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심장 질환자 및 심장 수술을 받은 사람의 스포츠 활동 처방

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Sport Activities in the Patients with Cardiac Disorder and Who Underwent Cardiac Surgery

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Abstract

Prescription of sports participation in the patients with cardiac disorder and who underwent cardiac surgery requires assessment of sports type, athlete type, cardiac disorders and drugs the athlete is taking. The type of exercise can be classified according to the portion of dynamic and static components and intensity. Also the likelihood of impact occurrence during exercise should be assessed. Type of athlete can be divided competitive or recreational athlete according to the intensity and purpose of sporting. Exercise recommendation should be based on risk stratification according to the athletes' cardiac disorder or type of surgery and should be regularly assessed. Finally for athletes using anticoagulation or antiplatelet should consider participating in low impact sports. Meticulous approach is required for exercise prescription in order to insure safe sports activities in the patients with cardiac disorder and who underwent cardiac surgery.

Key Words

Sport activity, Cardiac rehabilitation, Cardiac surgery, Risk

Introduction

Returning to sports activities after cardiac surgery requires meticulous approach in order to reduce the risk of adverse events, especially in the competitive, elite athletes. While vigorous physical activity is recommended as a key component in the prevention of cardiovascular disease which is associated with reduced cardiovascular and all-cause mortality [1], the sports participation in the competitive athletes needs a balance between the potential benefits of exercise, the risk of adverse events such as sudden death, and the athlete's goals for continuing the

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sports participation [2].

Another aspect of adverse event that can occur during sport activity is major bleeding including intracranial hemorrhage especially during participation of contact sports. Since a large portion of patients who undergo cardiac surgery requires anticoagulation or antiplatelet therapy after surgery, the possibility of contact-induced bleeding event should be also taken into account [3].

In this article, we will overview the classifications of sports activities and athletes, and latest guidelines from European Society of Cardiology (ESC) [2] and American Heart Association and the American College of Cardiology (AHA/ACC) [4-8] on the sports activity participation according to the heart disease and surgery types.

Main Text

1) Classifications on sports activities

ESC guideline classifies types of sports based on the proportion of exercise components (aerobic and resistance exercise) and the degree of skills needed to perform. Types of sports are classified into skill, power, mixed and endurance exercise [2]. With in each category, the intensity is defined using ranges of maximal oxygen consumption, maximal heart rate (HR) or HR reserve acquired from maximal exercise testing. AHA/ACC guideline classifies the types of sports by proportion of dynamic and static component of which specific underlying cardiovascular may be more susceptible to complications [5]. In the dynamic exercise, there is proportional increase of cardiac output to oxygen consumption and increase in the intensity leads to increased HR, stroke volume, end-diastolic volume and decreased end-systolic volume. While in the static exercise, large, sustained blood pressure (BP) changes through exercise pressor reflex. Thus increase in the intensity of static exercise results in increased BP, while no relatively no change to end-diastolic/end-systolic volume [9]. Moreover, if Valsalva maneuver, often used in strength exercise, is applied, there can be additional BP rise. In short, dynamic components affects volume load to left ventricle and static components affect pressure load to left ventricle.

Another category of sports classification is defined by the likelihood of impact during sports [5]. This is important because anticoagulation/antiplatelet therapy is often required to the patients who undergo cardiac surgery and there is increased risk of intracranial hemorrhage (ICH) development in the impact-expected sports participation. The possibility of impact during sports may differ by age, with college/professional participants playing more competitively than the younger high-school players, leading to higher possibility of having impact [10].

2) Classifications on athletes

Athlete is defined as ‘an individual of young or adult age, either amateur or professional, who is engaged in regular exercise training and participates in official sports competition’ according to ESC [11]. AHA/ACC guidelines’ definition of athlete is similar, with classification of athletes into competitive athlete who participates in an organized team or individual sport that requires regular competition against others as a central component, places a high premium on excellence and achievement, and requires some form of systematic (and usually intense) training and recreational athletes who participate in sports for pleasure, at a lower level of competition, and typically do not require systematic training [12].

3) Guidelines on sports activity participation according to heart disease and surgery type

In this section, we will review recommendations for exercise participation in 3 major cardiac disorders and related cardiac surgery as well as guidelines for exercise participation according to the anticoagulation/antiplatelet usage.

