

# Il mito di Highlander. Patologie cardiovascolari nello Sportivo Master

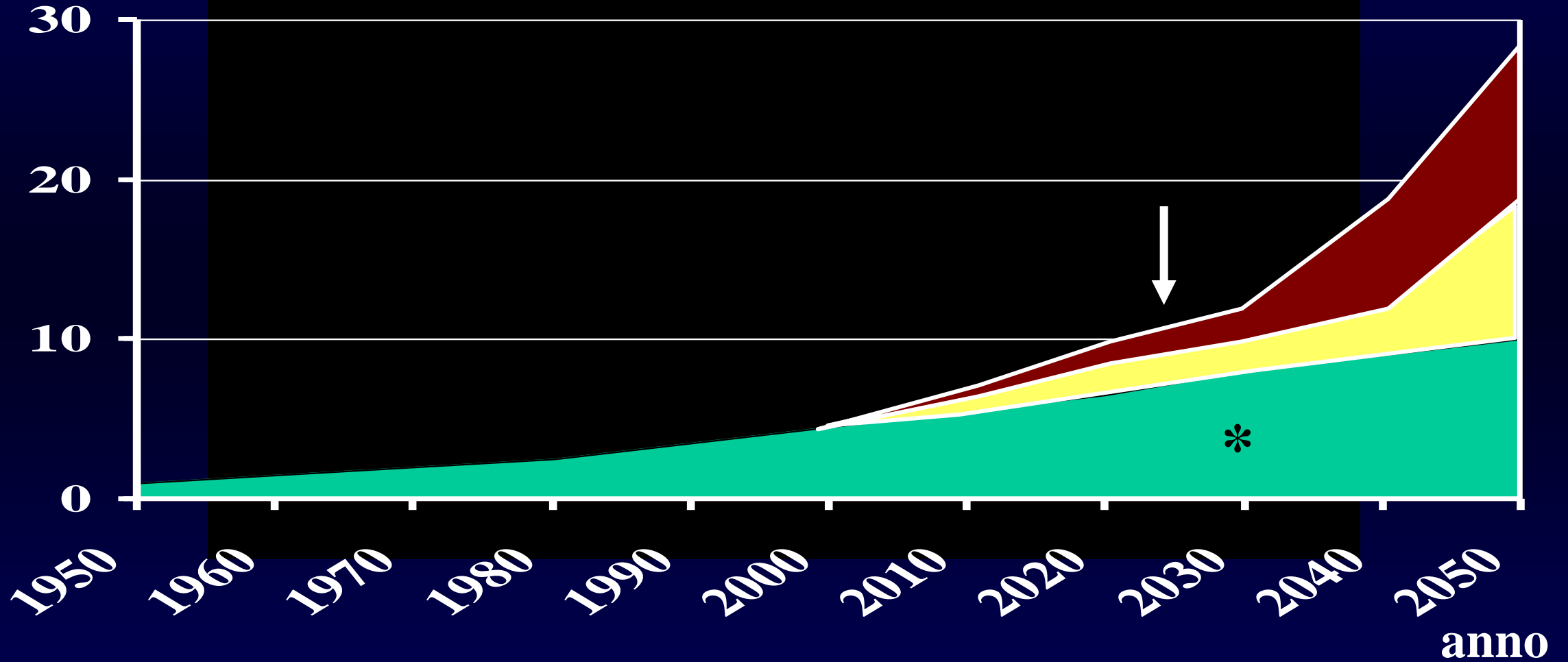
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Cardiologia Territoriale – ASUR-AV1 – Fano (PU)

24 ottobre 2020

# Numero di persone > 85 anni




Milioni



*U.S.A. Bureau of Censis*

# ANATOMIA DEL CUORE NELL'ANZIANO

## Modificazioni dell'apparato cardiovascolare

-  **del peso del miocardio** (1-1,5 g/anno) dopo i 30 aa prevalente a livello del setto prossimale (aumenta la componente connettivale con isoforma di collagene meno distensibile)
-  **dimensioni atrio sin.** (aumento della fibrosi e riduzione della elasticità parietale con riduzione della compliance del ventr. sin.)
- **Calcificazione** dell'annulus mitralico (+ posteriore), dei lembi mitralici e delle cuspidi aortiche.
-  **delle cellule pace-maker e del sistema di conduzione** associata a fibrosi del sistema di conduzione.
- **Perdita di elasticità e distensibilità con dilatazione delle arterie** (in particolare l'aorta diviene più rigida, si allunga, si dilata e ruota verso dx)

# IL CUORE SENILE

## Aspetti funzionali

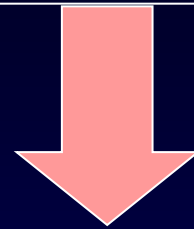
- **Aumentata rigidità ventricolare** (*stiffness*)
- **Aumento postcarico** (*rigidità vascolare, maggiore impedenza aortica, per aumento collagene*)
- **Ridotta risposta cronotropa, inotropica e vasodilatatoria**

# INVECCHIAMENTO



**Riduzione riserva  
cronotropa  
ed inotropica**

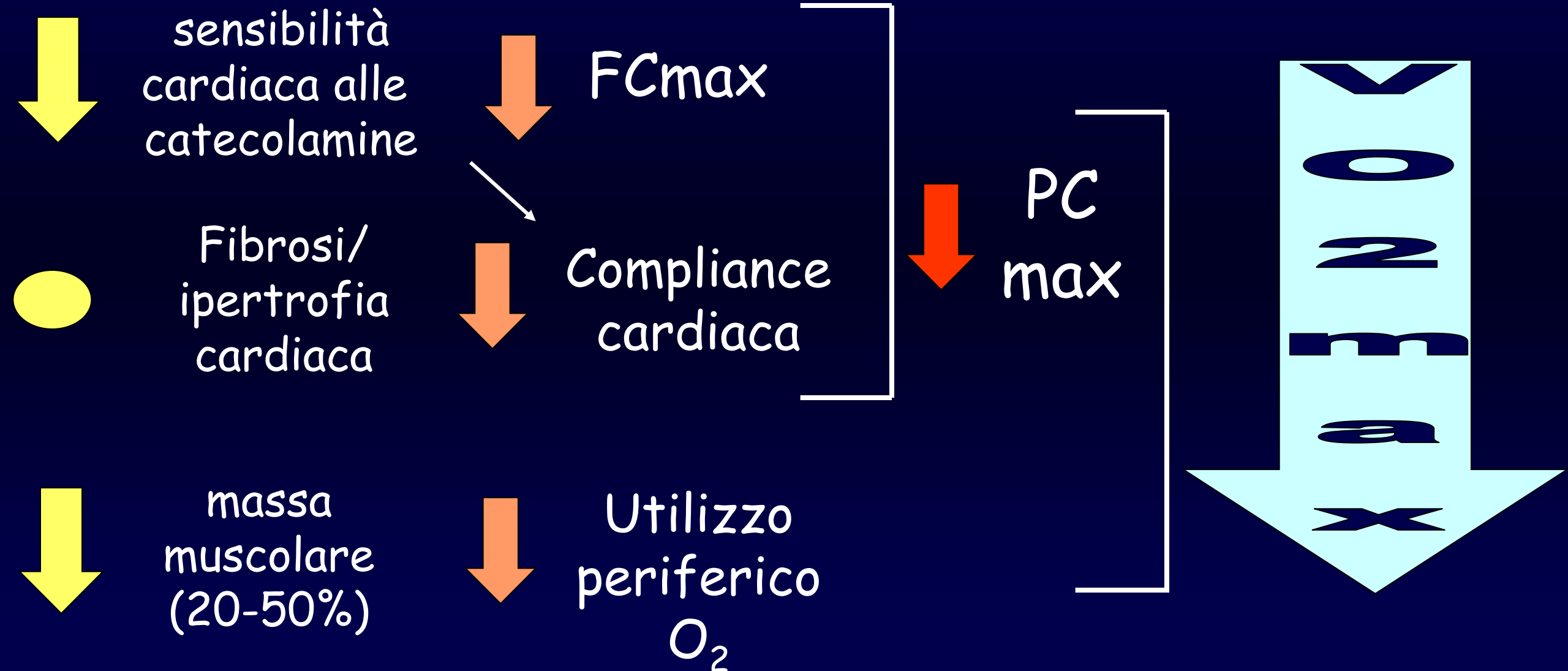
**Riduzione  
compliance  
ventricolare**



