

# Sudden Death Due to Recreational Exercise in Physicians

Z. Duraković<sup>1</sup>, M. Mišigoj-Duraković<sup>2</sup> and J. Škavić<sup>3</sup>

<sup>1</sup> Department of Internal Medicine, University Hospital Center »Zagreb«, Zagreb, Croatia

<sup>2</sup> Department of Kinesiological Anthropology, Faculty of Kinesiology, University of Zagreb, Zagreb, Croatia

<sup>3</sup> Department of Forensic Medicine, School of Medicine, University of Zagreb, Zagreb, Croatia

## ABSTRACT

*In a period from 1982-2002 we noticed five dead among Croatian male physicians aged 34 to 67, during or after recreational physical exercise: swimming, soccer, tennis and jogging. Three of them who were autopsied, have been non-smokers and without previous symptoms. In all coronary heart disease was found. The left descending anterior artery was stenotic in one and occluded in two, with myocardial scars in one. An acute myocardial infarction was found in none of them, and in two-left ventricular hypertrophy 15 and 18 mm. We could not find a recent medical record in those physicians including a clinical finding and other findings. Two physicians who were not been autopsied, had possible an alcohol cardiomyopathy. Both of them were smokers. In Croatia about 7 % of the whole population are engaged in recreational physical exercise. In a period of twenty years (1982–2002) we noticed 43 sudden and unexpected deaths during or immediately after physical exercise: it reached 43/6,300,000 sudden death in Croatia in twenty years or 2.15/315,000 yearly among persons engaged in physical exercise. In Croatia there are 4,957 male physicians-specialists, and a rate of sudden cardiac death during or immediately after physical exercise in this group reached 5/99,140 in 20 years or 1/19,828 every four years. A medical check up before recreational physical exercise is essential including a clinical examination, a serum concentration of risk factors and other risk factors, an electrocardiogram at rest, a stress test and echocardiography in clinical indication, as are medical controls over persons taking exercise. This study shows that medical evaluation is important because of the underlying problems such as sudden death during exercise. In non-trained persons and in the elderly a physical exercise should be recommended of a gradually intensity, which could not exceed 6 METs.*

## Introduction

A growing number of persons are continuously involved in recreational physical exercise. Physical exercise is widely accepted as a therapeutic tool. It is beneficial for humans and promoting of health, but has to be regular, controlled and adapted to the state of the organism. If the principles of physical training are observed, possible complications could be avoided. Complications – during or after exercise – might occur both in persons who suffer from heart disease and in those who are free from disease<sup>1–11</sup>. That is why a medical check up before exercise is essential, as is medical control over persons taking exercise.

## Patients and Methods

In the period of twenty years: between 1982 and 2002 we noticed 43 sudden and unexpected death due to recreational physical exercise in Croatia. Five of them were male physicians-specialists, aged 34–67 years. The first was internist-cardiologist, the second was surgeon, the third was pathologist, the fourth was immunologist and the fifth was radiologist. They have been involved in swimming, soccer, tennis and jogging. They felt healthy and that is probably why in all but one we have not been able to find their recent medical records, for example risk factors and other data- they all have not been examined medically in a recent time. Two non-autopsied were moderate smokers and used an alcohol drink for years. One had atrial fibrillation one year before sudden death. The other had arterial hypertension, high level of serum lipoproteins and had been treated with antihypertensives and antihyperlipemics.

## Results

In three of them a forensic autopsy was performed. All three had coronary

heart disease; two of them left ventricular hypertrophy also. In all three left descending anterior coronary artery was atherosclerotic, with stenosis in one and occlusion in two. In one of them myocardial scars of two past myocardial infarctions were found. In no one acute myocardial infarction was found, so that obviously malignant ventricular arrhythmia was a cause of death. Two of them had a thickness of the left ventricle 15 and 18-mm. The main characteristics of five male physicians died suddenly due recreational physical exercise are presented in Table 1.