(1) Patients who had coronary artery disease (CAD) and underwent surgery (intervention)

According to ESC guideline, patients who has CAD requires risk stratification before engaging exercise [2]. Low risk profiles include, absence of critical coronary stenosis, Normal, age-adjusted exercise capacity, absence of inducible ischemia on maximal exercise testing, absence of major ventricular tachyarrhythmia, polymorphic or very frequent ventricular extra beats at rest and during maximal stress testing). High risk profiles include Presence of at least one critical coronary stenosis of a major coronary artery (> 70%) or left main stem (> 50%) on coronary angiography, ejection fraction < 50% on echocardiography, exercise-induced ischemia with 0.1 mV ST depression in two chest leads or ST elevation > 0.1 mV or new left bundle branch block at low exercise intensity or immediately post-exercise, Dyspnea at low exercise intensity, relevant ventricular tachyarrhythmia, symptoms such as dizziness or syncope on exertion [13]. If the patient fulfills all the low-risk profiles, the patient is classified as low risk group. If there is any high risk profile, the patient is regarded as high risk group. Competitive sports activities should be considered in individuals at low risk, and not recommended in the high risk group, except for the individually recommended skill sports. Leisure exercise below the angina and ischemic thresholds can be considered in the high risk group [2]. Patients who underwent percutaneous coronary intervention of surgical revascularization within a year are considered as high-risk group.

The AHA/ACC guideline also recommends competitive sporting activities to the patients with ejection fraction > 50%, asymptomatic and no inducible ischemia or electrical instability during exercise. Patients who do not fulfill the above mentioned criteria, are recommended to participate in exercises with low dynamic and low to moderate static demands [8]. Patients who underwent coronary revascularization are prohibited from competitive sport participation for at least 3 months.

(2) Patients who had valvular disease and underwent surgery (intervention)

The ESC guideline prohibits all patients with symptomatic aortic valve stenosis (AS) or aortic valve regurgitation (AR) in participating any competitive sport or recreational sports. Only mild exercise that does not provoke symptom may be considered. All patients with symptomatic mitral valve stenosis (MS) or mitral valve regurgitation (MR) are also prohibited from participating in any competitive sport or recreational sport with moderate to severe intensity. Low intensity exercise that does not provoke symptom may be considered. All participants with asymptomatic Tricuspid valve regurgitation, bicuspid aortic valve (BAV), mitral valve prolapse can participate in all competitive and leisure sports [2].

AHA/ACC guideline provides detailed recommendations after cardiac valve surgery. Athletes with aortic or mitral bio-prosthetic valves, not taking anticoagulant agents, and who have normal valvular and cardiac function can participate in low to moderate intensity competitive sports. Patients with aortic or mitral mechanical prosthetic valves taking anticoagulant agents with normal valvular and cardiac function can participate in low-intensity, low-impact competitive sports. Patients with MS who have undergone successful repair can participate in competitive sports based on the residual severity of the MS or MR and pulmonary artery pressures at rest and with exercise. Athletes who received mitral valve repair for mitral valve regurgitation or surgical aortic valve repair with no or mild residual AR or MR, and have normal cardiac function may be considered for participation in competitive sports with low impact [6].

(3) Patients who had aortic disease and underwent surgery (intervention)

In general, dynamic exercise are more suitable than the static exercises in the patients with aortic disease. Risk stratification is required in this group of patients before engaging exercise, while high risk factor includes severe aortic dilatation in which group, all competitive sports are

prohibited. Low risk group, who has aorta < 40 mm in BAV or tricuspid valve, can participate in all competitive, leisure sports except for the power sports [2].

AHA/ACC guideline recommends participation in low static, low dynamic and low impact sports in the patients who underwent surgical correction of aortic root or ascending aorta aneurysm or dissection with no evidence of residual aortic enlargement or dissection. Athletes with Marfan syndrome, familial thoracic aortic aneurysm syndrome, Loeys-Dietz syndrome should not participate in competitive sports with impact [7].

For the exercise prescription in the post-aortic dissection patients, Chaddha et al. [14], recommended engagement in aerobic activity at an intensity of 3 to 5 metabolic equivalents (moderate exertion), for at least 30 minutes on most days of the week, for a total of 150 minutes/week or more. For weightlifting exercise, using small amounts of weight and stopping several repetitions before failure was recommended.

