

Sport activity in patients with myocarditis and pericarditis

Sportske aktivnosti kod bolesnika s miokarditisom i perikarditisom

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Summary

Myocarditis and pericarditis may be related with sudden cardiac death/cardiac arrest (SCD/CA) in athletes, not exclusively in those with reduced left ventricular systolic function, but also in subjects with normal cardiac function related to arrhythmias generated in the area of myocardial necrosis and scar. The diagnosis is based on a complete cardiac evaluation (12-lead ECG, echocardiography, cardiac magnetic resonance imaging, and endomyocardial biopsy).

In this review, we outline the latest recommendations published by the Sport Cardiology Section of the European Association of Preventive Cardiology (EAPC) on sport activity with these patients. It offers recommendations for practicing cardiologists and sport physicians for safe participation in competitive sport at professional and amateur level. Participation in competitive sport should be considered on an individual basis, after the evaluation of the disease characteristics and risk determinants, and complete resolution of the inflammatory process.

Key words: myocarditis, pericarditis, athletes, competitive sport.

Sažetak

Miokarditis i perikarditis mogu biti povezani s iznenadnom smrću/kardijalnim arestom u sportaša, ne isključivo u onih s reduciranom sistoličkom funkcijom lijevog ventrikla, nego i kod osoba s normalnom srčanom funkcijom i aritmijama generiranim u području miokardijalne nekroze i ožiljka. Dijagnostika je bazirana na kompletnoj kardiološkoj obradi (elektrokardiogram, ehokardiografija, magnetska rezonancija srca, endomiokardijalna biopsija).

U ovom preglednom članku donosimo najnovije preporuke Sekcije za sportsku kardiologiju pri Europskom društvu za preventivnu kardiologiju (engl. EAPC) o sportskoj aktivnosti kod navedenih bolesnika. Donosimo preporuke za kardiologe i sportske liječnike za sigurno sudjelovanje u kompetitivnom sportu na profesionalnoj i amaterskoj razini. Sudjelovanje u kompetitivnom sportu treba razmotriti na individualnoj bazi, nakon evaluacije karakteristika same bolesti i čimbenika rizika, i nakon kompletne rezolucije upalnoga procesa.

Ključne riječi: miokarditis, perikarditis, sportaši, kompetitivni sport.

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Introduction

Myocarditis and pericarditis are usually infective etiology (ie. viral, tuberculosis), but also can be a consequence of autoimmune processes, and are related with sudden cardiac death/cardiac arrest (SCD/CA) in athletes. The diagnosis is based on complete cardiac evaluation (12-lead ECG, echocardiography, cardiac magnetic resonance imaging (CMRI)), including endomyocardial biopsy (EMB) at myocarditis of doubtful etiology (viral vs giant cell or sarcoidosis) for adequate treatment choice and prognosis improvement.¹

In this review article, we outline the latest recommendations published by the Sport Cardiology Section of the European Association of Preventive Cardiology (EAPC) on sport activity, which provides pragmatic advice for safe participation in competitive sport at professional and amateur level.¹

Myocarditis

It is an inflammatory process of the myocardium, with histological evidence of myocyte degeneration and necrosis of non-ischaemic origin, associated with inflammatory infiltration.^{2,3} It could be a cause of SCD/CA with athletes in 2-8% of cases.^{4,6} Clinical presentation may include respiratory symptoms, diarrhea, fatigue as well as arrhythmia, heart failure, or simulate myocardial infarction.^{2,3}

Diagnostic evaluation

Routine evaluation should include the measurement of serum cardiac biomarkers.^{2,3} 12-lead ECG may include ventricular and supraventricular arrhythmias, ST-segment alterations, T-wave inversion, various conduction abnormalities (LBBB, AV block) and low QRS amplitude (heart failure, pericardial effusion).⁷

Echocardiographic changes may reveal a mild dilatation of LV cavity and thin myocardial walls (like in DCM). Other subjects may have normal LV cavity and increased LV wall thickness related to myocardial oedema.⁸ Other findings include LV systolic dysfunction and pericardial effusion.⁹ CMRI has excellent sensitivity in detecting myocarditis and can identify hyperaemia, inflammation oedema, and/or focal scar.^{10,11} Detection of late gadolinium enhancement (LGE) is a strong independent predictor of events during follow-up.¹⁰⁻¹⁴

Endomyocardial biopsy (EMB) is the gold-standard for the diagnosis of myocarditis. Immuno-biochemical testing and polymerase chain reaction (PCR) analysis allows definitive diagnosis and

identification of viral genome. EMB is not usually performed for clinical diagnosis, but it is crucial for differentiation between the viral and non-viral myocarditis (ie giant cell, sarcoidosis) and for adequate treatment choice as well as prognosis improvement.^{15,16}

