

Physical Exercise and Cardiac Death Due to Pneumonia in Male Teenagers

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ABSTRACT

From 1998 to 2008 we noticed 3 cardiac deaths in male teenagers aged 18–19 during or after physical exercise. The first was working at the site recreatively, the second was engaged in soccer recreatively and the third was professional soccer player. One felt general tiredness and was exhausted of a heavily physical effort, the other after physical exercise became septic and the third was without symptoms. One died suddenly during physical exercise at the field and two died in the hospital. At the forensic autopsy the first had bilateral bacterial pneumonia, possible high-altitude non-cardiogenic pulmonary edema and cerebral edema. The second had bilateral bacterial pneumonia, adult respiratory distress syndrome, disseminated intravascular coagulation, suprarenal bleeding, cerebral edema, hypoplastic right coronary artery and myocardial fibrosis. The third had bilateral bacterial pneumonia, fibrinous pericarditis, cerebral contusion with edema, thickening of the left ventricle 20 mm and hypoplastic ascending aorta. In Croatia the death rate among athletes reached 0.15/100 000, in athletes suffered of acute pneumonia 0.28/100 000, in others who practice exercise recreatively 0.57/100 000 ($p=0.0068$), in all males who practice exercise recreatively 0.75/100 000 ($p=0.0014$). Physical exercise is contraindicated in acute respiratory tract infections. Every such case has to be treated by physician. When to start with physical training after bacterial pneumonia depends on disappearing of clinical and X-ray signs of pneumonia, normalization of erythrocyte sedimentation rate and of white cell count.

Key words: male teenagers, physical exercise, pneumonia, cardiac death

Introduction

Sport and recreational physical exercise: regular, controlled and adapted to the state of the organism has beneficial effects which are greater than hazards^{1–9}. In healthy persons health-related incidences are rare as is sudden death. In those under 30 years who died suddenly during or after physical exercise the most common reasons are cardiovascular diseases. Acute respiratory tract infections are most frequent reasons of morbidity and inability of exercise. Their frequency reached over 65 per cent of all infections. Several epidemiological studies point out the increased risk of morbidity from the respiratory tract infections in athletes during the intensive inducance training sessions⁵. Athletes in periods of intensive training and after highly strenuous training are more often affected by respiratory tract infections. But in those engaged in recreative physical exercise consider

that such regular activities protect them from these infections^{7–10}.

The aim of the study is to analyze bacterial pneumonia and their consequences as a cause of cardiac death due to physical exercise in young persons engaged in sport and recreative exercise.

Case Reports

The present data are a part of a large retrospective study dealing with 57 sudden and unexpected deaths due or after sport or recreational exercise in a period of 10 years: from 1998–2007 (12,4) of all ages and both sexes in Croatia, collected from the whole population consisted 4 500 000 persons. Seven of them were athletes and 50

were doing recreative exercise. The deceased persons were found from the registry of Services of Forensic Medicine, Public Health Registry and Sports clubs. In this period we detected three deaths during respiratory tract infections. One of them died suddenly due to physical exercise and two after physical exercise, died in a hospital because of a development of complications due to exercise. All were teenagers aged 18–19 years. One of them was professional soccer players, one was recreational soccer player and one was working at the site recreationally. All of them were without symptoms before the last physical exercise. The data of three cases are presented in Table 1.

The statistical difference was calculated using chi-square test and Poisson rates.

The first aged 18, smoker, just finished a secondary school and started to work recreatively at the site. Several days ago he felt general tiredness and was exhausted because of a heavy physical effort in his opinion, and he did not referee his troubles to any physician. He died suddenly in December 2001 during work. All resuscitation efforts were with no effects. The forensic autopsy showed bilateral bacterial pneumonia, possible high-altitude non-cardiogenic pulmonary edema and heavy cerebral edema.

The second aged 19 was a student who played soccer recreatively. In January 2002 he played soccer and few hours after a game he felt several pain in his left hip and leg and he developed high body temperature: 40 °C. He left to the hospital at the other day. At the admittance he was septic and died one day later in spite of all therapeutic effort including antibiotics, inotropic drugs, fresh frozen plasma, coagulation factors, mechanic ventilation

etc. The clinical diagnoses were: septic shock, adult respiratory distress syndrome, disseminated intravascular coagulation, acute renal failure. The forensic autopsy showed adult respiratory distress syndrome, disseminated intravascular coagulation, multiple pulmonary and suprarenal bleeding, hypoplastic right coronary artery, myocardial fibrosis and acute cerebral edema. Histological finding showed bilateral bacterial pneumonia.

The third aged 18 was a school boy and professional soccer player. He did complaint of any discomfort during physical exercise. During a soccer game in May 2006 one player kicked his head with a ball. He felt general weakness with a short breath and he felt down. He was transferred to the nearest University Hospital where he died two days after admittance in spite of all therapeutic efforts. The forensic autopsy showed large bilateral bacterial pneumonia, fibrinous pericarditis, cerebral contusions with edema and and pointed bleeding, hypoplastic ascending aorta and biventricular hypertrophy: left ventricular wall reached 20 mm indicating hypertrophic cardiomyopathy and right ventricular wall reached 4 mm, and the weight of the heart reached 450 g.

