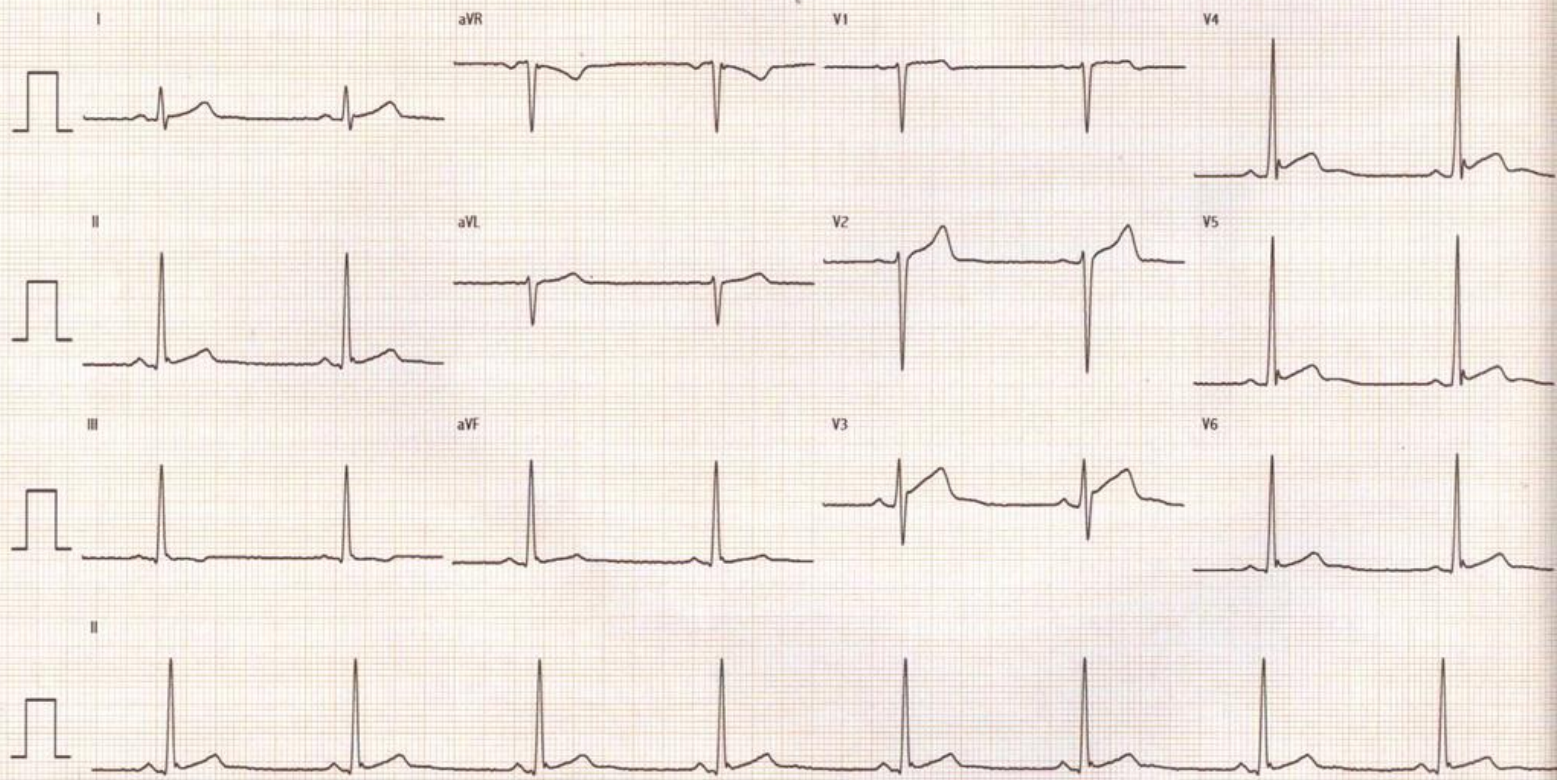
P 106 ms P-Q 148 ms Qrs 98 ms  
Q-T 430 ms Q-T/RR 0.344 Q-T Rel. 99 %  
Hr: 48 /Min. Bradicardia  
P 0.11 Axis 52 Deg  
Qrs 1.96 Axis 81 Deg  
T 0.22 Axis 18 Deg  
Tipo Verticale  
Ritmo

Ritmo Sinusale

Interpretazione Qrs-T:

Dubbio Di Ipertrofia Ventricolare Sinistra

Firmato il: 28/05/2013  
da: DOT





1166  
Maschio 28/12/1983

Esercizio (13:58)  
Picco (01:58)

