



An Overview of the Level of Occupational Stress of Anesthesiologists in The Surgical Room of the Hospital In the Banyumas District Area

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Case Study Report

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Introduction:

Regular exercise is one of the foundations of the rehabilitation process of treatment which starts with lifestyle changes to improve physical abilities optimally and be healthy overall. Even though exercise is not categorized as a drug, it has a role in pharmacological metabolic functions. Regular exercise can stimulate a number of beneficial physiologies in the body and can be very effective in the prevention and treatment of many chronic diseases such as heart disease, hypertension, and diabetes mellitus (1).

Abstract

Background: Engaging in exercise can effectively enhance one's overall health condition when according to prescribed guidelines or programmes. Nevertheless, engaging in excessive physical activity without considering the limitations of the body's organs, particularly the heart, can result in the development of several illnesses, including heart disease, specifically characterized by irregularities in heart rhythm. The fatality rate among competitors during competition in 2022 is projected to remain at 29%. **Purpose:** to demonstrate the superiority of Holter monitoring (ambulatory ECG monitoring) in evaluating cardiac rhythm in athletes. **Methods:** A study based on a case report. **Results:** Arrhythmias in athletes occur due to insufficient cardiac remodelling, which leads to changes in the ion channels of the atrioventricular node. Specifically, the inwardly conducting L-type calcium (Ca²⁺) channels are responsible for the diastolic depolarization of the atrioventricular node, as well as regulating excitability and enhancing axis potentiation. Cardiac-relevant Ca²⁺ channels exhibit a deceleration mechanism that hinders the conduction of the atrioventricular node. **Conclusions:** The dysfunction of the axonal action potential phase, where calcium is unable to substitute for potassium in cells, leads to impaired electrical impulses.

However, without the wider community, especially the Indonesian people, realizing it, many Indonesians do excessive sports activities such as using bicycles, running at night, badminton and playing football without knowing the dangers of excessive exercise which can cause sudden cardiac death (1).

According to (2) during sports competitions it was found that the rate of heart attacks in competitive athletes was around 0.75 per 100,000 athletes per year, and among them were young athletes, namely 29% of athletes who developed heart rhythm disorders (arrhythmias).

Heart rhythm disturbances are a type of heart disease that can cause various disease complications and result in sudden death. According to (3) (Yuniadi, 2017) in Indonesia, arrhythmia has a risk of sudden death of around 87%. According to APA arrhythmia registration data, My Healthy Heart at Budhi Asih Regional Hospital for 2022-2023 from 671 patients, 53.3% of the patients' ages were 12-35 years.

Objective

The aim of this presentation is to report a case of heart rhythm disturbances due to excessive exercise.

Case Reports:

A 33 year old man is one of the health workers and came to the Heart Polyclinic of Budhi Asih Regional Hospital on December 31 2023 with complaints of weight loss since the last 1 year, no shortness of breath, no chest pain and the patient had no complaints whatsoever and can do strenuous activities. The patient's confession was that he was only asked by his friend, a fellow health worker, to check with a heart specialist because he had told him that his heart rate was below 40 x/minute while cycling. The patient likes to exercise by cycling or running a distance of more than 20 KM/day. However, the patient did not have any complaints at all even though his heart rate was below 40 x/minute. The patient does not have hypertension, diabetes mellitus, heart disease, only a history of Covid-19 in 2020.

On physical examination, he was aware of compos mentis with blood pressure 100/60 mmHg, heart rate 48 x/minute, respiratory rate 18 x/minute with oxygen saturation 99%. On physical examination, there were no murmurs, rhonchi, wezzhing, and other examinations were within normal limits. The ECG showed sinus rhythm with a QRS rate of 48 x/minute, normal axis, normal P wave,

PR interval 0.12 seconds, QRS duration 0.09 seconds, QT interval 0.432 seconds, no ST-segment abnormalities and hypertrophy were found (Figure 1).