The statistical difference was calculated using Chi-square test and Poisson rates.

Discussion

The article deals with the aspects of the interrelationship between physical exercise and acute respiratory tract infections in young male athletes. All three presented teenagers athletes suffered of bacterial pneumonia. Two of them had cardiovascular diseases: one aged 19 had hypoplastic right coronary artery and myocardial

TABLE 1
CHARACTERISTICS OF FOUR YOUNG MALES WITH ACUTE RESPIRATORY TRACT INFECTIONS WHO DIED DURING OR AFTER EXERCISE

Case	Age	Physical exercise	Symptoms	Physical finding	Lethal event	Resuscitation	Forensic autopsy
1	18	working at the site recreationally	general tiredness	no data	during work	yes	bilateral pneumonia, possible high-altitude non-cardiogenic pulmonary edema, cerebral edema
2	19	recreative soccer player	no	no data	in a hospital 1 day after development of sepsis, shock, disseminated intravascular coagulation, acute renal failure	yes	bilateral pneumonia, adult respiratory distress syndrome, disseminated intravascular coagulation, pulmonary and suprarenal bleeding, hypoplastic right coronary artery, myocardial fibrosis, cerebral edema
3	18	professional soccer player	no	no data	in a hospital 2 days after admission after trauma of the chest	yes	bilateral bronchopneumonia, pericarditis fibrinosa, cerebral contusion with edema, hypoplastic ascending aorta, thickening of both ventricles: left 20 mm, right 4 mm, ventricles: left 20 mm and right 4 mm, hypoplastic ascending aorta

fibrosis and the other aged 18 had hypertrophic cardiomyopathy and hypoplastic ascending aorta.

Pneumonia as a cause of sudden cardiac death during physical exercise is very rare ². In Swedish study during 14 years, 15 young men and one young woman died during exercise, and pneumonia caused by Chlamidia was a case in one of them ¹¹. In athletes who died suddenly due to exercise, the most common reasons for such events are cardiomyopathies, coronary anomalies and myocarditis ¹². By some authors hypertrophic cardiomyopathy is the most frequent causes of death in younger subjects ^{13,14}. By some other authors hypertrophic cardiomyopathy was an uncommon cause of death in young competitive athletes: in Veneto region in Italy, of 49 sudden death in athletes from 1979–1996, 12.2% had anomalous origin of a coronary artery and only 2.0% had hypertrophic cardiomyopathy ¹². Sometimes it is not easy to distinguish physiological myocardial hypertrophy from hypertrophic cardiomyopathy. Normal values of ventricular thickness reached 11 mm, borderline values between 11–13 mm and thickness for hypertrophic cardiomyopathy above 15 mm. These data was present in one athlete in our study.

Two of presented cases had multiple cardiovascular anomalies and acute bacterial pneumonia at the same time which amounted the risk for sudden cardiac death. One had hypoplastic aorta with subacute diffuse myocarditis. The other had hypoplastic right coronary artery. Coronary artery hypoplasia is an infrequent disease and could be associated with sudden cardiac death as could be narrowness of the ascending aorta or hypoplastic aorta.

These result differ by different authors: in young persons who died suddenly in the Veneto Region in Italy, coronary anomalies reached 3.5% ⁶, and in 13.7% in USA ⁷.

Myocarditis possibly related to exercise during the febrile phase of a viral illness could be the reason for sudden death ^{13,14}, especially when it is connected with the

narrowing of the ascending aorta as was the case in one teenager in our study.

In Croatia the death rate including all reasons among athletes reached 0.15/100 000, in recreative athletes suffered of acute respiratory tract infections reached 0.28/100 000, in others who practice exercise recreatively reached 0.57/100 000 (the difference is significant: $p=0.0068$), in all males who practice exercise reached 0.75/100 000 (the difference is significant: $p=0.0014$). The sudden and unexpected cardiac death rate among USA athletes below age of 30 amounts 1.6/100 000, which is higher than in our study. In Minnesota that rate reached 0.2/100 000 or 0.46/100 000 annually which is higher than in our study (8,12). The relative risk of cardiovascular complications is higher in exercise than at rest: cross-country skiing is 14.5 times higher than in other exercises. The risk in strenuous exercise is 4.5 times higher than in non-strenuous exercise ⁵. In literature we were unable to find data of mortality rate during bacterial pneumonia in athletes during training.

In conclusion. Physical exercise is contraindicated in acute respiratory tract infections. In all three present cases acute bacterial pneumonia had been a cause of death Every case suffered of acute respiratory tract infections has to be reported and treated by physician. When to start with physical training after pneumonia depends on disappearing of clinical signs of pneumonia, normalization of body temperature, disappearing of pulmonary infiltrate by chest X-ray or local signs of tonsillitis and regional physical finding i.e. an enlargement of lymphatic nodes, of erythrocyte sedimentation rate and normalization of white cell count.

