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AHA/ACC SCIENTIFIC STATEMENT

Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Task Force 4: Congenital Heart Disease

A Scientific Statement From the American Heart Association and American College of Cardiology

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Congenital heart disease (CHD) is the most common form of serious birth defect, occurring in 8 per 1,000 live births (1). The past several decades have seen dramatic improvements in survival with palliative or corrective heart surgery, such that there are now more adult patients than pediatric patients alive with CHD. Although restriction from competitive athletics may well be indicated for some, the great majority of patients can and should engage in some form of physical activity and should avoid a sedentary lifestyle. Clinicians should encourage their patients to engage in healthy physical activities, bearing in mind specific features in some patients, such as residual obstruction, pulmonary vascular disease, low systemic ventricular function, and preexisting arrhythmias in the presence of implanted cardiac rhythm devices such as pacemakers and implantable cardioverter-defibrillators. In addition, the physiological effects of athletic activities at high altitude should be considered for patients with elevated pulmonary vascular resistance. These issues are covered elsewhere in this document. Fortunately,

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although repaired CHD is clearly associated with the development of arrhythmias such as atrial flutter and ventricular tachycardia, exercise does not appear to contribute to the risk.

The level of sports participation recommended includes consideration of both the training and the competitive aspects of the activity but must be individualized to the particular patient, taking into account the patient's functional status and history of surgery. Noninvasive testing, such as formal exercise testing, Holter monitoring, echocardiography, and cardiac magnetic resonance imaging studies, is also often useful.

TYPES OF CONGENITAL DEFECTS

Simple Shunting Lesions (Atrial Septal Defect, Ventricular Septal Defect, Patent Ductus Arteriosus), Treated and Untreated

Of the 8 most common subtypes of CHD, ventricular septal defect (VSD; 34%), atrial septal defect (ASD; 13%), and patent ductus arteriosus (PDA; 10%), respectively, are the most common (2). With rare exceptions, patients with hemodynamically insignificant CHD such as VSD, ASD, and PDA may participate competitively in all sports. There are no demonstrative data that children with hemodynamically insignificant VSD (open or after closure), ASD (open or after closure), or PDA (open or after closure) require exercise limitations or that these lesions are related to acknowledged episodes of sudden cardiac death (SCD) (3,4). Patients with associated pulmonary hypertension secondary to the above-mentioned lesions that is hemodynamically significant can develop acute symptoms, including reduced exercise capacity or, more importantly, arrhythmias, syncope, chest pain, or sudden death (5,6). For the purposes of this document, pulmonary hypertension is defined as a mean pulmonary artery pressure >25 mm Hg or a pulmonary vascular resistance index of >3 Wood units.

Patients with right-to-left shunting may become more cyanotic during exercise, at least in part because of changes in the ratio of systemic vascular resistance to pulmonary vascular resistance, which can result in increased hypoxemia. Therefore, full clinical assessment, including laboratory and exercise testing, should be considered before any physical activity, because this population represents a very high risk of sudden death (6). Additional precautions should be taken when these patients are exercising at altitude, because the pulmonary vascular resistance generally rises, thus increasing the degree of hypoxemia and cardiac workload.

Children with open or surgically closed VSDs have a normal exercise capacity despite a mild chronotropic limitation in the latter. Some data suggest that aerobic capacity is reduced in patients with open or closed VSDs, as well as in patients with closed ASDs. Abnormal right ventricular (RV) and pulmonary pressure can also occur in those with isolated VSDs; however, these findings did not impact these exercise recommendations or identify any episodes of SCD (7).

ASD: Untreated

Recommendations

1. **It is recommended that athletes with small defects (<6 mm), normal right-sided heart volume, and no pulmonary hypertension should be allowed to participate in all sports *(Class I; Level of Evidence C)*.**
2. **It is recommended that athletes with a large ASD and no pulmonary hypertension should be allowed to participate in all sports *(Class I; Level of Evidence C)*.**
3. **Athletes with an ASD and pulmonary hypertension may be considered for participation in low-intensity class IA sports *(Class I; Level of Evidence C)*.**
4. **Athletes with associated pulmonary vascular obstructive disease who have cyanosis and a large right-to-left shunt should be restricted from participation in all competitive sports, with the possible exception of class IA sports *(Class III; Level of Evidence C)*.**

ASD: After Surgical Repair or Closure by Interventional Catheterization

Recommendations

1. **Three to 6 months after operation or intervention, athletes without pulmonary hypertension, myocardial dysfunction, or arrhythmias may participate in all sports *(Class I; Level of Evidence C)*.**
2. **After operation or intervention, patients with pulmonary hypertension, arrhythmias, or myocardial dysfunction may be considered for participation in low-intensity class IA sports *(Class IIb; Level of Evidence C)*.**

VSD: Untreated

Recommendations

1. **An athlete with a small or restrictive VSD with normal heart size and no pulmonary hypertension can participate in all sports *(Class I; Level of Evidence C)*.**
2. **An athlete with a large, hemodynamically significant VSD and pulmonary hypertension may consider participation in only low-intensity class IA sports *(Class IIb; Level of Evidence C)*.**