Proceedings of ICBioMed 2025 Symposium: Extended Reality (XR) Applications in Medical Imaging
DOI: 10.54254/2753-8818/114/2025.PJ23387

Risk Screening of Premature Heartbeat and Sports Rehabilitation

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Abstract: Due to the increase in the number of early cardiac groups in today's society, there is no complete screening and rehabilitation process for early cardiac groups at the social level. This paper mainly studies the whole process of screening methods and sports rehabilitation methods to improve the quality of life of patients and help the body recover. This article mainly summarizes and reviews the relevant papers in the past and concludes that the screening of early heart disease requires a variety of means of synchronous cooperation. Holter, electrocardiogram, B-ultrasound and exercise electrocardiogram are synchronously coordinated to determine the risk of premature heartbeat. In cooperation with medium- and low-intensity aerobic training and strength training, physical recovery and improvement of heart function. As a relatively common heart disease, the popularization of the perception of the disease should not only be at the doctor's level, but should also make patients correctly recognize the means of rehabilitation and recovery of the disease, so that patients can reduce psychological pressure and face it positively. Having a correct and complete understanding of the disease can also help the body recover.

Keywords: Early heartbeat, risk screening, sports rehabilitation

1. Introduction

The pace of modern social life is accelerating, and people are facing high-intensity work, learning tasks and complex socializing. In this state for a long time, staying up late, insomnia and other problems are more common. Staying up late will disturb the human body's biological clock and interfere with the normal rhythm regulation mechanism of the heart. The symptoms of early heartbeat are becoming more and more common in modern people. Early heartbeat has become a common arrhythmia. It refers to the pulsation of the heart that occurs in advance outside the normal rhythm. Because most patients with early heartbeat have an unclear understanding of the disease, it further increases psychological anxiety, thus aggravating the premature heartbeat. Symptoms, the severity of premature heartbeat can be roughly divided into benign premature heartbeat and malignant premature heartbeat. Severe malignant premature heartbeat may expose patients to serious risks, such as causing more serious arrhythmia and affecting heart function. As an important part of heart disease management, sports rehabilitation has potential value for the rehabilitation and improvement of the quality of life of patients with premature heartbeat. This article aims to review the screening methods of early heartbeat, so that people with early heartbeat can learn more about their degree of early heartbeat, and actively face the means of calming down and cooperating with sports rehabilitation to actively improve early heartbeat.

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2. The definition and classification of premature heartbeat

2.1. Definition

Premature heartbeat, also known as pre-period contraction, is the early excitation of one point of the heart's conduction system. This excitement caused the heart to contract prematurely. According to the location of the excitation point, it is called atrial premature beat, atrioventricular junction premature beat and ventricular premature beat [1]. Classification by frequency: occasional premature heartbeat (less than 2,000 times), frequent premature heartbeat (more than 2,000 times).

2.2. Classification of risk levels of premature heartbeat

2.2.1. Low risk

The low frequency of attacks shows a low number of premature beats in the 24-hour dynamic electrocardiogram (Holter). Moreover, the single form is mainly monogenic (monomorphic) with early beat, no pairing, short-array knitting speed and other complex performances. Moreover, there are no structural heart disease, heart failure, myocardial scars or other abnormalities. No symptoms or mild symptoms, occasional palpitations, but no quality of life, no fainting, chest pain or difficulty breathing.

2.2.2. Middle danger

The attack frequency is moderate in the 24-hour load of 5%-10% (about 2000-10,000 times/day) of ventricular early beats, or the load of atrial early beats is relatively high (>100 times/day). And the morphology is complex; it is a multi-source (polymorphic) premature beat, and occasionally there is a pair or short-term non-sustained ventricular velocity (NSVT). Combined with mild cardiac abnormalities, such as mild left ventricular hypertrophy and partial ventricular wall movement abnormalities, the blood ejection fraction (LVEF) is normal (≥50%). The symptoms are obviously accompanied by frequent palpitations and chest tightness after slight activity, which may be accompanied by anxiety.

