

Sports Participation in Patients with Known Heart Disease

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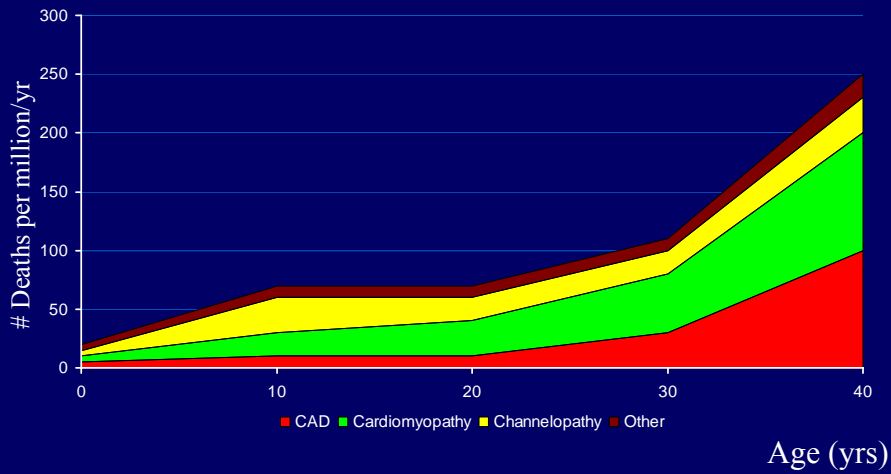
Outline

- Sports and SCD: Scope of problem
- Sports and Inherited disorders (GCVD)
- Sports and congenital heart disease
- Guidelines

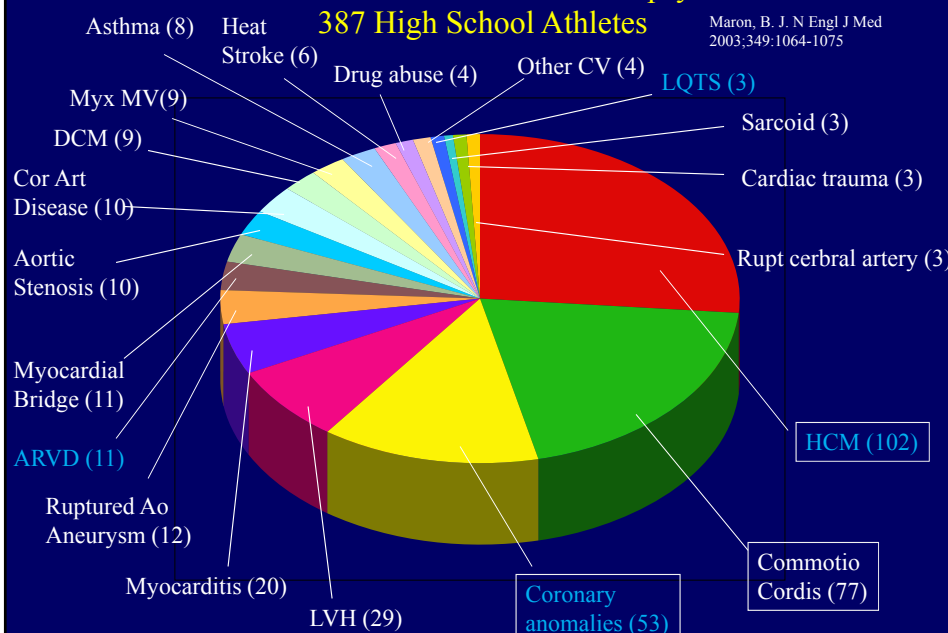
Restrictions

- What is the basis for restrictions
 - Data is scarce
 - Guidelines 2004, 2005, 2008
- Definition of Competitive vs recreational sports
- Liability concerns
- Genotype positive phenotype negative patients
- AICD's