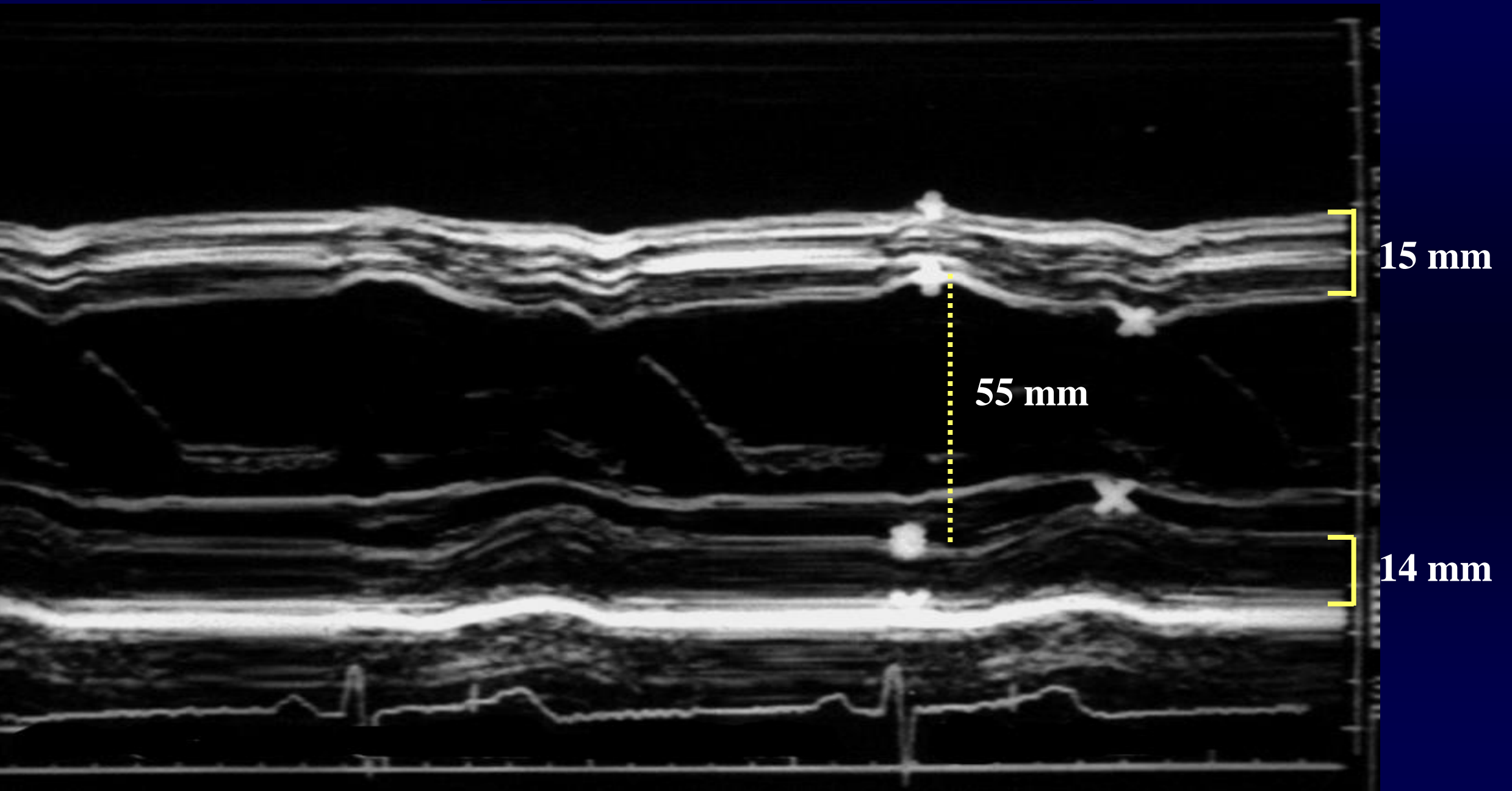
**CUORE SENILE**

# FISIOLOGIA DELL'INVECCHIAMENTO

## Fattori condizionanti la riduzione del $\dot{V}O_2\text{max}$



*B.F. 58 aa., maratona*



# **ATLETI MASTER**

**ATLETI** che continuano l'attività  
dopo l'agonismo giovanile

**ATLETI** che interrotta l'attività sportiva  
la riprendono in età avanzata

**SEDENTARI** che divengono **ATLETI**  
in età matura o avanzata



# SINDROME DI HIGHLANDER

(o sindrome dell'immortalità)

*Spiccata competitività*

*Autostima ingravescente*





*Stato di benessere*

*(elevato tono endorfinico)*

*P. Zeppilli*



**Figure 2** Sporting discipline in relation to the predominant component (skill, power, mixed, and endurance) and intensity of exercise

	Skill 	Power 	Mixed 	Endurance 
LOW	Golf (buggy)	Shot putting (recreational)	Soccer (adapted)	Jogging
	Golf (18 holes Walking)	Discus (recreational)	Basketball (adapted)	Long distance walking
	Table tennis (double)	Alpine skiing (recreational)	Handball (adapted)	Swimming (recreational)
	Table tennis (single)	Short distance running	Volleyball	Speed walking
	Shooting	Shot putting	Tennis (double)	Mid/long distance running
MEDIUM	Curling	Discus	Ice-Hockey	Style dancing
	Bowling	Alpine skiing	Hockey	Cycling (road)
	Sailing	Judo/karate	Rugby	Mid/long distance swimming
	Yachting	Weight lifting	Fencing	Long distance skating
	Equestrian	Wrestling	Tennis (single)	Pentathlon
HIGH		Boxing	Waterpolo	Rowing
			Soccer (competitive)	Canoeing
			Basketball (competitive)	X-country skiing
			Handball (competitive)	Biathlon
				Triathlon

■ Low intensity   
 ■ Medium intensity   
 ■ High intensity

Intensity of exercise must be individualized after maximal exercise testing, field testing and/or after muscular strength testing (Table 2).

**Figure 2** Sporting discipline in relation to the predominant component (skill, power, mixed and endurance)

**Table 2** Indices of exercise intensity for endurance sports from maximal exercise testing and training zones

Intensity	$VO_{2max}$ (%)	$HR_{max}$ (%)	HRR (%)	RPE Scale	Training Zone
Low intensity, light exercise <sup>a</sup>	<40	<55	<40	10–11	Aerobic
Moderate intensity exercise <sup>a</sup>	40–69	55–74	40–69	12–13	Aerobic
High intensity <sup>a</sup>	70–85	75–90	70–85	14–16	Aerobic + lactate
Very high intense exercise <sup>a</sup>	>85	>90	>85	17–19	Aerobic + lactate + anaerobic

<sup>a</sup>Adapted from Vanhees L et al (Eur J Prev Cardiol 2012 Part I & II) using training zones related to aerobic and anaerobic thresholds. Low intensity exercise is below the aerobic threshold, moderate is above the aerobic threshold but not reaching the anaerobic zone; high intensity is close to the anaerobic zone and very intense exercise is above the anaerobic threshold. The duration of exercise will also largely influence this division in intensity.

# Paradosso dell'esercizio fisico

L'esercizio fisico regolare ha la capacità di ridurre il rischio di eventi cardiovascolari

L'esercizio fisico, specie se intenso, ha la potenzialità di scatenare un evento cardiovascolare acuto in presenza di un substrato patologico

## Table 3 Cardiovascular Risk Categories (1)

### Very-high-risk

People with any of the following:

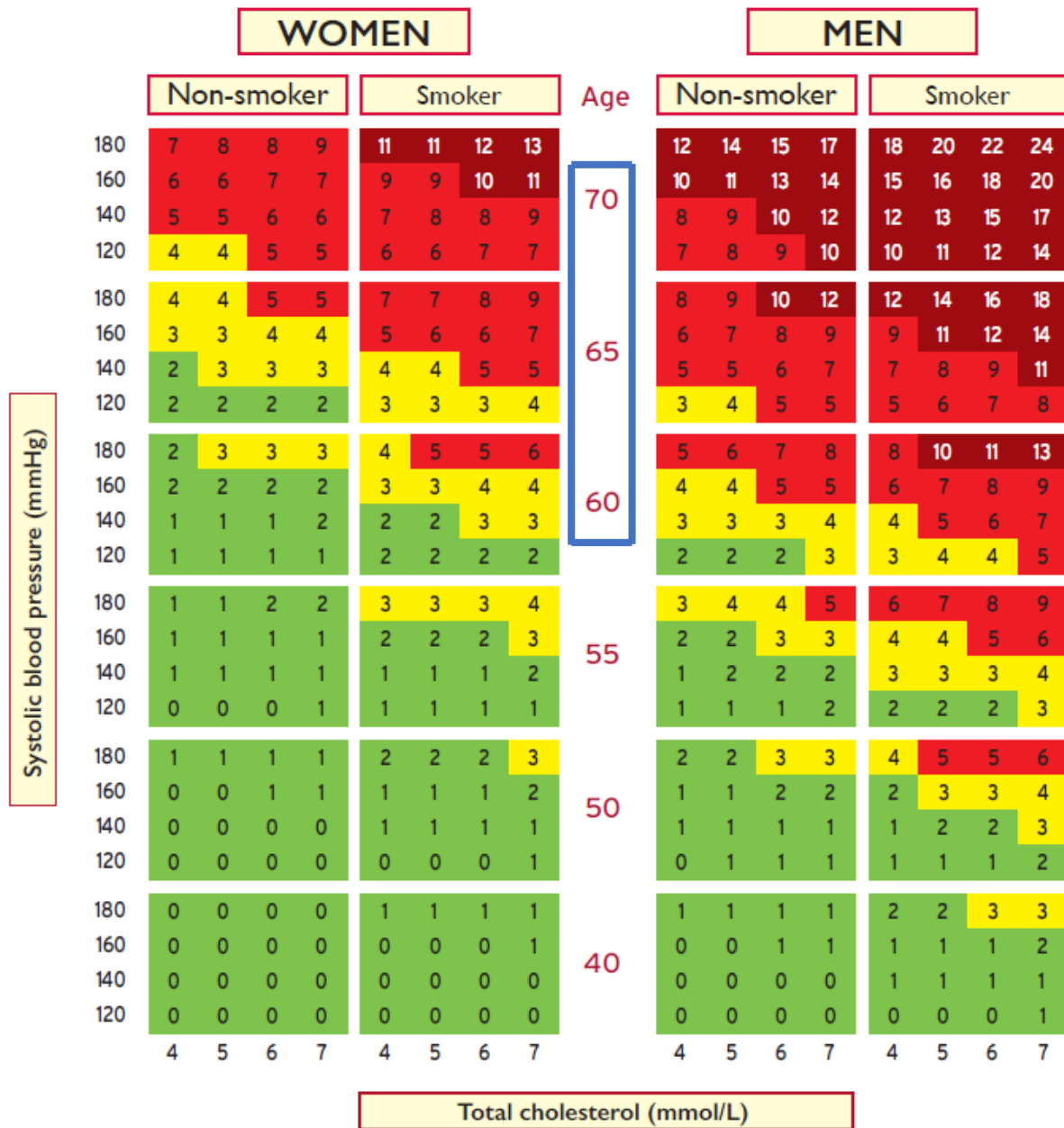
- Documented ASCVD, either clinical or unequivocal on imaging. Documented ASCVD includes previous ACS (MI or unstable angina), stable angina, coronary revascularization (PCI, CABG, and other arterial revascularization procedures), stroke and TIA, and peripheral arterial disease. Unequivocally documented ASCVD on imaging includes those findings that are known to be predictive of clinical events, such as significant plaque on coronary angiography or CT scan (multivessel coronary disease with two major epicardial arteries having >50% stenosis), or on carotid ultrasound.
- DM with target organ damage,<sup>a</sup> or at least three major risk factors, or early onset of T1DM of long duration (>20 years).
- Severe CKD (eGFR <30 mL/min/1.73 m<sup>2</sup>).
- A calculated SCORE ≥10% for 10-year risk of fatal CVD.
- FH with ASCVD or with another major risk factor.