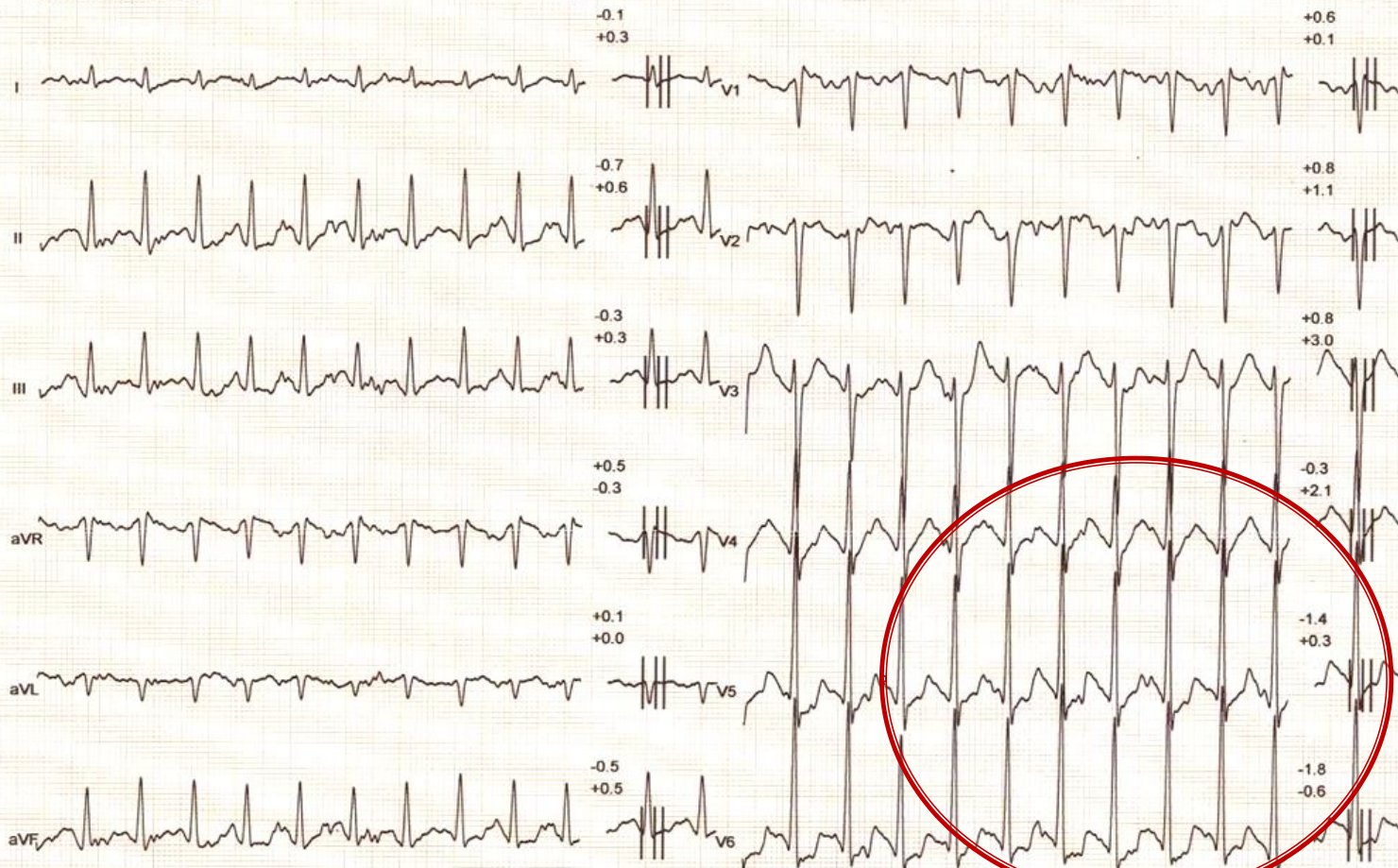
153 bpm  
(80%)

280 Watt

195/80  
mmHg

298

15.1



# 2D-echocardiography

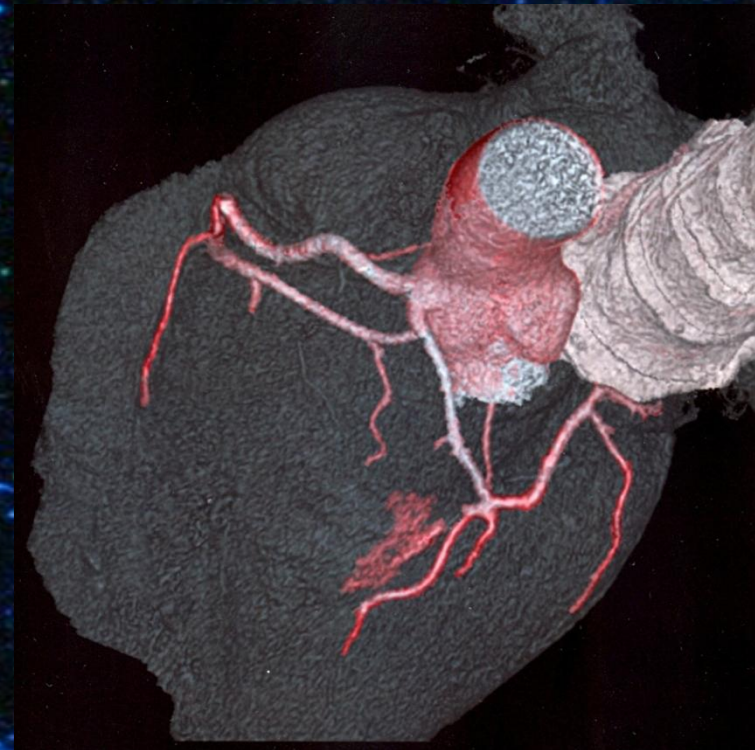
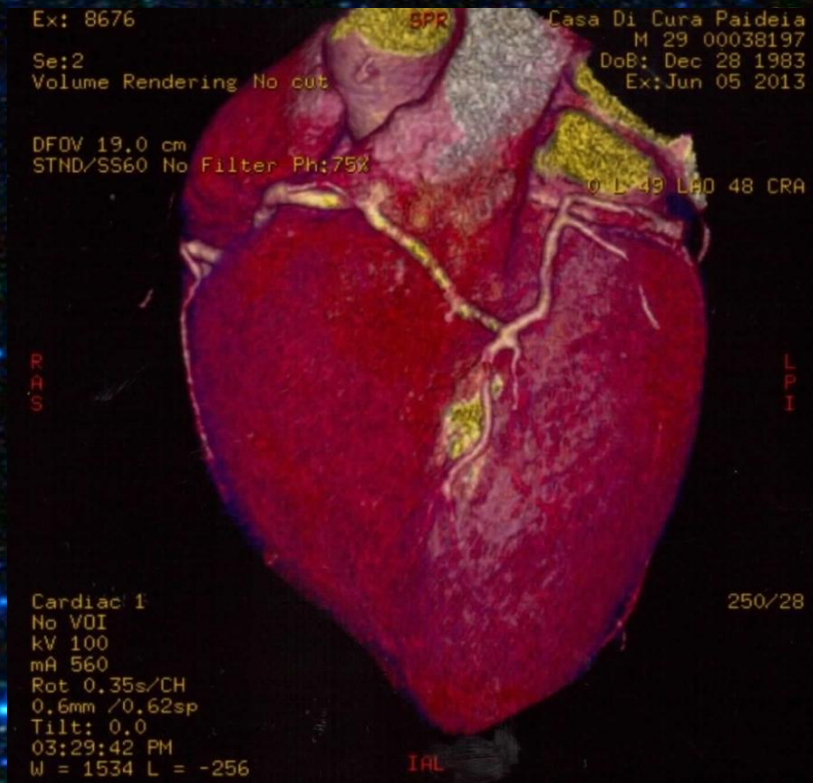




