

Cardiovascular Examination in Children: The Risk of Overdiagnosis

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The risk of overdiagnosing abnormal conditions in healthy subjects is particularly serious in modern medicine. The abundance of available diagnostic procedures, in conjunction with "defensive" medical practice, inadequate training in patient-physician communication skills and the lack of emphasis on clinical evaluation, often lead to iatrogenic disorders that sometimes have worse implications than some real diseases. The risk is even greater when it comes to children, because it is associated with a significant psychological burden and anxiety. The average cardiologist has limited experience in the assessment of children. Nevertheless, overdiagnosis in children is common, even in cases assessed by specialists in paediatric cardiology. The negative impact of a false diagnosis on the mental balance of not only the children, but the whole family, is tremendous, especially when it leads to "overtreatment".

In Greece, the cardiovascular examination of asymptomatic children has taken on great dimensions in recent years. This exaggeration is evident in the frequent referrals for cardiac evaluation before a child enters a sport (pre-participation screening), when the paediatrician hears an invariably innocent cardiac murmur, or just for "prevention". This situation has led to thousands of "false diagnoses" which in turn result in undue restrictions of physical exercise in children, as

well as feelings of distress and anxiety in both children and their parents. As far as prevention is concerned, emphasis should be placed on the management of obesity, the lack of exercise, and the avoidance of smoking; instead, thousands of children are stigmatised as having "hypercholesterolaemia" or "idiopathic hypertension", based on unreliable or inappropriate scientific evidence.

All cardiologists can and should examine children. Referral to a paediatric cardiologist is warranted only in a few cases, as with any referral to other specialties of cardiology. Older children referred for an athletic pre-participation examination present minimal deviations from the standard clinical evaluation, electrocardiogram and echocardiogram. Sudden death in athletes is a particularly tragic, as well as rare event (less than 1 in 100,000 athletes per year), much rarer than other cases of death in young people (e.g. road accidents, drug use, suicides). One should seek to exclude certain conditions, i.e. hypertrophic and other types of cardiomyopathy, Marfan syndrome, severe aortic stenosis, aortic coarctation, aberrant origin and course of anomalous coronary arteries, Wolff–Parkinson–White syndrome, and other rarer causes of sudden death in sports. All cardiologists treating adults have or can acquire expertise and experience in the identification of these conditions.¹

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A cardiologist can also diagnose and evaluate the severity of the simple and most common congenital heart diseases. Atrial defects not causing right ventricular dilatation do not require closure and impose no restriction of sporting activity. The same goes for ventricular septal defects and patent *ductus arteriosus*, as long as they do not cause haemodynamic deterioration. Bicuspid aortic valve commonly causes no restriction in childhood, which is also the case for mild to moderate pulmonary valve stenosis. The more severe and complex congenital heart abnormalities have generally already been diagnosed at birth and patients are followed up in specialised facilities or by specialists in grown-up congenital heart diseases.

A careful auscultation of the heart may reveal an innocent (normal) murmur in most children. In suspected abnormal murmur, an electrocardiogram is in most cases sufficient, although an echocardiogram will be difficult to avoid under the pressure of most paediatricians and the anxious parents. Since echocardiography is readily available, because of the abundance of cardiologists and echocardiography equipment, this is not necessarily bad, as long as it does not cause “echo disease”, i.e. false diagnoses. Children have a very good “acoustic window”, which allows easy demonstration of the normal back-flow through the atrioventricular and the pulmonary valves. Trivial regurgitation through a normal tricuspid aortic valve is not a rare finding in athletes, but does not seem to have any clinical significance. Hence, such diagnoses as “mild regurgitation or leakage” of the mitral, tricuspid and pulmonary valve are not justified in the conclusion of an echocardiographic study, and such formulations only create confusion and anxiety in parents, paediatricians and trainers. In all of the above situations the conclusion of the echocardiographic study should be “normal findings”.

The diagnosis of mitral valve prolapse in children, as in adults, is warranted only in cases of definite thickening of the mitral valve leaflets due to an excess of myxomatous tissue. The agile valve leaflets in children, in combination with the hyperdynamic circulation, may give the impression of prolapse, particularly if the echocardiographic views are even slightly modified. A significantly large number of children have been diagnosed incorrectly with mitral valve prolapse and have received a recommendation for exercise restrictions and chemoprophylaxis. The true incidence of mitral valve prolapse in children is about 1% and the course of this abnormality in childhood is almost always benign. Restriction of exercise in childhood, mainly isometric (static) exercise,

is justified only in the rare cases of significant mitral regurgitation or serious arrhythmias.