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REFERENCES

1. DURAKOVIĆ, Z, MIŠIGOJ DURAKOVIĆ M, ŠKAVIĆ J, Coll Antropol 26 (2002) 509. — 2. DURAKOVIĆ, Z, MIŠIGOJ DURAKOVIĆ M, VUORI I, ŠKAVIĆ J, BELICZA M, J Sports Med Phys Fitness 45 (2005) 532. — 3. PODEWILS, Lj, GUALLAR E, Ann Intern Med 144 (2006) 135. — 4. DURAKOVIĆ, Z, MIŠIGOJ DURAKOVIĆ M, MEDVED R, ŠKAVIĆ J, Physical exercise and cardiovascular risks – sudden death. Proceedings of the European Conference: Health related physical activity and adults. Poreč, Croatia June 22–5, 2000, pp. 1–6. — 5. VUORI, I, Kinesiology 2 (2004) 123. — 6. BASSO, C, CORRADO C, CORRADO D, THIENE G, Cardiology in Review 7 (1999) 127. — 7. MARON, BJ, N Engl J Med 349 (2003) 1064. — 8. MARON, BJ, Athlete's heart, http://www.hopkinsmedicine.org/cardiomyopathy/athlete_s_heart.htm (2003). — 9. MARON, BJ, THOMPSON PD, PUFFER JC, MCGREW CA, STRONG WB, DOUGLAS PS, CLARK LT, MITTEN MJ, CRAWFORD MH, ATKINS DL, DRISCOLL DJ, EPSTEIN AE, Circulation 94 (1996) 850. — 10. MARON, BJ, DOUGLAS PS, GRAHAM TP, NISHIMURA RA, THOMPSON PD, J Am Coll Cardiol 45 (2005) 132. — 11. WESSLEN, L, PAHLSON C, LINDQUIST O, HJELM E, GNARPE J, LARSSON E, BAANDRUP U, ERIKSSON L, FOHLMAN J, ENGSTRAND L, TINGLOF T, NYSTROM-ROSSANDER C, GNARPE H, MAGNIUS L, ROLF C, FRIMAN G, Europ Heart J 17 (1996) 902. — 12. CORRADO, D, BASSO C, SCHIAVON M, THIENE G, N Engl J Med 339 (1998) 364. — 13. FUTTERMAN, LG, MYERBURG R, Sports Med 26 (1998) 335. — 14. OAKLEY, D, Heart 86 (2001) 722.

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IZNENADNA SMRT ZBOG UPALE PLUĆA ZA VRIJEME TJELOVJEŽBE U TROJICE MLADIĆA

SAŽETAK

U vremenu od 1998–2008 godine suočili smo se s tri nagla i neočekivana smrtna ishoda u mladića dobi 18–19 godina. Jedan je radio na gradilištu rekreacijski, drugi se bavio nogometom rekreacijski, treći bio je profesionalni nogometaš. Jedan je osjećao opću iscrpljenost, drugi je razvio kliničku sliku sepse nakon tjelesnog napora, dok se treći nije tužio na simptome. Jedan je naglo preminuo na gradilištu, dok su druga dvojica preminula u bolnici. Nalaz sudsko-medicinske obdukcije u prvog je upućivao na obostranu bakterijsku upalu pluća, mogući nekardiogeni edem pluća i edem mozga. U drugog nalaz je upućivao na obostranu bakterijsku upalu pluća, respiracijski distresni sindrom odraslih, diseminiranu intravaskularnu koagulopatiju, krvarenje u nadbubrežne žlijezde, hipoplastičnu desnu koronarnu arteriju i fibrozu miokarda. U trećeg nalaz je upućivao na obostranu bakterijsku upalu pluća, fibrinozni perikarditis, cerebralnu kontuziju s edemom, zadebljanje lijeve klijetke od 20 mm i hipoplastičnu uzlaznu aortu. U Hrvatskoj stopa smrtnog ishoda u tjelovježbača iznosi 0,15/100 000 godišnje, u tjelovježbača koji su bolovali od akutne upale pluća iznosi 0,28/100 000, u ostalih koji se bave rekreacijskom tjelovježbom iznosi 0,57/100 000 ($p=0,0068$), u svih muškaraca koji se bave tjelovježbom iznosi 0,75/100 000 ($p=0,0014$). Tjelovježba je kontraindicirana u onih koji boluju od akutne infekcije dišnih putova. Svaki takav slučaj treba biti liječen od liječnika. Kada nastaviti s trenažnim procesom nakon bakterijske upale pluća ovisi o nestanku kliničkog nalaza na plućima, rendgenskog nalaza infiltrata na plućima, normalizaciji laboratorijskog nalaza sedimentacije eritrocita i normalizaciji nalaza bijele krvne slike.