2.2.3. High-risk

Precardiatic high-frequency attacks, ventricular precarycardia load >10% (>10,000 times/day), or atrial premata load extremely high (>1000 times/day). With malignant morphology accompanied by polymorphic ventricular early, the R-on-T phenomenon (early pulse falls on the T wave of the previous cardiac pulse), and persistent ventricular velocity (>30 seconds). Structural heart has high-risk symptoms such as fainting, blackness, cardiogenic chest pain, etc.

3. Analysis of the causes of premature heart disease

The cause of premature heartbeat is relatively complex. 100% of adults have had premature heartbeats, but not necessarily organic heart diseases. The causes of premature beats can be divided into the following two types: the causes of premature beats are relatively complex. 100% of adults and children have had premature beats, but not necessarily all of them have organic heart diseases.

The causes of premature beats can be divided into the following two categories: (1) Factors other than the heart, such as tension, excitement, fatigue, hypoxia, smoking, drinking, strong tea, coffee, surgery and other stressful situations can be induced. Some diseases, such as infection, intestinal diseases, kidney diseases or kidney pain, hyperthyroidism, electrolyte disorder or the imbalance of acidity, as well as drugs (such as chlorhea, quinidine, amoxycillin, etc.) can also be induced; heart

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disease can be seen in various types of heart disease, such as coronary heart disease, hypertension, pulmonary heart disease, cardiomyopathy, rheumatic heart disease, congenital heart disease, etc. [2]. (2) Athletes' heart and ventricular premature beats (the reason why athletes' hearts are added here is that with the popularization of social exercise habits, most of the sports enthusiasts, semi-professional and amateur sports enthusiasts with long-term exercise habits and high-intensity sports experience may also be a high-incidence group of athletes' cardiac heartbeats)

Athletes' hearts can adapt so magically to cope with the pursuit of constantly breaking through the limits of the body. It swells and expands so that it can perform higher travel work. It slows down at rest and increases the heart rate reserve to further optimize the cardiac output during exercise. Athletes will encounter extreme physiological conditions during physical activity and abnormally when resting, with high adrenaline tension. Ischemia, ionic interference and high wall stress may occur during physical activity, as well as high vagus nerve tension, bradycardia and repolar dispersion during rest. Mixed atrial and ventricular pre-constrictions are triggers. All these wonderful structural and functional changes may make athletes' hearts prone to arrhythmia at the atrial, lymph node and ventricular levels. In essence, the athlete's heart is an arrhythmic heart [3].

Most of the athletes have physiological premature beats (no structural heart disease, asymptomatic) and are classified as low-risk, but pathological factors, such as myocarditis and ARVC need to be excluded. If the frequency of early beats increases or induces ventricular tachycardia in the exercise load test, it needs to be reassessed as a high risk. Although athletes' early heartbeats are mostly at low risk, half of the number of early heartbeats higher than 20,000 is recommended for radiofrequency ablation. It is generally recommended that after screening all organic heart disease and family hereditary heart disease and heart function, it is recommended to carry out further screening of nuclear magnetic resonance to screen myocardial scars [4], in the exercise electrocardiogram screening of the athletes' heart, whether it is a benign premature beat that is suppressed after exercise or nausea that increases after exercise. If all the screening results are benign, you can gradually resume exercise, enhance cardiopulmonary capacity, and regularly return for visits to screen the number of heart B-ultrasound and Holter heart early beats throughout the day.

4. Risk screening for premature heartbeat

4.1. Collection of medical history

Understanding whether the patient has a history of heart disease, a family history of heart disease, hypertension, diabetes and other underlying diseases, as well as whether there is a recent infection, drug use, excessive mental stress, etc. These factors may increase the risk of premature heartbeat.

4.2. Physical examination

After auscultation of the heart, judging the frequency, rhythm, etc. of premature beats, and checking whether there are abnormal signs such as cardiac murmur and enlargement of the heart boundary, which is conducive to the preliminary evaluation of the structure and function of the heart.