Causes of SCD under 40 years

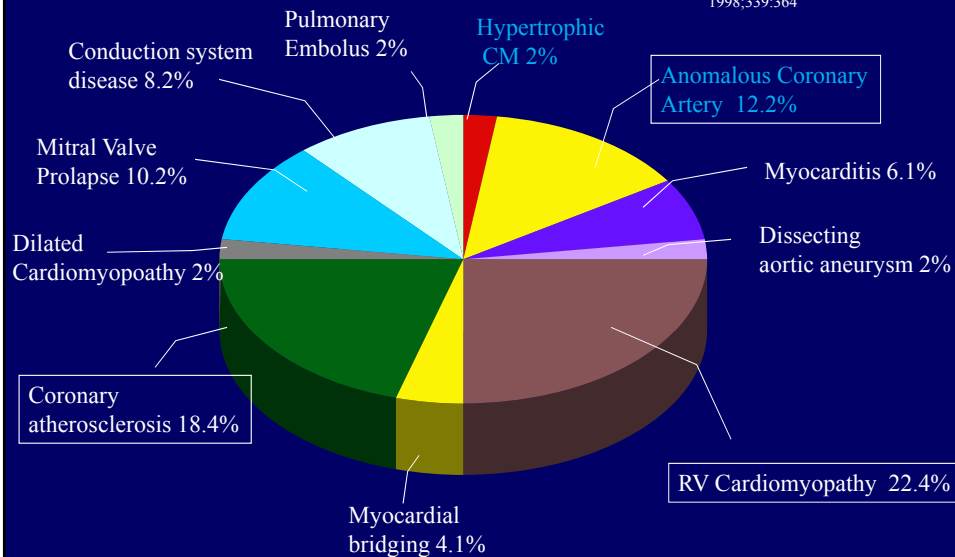


Causes of Sudden Death at autopsy in 387 High School Athletes



Causes of SCD in young athletes in the Veneto region of Italy

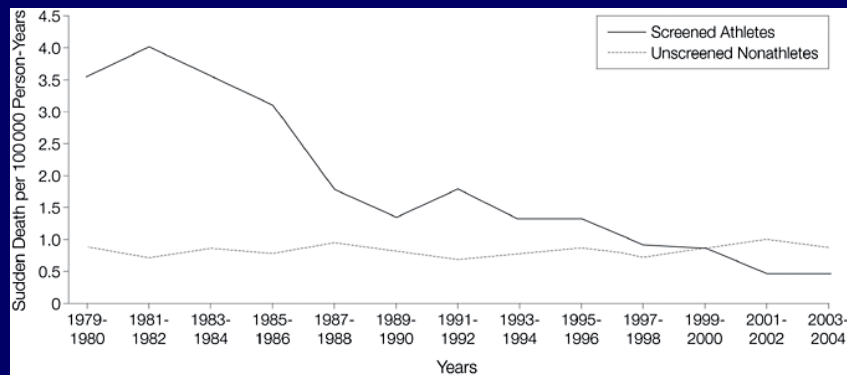
Corrado et al, Ann Int Med 1998;339:364



Impact of ECG based pre-participation screening programme in Veneto region of Italy

JAMA

Corrado, D. et al. JAMA 2006;296:1593-1601.



2,009,600 persons in Veneto region of Italy < 35 years old

1,058 disqualified, 621 (1.8%) for cardiac reasons;

269 sudden unexpected cardiac deaths (49 athletes and 220 nonathletes)

- 33,735 athletes underwent 73,718 screenings
- 3,016 (8.9%) required echocardiograms

HTN 27.1%
SVTs 7.6%
HCM 3.5%
AVB 1.6%

PVCs / VT 9.5%
WPW 7.1%
LBBB or RBBB / LAD 1.9%
Long QT 0.6%

Absolute Risk of Sudden Cardiac Death During Exertion in Men versus Women

	<u>Men</u>	<u>Women</u>
<u>Risk of SCD during moderate/vigorous exertion:</u>	1 SCD per 2.8 million person-hours at risk	1 SCD per 17.9 million person-hours at risk
<u>Risk of SCD during lesser or no exertion:</u>	1 SCD per 23 million person-hours.	1 SCD per 66 million person-hours.
<u>Risk Difference:</u>	1 <u>excess</u> SCD per 3.2 million person hours	1 <u>excess</u> SCD per 24.5 million person hours
<u>Attributable Risk Percent</u>	88%	73%

Albert et al, Physicians Health Study, N Eng J Med 2000

Classification of Sports

- Type of exercise
 - Dynamic
 - Static
- Level on intensity
 - Competitive vs recreational
- Danger of bodily collision *