<sup>a</sup>Target organ damage is defined as microalbuminuria, retinopathy, or neuropathy.

## Table 3 Cardiovascular Risk Categories (2)

<b>High-risk</b>	<p>People with:</p> <ul style="list-style-type: none"> <li>• Markedly elevated single risk factors, in particular TC &gt;8 mmol/L (&gt;310 mg/dL), LDL-C &gt;4.9 mmol/L (&gt;190 mg/dL) , or BP ≥180/110 mmHg.</li> <li>• Patients with FH without other major risk factors.</li> <li>• Patients with DM without target organ damage,<sup>a</sup>with DM duration ≥10 years or another additional risk factor.</li> <li>• Moderate CKD (eGFR 30–59 mL/min/1.73m<sup>2</sup>).</li> <li>• A calculated SCORE ≥5 % and &lt;10% for 10-year risk of fatal CVD.</li> </ul>
<b>Moderate-risk</b>	<p>Young patients (T1DM &lt;35 years; T2DM &lt;50 years) with DM duration &lt;10 years, without other risk factors. Calculated SCORE ≥1% and &lt;5% for 10-year risk of fatal CVD.</p>
<b>Low-risk</b>	<p>Calculated SCORE &lt;1% for 10-year risk of fatal CVD.</p>

<sup>a</sup>Target organ damage is defined as microalbuminuria, retinopathy, or neuropathy.





**Figure 3b SCORE Cardiovascular Risk Chart 10-year risk of fatal CVD low-risk regions of Europe**



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# Recommendations for exercise in ageing individuals

Recommendations	Class	Level
Among adults aged 65 or older who are fit and have no health conditions that limit their mobility, moderate-intensity aerobic exercise for at least 150 min/week is recommended.	I	A
In older adults at risk of falls, strength training exercises to improve balance and coordination on at least 2 days a week are recommended.	I	B
 A full clinical assessment including a maximal exercise test should be considered in sedentary adults aged 65 or older who wish to participate in high intensity activity.	IIa	C
 Continuation of high and very high intensity activity, including competitive sports, may be considered in asymptomatic elderly athletes (master athletes) at low or moderate CV risk.	IIb	C



## **Table 5** Exercise prescription in the elderly

### **Aerobic work**

- Frequency: Moderate exercise for 5 days per week or vigorous exercise for 3 days per week.
- Intensity: 5–6 points (for the modified 10 point Borg scale) for moderate exercise or 7–8 points for vigorous
- Duration: 30 minutes per day for moderate or at least 20 minutes for continuous exercise.

### **Strength training (all major muscle groups)**

- Frequency: at least twice a week
- Number of exercises: 8–10
- Number of repetitions: 10–15

### **Exercises for flexibility and balance**

- At least twice a week

## Table 6 Exercise activities for older people according to exercise type and intensity

Age-related moderate effort activities	Age-related intense effort activities	Muscle-strengthening activities
<ul style="list-style-type: none"> <li>• walking</li> <li>• water aerobics</li> <li>• ballroom and line dancing</li> <li>• riding a bike on level ground or with few hills</li> <li>• doubles tennis</li> <li>• pushing a lawn mower</li> <li>• canoeing</li> <li>• volleyball</li> </ul>	<ul style="list-style-type: none"> <li>• jogging or running</li> <li>• aerobics</li> <li>• swimming fast</li> <li>• riding a bike fast or on hills</li> <li>• singles tennis</li> <li>• football</li> <li>• hiking uphill</li> <li>• energetic dancing</li> <li>• martial arts</li> </ul>	<ul style="list-style-type: none"> <li>• carrying or moving heavy loads</li> <li>• groceries activities that involve stepping and jumping</li> <li>• dancing</li> <li>• heavy gardening, such as digging or shoveling</li> <li>• exercises that use your body weight for resistance, such as push-ups or sit-ups</li> <li>• yoga</li> <li>• pilates</li> <li>• lifting weights</li> </ul>

## **Table 4** Potential risks for older people during exercise

Arrhythmias, increase in blood pressure, myocardial ischaemia

Musculoskeletal injuries and fractures

Muscle soreness or swollen joints

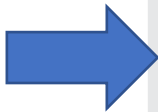
Increased risk of falls and subsequent injuries

# Recommendations for cardiovascular evaluation and regular exercise in healthy individuals aged >35 years (1)

Recommendations	Class	Level
Among individuals with low to moderate CVD risk, the participation in all recreational sports should be considered without further CV evaluation.	Ila	C
→ Cardiac screening with family history, symptoms, physical examination and 12-lead resting ECG should be considered for competitive athletes.	Ila	C
→ Clinical evaluation, including maximal exercise testing, should be considered for prognostic purposes in sedentary people and individuals with high or very high CV risk who intend to engage in intensive exercise programmes or competitive sports.	Ila	C

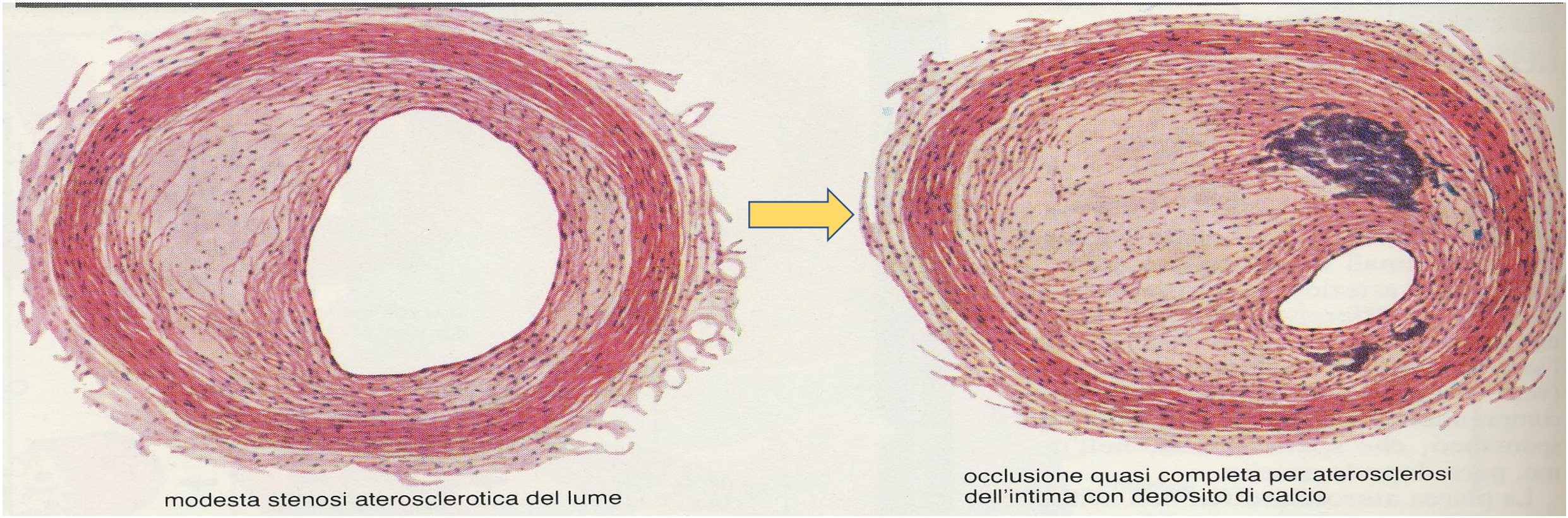
# Recommendations for cardiovascular evaluation and regular exercise in healthy individuals aged >35 years (2)

Recommendations	Class	Level
In selected individuals without known CAD who have very high CVD risk (e.g. SCORE >10%, strong family history or familial hypercholesterolaemia) and want to engage in high or very high intensity exercise, risk assessment with a functional imaging test, coronary CCTA or carotid or femoral artery ultrasound imaging may be considered.	IIb	B