# CT scan



# CT scan





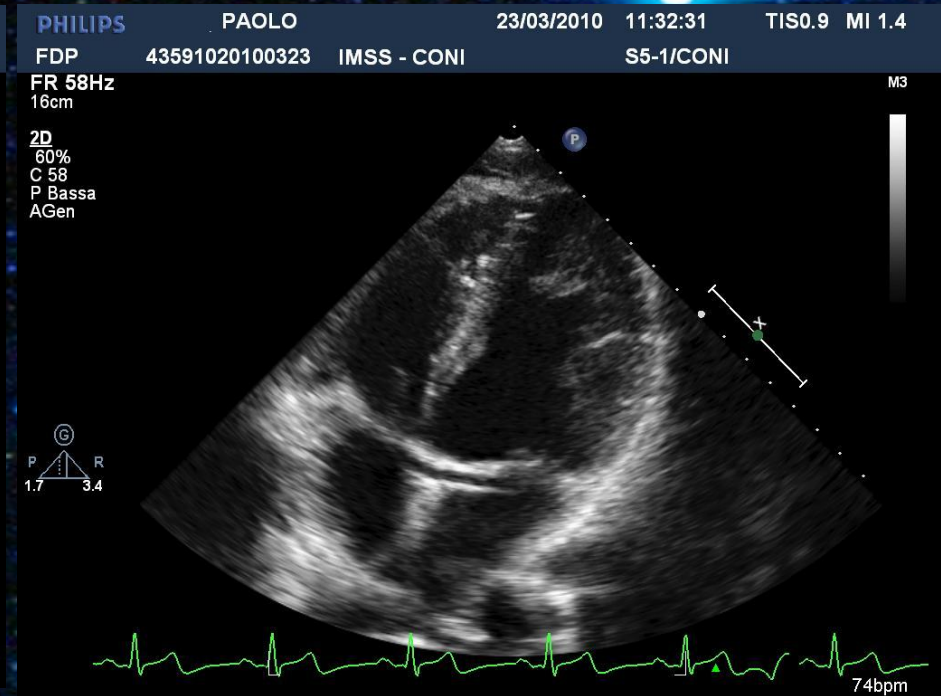
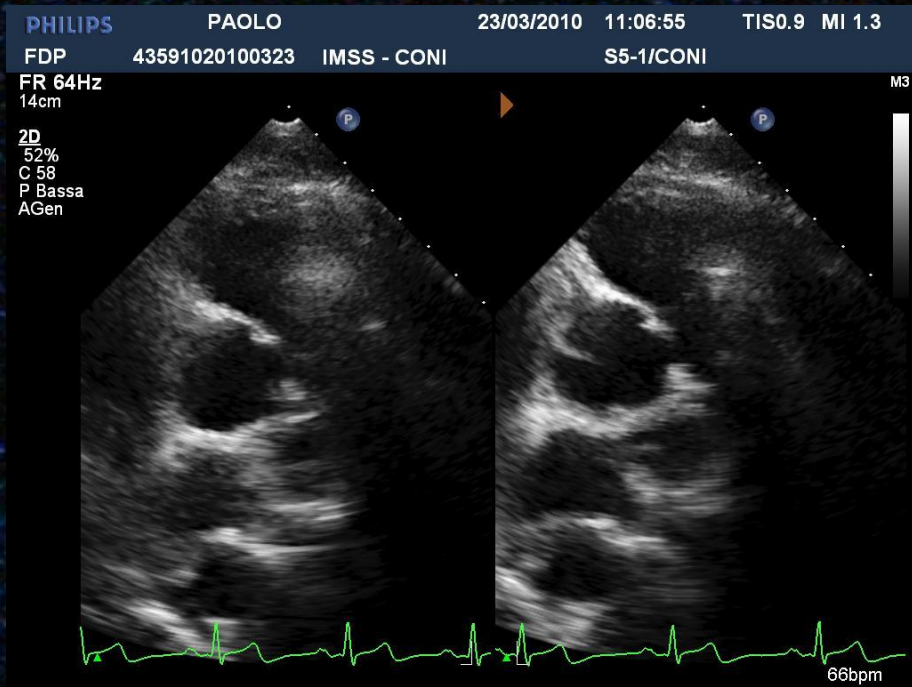
## CLINICAL CASE