(4) Patients who take anticoagulant or antiplatelet

It is recommended that athletes receiving anticoagulation (vitamin K antagonists or direct thrombin or factor Xa inhibitor) should not participate in sports with impact expected, in which the risk of intracranial hemorrhage is increased. Individuals taking dual antiplatelet agents should avoid sports with impact expected, due to increased hemorrhage risk [3].

Conclusion

Meticulous approach is required for exercise prescription in the athletes with cardiac disorder and who underwent cardiac surgery. Exercise type, intensity, likelihood of impact during sports and degree of exercise participation (whether the athlete is competitive or recreational) should be taken into account along with the status of underlying cardiac disorder, type of surgery and drugs (anticoagulation/antiplatelet) of the patient should all be considered in order for safe exercise prescription.

REFERENCES

1. Piepoli MF, Hoes AW, Agewall S, Albus C, Brotons C, Catapano AL, et al. 2016 European guidelines on Cardiovascular Diseases prevention in clinical practice the Sixth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Diseases Prevention in Clinical Practice (constituted by representatives of 10 societies and invited experts). Eur J Prev Cardiol 2016;23:NP1.
2. Pelliccia A, Sharma S, Gati S, Bäck M, Börjesson M, Caselli S, et al. 2020 ESC guidelines on sports cardiology and exercise in patients with cardiovascular disease. Eur Heart J 2021;42:17-96.
3. Kichloo A, Amir R, Wani F, Randhawa S, Rudd B, Rechlin D. Anticoagulation and antiplatelet therapy in contact sports: is it career limiting? J Investig Med 2021;69:781-4.
4. Maron BJ, Zipes DP, Kovacs RJ. Eligibility and disqualification recommendations for competitive athletes with cardiovascular abnormalities: Preamble, principles, and general considerations. Circulation 2015;132:e256-e61.
5. Levine BD, Baggish AL, Kovacs RJ, Link MS, Maron MS, Mitchell JH. Eligibility and disqualification recommendations for competitive athletes with cardiovascular abnormalities: Task force 1: Classification of sports: Dynamic, static, and impact. Circulation 2015;132:e262-e6.
6. Bonow RO, Nishimura RA, Thompson PD, Udelson JE. Eligibility and disqualification recommendations for competitive athletes with cardiovascular abnormalities: task force 5: valvular heart disease: a scientific statement from the American Heart Association and American College of Cardiology. Circulation 2015;132:e292-e7.
7. Braverman AC, Harris KM, Kovacs RJ, Maron BJ. Eligibility and disqualification recommendations for

competitive athletes with cardiovascular abnormalities: task force 7: aortic diseases, including Marfan syndrome: a scientific statement from the American Heart Association and American College of Cardiology. Circulation 2015;132:e303-e9.

8. Thompson PD, Myerburg RJ, Levine BD, Udelson JE, Kovacs RJ. Eligibility and disqualification recommendations for competitive athletes with cardiovascular abnormalities: task force 8: coronary artery disease: a scientific statement from the American Heart Association and American College of Cardiology. Circulation 2015;132:e310-e4.
9. Schibye B, Mitchell JH, Payne FC, Saltin B. Blood pressure and heart rate response to static exercise in relation to electromyographic activity and force development. Acta Physiol Scand 1981;113:61-6.
10. Harmon KG, Drezner J, Gammons M, Guskiewicz K, Halstead M, Herring S, et al. American Medical Society for Sports Medicine position statement: concussion in sport. Clin J Sport Med 2013;23:1-18.
11. Solberg EE, Borjesson M, Sharma S, Papadakis M, Wilhelm M, Drezner JA, et al. Sudden cardiac arrest in sports - need for uniform registration: A position paper from the sport cardiology section of the European Association for Cardiovascular Prevention and Rehabilitation. Eur J Prev Cardiol 2016;23:657-67.
12. McKinney J, Velghe J, Fee J, Isserow S, Drezner JA. Defining athletes and exercisers. Am J Cardiol 2019;123:532-5.
13. Borjesson M, Dellborg M, Niebauer J, LaGerche A, Schmied C, Solberg EE, et al. Recommendations for participation in leisure time or competitive sports in athletes-patients with coronary artery disease: a position statement from the sports cardiology section of the European Association of Preventive Cardiology (EAPC). Eur Heart J 2019;40:13-8.
14. Chaddha A, Kline-Rogers E, Woznicki EM, Brook R, Housholder-Hughes S, Braverman AC, et al. Cardiology patient page. Activity recommendations for postaortic dissection patients. Circulation 2014;130:e140-2.