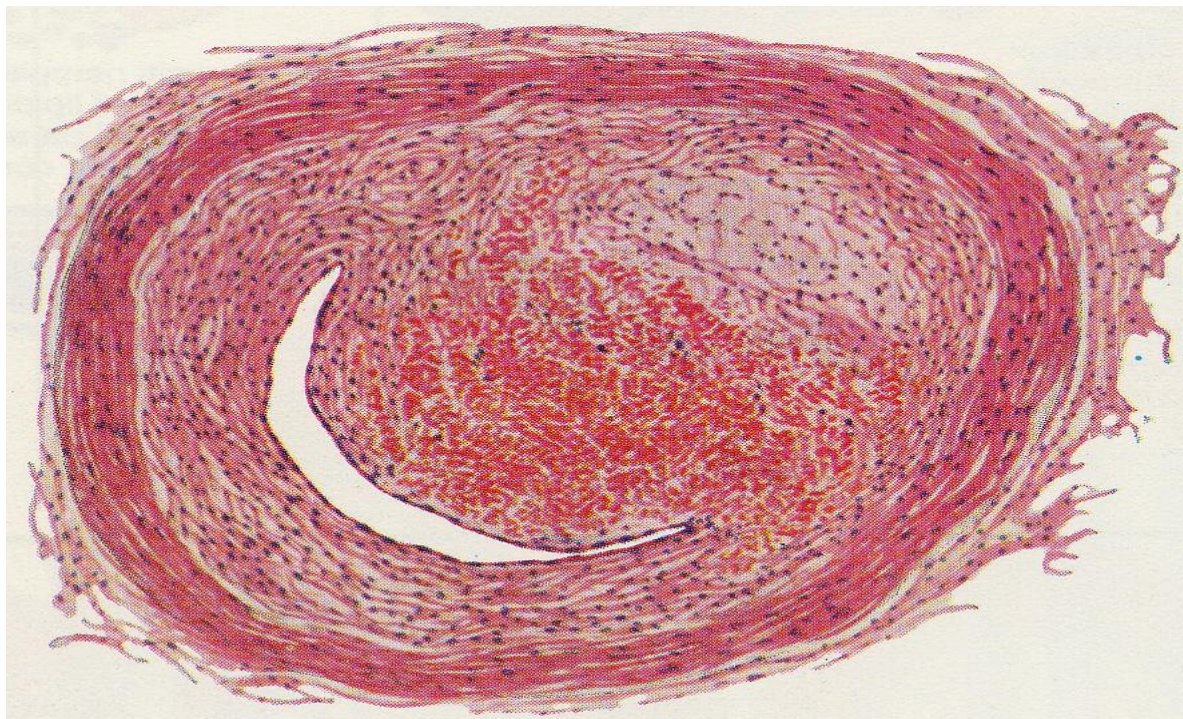
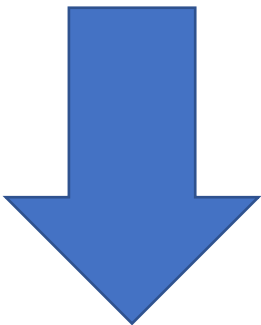
# CARDIOPATIA ISCHEMICA

**“Un nemico ...  
più o meno silenzioso”**

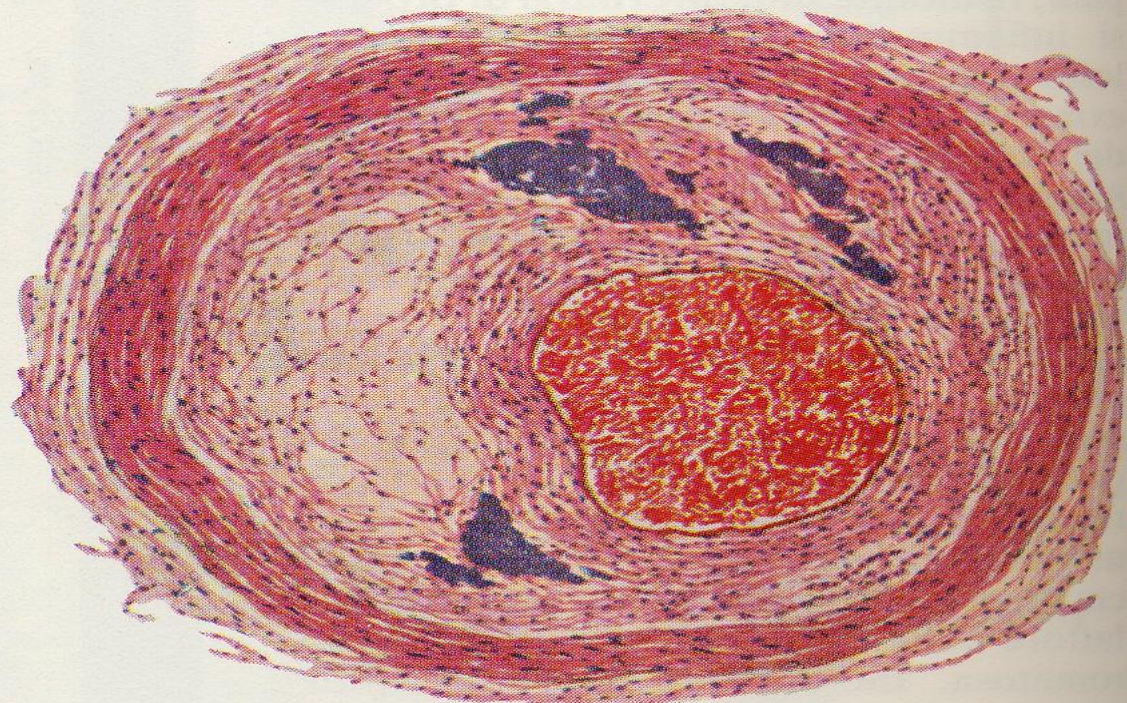


modesta stenosi aterosclerotica del lume

occlusione quasi completa per aterosclerosi dell'intima con deposito di calcio



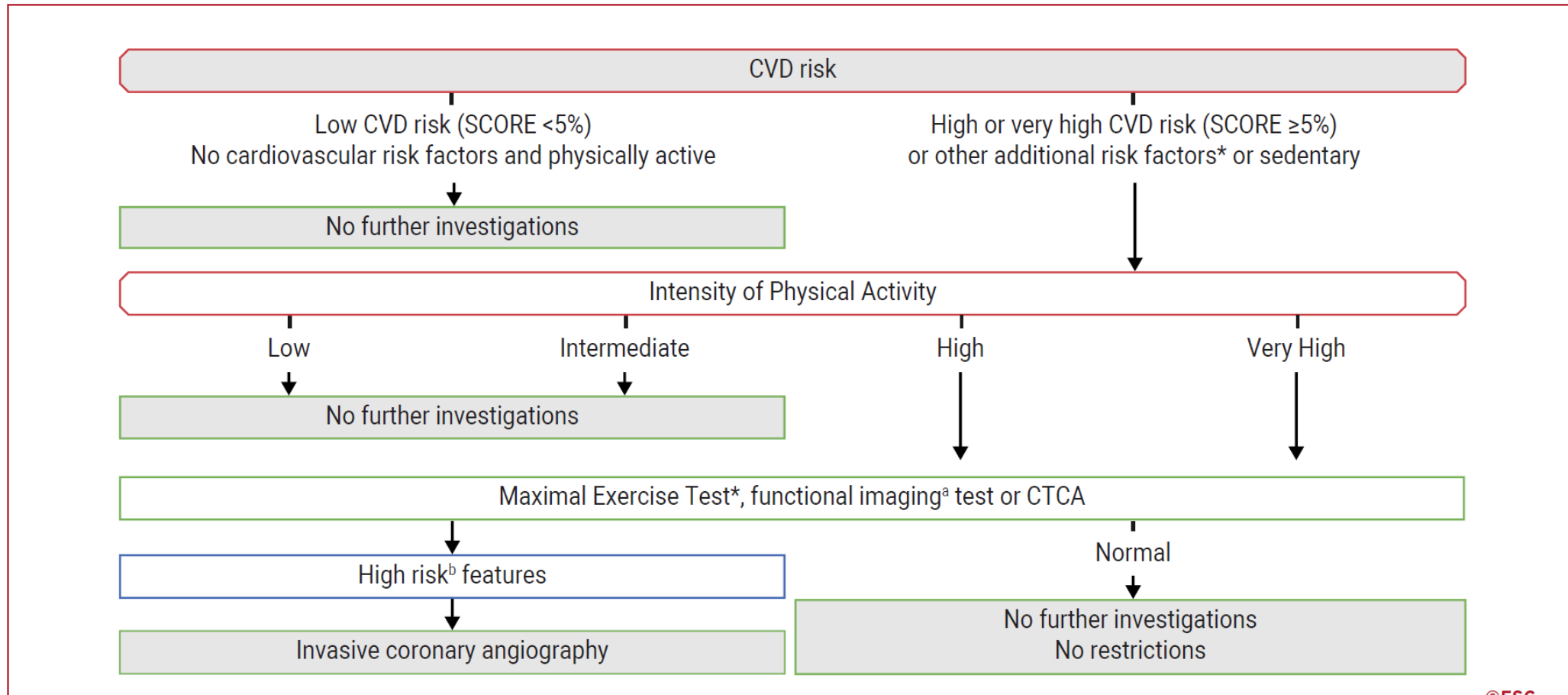
emorragia nell'ateroma, che lascia solo un lume simile a una fessura



occlusione completa a causa di un trombo in un lume già molto stenotizzato dall'ateroma.



# Figure 4 Proposed algorithm for pre-participation cardiovascular assessment in individuals aged >35 years



\*Consider functional test or CCTA if exercise stress test is equivocal or the ECG is uninterpretable. <sup>a</sup>See text for examples of functional imaging. <sup>b</sup>Single-photon emission computed tomography: area of ischaemia  $\geq 10\%$  of the left ventricular myocardium; stress echocardiography:  $\geq 3$  of 16 segments with stress-induced hypokinesia or akinesia; stress cardiovascular magnetic resonance:  $\geq 2$  of 16 segments with stress perfusion defects or  $\geq 3$  dobutamine-induced dysfunctional segments; coronary computed tomography angiography (CCTA): three-vessel disease with proximal stenoses; left main disease; proximal left anterior descending disease.