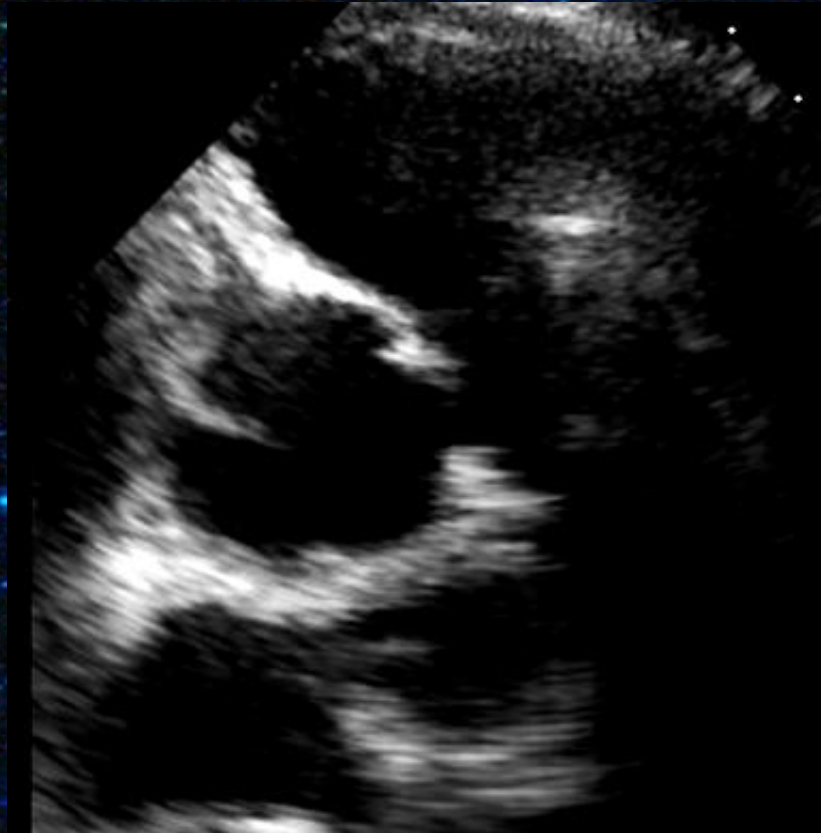
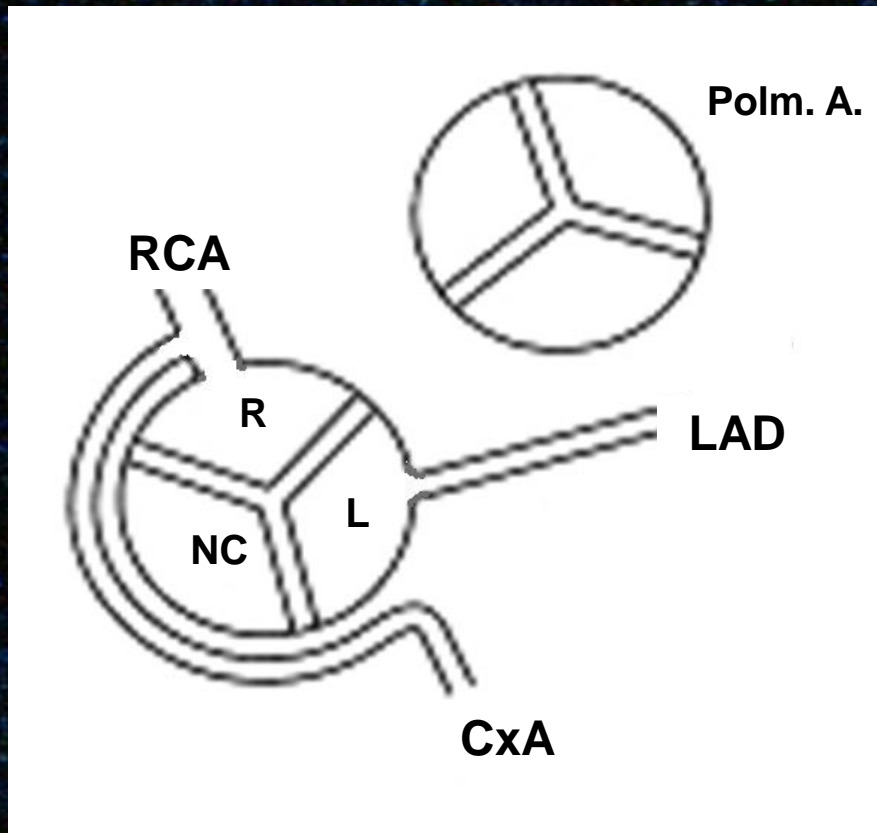
### Rower, 21 years-old male

- Negative family history for CV diseases.
- Negative personal history for cardiac symptoms.
- Height 185cm, Weight 82Kg
- PA 115/75 mmHg
- Normal physical examination (no murmur)
- Training schedule: 5-8 hours per day