Laboratory examination showed hemoglobin levels 12.7 gr/dl, hematocrit 48%, leukocytes 8.8 thousand/ul, platelets 256 thousand/ul, sodium: 146 mmol/L, potassium 4.1 mmol/L, chloride 105 mmol/L, FT4 18.2 pmol/l, TSH 1.77 uIU/ml.

The treatment test (weight training test) showed that the patient was able to complete the weight training test with a maximum heart rate of 142 x/minute, blood pressure 135/70 mmHg, without any complaints when carrying out the weight training activity (Figure 2).

The results of holter monitoring (ambulatory ECG monitoring) for 48 hours showed basic rhythm results: sinus rhythm, chronotopic disability: negative, AV conduction: paroxysmal total AV block, episodes of tachycardia: sinus tachycardia during activity at 07.00 WIB with a heart rate of 183 x/minute, bradycardia episodes: sinus with paroxysmal total AV block with episodes of R to R interval 4090 ms (Figure 3).

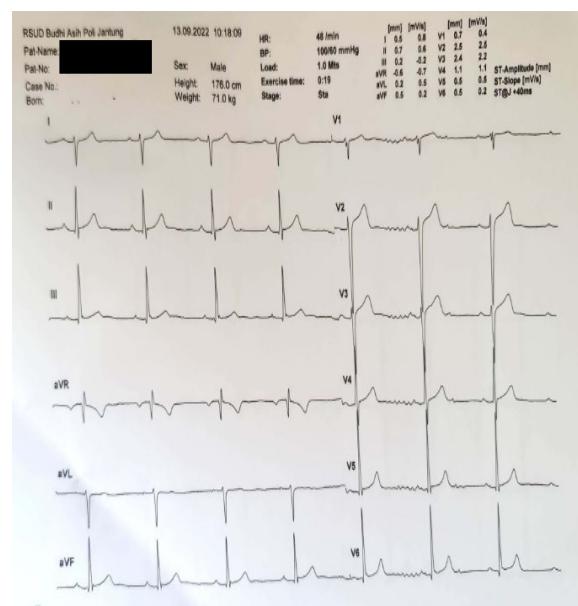


Figure 1. Electrocardiography, interpretation of Sinus Bradycardia

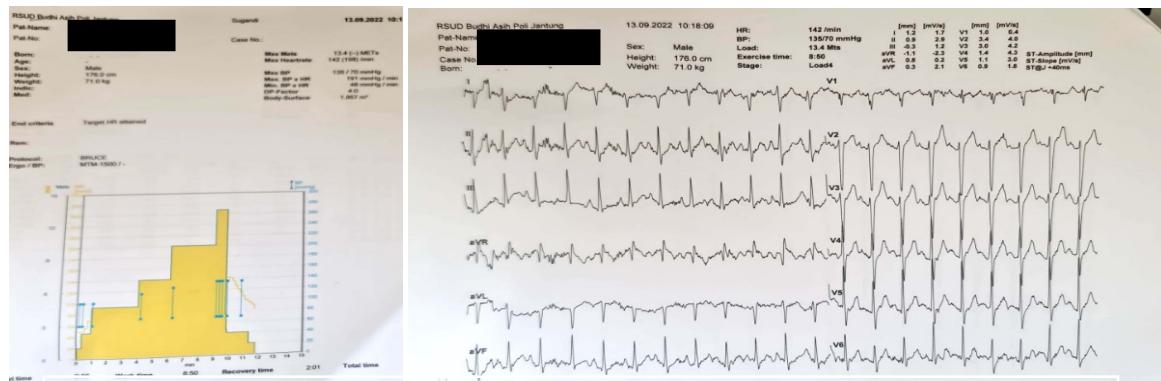


Figure 2. a) treadmill; b) electrocardiography of the patient during the maximal phase of the heart load training test; Interpretation of sinus tachycardia during activity