# Recommendations for exercise in individuals at risk of atherosclerotic coronary artery disease (CAD) and asymptomatic individuals in whom CAD is detected at screening

Recommendations	Class	Level
Among individuals with asymptomatic CCS, defined as CAD without inducible myocardial ischaemia on a functional imaging or conventional exercise stress test, participation in all types of exercise, including competitive sports, should be considered based on individual assessment.	IIa	C

*Raccomandazione più permissiva rispetto alle Linee Guida Italiane del COCIS*

## **Table 8** Factors determining risk of adverse events during intensive exercise and competitive sports in asymptomatic individuals with long-standing coronary artery disease

Type and level of sports competition

Fitness level of the individual patient

Profile of cardiovascular risk factors

Presence of exercise-induced myocardial ischaemia

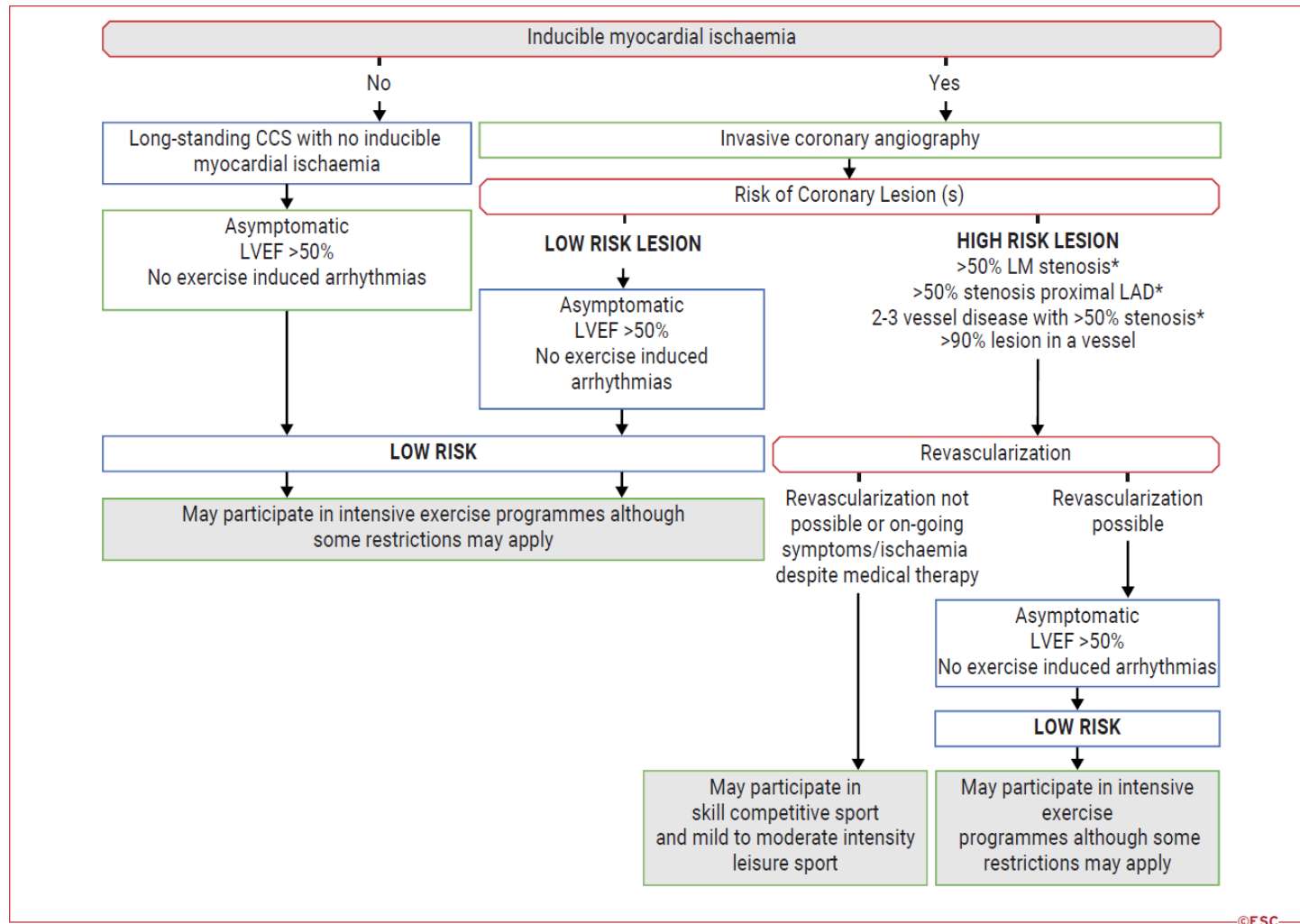
Exercise-induced arrhythmia

Evidence of myocardial dysfunction

## **Table 9 High-risk features for exercise-induced adverse cardiac events in patients with atherosclerotic coronary artery disease**

- Critical coronary stenosis, >70% in a major coronary artery or >50% in the left main stem on coronary angiography, and/or FFR <0.8 and/or iFR <0.9.
- Basal left ventricular ejection fraction  $\leq$ 50% and wall motion abnormalities.
- Inducible myocardial ischaemia on maximal exercise testing.
- NSVT, polymorphic or very frequent ventricular premature beats, at rest and during maximal stress
- Recent ACS  $\pm$  PCI or surgical revascularization (<12 months).

# Figure 5 Clinical evaluation & recommendations for sports participation in individuals with established coronary artery disease



\*With documented ischaemia or a haemodynamically relevant lesion defined by FFR <0.8 or iFR <0.9.

# Recommendations for exercise in individuals with long-standing chronic coronary syndrome (1)

Recommendations	Class	Level
<u>Risk stratification</u> for exercise-induced adverse events is recommended in individuals with established (long-standing) chronic coronary syndrome (CCS) prior to engaging in exercise.	I	C
<u>Regular follow-up</u> and risk stratification of patients with CCS is recommended.	I	B
It is recommended that individuals at high-risk of an adverse event from CAD are managed according to the current guidelines on CCS.	I	C
Competitive or leisure sports activities (with some exceptions such as older athletes and sports with extreme CV demands) should be considered in individuals at low risk of exercise-induced adverse events.	IIa	C

*Raccomandazione più permissiva rispetto alle Linee Guida Italiane del COCIS*

# Recommendations for exercise in individuals with long-standing chronic coronary syndrome (2)


Recommendations	Class	Level
Leisure-time exercise, below the angina and ischaemic thresholds, may be considered in individuals at high risk of exercise-induced adverse events, including those with persisting ischaemia.	<b>IIb</b>	<b>C</b>
Competitive sports are not recommended in individuals at high risk of exercise-induced adverse events or those with residual ischaemia, with the exception for individually recommended skill sports.	<b>III</b>	<b>C</b>

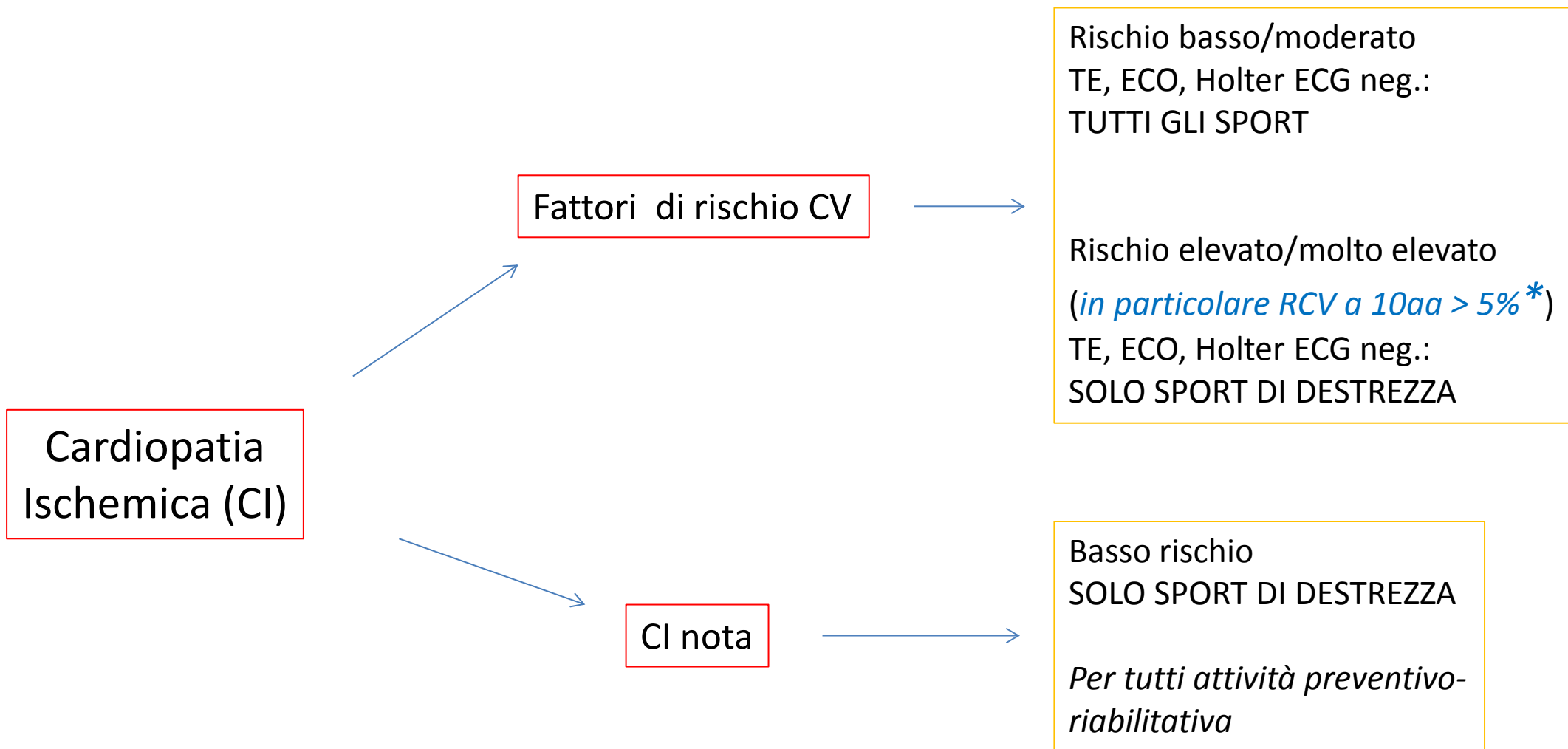
# Recommendations for return to exercise after acute coronary syndrome

