

# Cardiac Dysrhythmias and Sports

Committee on Sports Medicine and Fitness

Sudden unexpected death during athletic participation is the overriding consideration in advising individuals with dysrhythmias about participation in sports. The incidence of sudden death is 1 to 2 per 200 000 athletes per year and approximately 12 per year in US high school athletes.<sup>1</sup> Between 5 and 22% of these deaths occur during sports or physical activities that include basketball, racquetball, jogging, football, soccer, and golf.<sup>2</sup> The remainder occur during sedentary activities.<sup>2</sup> Another potential risk for the athlete with a dysrhythmia is injury to self or others from syncope or near syncope while playing sports.

The leading cause of sudden unexpected cardiac death is hypertrophic cardiomyopathy.<sup>1</sup> A dysrhythmia of ventricular or supraventricular origin may be a significant factor in the sudden unexpected death of these individuals.<sup>1</sup> Myocarditis is also a cause of sudden cardiac death. Severe dysrhythmia may be a prominent feature of myocarditis even in the absence of significant cardiac dysfunction.<sup>1</sup> This diagnosis should be considered in an individual who has a recent sudden onset of a symptomatic dysrhythmia.<sup>3</sup> Ventricular dysrhythmias with exercise are a potential cause of death in individuals with arrhythmogenic right ventricular dysplasia (a rare muscle disorder of the right ventricle).<sup>1</sup>

Sudden death resulting from dysrhythmia can occur with exertion or excitement in individuals who have hereditary syndromes that include prolongation of the QT<sub>c</sub> interval.<sup>3</sup> Sudden death has also been associated with mitral valve prolapse (rarely) and with Wolff-Parkinson-White syndrome.<sup>3</sup>

## MEDICAL HISTORY

The patient's medical history is of critical importance. Dysrhythmias may be episodic and not apparent at the time of physical examination. Some disorders, such as the prolonged QT<sub>c</sub> interval syndrome, may be familial, and a family history of dysrhythmias or sudden death sometimes provides a clue to their presence. It is also imperative to distinguish between dysrhythmias occurring in a patient with a structurally normal heart and those occurring in a patient with congenital heart disease, including one who has had cardiac surgery, because the prognosis

in the latter group may be less favorable as a result of progression of the lesion. Certain medications or drugs of abuse (eg, tricyclic antidepressants, inhalants, or cocaine) can cause dysrhythmias.<sup>4</sup> Anorexia nervosa can cause a prolonged QT<sub>c</sub> interval or significant bradycardia. Specific information should be obtained regarding a history of syncope or near syncope, dizziness or light-headedness, seizures, palpitations, chest pain, pallor, previously diagnosed dysrhythmias or heart disease, or use of medications.<sup>2</sup> It is important to determine whether any family members have died suddenly or unexpectedly or have had any of the following conditions: syncope; dysrhythmia; mitral valve prolapse; prolonged QT<sub>c</sub> syndrome; or hypertrophic cardiomyopathy.<sup>2</sup> Further diagnostic studies and cardiac consultation are indicated if abnormalities are suggested from the history or physical examination.

## TESTING

The most common dysrhythmias in school-aged children are sinus dysrhythmias and premature atrial contractions.<sup>3</sup> These dysrhythmias are benign if the heart is structurally normal. An electrocardiogram demonstrates sinus dysrhythmia or premature atrial contractions. No other cardiac studies are necessary.

Further evaluation is indicated for ventricular ectopic beats or more complex dysrhythmias. Formal exercise electrocardiography (exercise test) is a useful technique for both the evaluation and documentation of dysrhythmias because exercise may provoke, modify, or suppress the dysrhythmia. The sinus tachycardia that normally occurs during exercise may suppress the dysrhythmia by increasing the sinoatrial node frequency and inhibiting the ectopic focus before it reaches its threshold potential. The sinus rate that usually suppresses this focus is about 150 beats per minute in the asymptomatic patient. If the premature ventricular contractions disappear when the cardiac rate reaches 140 to 150 beats per minute, the ectopic beats are benign and do not require further evaluation.<sup>3</sup> This exercise test may be ordered by a pediatrician or a pediatric cardiologist.

## REFERRAL

The presence of a symptomatic dysrhythmia requires exclusion from physical activity until this problem can be adequately evaluated by a cardiologist and controlled. Graded exercise electrocardiographic testing, 24-hour electrocardiographic (Holter) monitoring, transient dysrhythmia monitoring or event monitoring, and echocardiography are

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The recommendations in this statement do not indicate an exclusive course of treatment or procedure to be followed. Variations, taking into account individual circumstances, may be appropriate.