Definitions

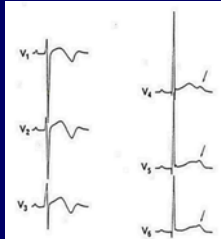
- Dynamic exercise – Changes in muscle length and joints with rhythmic contractions and little intramuscular force
- Static exercise – large intramuscular force with little or no change in muscle length

CLASSIFICATION OF SPORTS

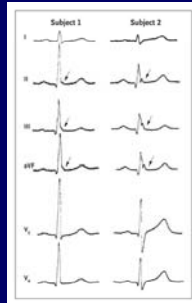
↑ Increasing Static Component III. High II. Moderate I. Low	III. High (>50% MVC)	Bobsledding/Luge*†, Field events (throwing), Gymnastics*†, Martial arts*, Sailing, Sport climbing, Water skiing*†, Weight lifting*†, Windsurfing*†	Body building*†, Downhill skiing*†, Skateboarding*†, Snowboarding*†, Wrestling*	Boxing*, Canoeing/Kayaking, Cycling*†, Decathlon, Rowing, Speed-skating*†, Triathlon*†
	II. Moderate (20-50% MVC)	Archery, Auto racing*†, Diving*†, Equestrian*†, Motorcycling*†	American football*, Field events (jumping), Figure skating*, Rodeoing*†, Rugby*, Running (sprint), Surfing*†, Synchronized swimming†	Basketball*, Ice hockey*, Cross-country skiing (skating technique), Lacrosse*, Running (middle distance), Swimming, Team handball
	I. Low (<20% MVC)	Billiards, Bowling, Cricket, Curling, Golf, Rifery	Baseball/Softball*, Fencing, Table tennis, Volleyball	Badminton, Cross-country skiing (classic technique), Field hockey*, Orienteering, Race walking, Racquetball/Squash, Running (long distance), Soccer*, Tennis
		A. Low (<40% Max O ₂)	B. Moderate (40-70% Max O ₂)	C. High (>70% Max O ₂)
Increasing Dynamic Component →				

GCVD

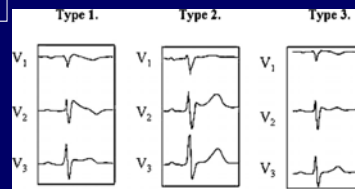
Long QT Syndrome



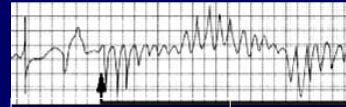
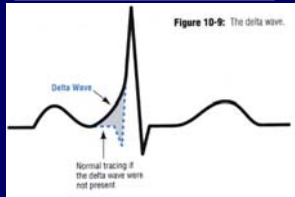
Early Repolarisation / J point elevation



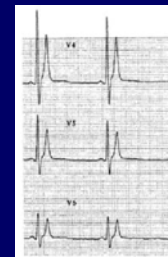
Brugada Syndrome



Wolf-Parkinson-White Syndrome



Catecholaminergic Polymorphic VT



Short QT Syndrome

2004 Guidelines

Recommendations for the Acceptability of Recreational (Noncompetitive) Sports Activities and Exercise in Patients With GCVDs*

Intensity Level	HCM†	LOTS†	Marfan Syndrome†	ARVC	Brugada Syndrome
High					
Basketball					
Full court	0	0	2	1	2
Half court	0	0	2	1	2
Body building§	1	1	0	1	1
Ice hockey§	0	0	1	0	0
Ropeclimbing‡	0	2	2	0	2
Rock climbing§	1	1	1	1	1
Running (sprinting)	0	0	2	0	2
Skating (downhill)§	2	2	2	1	1
Skating (cross-country)	2	3	2	1	4
Soccer	0	0	2	0	2
Tennis (singles)	0	0	3	0	2
Touch (flag) football	1	1	3	1	3
Windsurfing	1	0	1	1	1
Moderate					
Baseball/softball	2	2	2	2	4
Biking	4	4	3	2	5
Moderate hiking	4	5	5	2	4
Motorcycling§	3	1	2	2	2
Jogging	3	3	3	2	5
Sailing	3	3	2	2	4
Surfing	2	0	1	1	1
Swimming (bays)	5	0	3	3	4
Tennis (doubles)	4	4	4	3	4
Traditional/recreational bicycling	5	5	4	3	5
Weightlifting (free weights)§	1	1	0	1	1
Hiking	3	3	3	2	4
Low					
Bowling	5	5	5	4	5
Golf	5	5	5	4	5
Horseback riding§	3	3	3	3	3
Scuba diving	0	0	0	0	0
Skating†	5	5	5	4	5
Swimming	5	0	5	4	4
Weightlifting (non-free weights)	4	4	0	4	4
Brisk walking	5	5	5	5	5