## Discussion

The paper deals with the aspects of the interrelationship between physical exercise and cardiovascular risks in five middle-aged physicians. Three of them were autopsied and in all coronary heart disease was found, with no signs of an acute myocardial infarction: in two a left ventricular hypertrophy was found which could be an important risk factor for a malignant arrhythmia. In two who were not been autopsied, an alcohol cardiomyopathy was probably a reason for malignant arrhythmia. One had atrial fibrillation one year before sudden death. The other had arterial hypertension also, an excessive hyperlipoproteinaemia, and probably a silent myocardial ischemia due to coronary heart disease. Coronary heart disease is caused mostly by an atherosclerotic process followed by imbalance between myocardial supply and requirements, due to physical exercise (transient decreased O<sub>2</sub>) or at rest, followed by stable angina pectoris, unstable angina, myocardial infarction, congestive heart failure, cardiac arrhythmia or sudden death. Atherosclerosis is silent until critical stenosis, coronary thrombosis (observed in three physicians); embolus or coronary dissection or aneurysm super-

**TABLE 1**  
CHARACTERISTICS OF MALE PHYSICIANS DIED SUDDENLY DUE  
TO RECREATIONAL PHYSICAL EXERCISE

Case	Age	Profession/ physical exercise	Symptoms	Physical finding/ ECG	Lethal event	Resus- citation	Forensic autopsy
1	42 smoker	internist- car- diologist/ swimming	paroxysmal atrial fibrillation a year ago	no recent data	June 1982 drowned in a lake (he was a good swimmer)	no (found a day after)	not done
2	43 non- smoker	pathologist/ soccer player	no	no data	August 1984 during a game	yes	CHD, LAD stenotic, LV wall 18 mm
3	67 non- smoker	surgeon/ tennis	no	not recent data, normal ECG finding few years earlier	February 1992 during a game	yes	CHD, LAD occluded, myocardial fibrosis, LV wall 15 mm
4	50 non- smoker	immuno- logist/ jogging	no	no data	July 1997 during a game	no	CHD, LAD occluded, LV wall 11 mm
5	60 smoker	radiologist/ swimming	general weakness in this day	LVH by ECG- arterial hy- per-tension, hyperlipoprot enaemia	June 2002 during swimming	no	not done

CHD = coronary heart disease; LAD = left descending anterior coronary artery; LV = left ventricle

venes. Sudden cardiac death could sometimes be the first sign of coronary disease (in over 25 per cent), precipitated by excessive physical exercise, what was observed in five presented physicians. Left ventricular hypertrophy, presented in two of three autopsied physicians, is very often connected with arterial hypertension. In ventricular hypertrophy there is also an imbalance between myocardial supply and requirements. This disease is very often a silent cardiovascular risk factor and could have important prognostic implications<sup>1,7–11</sup>.

Sudden death in apparently healthy persons who are engaged in physical exercise is extremely rare. When cardiovascular incidents occur during exercise, the most frequent cause is an organic heart

or vascular disease<sup>1–8,12–14</sup>. One should always bear in mind the fact that a great number of persons with coronary disease engage in physical exercise, and only a few have any discomfort. These data are supported by the analysis of the health-related condition of the Croatian population<sup>1–6,11</sup>; the so-called healthy persons of both genders aged 65–84 have 6 diagnoses on the (range 0–17) including cardiovascular diseases. The relative risk of cardiovascular complications seems to be higher in exertion than at rest<sup>1–12</sup>. It is estimated that, for example, in cross-country skiing the risk is 14.5 times higher than other exercise<sup>8</sup>. The analysis of the results shows however that the risk in all exercises is 4.5, in non-strenuous exercise it is 3.3, whereas it is three times higher

in strenuous exercise: 9. The relative risk of sudden death during up to 30 minutes of vigorous exercise reached 16.9, and absolute risk was low: 1/1,510,000.

In Croatia about 7 per cent of the whole population are engaged in recreational physical exercise<sup>11</sup>. In a period of twenty years (1982–2002) we noticed 43 sudden and unexpected deaths during or immediately after physical exercise: it reached 43/6,300,000 sudden death in Croatia in twenty years or 2.15/315,000 yearly among persons engaged in physical exercise. In Croatia there are 4,957 male physicians-specialists, and a rate of sudden cardiac death during or immediately after physical exercise reached 5/99,140 in 20 years or 1/19,828 every four years. From a study in USA<sup>12</sup>, 122 sudden death due to physical exercise were described among 21,481 male physicians or 41/7,176 every four years, which is much higher than in Croatia. They were without symptoms of cardiovascular disease during a 12 years period of follow-up. In relation to that, it is not possible to answer the question how many physicians in Croatia are included in recreational exercise and it is not possible to make any comparison between these

rates in physicians in relation to a general population.