4.3. Electrocardiogram examination

Conventional electrocardiogram: It can capture the electrocardiogram changes when a premature heartbeat occurs, determine the type of premature heartbeat, such as atrial premature heartbeat, ventricular premature heartbeat, etc., and can also preliminarily judge the severity of the premature heartbeat.

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Dynamic electrocardiogram monitoring (Holter): Continuously record electrocardiograms for 24 hours or more, which can accurately count the number, frequency, occurrence time, etc. of premature beats, which helps to detect short-term premature beats and the relationship with activity, sleep, etc.

4.4. Ultrasound examination of the heart

The structure and function of the heart can be clearly observed, including the size of the atrium, ventricle, myocardial thickness, the activity of the heart valve, etc., and judge whether there are potential factors leading to premature beats, such as myocardial lesions and abnormal heart structure.

4.5. Exercise electrocardiogram

Let the patient exercise on the exercise tablet or pedal, and observe the changes in early pulse during the exercise process. If there is a significant increase in early heartbeat or other serious arrhythmias after exercise, it suggests that there may be a high risk.

4.6. Other inspections

For example, myocardial nucleus imaging, cardiac magnetic resonance imaging, etc., can further evaluate the perfusion and metabolism of the heart muscle, and help to detect potential myocardial lesions for some complex or difficult-to-identify early heartbeats. For patients with suspected hereditary arrhythmias, such as ion channel disease, genetic testing may also help to make a clear diagnosis.

Blood screening can determine whether there is anemia. During anemia, the body will speed up the heart rate in order to satisfy the oxygen supply of various organs, which may induce premature beats.

Check thyroid function to detect thyroid-stimulating hormone (TSH), thyroid hormone (T3, T4) and other indicators. During hyperthyroidism, excessive secretion of thyroid hormone will accelerate the body's metabolism and excite the sympathetic nerve, resulting in increased heart contractility and accelerated heart rate, which is easy to cause premature beat.

Check the electrolyte level, focusing on potassium, sodium, calcium, magnesium and other electrolyte levels. Electrolyte disorders, such as hypokalemia and hypomagnesemia, will affect the normal electrophysiological activities of myocardial cells and increase the excitability of myocardial cells, thus inducing premature beats.

Attention to myocardial injury markers includes troponin, creatine kinase isoenzyme (CK-MB), etc. The increase in these indicators may indicate myocardial damage, such as myocardial infarction, myocarditis, etc. Myocardial damage will lead to unstable electrical activity of myocardial cells, which will lead to premature beats.

5. Sports rehabilitation and life guidance for early heart

After the risk screening of early cardiac infarction, if the recipient is a low-risk cardiac premature heartbeat patient (the number of occasional and frequent cardiac premature heartbeats is less than 10,000 times a day, no organic heart disease, family hereditary heart disease history, no myocardial damage, normal heart function, no R-on-T phenomenon, or movement. The member's heart can undergo restorative exercise training after in-depth screening of nuclear magnetic resonance and exercise electrocardiogram.

Rehabilitation exercise is an important non-drug intervention for the secondary prevention and treatment of cardiovascular diseases, which can effectively improve the reinvention of patients' hearts. Exercise training can reduce myocardial cell apoptosis, reduce extracellular matrix deposition and

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fibrosis, promote angiogenesis, and regulate inflammatory response to improve cardiac remodeling [5].

Sports training is the cornerstone of cardiac rehabilitation, and aerobic training is the main form of training. The benefits of sports training are multifaceted, and it is very important to improve cardiopulmonary health. Medium-intensity continuous training, supplemented by resistance training, is traditionally the most common form of exercise training in cardiac rehabilitation [6].

Strength training and aerobic training play an important role in improving heart function and maintaining cardiovascular health. The effectiveness of improving the quality of life for heart patients. Strength training is an effective intervention that is well tolerated and does not require excessive equipment expenditure. It has a significant therapeutic effect on the dimensions of depression, fatigue and total mood disorder, and can effectively reduce the trend of tension and anger [7].

5.1. Strength training

Add high-intensity strength training or flexibility training to the heart rehabilitation training of heart patients to improve the quality of life and mood of patients [8].