GCVD and Exercise/Considerations

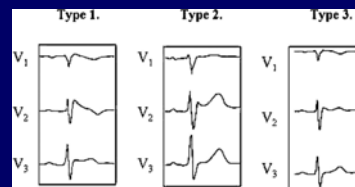
- Arrhythmogenicity of sports
- Burst exertion
- Auditory stimuli
- Swimming
- Diving
 - Restricted in all GCVD
- Greater risk of trauma in sports such as rock climbing, downhill skiing, ice hockey
- Increased stress/surges of emotion : roller coasters
- Paired athletic activities

Long QT

- Long QT patients with QTc greater than 0.48 s in males and 0.48 s in females are restricted from high intensity competitive sports
 - ESC 0.44 males and 0.46 females
- Genotype negative and phenotype positive are discouraged from participation in sports
 - ESC all gene positives excluded
- Genotype negative and borderline QTc are allowed to participate with close surveillance

Brugada syndrome

- Restricted from sports
 - No clear association between exercise and SCD in Brugada (potential impact of hyperthermia)
- Genotype positive and phenotype negative, no restriction
 - ESC : restricted



ARVD and CPVT

- CPVT
 - Restricted from sports
- ARVD
 - Restricted from sports

WPW

- EP study/ablation
 - Required in pts with impaired consciousness or persistent palpitations
 - Advisable in asymptomatic pts engaging in moderate or high level competitive sports
 - Asymptomatic athletes with WPW , EPS is not mandatory
 - ESC: mandatory
 - Return to sports: 4 wks/3 months post EPS

PVC's

- No limitations in athletes without cardiac disease
- Low intensity sports in athletes where PVC's increase with exercise

NSVT

- No restrictions , in Asymptomatic athletes without CHD , no NSVT > 10 beats, > 150/min and demonstrate suppression during exercise

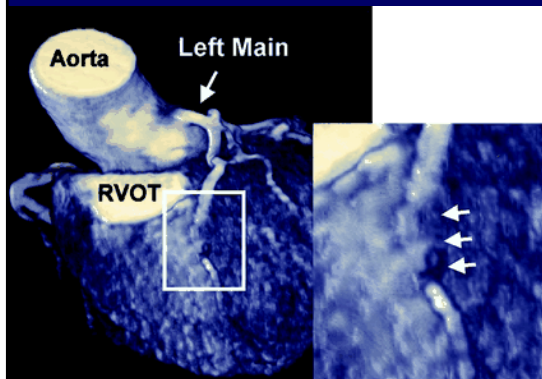
HCM: Recommendations

- Excluded from all sports except low intensity sports such as golf
- HCM with low risk features
 - SCD of Cameroon soccer player Marc Vivien Foe
- Gene positive phenotype negative individuals
 - US/BC : not precluded from sports
 - ESC: restricted, based on regular exercise may play a role in triggering cellular mechanisms leading to HCM phenotype/ cell death and myocardial fibrosis

TASK FORCE 2: Congenital Heart Disease

- Left-to-right shunting lesions: ASD, VSD, PDA
- Obstructive lesions: Pulmonary valve stenosis, Aortic valve stenosis, Coarctation of the aorta
- Cyanotic congenital cardiac disease – unoperated/operated
- Congenital coronary artery anomalies

Anomalous Coronary Arteries



Intra-arterial course
of Left Main Cor Art

Exclusion from all competitive sports

Participation 3 months after surgery after echo, max exercise testing

Atrial septal defect (ASD)

- small or large defect without pulmonary HTN – *can participate in all competitive sports*
- with pulmonary HTN – *low intensity sports only (Class IA).*
- with PVOD (pulmonary vascular obstructive disease). *Cannot participate in competitive sports.*

ASD: s/p closure

- 3-6 months after closure *can fully participate in competitive sports if*
 - No pulmonary hypertension
 - No arrhythmias
 - No evidence of myocardial dysfunction

VSD (ventricular septal defect)

- Small, restrictive defects – *can participate in all competitive sports*
- Large VSD – VSD closure recommended.
If no pulm HTN – *low intensity sports only (IA)*
- 6 months post closure, *full participation if:*
No residual or small residual defect, no pulmonary HTN, no evidence of myocardial dysfunction.