# 2D-echocardiography







Anomalous origin of the  
left coronary artery  
from the right sinus







***RISK ASSESSMENT***

Eligibility

Non eligibility

# RISK ASSESSMENT EXERCISE INDUCED ISCHEMIA



1. Myocardial scintigraphy
2. Stress echocardiography
3. IVUS (coronary echocardiography)
4. FFR (coronary angiography)

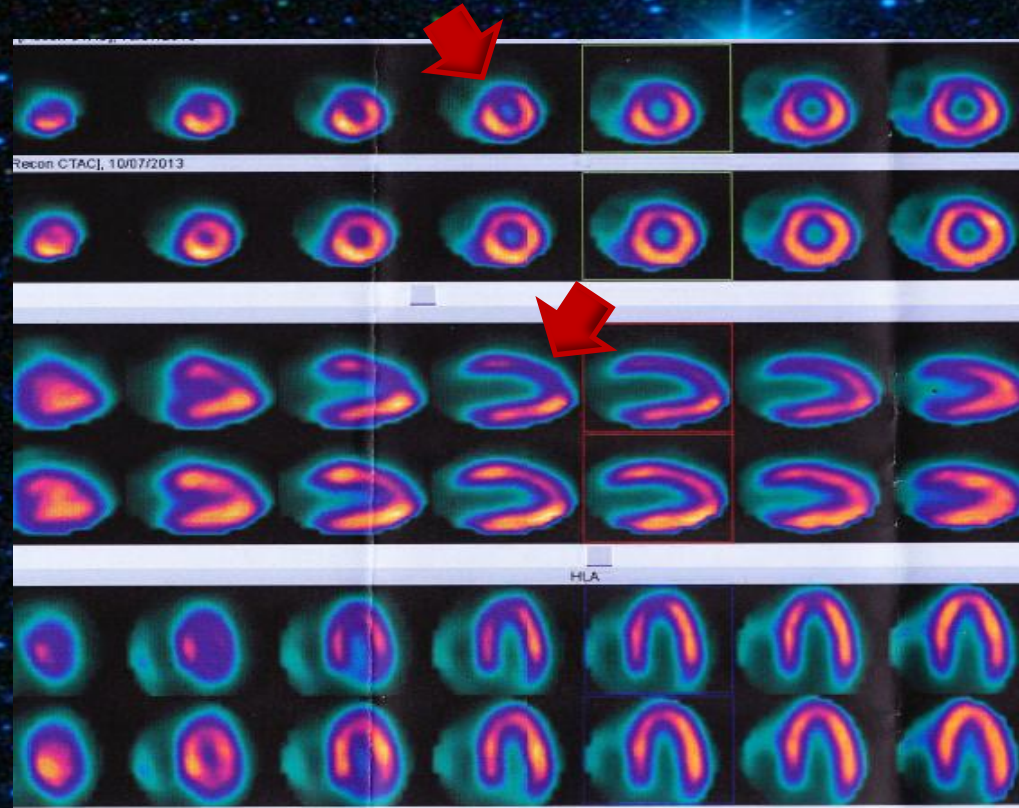
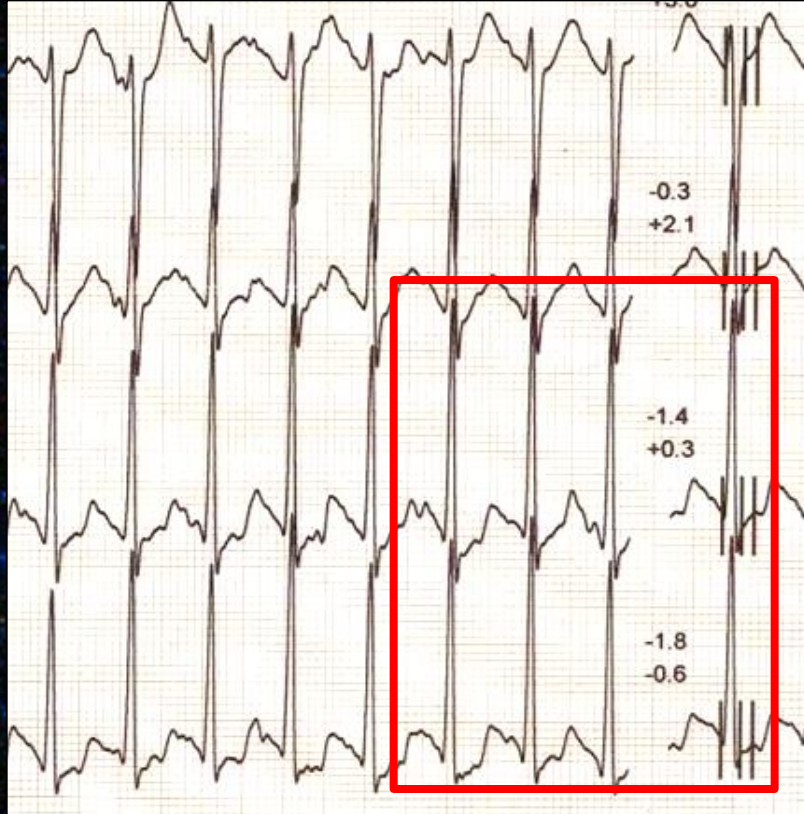
Diastolic Fractional Flow Reserve- dobutamina mean and diastolic

4. FFR (coronary angiography)



# RISK ASSESSMENT EXERCISE INDUCED ISCHEMIA

*Clinical case: judo athlete*



AHA/ACC SCIENTIFIC STATEMENT

**Eligibility and Disqualification  
Recommendations for Competitive Athletes  
With Cardiovascular Abnormalities:  
Preamble, Principles, and  
General Considerations**

A Scientific Statement From the American Heart Association and American College of Cardiology

1. Athletes with an anomalous origin of a right coronary artery from the left sinus of Valsalva should be evaluated by an exercise stress test. For those without either symptoms or a positive exercise stress test, permission to compete can be considered after adequate counseling of the athlete and/or the athlete's parents (in the case of a minor) as to risk and benefit, taking into consideration the uncertainty of accuracy of a negative stress test (Class IIa; Level of Evidence C).
2. Athletes with an anomalous origin of a left coronary artery from the right sinus of Valsalva, especially when the artery passes between the pulmonary artery and aorta, should be restricted from participation in all competitive sports, with the possible exception of class IA sports, before surgical repair. This recommendation applies whether the anomaly is identified as a consequence of symptoms or discovered incidentally (Class III; Level of Evidence B).