Recommendations	Class	Level
Exercise-based cardiac rehabilitation is recommended in all individuals with CAD to reduce cardiac mortality and rehospitalization	I	A
During the initial period, motivational and psychological support, and individualized recommendations on how to progress the amount and intensity of sports activities should be considered in patients with CAD.	IIa	B
All sports activities should be considered, at an individually adapted intensity level in low risk individuals with CCS.	IIa	C



# CARDIOPATIA ISCHEMICA

- **COCIS 2009**: negli sportivi di età superiore a 35-40 anni la visita deve prevedere sempre l'esecuzione di un test ergometrico massimale.
- 
- **COCIS 2017**: l'indicazione al test da sforzo prende in considerazione, oltre al limite di età (40 aa per maschi e 50 aa per femmine), anche il livello di rischio cardiovascolare calcolato con Heart Score di ESC e l'impegno cardiovascolare dello sport specifico.



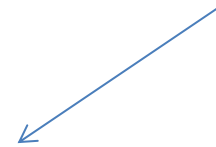
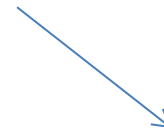
- \* • M, 60 aa, non-smok, PAS 160, CoIT 200;
- M, 60 aa, smok, PAS 140, CoIT 150;
- **M, 65 aa, non-smok, PAS 140, CoIT 200;**
- F, 60 aa, smok, PAS 160, CoIT 230.

# Profilo di rischio basso o intermedio

TE normale

TE dubbio

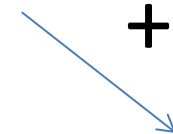
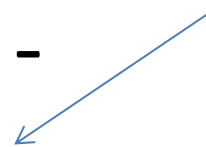
TE pos. per CI



ECO-STRESS o SCINTIGRAFIA da SFORZO  
TC CORONARICA

-

+



Idoneità 1 anno  
Per tutti gli sport

Idoneità 1 anno  
Per tutti gli sport

Non idoneità  
Indicazione a CRG



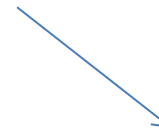
# Profilo di rischio elevato o molto elevato

TE – ECO – HOLTER  
normali

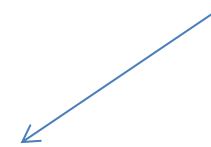


Idoneità 1 anno  
per sport di destrezza

TTE – ECO – HOLTER  
dubbio

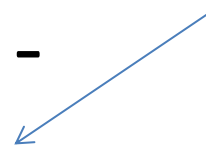


TTE – ECO – HOLTER  
indicativi di CI



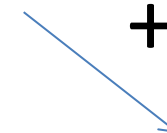
ECO-STRESS o SCINTIGRAFIA da SFORZO  
TC CORONARICA

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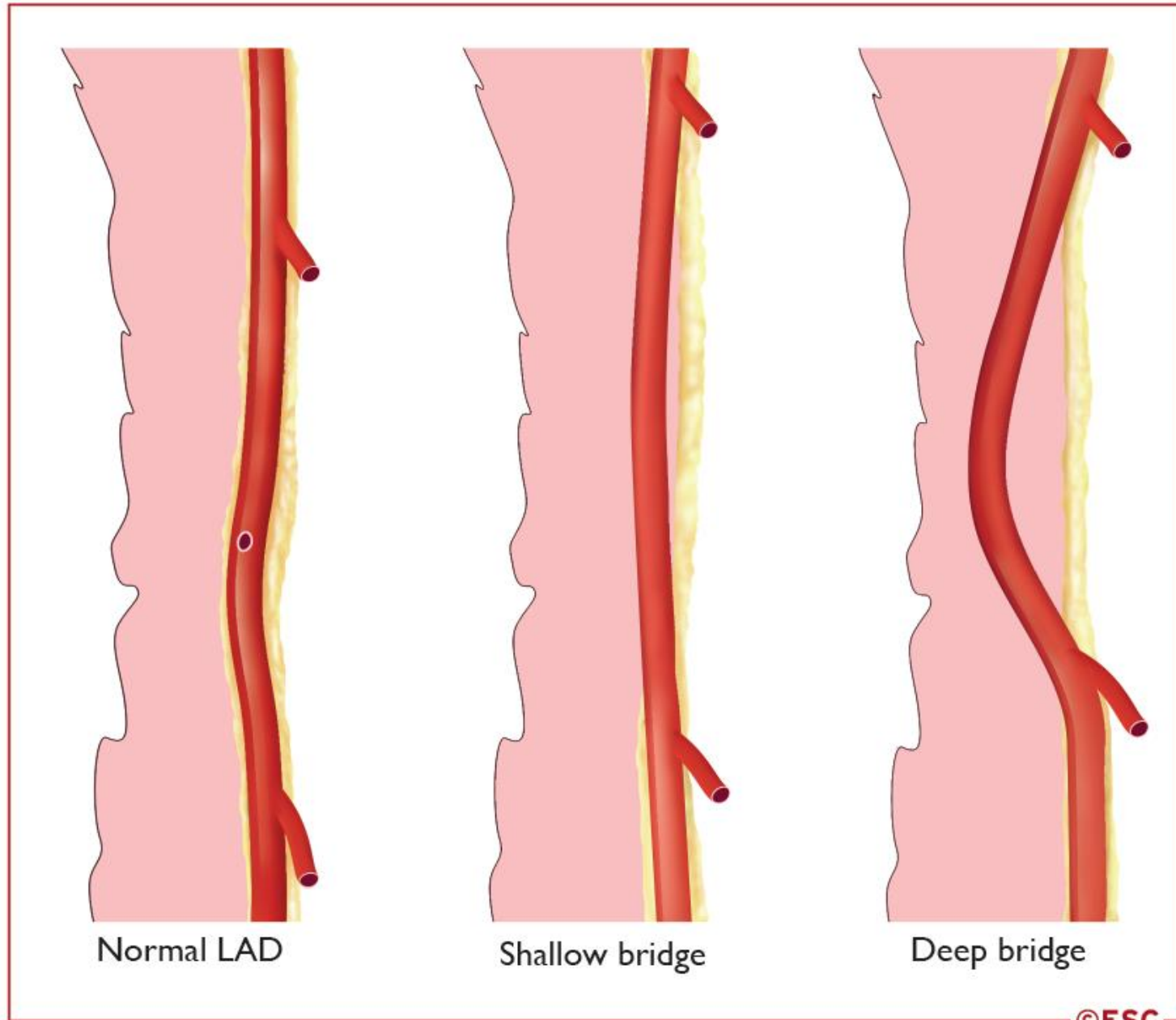


Idoneità 1 anno  
per sport di destrezza

+



Non idoneità  
indicazione a CRG



**Figure 7** Schematic representation of a myocardial bridge

©ESC

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# Recommendations for exercise/sports in individuals with myocardial bridging

Recommendations	Class	Level
Participation in competitive and leisure-time sports should be considered in asymptomatic individuals with myocardial bridging and without inducible ischaemia or ventricular arrhythmia during maximal exercise testing.	<b>IIa</b>	<b>C</b>
Competitive sports are not recommended in individuals with myocardial bridging and persistent ischaemia or complex cardiac arrhythmias during maximal exercise stress testing.	<b>III</b>	<b>C</b>

# Ponti miocardici

- **2009**: la presenza di ponte miocardico anche senza evidenza di ischemia da sforzo rappresenta un fattore di rischio per MI per cui non consente l'idoneità agonistica per sport del gruppo A (elevato impegno CV).
- **2017**: nei casi più frequenti in cui il soggetto asintomatico con riscontro occasionale di ponte miocardico (lunghezza < 1 cm, profondità < 3 mm) non presenti evidenza di ischemia inducibile (mioscinti da sforzo, FFR alla CRG), non si ravvedono controindicazioni alla pratica agonistica di tutte le discipline sportive.

# Recommendations for exercise and participation in recreational/leisure sports in asymptomatic individuals with aortic stenosis (1)

Aortic Stenosis <sup>a</sup>			
	Recommendations	Class	Level
<b>Mild</b>	Participation in all recreational sports, if desired, is recommended.	<b>I</b>	<b>C</b>
<b>Moderate</b>	Participation in all recreational sports involving low to moderate intensity, if desired, should be considered in individuals with LVEF $\geq$ 50%, good functional capacity and normal exercise test.	<b>IIa</b>	<b>C</b>

<sup>a</sup>For mixed valvular disease, the recommendation for the predominant lesion (stenotic or regurgitant) should be followed.

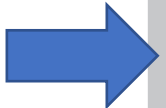


# Recommendations for exercise and participation in recreational/leisure sports in asymptomatic individuals with aortic stenosis (2)

	Aortic Stenosis <sup>a</sup>		
	Recommendations	Class	Level
<b>Severe</b>	Participation in all recreational sports/exercise involving low intensity, if desired, may be considered in individuals with LVEF $\geq$ 50% and normal BP response during exercise.	<b>IIb</b>	<b>C</b>
	Participation in competitive or recreational sports/exercise of moderate and high intensity is not recommended.	<b>III</b>	<b>C</b>

<sup>a</sup>For mixed valvular disease, the recommendation for the predominant lesion (stenotic or regurgitant) should be followed.