It can improve heart function: appropriate strength training can enhance myocardial contractility and improve the blood-pumping function of the heart. This helps to improve the overall function of the heart, enabling the heart to deliver blood to the whole body more effectively and reducing the burden on the heart, thus having a positive impact on the early heartbeat to a certain extent.

Regulate autonomic nervous function: Strength training can regulate the balance of the autonomic nervous system. The occurrence of premature heartbeat is sometimes related to autonomic dysfunction. Through strength training, the regulation of sympathetic and parasympathetic nerves can be more coordinated, which helps to stabilize the electrophysiological activity of the heart and reduce the occurrence of premature heartbeat. Improve the stability of the cardiovascular system. Long-term regular strength training can improve the endurance and adaptability of the cardiovascular system, increase the elasticity of blood vessels, and make blood pressure more stable. Good cardiovascular condition can provide a more stable blood supply and internal environment for the heart, reducing the risk of premature heartbeat due to cardiovascular instability.

Improve your psychological state: Strength training helps to relieve bad moods such as stress, anxiety and depression. Psychological factors often play an important role in the occurrence and aggravation of premature heartbeat. By improving the psychological state, the premature heartbeat caused by psychological factors can be indirectly reduced.

5.2. Aerobic training

Continuous moderate-intensity aerobic exercise (CAE) and high-intensity intermittent aerobic exercise (HIAE) can affect vascular endothelial function and play a role in heart protection [9]. Aerobic training can enhance myocardial contractility, improve the blood-pumping function of the heart, and increase the output of the heart per beat. Long-term persistence can make the heart meet the body's metabolic needs at a low heart rate level, which helps to maintain the stability of sinus rhythm and reduce premature heartbeat caused by abnormal heart function.

Regulate autonomic nerve function: Under normal circumstances, the sympathetic nerve and the parasympathetic nerve coordinate with each other to jointly regulate the rhythm of the heart. Aerobic training can promote the balance of the autonomic nervous system to change in the direction of the dominance of the parasympathetic nerve. When the parasympathetic nerve is excited, it will inhibit the frequency of impulses at the pacing point (sinoatrial node) of the heart, so that the sinus rhythm is appropriately slowed down and more stable. At the same time, it reduces the excitability of the heart muscle and reduces the occurrence of early heartbeat.

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Improve myocardial metabolism: Aerobic training can promote the formation of lateral branch circulation of the coronary arteries, increase the blood supply of the myocardial, enable myocardium cells to obtain more sufficient oxygen and nutrients, and improve myocardial metabolism. This helps to maintain the normal electrophysiological characteristics of myocardial cells and makes the function of the cardiac pacing conduction system, such as the sinus node, more stable, thus reducing the occurrence of premature beats.

Reduce cardiovascular risk factors: Aerobic training helps to reduce blood pressure and blood lipids, control weight, improve blood sugar metabolism, etc., reduce the damage of these cardiovascular risk factors to the heart, thereby maintaining the normal structure and function of the heart, ensuring the stability of sinus rhythm, and indirectly reducing the occurrence of premature beats.

5.3. Specific exercise plan

For patients with premature heartbeat and athletes who have eliminated the risk, low to moderate aerobic exercise (such as walking, jogging, or swimming) is recommended. The target heart rate is 50%-70% of the maximum heart rate every 3-5 times, 30-60 minutes each time, so that the body can gradually adapt and gradually increase the aerobic intensity and heart rate. With mid-intensity strength training, medium and high-intensity strength training, such as bench press, high pull-down, hard pull-up, squat, and sitting leg flexion and extension, use about 50% of 1RM progressive overload, and the heart rate is maintained at 50%-80% of the maximum heart rate. Repeat 1-3 groups for 8-12 times per group [5].

5.3.1. Nutrition and routine adjustment

For patients with early cardiac recovery, it is recommended to supplement fructose sodium diphosphate, coenzyme Q10 and other most nutritious myocardial cells to promote myocardial cell repair; supplement 0mega-3 fish oil or deep-sea fish nutrient myocardial cells, improve the stability of cardiac electrical signals, and supplement foods rich in potassium and magnesium (e.g. bananas, nuts, spinach, animal organs, pig heart, etc.) promote the stability of cardiac electrical signals, reduce the occurrence of premature heart disease, fully supplement protein, give priority to natural food, and adjust the physical condition through a diversified diet.