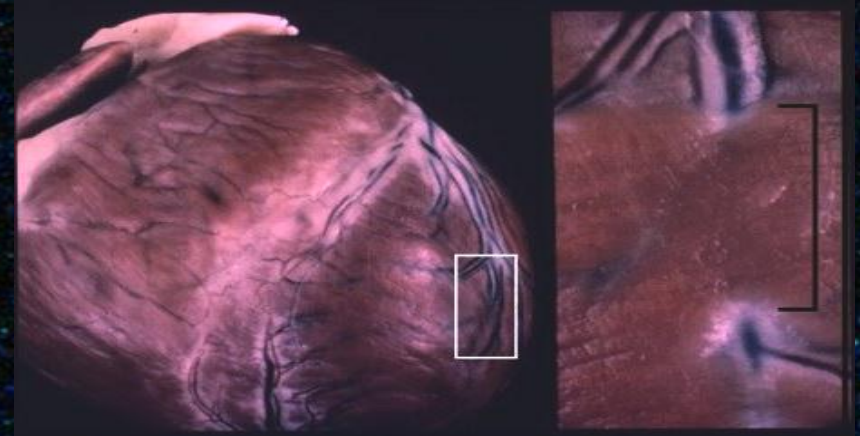
- Myocardial bridge

μυοκαρδιακή γέφυρα

# MYOCARDIAL BRIDGE



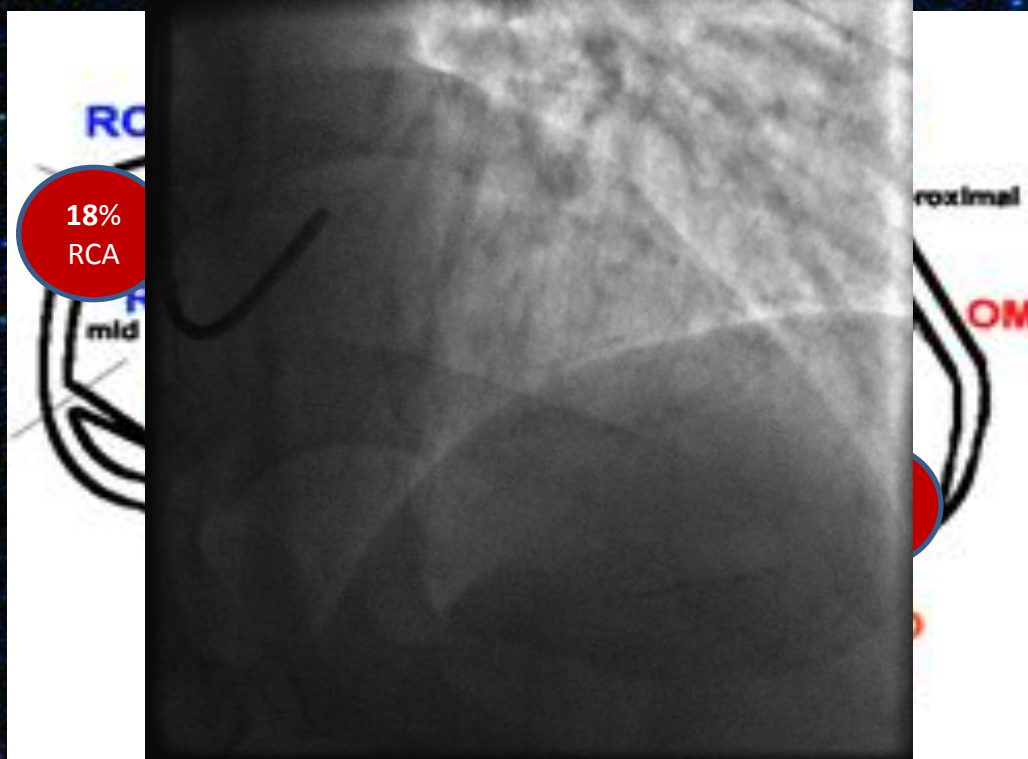
Muscle overlying the intramyocardial segment of an epicardial coronary artery



- ✓1737 Reyman → 1<sup>st</sup> autopsy finding
- ✓1960 Portmann e Iwig → 1<sup>st</sup> angiographic finding
- ✓1.5 a 16% in coronary angiography
- ✓≥80% in autopsy



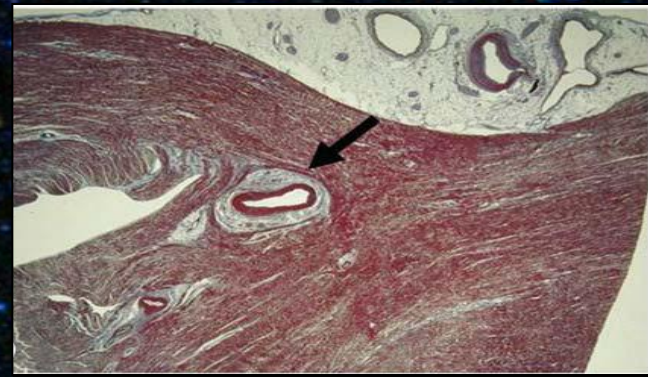
- Location of Myocardial Bridges



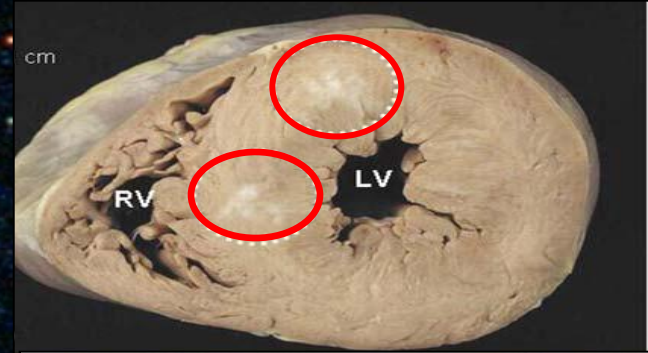
The "milking" effect



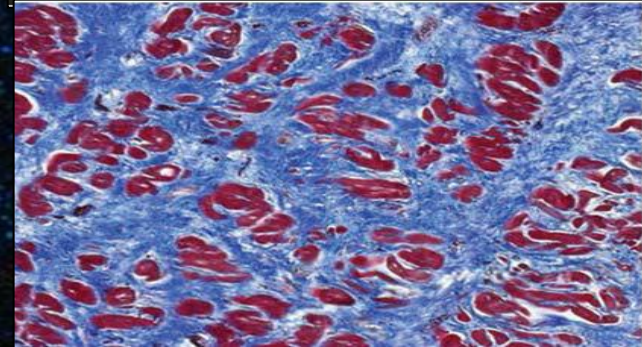
LAD (arrow) penetrating the  
anterior anterior portion of  
ventricular septum (depth, 5 mm).



two fibrous scars in anterior  
and mid-septal regions.



areas of replacement fibrosis among  
islands of surviving myocytes.