A patent *foramen ovale* may be found in most children, if meticulously sought. It is a normal finding and should be described as such in the echocardiographic study. No further investigation or exercise restriction or other recommendation is warranted. It is unacceptable to refer to the possibility of occlusion with an “umbrella” in the future. Such references are not supported by the current scientific evidence and have a great negative psychological impact on the whole family. The accidental finding of a patent *foramen ovale* is a typical case of iatrogenic “echo disease”, which is endemic in Greece.

Hypertension in childhood is rare and mostly secondary, commonly due to aortic coarctation or nephropathy. The current criteria for primary hypertension in children are arbitrary, since they are not based on documented studies. High blood pressure measurements, especially in obese and anxious children, do not predict the development of hypertension in adulthood. Screening children for hypertension has serious negative implications. Thousands of children with slight deviations from the arbitrarily defined “normal values” are labelled hypertensive and are subjected to a host of unnecessary or even risky diagnostic procedures. Following the British NICE recommendations, the recent American guidelines discourage screening for hypertension in children; unfortunately, it is still currently practised in Greece, leading to a high rate of false diagnoses and causing great distress to both children and their parents.^{2,3}

Normal cholesterol values in children are equally arbitrary and disputable. The American Heart Association points out that in childhood and adolescence the normal values for lipid levels and arterial pressure are indeterminable, since they represent “moving targets” in a population continuously moving through sequential development stages.⁴ Hence, the label of “hypercholesterolaemia” or “hypertension” in a child is not useful. Instead, the emphasis should be put on the prevention of obesity and smoking, as well as on the encouragement of routine exercise. Cholesterol is a valuable and indispensable building block in the development process; in particular, it is implicated in the synthesis of hormones and cell membranes, as well as the development of the brain and the entire nervous system. Therefore, there is a wide range of normal cholesterol levels depending on the development stage. In contrast to “familial hypercholesterolaemia”, a metabolic disorder that occurs in 1 out of every 500 children

and is associated with an increased risk of cardiovascular disease in adulthood, children and their families are nowadays faced much more frequently with the risk of “iatrogenic hypercholesterolaemia”. The latter has become endemic in Greece and has serious implications for children’s mental as well as physical health, as children are irrationally subjected to strict and harmful dietary restrictions and are prescribed statins and other medication off-label, with long-term side effects that are still unknown. There are “specialists” in this field who prescribe medication in children with incredible ease, using criteria that no international institution or medical association has endorsed. However, even the official recommendations have been rigorously criticised as unjustifiably aggressive.^{5,6}

There is a need to improve the training and confidence of cardiologists in the cardiovascular evaluation of children, so that “iatrogenic diseases” in children can be eliminated. A physician should not treat laboratory tests instead of patients, as it is often the case in contemporary medicine.⁷ Children are our future and are becoming proportionately fewer over time. Nowadays, their families are having to deal with serious financial and social problems. They do not need to be overwhelmed with non-existent disease. We have to persuade and encourage them to adopt healthy habits, not deprive them of their pleasures and the opportunity to enjoy life to the full.

References

1. Corrado D, Pelliccia A, Bjørnstad HH, et al. Cardiovascular pre-participation screening of young competitive athletes for prevention of sudden death: proposal for a common European protocol. Consensus Statement of the Study Group of Sport Cardiology of the Working Group of Cardiac Rehabilitation and Exercise Physiology and the Working Group of Myocardial and Pericardial Diseases of the European Society of Cardiology. *Eur Heart J.* 2005; 26: 516-524.
2. NSC, UK National Screening Committee. Screening for hypertension in children. External review against programme appraisal criteria for the UK National Screening Committee. Dec. 2010.
3. U.S. Preventive Services. Task Force Final Recommendation on Screening for Hypertension in Children and Adolescents. Oct. 2013.
4. Steinberger J, Daniels SR, Eckel RH, et al. Progress and challenges in metabolic syndrome in children and adolescents: a scientific statement from the American Heart Association Atherosclerosis, Hypertension, and Obesity in the Young Committee of the Council on Cardiovascular Disease in the Young; Council on Cardiovascular Nursing; and Council on Nutrition, Physical Activity, and Metabolism. *Circulation.* 2009; 119: 628-647.
5. Schroeder AR, Redberg RF. Cholesterol screening and management in children and young adults should start early – NO! *Clin Cardiol.* 2012; 35: 665-668.
6. Newman TB, Pletcher MJ, Hulley SB. Overly aggressive new guidelines for lipid screening in children: evidence of a broken process. *Pediatrics.* 2012; 130: 349-352.
7. Schroeder AR, Harris SJ, Newman TB. Safely doing less: a missing component of the patient safety dialogue. *Pediatrics.* 2011; 128: e1596-1597.