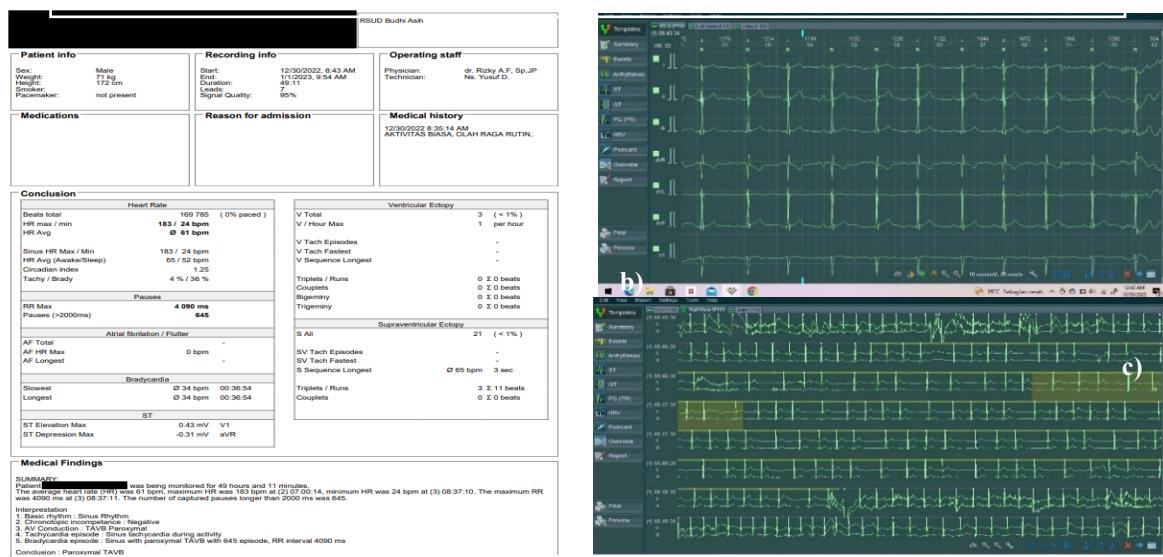


Figure 3. a) Holter monitoring results report; b) Initial recording of heart rhythm images via Holter; c) 48 hour recording of Holter heart rhythm images

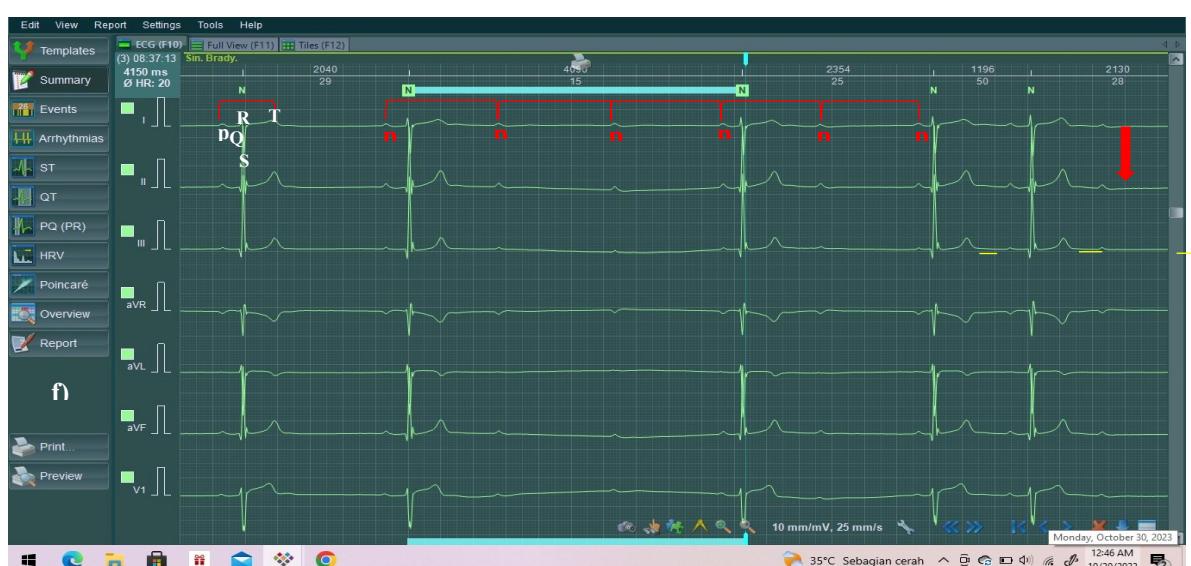


Figure 4. d) Arrest of AV block conduction disturbances at 08.37 WIB; e) Arrest of Premature Ventricular Contraction (PVC) rhythm disturbance at 15.44 WIB; c) Evidence of arrest of paroxysmal AV Block heart rhythm disturbances