Recommendations

The major risk of SCD/CA is related to LV dysfunction and less with the severity of myocardial inflammation and serum concentrations of cardiac troponin.^{6, 17, 18} However, SCD/CA may occur despite normal LV function and is mostly related to tachyarrhythmias from the region of the remaining myocardial scar. Therefore, the interval between the initial assessment and retesting before resumption of sports will vary on individual basis depending on the severity of the initial illness and morphological sequelae. Thus, recommendations are as follows:

- Athletes with diagnosis of myocarditis should be restricted from exercise programs for a period of 3–6 months, according to the clinical severity and duration of the illness, LV function at onset, and extent of inflammation on the CMRI. This time period is considered appropriate to ensure the clinical and biological resolution of the disease (Class IIb/Level C),^{3,17-21}

- Individuals with previous myocarditis have an increased risk for recurrence and silent clinical progression of the disease. Therefore, athletes with previous myocarditis should undergo a periodical re-assessment, particularly within the first 2 years (Class IIa/ Level C);

- It is reasonable for athletes to resume training and competition after myocarditis, if all of the following criteria are met: LV systolic function has returned to the normal range, serum biomarkers of myocardial injury have normalized, and clinically relevant arrhythmias, such as frequent or complex repetitive forms of ventricular or supraventricular arrhythmias are absent on 24-h ECG monitoring and exercise test (Class IIa/ Level C); and

- The clinical significance of persistent LGE in an asymptomatic athlete with clinically healed myocarditis is unknown. However, a myocardial scar is a potential source of ventricular tachyarrhythmias.¹²⁻¹⁴ At present, it seems reasonable for these athletes to resume training and participate in competitive sport if LV function is preserved and in the absence of frequent or complex repetitive forms of ventricular or supra-ventricular arrhythmias during maximal exercise and on 24-h ECG monitoring (including session of training/competition). Asymptomatic athletes with

LGE, however, should remain under annual clinical surveillance (Class III/ Level C).

Pericarditis

Pericarditis is defined as an inflammatory process of the pericardium, with potential involvement of the sub-epicardial layers of the myocardium.^{3,22} It is usually caused by viruses, while in developing countries the most frequent cause is tuberculosis.^{22,23} Clinical presentation may include chest pain, fatigue and dyspnoea, usually preceded with respiratory and gastrointestinal symptoms. Pericarditis and myocarditis may coexist (20–30%), with elevation of serum cardiac troponins and myocardial edema on CMR. Such subjects have an increased risk for complications (i.e. LV dysfunction).

Diagnostic evaluation

Increased serum cardiac biomarkers may be related to myocardial involvement.²³ The 12-lead ECG may include widespread ST-segment elevation, or PR interval depression in the acute phase. Echocardiographic changes may include pericardial effusion at the onset of the disease, while pericarditis with increased biomarkers for cardiac damage should be investigated with CMRI to assess the extent of myocardial involvement.

Recommendations

Individuals with pericarditis usually have an excellent prognosis with complete resolution of the pathological process.^{3,22,23} However, patients with idiopathic acute pericarditis and certain features at presentation (temperature >38°C), subacute course, large pericardial effusion, and resistance to non-steroidal anti-inflammatory drugs comprise a subset of patients with a more guarded prognosis and a greater risk for recurrence and progressing to pericardial constriction.^{3,18,23} Thus, recommendations are as follows:

- Athletes with pericarditis should not participate in competitive sports during the acute phase. Athletes can return to sport activity only after a complete resolution of the active disease. The time period of 3 months is considered appropriate to ensure a complete clinical and biological resolution of the disease, but a shorter period (at least 1 month) may be considered in selected cases with only a mild clinical picture and prompt resolution. (Class III, Level C);

- It is reasonable to return to play if the serum biomarkers have normalized, LV function is normal

and there are no resting, or exercise-induced frequent/complex ventricular arrhythmias detectable on 24-h ECG monitoring or exercise ECG (Class IIa, Level C);

- Athletes with concomitant myocardial involvement should be treated in accordance with the recommendations for myocarditis (Class IIa, Level C); and

- Asymptomatic athletes with small pericardial effusion, detected incidentally by imaging testing, but without clinical, biochemical and CMR evidence of myocardial inflammation, should not be considered as affected by myopericarditis and should not be restricted from sport participation. A periodical surveillance is however advisable. (Class IIb, Level C).

Conclusion

The diagnosis of myocarditis and pericarditis is based on complete cardiac evaluation (12-lead ECG, echocardiography, CMRI), including EMB in patients with myocarditis of doubtful etiology. Both entities may be the cause of SCD/CA in athletes, not exclusively in those with reduced LV systolic function, but also in subjects with normal cardiac function related to arrhythmias generated in the area of myocardial necrosis and scar. Participation in competitive sport should be considered on an individual basis, after the evaluation of the disease characteristics and risk determinants, and complete resolution of the inflammatory process.

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