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often utilized in this evaluation. During both exercise testing and ambulatory monitoring, the patient's activities should be as similar as possible to those experienced during sports participation.

### RECOMMENDATIONS

The recommendations of the American Academy of Pediatrics are in agreement with those of the 26th Bethesda Conference on Cardiovascular Abnormalities in the Athlete.<sup>4</sup>

The American Academy of Pediatrics recommends that athletes with dysrhythmias be evaluated.<sup>4</sup> Athletes who are suspected of having structural heart disease or significant conduction defects (eg, the presence of a heart murmur or an abnormal chest radiograph, electrocardiogram, or echocardiogram) or are symptomatic (ie, they experience syncope, near syncope, pallor, chest pain, or other symptoms of dysrhythmia) require consultation with, or referral to, a cardiologist before permission to participate in sports can be granted.

#### Disturbance of Sinus Node Function

Patients with a structurally normal heart whose dysrhythmia produces no symptoms and does not worsen with increased activity may participate in all sports.

1. Patients with syncope, near syncope, or other symptoms of dysrhythmia must not participate in sports until the cause of their condition has been determined and treated.
2. Patients whose symptoms clearly are attributable to a dysrhythmia should be treated and, if they remain asymptomatic for 3 to 6 months, may participate in all sports after re-evaluation by a cardiologist.
3. Patients treated with a pacemaker must not engage in sports without the approval of a cardiologist.

#### Premature Atrial Complexes

Patients with premature atrial complexes may participate in all sports.

#### Atrial Flutter and/or Fibrillation

Patients with atrial flutter, fibrillation, or both must be evaluated by a cardiologist before clearance is given for participation in sports.

#### Premature Atrioventricular Junctional Complexes

Patients who have a structurally normal heart without evidence of sustained tachycardia and with a normal heart rate response to activity may participate in all sports. Patients with an abnormal heart, depending on the type and extent of heart disease as determined by a cardiologist, may participate in low-intensity sports as described by the 26th Bethesda Conference on Cardiovascular Abnormalities in the Athlete.<sup>5</sup>

#### Supraventricular Tachycardia

Patients with prior supraventricular tachycardia who have had no recurrences on therapy during the previous 6 months demonstrated by testing may participate in all sports. Patients who do not have any

exercise-induced supraventricular tachycardia but experience rare, brief recurrences should have an attempt at prevention but may participate in low-intensity sports as outlined by the 26th Bethesda Conference.<sup>5</sup> Patients with obstructive heart disease, syncope, near syncope, or other symptoms of dysrhythmia must not participate in any competitive sports until they have been adequately treated and have had no recurrence of symptoms or documented dysrhythmia for at least 6 months (by history, exercise electrocardiography, and Holter monitoring).

#### Ventricular Preexcitation, or Wolff-Parkinson-White Syndrome

Evaluation by a cardiologist is warranted before participation. Patients without structural heart disease or a history of palpitations or tachycardia may participate in most sports. An in-depth evaluation is recommended before participation in moderate or high-intensity sports or competitive situations.<sup>5</sup>

#### Premature Ventricular Complexes

Patients with no structural heart disease, in whom premature ventricular complexes disappear during exercise at a heart rate of approximately 150 beats per minute, may participate in all sports if the premature ventricular contractions are uniform. All other patients with premature ventricular contractions must be evaluated by a cardiologist before participation is approved. This includes patients in whom premature ventricular complexes increase in frequency or occur in pairs or runs during exercise. Patients with structural heart disease who have premature ventricular contractions must be excluded from high- or moderate-intensity competitive sports, with or without treatment.<sup>5</sup> Patients with premature ventricular complexes and prolongation of the QT<sub>c</sub> interval must not participate in competitive athletics.

#### Ventricular Tachycardia

All patients with ventricular tachycardia should be evaluated by a cardiologist. Patients who have unsustained ventricular tachycardia with QRS complexes of uniform configuration at a rate of <150 beats per minute, and who have no structural heart disease or symptoms of dysrhythmia such as syncope or near syncope, may participate in all sports after clearance from a cardiologist. Patients who have structural heart disease; a history of syncope, near syncope, or other symptoms of dysrhythmia; ventricular tachycardia during exertion; or a prolonged QT<sub>c</sub> interval syndrome must not engage in any competitive sports.

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