5.3.2. Dietary taboos

Limit the intake of strong tea, coffee and alcohol; (Caffeine is easy to cause excited sympathetic nerves: caffeine will stimulate the sympathetic nerves and make them release hormones such as norepinephrine. These hormones will accelerate the heart rate, raise high blood pressure, increase the burden on the heart, and increase the excitability of myocardial cells, which is easy to cause premature heartbeat. Interfere with the ion channel of myocardial cells and affect the normal electrophysiological activity of myocardial cells. For example, it may make the repolarization process of myocardial cells abnormal, resulting in abnormal autorhythm of myocardial cells, which leads to premature beat.

5.3.3. Avoid staying up late

Staying up late breaks the balance between the sympathetic nerve and the parasympathetic nerve, which leads to the continuous excitement of the sympathetic nerve, increases the instability of myocardial electrical activity, and triggers premature beats. Staying up late for a long time can form an abnormal pattern of "nocturnal sympathetic nerve excitement", which interferes with the normal

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rhythm regulation of the heart, and is prone to hormone metabolism disorders in the morning, adrenaline, norepinephrine, abnormal secretion of stress hormones such as adrenaline directly enhances myocardial stress and induces ectopic pacing point activity. The risk of lyseptic disorders (such as hypokalemia) increases, affecting the potential stability of myocardial cell membranes. Long-term overload of the heart leads to myocardial hypoxia and metabolic waste accumulation, which reduces the stability of cardiac electrical activity. In chronic fatigue, the ability to repair the heart muscle decreases, and the frequency of early beating may increase with the prolongation of staying up late.

6. Conclusion

As a relatively common heart disease, as a patient, you should face it positively. Don't have too much mental pressure. You can use the guidance of this article. First, carry out systematic risk screening to understand the risk of your own heartbeat. For groups who often exercise training, systematically understand the science of early heartbeat. Exercise rehabilitation, aerobics combined with strength training to better improve heart function and improve quality of life.

In terms of screening methods, dynamic electrocardiograms are not sensitive enough to occasional premature beats, and intermittent high-risk cases may be missed.

Risk stratification is not unified. The existing guidelines do not unify the threshold definition of "frequent early occurrence" (such as 1000 times/24h vs. 500 times/24h), affecting clinical decision-making. At the level of sports rehabilitation, most studies have a small sample size, a short follow-up period, and a lack of long-term safety data (such as tracking for more than 10 years). And there is no complete rehabilitation study at the heart level. In terms of athlete data, there is little high-quality research on professional athletes, and it is difficult to formulate personalized sports prescriptions.

Optimize screening technology, promote wearable devices (such as intelligent electrocardiogram clothes) to achieve long-term monitoring, and automatically classify early beat types in combination with AI algorithms. Explore the application of genetic testing in genetic arrhythmia screening. Establish a multi-center cohort, unify the stratification standards of early fighting risk, and incorporate the covariate analysis of race, age, exercise intensity, etc. Deepen at the level of sports rehabilitation, and carry out RCT research to compare different sports modes (such as resistance training vs. Aerobic training) regulate the mechanism of early beats. Combined with cardiac nerve ablation, explore the therapeutic effect of "compound rehabilitation mode" on stubborn premature beats.

Conduct special research on athletes, track the natural course of premature athletes for a long time, and clarify the dose-effect relationship between exercise intensity and arrhythmia. Develop the "Athletes' Early Heartbeat Risk Assessment Model" and incorporate myocardial markers, imaging and epigenetic indicators. This article systematically sorts out the screening and rehabilitation strategies for premature heartbeat, but it is necessary to make up for the evidence gap through technological innovation and large sample research. In the future, we can focus on accurate stratification, intelligent monitoring and personalized management of athletes to optimize clinical practice.

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