A medical check up before recreational physical exercise is essential including a clinical examination, a serum concentration of risk factors and other risk factors, an electrocardiogram at rest, a stress test and echocardiography in clinical indication, as are medical controls over persons taking exercise. It has to be done every three years in that aged 40 and more who are without symptoms. It has to be done every two years in those aged 35 and more with one or more risk factors for atherosclerosis – coronary heart disease, in persons with suspect cardiac, pulmonary or metabolic disease. A medical check-up has to be done once a year in those with known cardiac, pulmonary or metabolic disease or with positive stress test previously regardless of their age<sup>1,5,16</sup>. This study shows that medical evaluation is important because of the underlying problems such as sudden death during exercise. In non-trained persons and in the elderly a physical exercise should be recommended of a gradually intensity, which could not exceed 6 METs (1 MET = 3.5 ml O<sub>2</sub>/kg/min.).

## REFERENCES

1. DURAKOVIĆ, Z., M. MIŠIGOJ-DURAKOVIĆ, R. MEDVED, J. ŠKAVIĆ, *Kinesiology*, 31 (1999) 68. –
2. DURAKOVIĆ, Z., M. MIŠIGOJ-DURAKOVIĆ, R. MEDVED, J. ŠKAVIĆ, *Coll. Antropol.*, 33 (2002) 239. –
3. DURAKOVIĆ, Z., M. MIŠIGOJ-DURAKOVIĆ, N. ČOROVIĆ, M. ČUBRILLO-TUREK, K. MARTINOVIĆ, *Coll. Antropol.*, 20 (1996) 213. –
4. ČOROVIĆ, N., Z. DURAKOVIĆ, M. PAVLOVIĆ, *Coll. Antropol.*, 20 (1996) 193. –
5. DURAKOVIĆ, Z., *Coll. Antropol.*, 16 (1992) 371. –
6. DURAKOVIĆ, Z., M. MIŠIGOJ-DURAKOVIĆ, N. ČOROVIĆ, M. ČUBRILLO-TUREK, S. TUREK, M. ĐUREK, S. NAUMOVSKI-MIHALIĆ, D. DE SYO, *Coll. Antropol.*, 22 (1998) 135. –
7. THOMPSON, P. D., *Arch. Intern. Med.*, 156 (1996) 2297. –
8. VUORI, I., *Acta Med. Scand.*, 711 (1986) 205. –
9. OSWALD, S., R. BROOKS, S. S. NUNIAN, J. H. CURVIN, M. ROELKE, P. RADVANY, J. N. RUSKIN, B. A. McGOVERN, *Ann. Intern. Med.*, 120 (1994) 1008. –
10. SISCOVICH, D. S., L. G. EKE-LUND, J. L. JOHNSON, Y. TRUONG, A. ADLER, *Arct. Intern. Med.*, 151 (1991) 325. –
11. MIŠIGOJ-DURAKOVIĆ, M.: Exercise and health. In *Croat. (Grafos, Zagreb, 1999)*. –
12. ALBERT, C. M., M. A. MITTLEMAN, C. U. CHOU, I. M. LEE, C. H. HENNEKEN, J. E. MANSON, *N. Engl. J. Med.*, 343 (2000) 1355. –
13. PATE, R. R., M. PRATT, S. N. BLAIR, J. A. M.A., 273 (1995) 402. –
14. MINISTERS RESPONSIBLE FOR SPORT IN EUROPE, Declaration on the significance of sport for society: Health, socialization, economy. In: *Proceedings. (8<sup>th</sup> Conference of European Ministers Responsible for Sports, Lisbon, 1995)*. –
15. FLETCHER, G. F., G. BALADY, S. N. BLAIR, J. BLUMENTHAL, C. CASPERSEN, B. CHATMAN, S. EPSTEIN, E. S. SIVARAJAN-FROELICHER, V. F.