VSD (ventricular septal defect)

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- Large VSD – VSD closure recommended.
If no pulm HTN – *low intensity sports only (IA)*
- 6 months post closure, *full participation if:*
No residual or small residual defect, no pulmonary HTN, no evidence of myocardial dysfunction.

Pulmonary stenosis s/p intervention

If adequate relief and normal ventricular function.

- Balloon valvuloplasty
resume full activity after 1 month
- Surgical valvotomy
resume full activity after 3 months

Mild aortic stenosis

Gradient ≤ 20 mmHg

*Can fully participate if normal ECG,
normal exercise tolerance,
asymptomatic (no history of exercise
related chest pain, syncope, or
arrhythmia)*

Moderate aortic stenosis

- Gradient 21-40 mmHG
- Mild LVH by echocardiography
- No LV strain on ECG
- Normal exercise test without ischemia or arrhythmia

Low static/low to moderate dynamic (Class IA & IB)

Moderate static/low dynamic (Class IIA)

Severe aortic stenosis

- Gradient ≥ 50 mmHg
- *NO COMPETITIVE SPORTS*

Sub AS and Supra Valvar AS

- *Aortic stenosis Criteria also applies to discrete (membranous) subaortic stenosis and supraaortic stenosis*

Coarctation - untreated

- Mild coarctation
No severe collateral vessels, no severe aortic root dilation, normal exercise test, small pressure gradients at rest, peak systolic BP <230 mmHg with exercise
– *Can fully participate in competitive sports*
- More than mild (systolic arm to leg gradient >20 mmHg or peak systolic blood pressure >230 mmHg with exercise) – *Low intensity sports (Class IA) only until treated.*

Coarctation – post operative

- Participation in sports 6 months after treatment if systolic arm to leg gradient < 20 mmHg. Normal peak systolic BP at rest and with exercise
NO high intensity static exercise (Class IIIA, IIIB, IIIC). No contact sports during first post-operative year.
- After first year
All sports except power lifting if asymptomatic, normal BP at rest and exercise.

Coarctation - untreated

- Mild coarctation – *Can fully participate in competitive sports*
No severe collateral vessels, no severe aortic root dilation, normal exercise test, small pressure gradients at rest, peak systolic BP < 230 mmHg with exercise
- More than mild (systolic arm to leg gradient > 20 mmHg or peak systolic blood pressure > 230 mmHg with exercise) – *Low intensity sports (Class IA) only until treated.*

Cyanotic Heart disease - untreated

- Exercise intolerance and progressive hypoxemia with increasing effort
- *Low-intensity competitive sports (class IA)*

Cyanotic heart disease - palliated

- Arterial saturation above 80%
- No symptomatic arrhythmias
- No ventricular dysfunction
- Near-normal capacity by exercise testing

Low intensity sports (Class IA)

Tetralogy of Fallot- s/p repair

- Normal or near normal right heart pressure
- Only mild RV volume overload
- No residual left-to-right shunt
- No rhythm abnormality by Holter or exercise study

Can participate in all competitive sports

Tetralogy of Fallot –s/p repair

- Residual RVH \geq 50% systemic
- Severe pulmonary regurgitation
- Rhythm abnormality by Holter or exercise

Low intensity sports (Class I A)

TGA (Transposition of the great arteries) – s/p arterial switch

- Normal heart size
- No residual defects
- Normal ventricular function
- Normal exercise study
- No arrhythmias

Can participate in all sports, however, high static sports with severe isometric effort (Class III A, IIIB, IIIC) should be discouraged.

Marfan's syndrome

- Low or moderate competitive sports in absence of
 - Aortic root < 4 cm/ > 2 SD from mean for BSA
 - Moderate MR
 - F/H of aortic dissection or SCD
- ESC
 - All phenotype or genotype positive are restricted

Conclusions

- Current guidelines possibly too restrictive
- Legal issues
- Individual exemptions may be made after detailed discussions and documentation
- Genotype positive phenotype negative cases will increasing need to be addressed
- AICD and sports