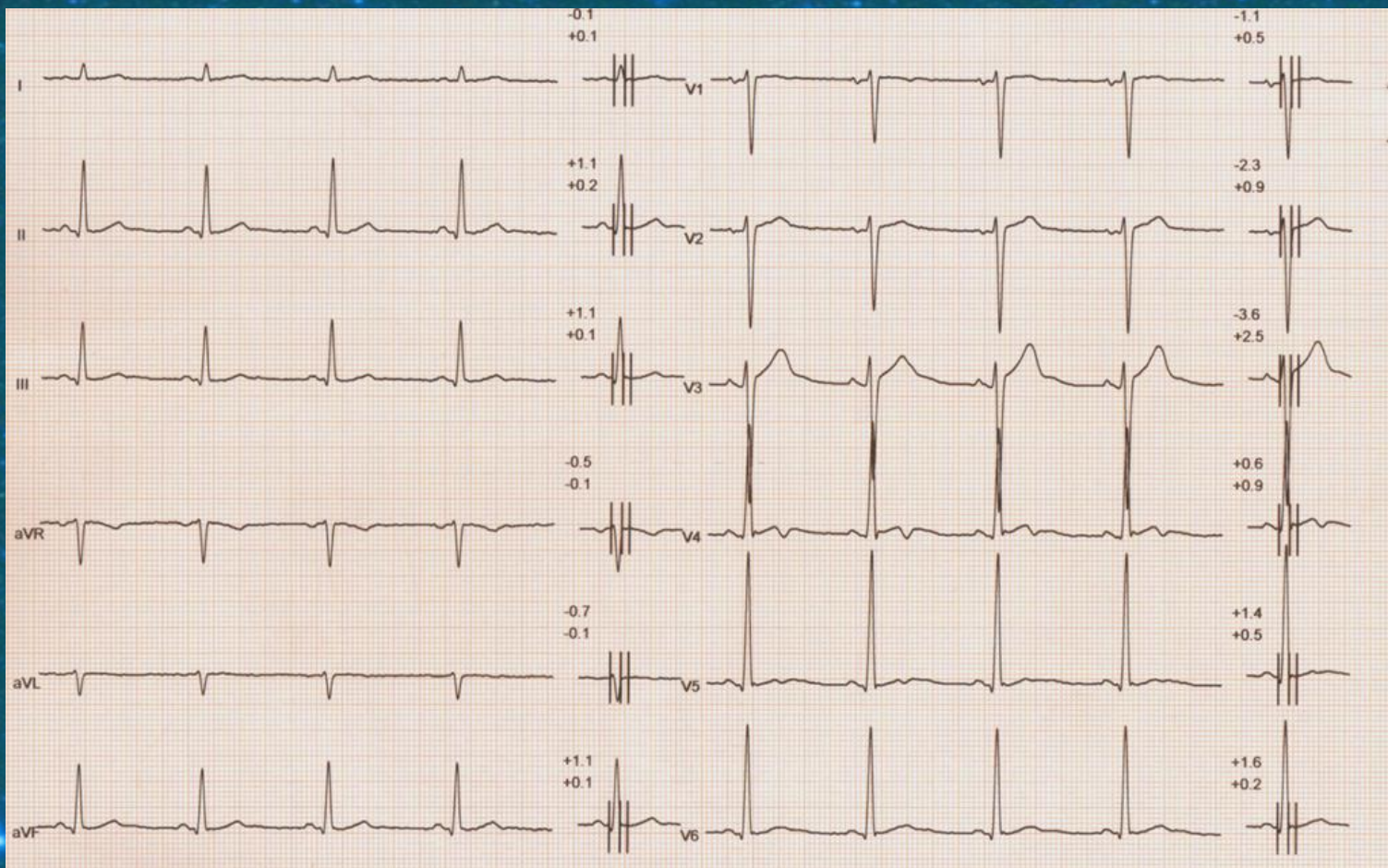
## CLINICAL CASE



*29 yo, male, snowboard  
asymptomatic athlete  
83 kg ; 176 cm  
Pre-Olympic evaluation*

- ✓ Family Hx positive for ischemic heart disease, hypertension and dyslipidemia (father) and ictus (mother);
- ✓ Negative personal Hx for symptoms or significant disease;
- ✓ Training schedule: 6 days/wek; 2-3 hour per session;
- ✓ Physical examination unremarkable; BP: 110/80 mmHg;
- ✓ Cholesterol 243mg/dl; HDL: 43 mg/dl; LDL 158 mg/dl







**Esercizio (12:50)**  
**Picco (00:50)**



**18.5**





# Echocardiography

Eco adulti

X5-1

50Hz

14cm

Z 1.4

2D

62%

C 50

P Basso

AGen

1.6 3.2

1.6 3.2

TIS0.4 MI 1.3

M3

48bpm





# Indication for coronary artery TC scan in young (<30 years) athletes:



1. Distinctly abnormal ST segment ( $>2$  mm in depth) consistently induced by exercise, even in the absence of symptoms ;
2. Unexplained symptoms (e.g., SYNCOPÉ) in association with non-significant ST segment changes ( $<2$  mm), and/or complex/frequent ventricular arrhythmias.