# Recommendations for participation in competitive sports in asymptomatic individuals with aortic stenosis

Aortic Stenosis <sup>a</sup>			
	Recommendations	Class	Level
 <b>Mild</b>	Participation in all competitive sports, if desired, is recommended.	<b>I</b>	<b>C</b>
<b>Moderate</b>	Participation in all competitive sports involving low to moderate effort, if desired, may be considered in individuals with LVEF $\geq$ 50%, good functional capacity and normal BP response during exercise.	<b>IIb</b>	<b>C</b>
<b>Severe</b>	Participation in low intensity skill sports may be considered in a select group of individuals with LVEF $\geq$ 50%.	<b>IIb</b>	<b>C</b>
	Participation in sports or exercise of moderate or high intensity is not recommended.	<b>III</b>	<b>C</b>

<sup>a</sup>For mixed valvular disease, the recommendation for the predominant lesion (stenotic or regurgitant) should be followed.

C.A. 71 aa., maratona 3<sup>h</sup> 12' -  $VO_2$  max 51 ml/Kg/min



**ECO-Color** (*insufficienza aortica*)

# Recommendations for participation in recreational/leisure-time sports in asymptomatic individuals with aortic regurgitation (1)

	Aortic Regurgitation <sup>a</sup>		
	Recommendations	Class	Level
Mild	Participation in all recreational sports, if desired, is recommended.	I	C
Moderate	Participation in all recreational sports, if desired, should be considered in asymptomatic individuals with a non-dilated LV with LVEF >50% and normal exercise stress test.	IIa	C

<sup>a</sup>For mixed valvular disease, the recommendation for the predominant lesion should be followed.

# Recommendations for participation in recreational/leisure-time sports in asymptomatic individuals with aortic regurgitation (2)

Aortic Regurgitation <sup>a</sup>			
	Recommendations	Class	Level
<b>Severe</b>	Participation in all recreational sports involving low and moderate intensity, if desired, may be considered with a mild or moderately dilated LV with LVEF >50% and normal exercise stress test.	<b>IIb</b>	<b>C</b>
	Participation in any moderate or high intensity recreational exercise is not recommended with LVEF ≤50% and/or exercise induced arrhythmias.	<b>III</b>	<b>C</b>

<sup>a</sup>For mixed valvular disease, the recommendation for the predominant lesion should be followed.

# Recommendations for participation in competitive sports in asymptomatic individuals with aortic regurgitation

	Aortic Regurgitation <sup>a</sup>		
	Recommendations	Class	Level
 <b>Mild</b>	Participation in all competitive sports, if desired, is recommended.	<b>I</b>	<b>C</b>
<b>Moderate</b>	Participation in all competitive sports, if desired, should be considered in individuals with LVEF >50% and normal exercise test.	<b>IIa</b>	<b>C</b>
<b>Severe</b>	Participation in most competitive sports involving low to moderate intensity may be considered in individuals with a mild or moderately dilated LV with LVEF >50% and normal exercise stress test.	<b>IIb</b>	<b>C</b>
	Participation in any moderate or high intensity competitive sports is not recommended in individuals with severe AR and/or LVEF ≤50% and/or exercise induced arrhythmias.	<b>III</b>	<b>C</b>

<sup>a</sup>For mixed valvular disease, the recommendation for the predominant lesion should be followed.

# Recommendations for participation in recreational/leisure-time sports in asymptomatic individuals with mitral regurgitation (1)

Mitral Regurgitation <sup>a,b</sup>			
	Recommendations	Class	Level
<b>Mild</b>	Participation in all sports, if desired, is recommended.	<b>I</b>	<b>C</b>
<b>Moderate</b>	Participation in all recreational sports, if desired, should be considered in individuals fulfilling the following: <ul style="list-style-type: none"> <li>• LVEDD &lt;60 mm or &lt;35.3 mm/m<sup>2</sup> in men and &lt;40 mm/m<sup>2</sup> in women</li> <li>• LVEF ≥60%</li> <li>• Resting sPAP &lt;50 mmHg</li> <li>• Normal exercise test.</li> </ul>	<b>IIa</b>	<b>C</b>

<sup>a</sup>For mixed valvular disease, the recommendation for the predominant valve lesion should be followed.

<sup>b</sup>No collision or body contact sports if anticoagulated for atrial fibrillation.

# Recommendations for participation in recreational/leisure-time sports in asymptomatic individuals with mitral regurgitation (2)


Mitral Regurgitation <sup>a,b</sup>			
	Recommendations	Class	Level
<b>Severe</b>	<p>Participation in all recreational sports involving low and moderate intensity, if desired, may be considered in individuals fulfilling the following:</p> <ul style="list-style-type: none"> <li>• LVEDD &lt;60 mm or &lt;35.3 mm/m<sup>2</sup> in men and &lt;40 mm/m<sup>2</sup> in women</li> <li>• LVEF <math>\geq</math>60%</li> <li>• Resting sPAP &lt;50 mmHg</li> <li>• Normal exercise test.</li> </ul>	<b>IIb</b>	<b>C</b>

<sup>a</sup>For mixed valvular disease, the recommendation for the predominant valve lesion should be followed.

<sup>b</sup>No collision or body contact sports if anticoagulated for atrial fibrillation.



# Recommendations for participation in competitive sports in asymptomatic individuals with mitral regurgitation (1)

Mitral Regurgitation <sup>a,b</sup>			
	Recommendations	Class	Level
 <b>Mild</b>	Participation in all competitive sports, if desired, is recommended.	<b>I</b>	<b>C</b>
<b>Moderate</b>	Participation in all competitive sports, if desired, should be considered in individuals fulfilling the following <ul style="list-style-type: none"> <li>• LVEDD &lt;60 mm or &lt;35.3 mm/m<sup>2</sup> in men and &lt;40 mm/m<sup>2</sup> in women</li> <li>• LVEF ≥60%</li> <li>• Resting sPAP &lt;50 mmHg</li> <li>• Normal exercise test.</li> </ul>	<b>IIa</b>	<b>C</b>

<sup>a</sup>For mixed valvular disease, the recommendation for the predominant valve lesion should be followed.

<sup>b</sup>No collision or body contact sports if anticoagulated for atrial fibrillation.

# Recommendations for participation in competitive sports in asymptomatic individuals with mitral regurgitation (2)

	Mitral Regurgitation <sup>a,b</sup>		
	Recommendations	Class	Level
<b>Severe</b>	Participation in competitive sports involving low exercise intensity, if desired, may be considered in individuals fulfilling the following: <ul style="list-style-type: none"> <li>• LVEDD &lt;60 mm or &lt;35.3 mm/m<sup>2</sup> in men and &lt;40 mm/m<sup>2</sup> in women</li> <li>• LVEF ≥60%</li> <li>• Resting sPAP &lt;50 mmHg</li> <li>• Normal exercise test.</li> </ul>	IIb	C
	Participation in competitive sports is not recommended in individuals with a LVEF <60%	III	C

<sup>a</sup>For mixed valvular disease, the recommendation for the predominant valve lesion should be followed.

<sup>b</sup>No collision or body contact sports if anticoagulated for atrial fibrillation.

# Recommendations for participation in recreational/leisure sports in individuals with mitral stenosis

Mitral Stenosis <sup>a,b</sup>			
	Recommendations	Class	Level
<b>Mild</b> (MVA 1.5–2.0 cm <sup>2</sup> )	Participation in all recreational sports, if desired, is recommended in individuals with a resting sPAP <40 mmHg and normal exercise test.	I	C
<b>Moderate</b> (MVA 1.0–1.5 cm <sup>2</sup> )	Participation in all recreational sports involving low and moderate intensity, if desired, may be considered in individuals with resting sPAP <40 mmHg and a normal exercise test.	IIb	C
<b>Severe</b> (MVA <1 cm <sup>2</sup> )	Participation in leisure sports of moderate or high intensity is not recommended.	III	C

<sup>a</sup>For mixed valvular disease, the recommendation for the predominant valve lesion should be followed.

<sup>b</sup>No collision or body contact sports if anticoagulated for atrial fibrillation.

# Recommendations for participation in competitive sports in asymptomatic individuals with mitral stenosis

Mitral Stenosis <sup>a,b</sup>			
	Recommendations	Class	Level
<b>Mild</b> (MVA 1.5–2.0 cm <sup>2</sup> )	Participation in all competitive sports, if desired, is recommended in individuals with a resting sPAP <40 mmHg and a normal exercise test.	I	C
<b>Moderate</b> (MVA 1.0–1.5 cm <sup>2</sup> )	Participation in all competitive sports involving low intensity may be considered in individuals with a resting sPAP <40 mmHg and normal exercise test.	IIb	C
<b>Severe</b> (MVA <1 cm <sup>2</sup> )	Participation in competitive sports is not recommended.	III	C

<sup>a</sup>For mixed valvular disease, the recommendation for the predominant valve lesion should be followed.

<sup>b</sup>No collision or body contact sports if anticoagulated for atrial fibrillation.