FROELICHER, I. L. PINA, M. L. POLLOCK, *Circulation*, 94 (1996) 857. – 16. PEARSON, T. A., S. N. BLAIR, S. R. DANIELS, R. H. ECKEL, J. M. FAIR, S. P. FORTMAN, B. A. FRANKLIN, L. B. GOLDSTEIN,

P. GREENLAND, S. M. GRUNDY, Y. HONG, N. HOUSTON MILLER, R. M. LAUER, I. S. OCKENE, R. L. SACCO, J. F. SALLIS, S. C. SMITH, N. J. STONE, K. A. TAUBERT, *Circulation*, 106 (2002) 388.

Z. Duraković

*Department of Internal Medicine, University Hospital Center »Zagreb«, Kišpatićeva 12, 10000 Zagreb, Croatia*

## **IZNENADNA SMRT TIJEKOM ILI NAKON REKREATIVNE TJELOVJEŽBE U LIJEČNIKA**

### **S A Ž E T A K**

U razdoblju od 1982. do 2002. godine, u Hrvatskoj je pet liječnika-specijalista naglo i neočekivano umrlo tijekom ili neposredno nakon rekreacijskog tjelesnog vježbanja: plivanja, nogometa, tenisa i trčanja, a bili su dobi od 34 do 67 godina. Trojica i to upravo ispitanici koji su bili bez prethodnih simptoma i nepušači, obducirani su i u svih je ustanovljena koronarna bolest srca: u jednog je nađena stenoza, u dvojice okluzija prednje silazne koronarne krvne žile, u jednog su nađeni ožiljci miokarda od dva ranije preboljela infarkta miokarda, u dva hipertrofija lijeve klijetke. U nijednog nije nađen akutni infarkt miokarda. Nismo ustanovili noviju medicinsku dokumentaciju tih liječnika. Od dvojice koji nisu obducirani, u oba radilo se o mogućoj alkoholnoj kardiomiopatiji. Obojica su bili pušači. U jednog zabilježena je fibrilacija atrija jednu godinu prije nagle smrti. U drugog vjerojatno se radilo o koronarnoj bolesti, uz arterijsku hipertenziju i hiperlipoproteinemiju. U Hrvatskoj oko 7% ukupne populacije uključeno je u rekreacijsku tjelovježbu. U periodu 1982-2002 g. zabilježili smo 43 nagle i neočekivane smrti za vrijeme ili neposredno nakon tjelovježbe. To čini stopu od 43/6.300.000 naglih smrti u 20 godina ili 2.15/315.000 godišnje u osoba uključenih u rekreacijsku tjelovježbu. U Hrvatskoj ima 4.957 liječnika specijalista muškaraca, pa navedena stopa naglih smrti za vrijeme tjelovježbe iznosi 5/99 140 u 20 godina ili 1/19.828 svake 4 godine. Prije rekreacijske tjelovježbe u svih osoba dobi iznad 40 godina, u osoba dobi 35 i više s jednim ili više čimbenika rizika, kao i u svih osoba onih s poznatom kardijalnom, pulmonalnom ili metaboličkom bolesti potrebno je učiniti klinički pregled, analizu čimbenika opasnosti za aterosklerozu, analizirati EKG u mirovanju, tijekom i nakon pokusa opterećenjem, pri indikaciji i ehokardiografiju. U osoba bez simptoma navedeno treba provesti svake 3 godine; u onih s jednim ili više čimbenika opasnosti ateroskleroze kao i u osoba sa suspektom kardijalnom, pulmonalnom ili metaboličkom bolesti to treba provesti svake 2 godine, a u onih s poznatom kardijalnom, pulmonalnom ili metaboličkom bolesti, kao i u onih s prethodno pozitivnim nalazom pokusa opterećenjem, to treba provesti jednom godišnje. Posebno u netreniranih osoba i u osoba tzv. starije dobi treba tjelesno opterećenje postupno provoditi i ne prijeći granicu od 6 MET-a.