Discussion

Heart rhythm disorders (arrhythmias) can occur in athletes, even though athletes are known as people who live healthy lives and have a good lifestyle. But you still can't avoid heart rhythm disorders. Heart rhythm disturbances in athletes often cause sudden death without any previous complaints from the patient. It was reported that 29% of sportsmen (athletes) died while competing (2).

In this patient, there was an electrical impulse disorder caused by excessive exercise. According to (Bansal et al., 2019) the mechanism of heart rhythm disturbances in athletes is still not well understood and is considered to be multifactorial. The mechanism of heart rhythm disturbances in athletes may be caused by the interaction of triggers, modulators and substrates. Specific triggers (atrial ectopics, exercise supplements, and illicit drug use) in the presence of appropriate substrates (genetic predisposition, inflammatory fibrosis, and cardiac remodeling) and modulators (autonomic activity, electrolyte abnormalities, acid reflux disease) remain the cornerstone of the disorder. rhythm in athletes (4).

The heart rhythm disturbance that occurred in this patient was a conduction disturbance which was due to a break in the electrical impulse which should have flowed from the sinoatrial node (SA) to the atrioventricular node (AV) but was interrupted and caused conduction to fail which is called a block. Atrioventricular block is manifested as a PR interval that is longer than the normal rhythm (sinus) or no QRS wave formation) which will result in the R to R interval becoming farther apart. AV block in athletes is triggered by changes in autonomic nerve activity in the

heart which increases vagal tone or cardiac remodeling (5). Remodeling is a cellular and interstitial molecular change that manifests clinically resulting in changes in the size, mass, geometry and function of the heart after contraction (6,7) In this patient, excessive activity from uncontrolled exercise resulted in less than optimal cardiac remodeling, causing ion channels in the atrioventricular node to experience immunohistochemical labeling, where L-type calcium (Ca^{2+}) channels that carry inward current are known to play a major role in the diastolic depolarization of the atrioventricular node. and regulates the stimulation and increase in axis potential. In the important Ca^{2+} channels in the heart, a slowing process occurs which results in a barrier to atrioventricular node conduction (8).

A decrease in the axipotential phase process where calcium cannot replace potassium in the cells results in electrical impulse disturbances (9), which will result in the autonomic suggestion system mediating the lengthening of the interval, PR on the electrocardiogram (EKG) image. This can result in thickening of the walls of the ventricles of the heart, which is called hypertrophy and will result in a large risk of death or sudden cardiac arrest (10).

Conclusion

Exercise can indeed improve the quality of health if it is done in accordance with the rules or program. However, excessive exercise without considering the capacity of the organs, especially the heart, can result in disease, one of which is heart disease, namely heart rhythm disturbances. In this case, it was found that the patient who frequently exercised and underwent a diagnostic examination on the weight training test (treadmill) showed normal results, namely that the patient was able to

complete the weight training test by running following the program of the treadmill medical device. Treadmills are often used as a reference tool for athletes in assessing physical abilities and health.

But even though the athletes were able to complete the weight training (treadmill) test without any obstacles. The death rate for athletes during 2019 was still at 29% while in competition. In this case, it proves that holter monitoring (ambulatory ECG monitoring) is better at assessing heart rhythms in athletes, so that it can provide information about the user's heart rhythm for at least 24 hours and can assess all activities as well as the process of rest and sleep. Holter monitoring can help in diagnosing heart disease in athletes so that it can reduce the risk of sudden death during competition. And patients can carry out treatment early to stop heart rhythm disturbances and other heart diseases caused by excessive exercise.

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