**Table 12** Classification of risk to perform sports in patients with aortic pathology (1)

	Low risk	Low-Intermediate risk	Intermediate risk	High risk
Diagnosis	<ul style="list-style-type: none"> <li>• Aortic diameter &lt;40 mm in BAV or tricuspid valve</li> <li>• Turner syndrome without aortic dilatation</li> </ul>	<ul style="list-style-type: none"> <li>• MFS or other HTAD syndrome without aortic dilatation</li> <li>• Aorta 40–45 mm in BAV or tricuspid valve</li> <li>• after successful thoracic aortic surgery for BAV or other low risk situation</li> </ul>	<ul style="list-style-type: none"> <li>• Moderate aortic dilatation (40–45 mm in MFS or other HTAD, 45–50 mm in BAV or tricuspid valve, Turner syndrome ASI 20–25 mm/m<sup>2</sup>, tetralogy of Fallot &lt;50 mm)</li> <li>• after successful thoracic aorta surgery for MFS or HTAD</li> </ul>	<ul style="list-style-type: none"> <li>• Severe aortic dilatation (&gt;45 mm in MFS or other HTAD, &gt;50 mm in BAV or tricuspid valve, Turner syndrome ASI &gt;25 mm/m<sup>2</sup>, tetralogy of Fallot &gt;50 mm)</li> <li>• after surgery with sequelae</li> </ul>

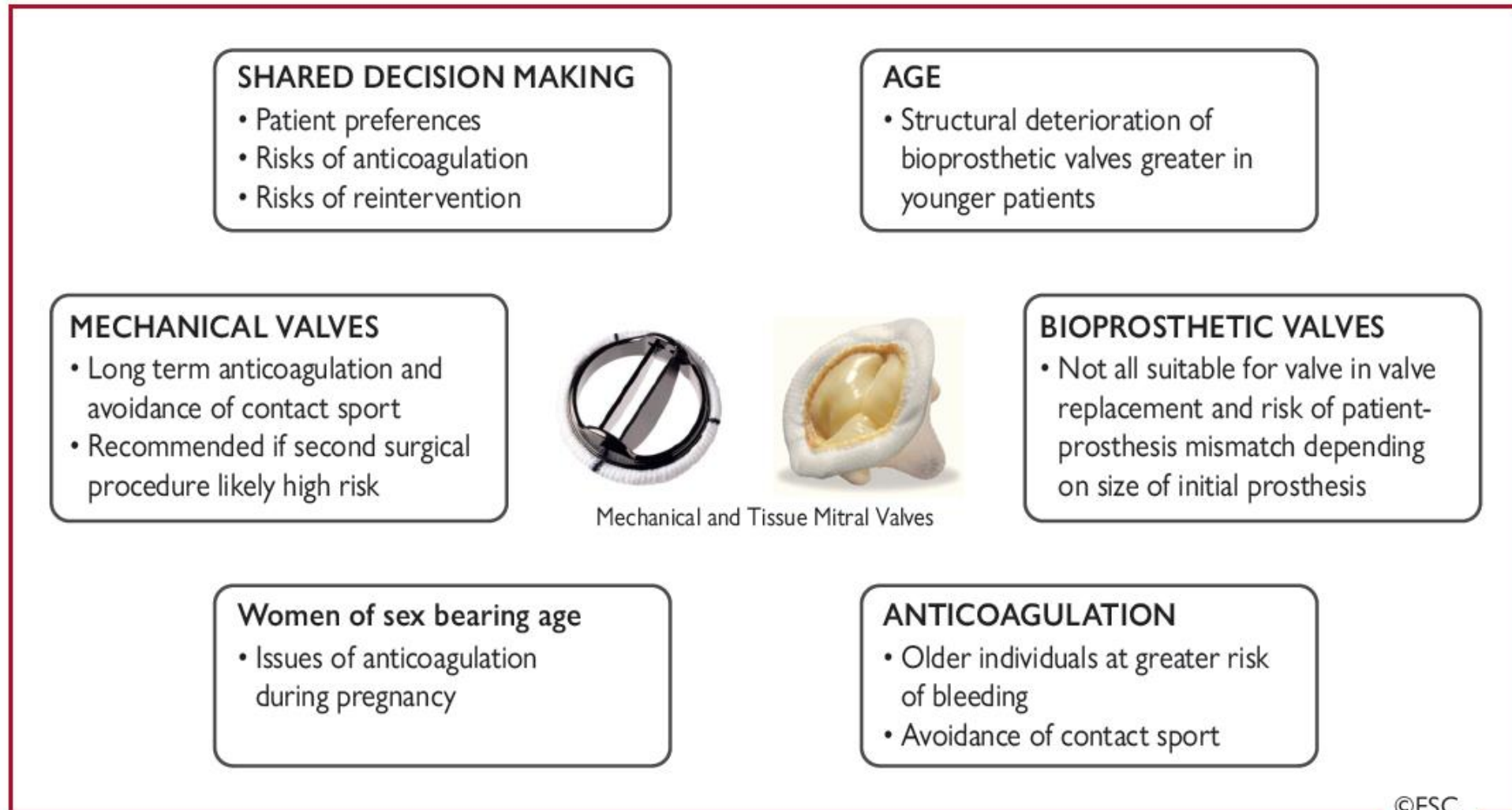
**Table 12** Classification of risk to perform sports in patients with aortic pathology (2)

	Low risk	Low-Intermediate risk	Intermediate risk	High risk
Advice	All sports permitted with preference for endurance over power sports	Avoid high and very high intensity exercise, contact, and power-sports. Preference for endurance over power sports	Only skill sports or mixed or endurance sports at low intensity	Sports are (temporarily) contra-indicated
Follow-up	Every 2–3 years	Every 1–2 years	Every 6 months to 1 year	Re-evaluation after treatment

# Recommendations for exercise and participation in sports in individuals with aortic pathology

Recommendations	Class	Level
Prior to engaging in exercise, risk stratification, with careful assessment including advanced imaging of the aorta (CT/CMR) and exercise testing with blood pressure assessment is recommended.	I	C
Regular follow-up including risk assessment is recommended.	I	C
Dynamic exercise should be considered more suitable than static exercise.	IIa	C
Participation in competitive or leisure-time sports activities (except power sports) should be considered in low risk individuals.	IIa	C
Participation in individualized leisure exercise programmes may be considered in high risk individuals.	IIb	C
Competitive sports are not recommended in individuals who are at high risk.	III	C

## Figure 2 Factors to consider in the choice of valve prosthesis for individuals participating in competitive sport





# Exercise recommendations in individuals with atrial fibrillation (1)

Recommendations	Class	Level
Regular physical activity is recommended to prevent AF.	I	A
Evaluation and management of structural heart disease, thyroid dysfunction, alcohol or drug abuse or other primary causes of AF is recommended before engaging in sports.	I	A
Counseling about the effect of long-lasting intense sports participation on (recurrence of) AF is recommended in individuals with AF who exercise vigorously for prolonged periods, especially in middle-aged men.	I	B
AF ablation is recommended in exercising individuals with recurrent symptomatic AF, and/or in those who do not want drug therapy, given its impact on athletic performance.	I	B

## Exercise recommendations in individuals with atrial fibrillation (2)

Recommendations	Class	Level
The ventricular rate while exercising with AF should be considered in every exercising individual (by symptoms and/or by ECG monitoring), and titrated rate control should be instituted.	<b>Ila</b>	<b>C</b>
Participation in sports without antiarrhythmic therapy should be considered in individuals without structural heart disease, and in whom AF is well-tolerated.	<b>Ila</b>	<b>C</b>
Cavo-tricuspid isthmus ablation should be considered in those with documented flutter who want to engage in intensive exercise, to prevent flutter with 1:1 atrioventricular conduction.	<b>Ila</b>	<b>C</b>
Prophylactic cavo-tricuspid isthmus ablation to prevent flutter should be considered in individuals with AF who want to engage in intensive exercise and in whom class I drug therapy is initiated.	<b>Ila</b>	<b>C</b>

# Exercise recommendations in individuals with atrial fibrillation (3)

Recommendations	Class	Level
The use of Class I antiarrhythmic drugs as monotherapy, without proof of adequate rate control of AF/flutter during vigorous exercise is not recommended.	III	C
After ingestion of pill-in-the-pocket flecainide or propafenone, participation in intensive sports is not recommended until two half-lives of the antiarrhythmic drug have elapsed (i.e. up to 2 days).	III	C
Sports with direct bodily contact or prone to trauma are not recommended in exercising individuals with AF who are anticoagulated.	III	A

# Recommendations for exercise in individuals with pacemakers and implantable cardioverter defibrillators(1)

Recommendations	Class	Level
It is recommended that individuals with implanted devices with/without resynchronization and underlying disease follow the <u>recommendations pertaining to the underlying disease.</u>	I	B
Participation in sports and exercise (except collision sports) should be considered in individuals with pacemaker therapy who do not have pathological substrates for fatal arrhythmias.	IIa	C
Prevention of direct impact to the implanted device by adapting the site of lead and/or device implantation, padding, or restricting direct impact sports should be considered.	IIa	C

# Recommendations for exercise in individuals with pacemakers and implantable cardioverter defibrillators(2)

Recommendations	Class	Level
<p>Holter recordings and device interrogation during and after resuming sports should be considered to allow appropriate tailoring of rate-responsive pacing parameters, exclusion of myopotential or electromagnetic inhibition, and detection of ventricular arrhythmias.</p>	IIa	C
<p>Shared decision-making should be considered during decisions relating to continuation of intensive or competitive sports participation in individuals with an ICD, taking into account the effect of sports on the underlying substrate, the fact that intensive sports will trigger more appropriate and inappropriate shocks, the psychological impact of shocks on the athlete/patient, and the potential risk for third parties.</p>	IIa	C
<p>An ICD is not recommended as a substitute for disease-related recommendations when these mandate sports restrictions.</p>	III	C



# Farmaci antipertensivi

## Doping ed effetto su prestazione

- Betabloccanti
- Diuretici
  
- Ace-inibitori
- Sartani
- Calcioantagonisti diidropiridinici
- *Alfabloccanti*