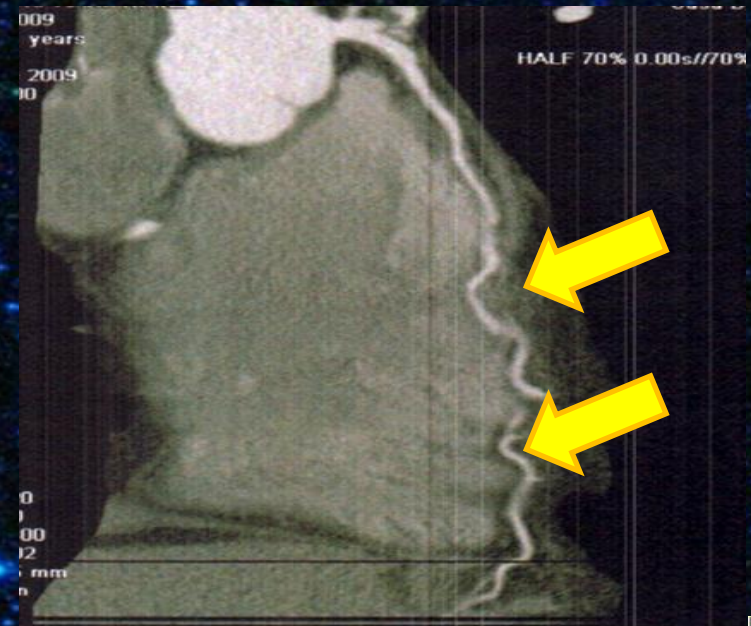
and/or complex/frequent ventricular arrhythmias.  
with non-significant ST segment changes ( $<2$  mm),  
5. Unexplained symptoms (e.g., SYNCOPÉ) in association



**CT scan (64) shows:**

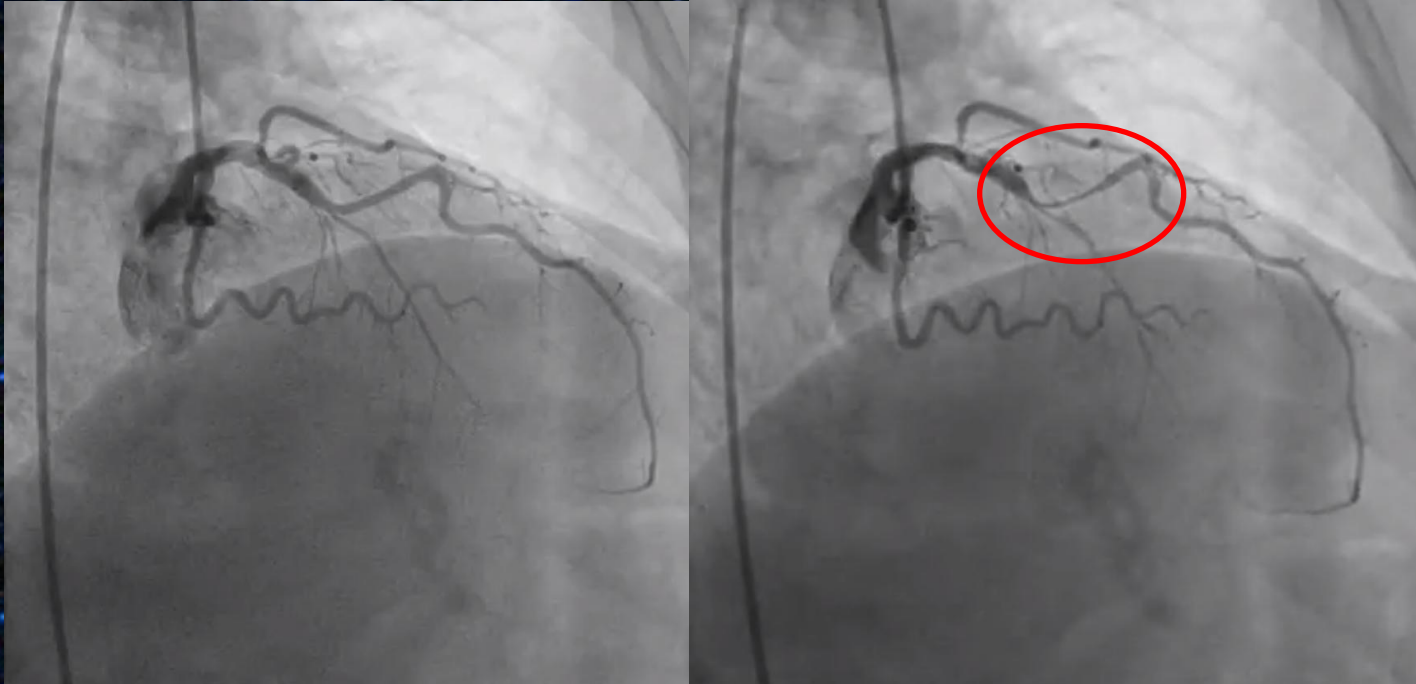
**No evidence of atherosclerotic lesions...**

**The intermediate segment of the LAD shows an intramyocardial course ....**





**Coronaro-angiography shows:**  
... in the intermediate segment an intramyocardial course of the LAD is evident, and systolic milking effect occurs ...







# *Myocardial bridge*

## *Criteria for eligibility*



### ABSENCE OF:

- Evidence for inducible ischemia on provocative testing (expression of deepness and lenght of the intramyocardial course)
- Evidence for symptoms/tachyarrhythmias induced by effort



## *Final considerations:*



- ✓ *Congenital coronary artery anomalies may occasionally be suspected by the abnormal exercise ECG; athletes with CCAA are at high risk for SCD*
- ✓ *Myocardial bridge is a relatively frequent "abnormality" in asymptomatic athletes and can be suspected by the abnormal exercise ECG*
- ✓ *Echocardiography: search coronary origin!*
- ✓ *CT scan is the "gold standard" testing for morphological assessment*
- ✓ *Risk stratification is based on detection of myocardial induced ischemia*



**THANKS FOR  
YOUR ATTENTION**