51 - PRESSURE BLOOD DECREASE AFTER EFFORT BY ANALYSIS OF BIOPHYSICS HEMODYNAMICS ANALYSIS BY POISEUILLE LAW

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Abstract

More modern methods of cardiac abnormalities detection are needed to better diagnosis of heart disease. Exercise causes profound changes in the heart during exercise and after exercise because of the Poiseuille Law. The increased flow causes reduced resistance in the walls of blood vessels sparing the heart of a larger effort to overcome the peripheral resistance. Mathematical methods like Detrended Fluctuations Analysis shows that exercise improves autocorrelation heart rhythms mathematically proving the regulation of heart rate with the effort. In this way, you can lower blood pressure after exercise benefit to heart health.

INTRODUÇÃO

Prevention of heart disease increases the interest in early diagnosis of diseases, ranging from birth defects to the aging-related disorders, which can lead to heart failure, arrhythmias and even death (PARKER ET AL., 2006; DUKES-McEWAN, 2006).

For this reason it is very important early cardiologic evaluation of these individuals (KOIKE ET AL., 2008). The increase in physical activity in individuals of different ages have been proposed aimed at providing a better quality of life (BLIENKO ET AL., 2015).

During efforts occur changes in blood fow coming modify the heart like a pump behavior as well as the hemodynamic for blood pressure by Poiseuille's Law, where the increased flow reduces the pressure on the vessel wall where the fluid is driven thereby reducing the pressure thereof (CHEN ET AL.,2016) .

In this work it is shown how the changes are explained in the light of biophysics to better understand the body's need to make efforts to combat heart disease and coronary heart disease through literature survey on HighWire database of Stanford University, articles they collected in October 2016 and with articles mostly less than 5 years.

BIOPHYSICS AND HEMODYNAMICS

Additional tests, as electrocardiogram (ECG), are essential for greater accuracy sin diagnosis, prognosis and treatment of possible cardiac dysfunction in asymptomatic at Home Individuals, however Revealed During the effort. The ECG is a Relatively cheap and extremely Useful examination for clinical and / or surgeons, when there is need to assess cardiac un Activity (HUANG ET AL., 2016).

Additional tests such as electrocardiogram (ECG), are essential for greater accuracy in the diagnosis, prognosis and treatment of possible cardiac dysfunction in asymptomatic individuals at rest, but revealed during the effort. The ECG is a relatively inexpensive test and extremely useful for clinical and / or surgeons, when there is need to assess cardiac activity (PENG ET AL., 1995; NASCIMENTO, 2008; CASTRO ET AL., 2014).

The combination of non-linearity and non-stationarity in physiological systems are not explained using classical models of physiological control. The fluctuations in the heart rate under normal conditions exhibit a type of long term correlation, which does not occur in the presence of certain diseases, such as in cases of patients who suffered myocardial infarction, congestive heart failure, among others. For these reasons, traditional methods for detecting changes in heart rate are becoming obsolete (PENG ET AL., 1994; PENG ET AL., 1995; CASTRO ET AL., 2014).

Regarding the behavior of blood pressure is necessary to analyze the flow behavior. Considering that most of the arteries of the body are in the longitudinal direction, the strength of the flow will be added to the force of gravity, causing the person in the standing position generates a greater force on the vessel walls. For these reasons many times would be interesting to throw the guy who feels discomfort arising from a hypertensive peak (TOWSEND & EPSTEIN, 2016)

During the year there is a possibility of lowering blood pressure to acute and chronic level. Acutely, can be explained mathematically. One can find the vessel pressure relating the force flow to the dissipated power, which is like a resistance force (KATAOKA ET AL., 2016; CASTRO ET AL., 2014).

Pressure = Flow x Resistance

Can be finded the value of pressure and flow, then:

$$Resistance = \frac{Pressure}{Flow}$$

Considering that the outlet pressure of the aorta is the average of 100mmHg. What it is around this value. At the entrance of the capillary there is a pressure 15mmHg. For this, there is the precapillary sphincters that will control the arterial runoff blood

The flow is calculated using an equation related to Poiseuille's law, which was a French physician who developed empirically, where it considers that the flow rate is found by the ratio of the pressure difference in a given length of vessel, the radius of this and blood viscosity, which can be varied by the number of erythrocytes, fat, and others (KRUSE ET AL., 2016; DARVISHI & FRAME, 2016).

Considering the output pressure of the aorta and the input capillaries and the flow rate is 85ml, it has been:

$$Resistence = \frac{100-15}{85} = 1 \text{ R unit}$$

A person who has a hypertensive peak where the pressure reaches 160mmHg, has:

$$Resistence = \frac{160-15}{85} = 1{,}7 \text{ R unit}$$

It has a resistance of 1.7, where the heart exert 1.7 times greater force to overcome resistance is required. As the striated skeletal fiber and heart striated fibers have the same characteristics, Stroke There will be a hypertrophy, because when put under resistance, the trend of this type of fiber is hypertrophied (PEDRIGI ET AL., 2016).

During the exercise, the flow tends to increase. Imagining an athlete 145 reaches the pressure and flow increase to 6 times, it be:

$$Resistence = \frac{145-15}{6 \; x \; 85} = \text{R unit}$$

In this case, during exercise, the heart will exert a force of 25% to circulate the blood, that is, although the heart is beating faster, it requires a smaller force.

It can therefore make a hypertensive print a pace which occurs an increase in blood flow in 6 times, as this may cause problems such as loosening of the atheromatous plaque and block a smaller vessel that if the heart can cause a stroke if for the head, a Stroke (TSENDSUREN ET AL., 2016; WILLEY ET AL., 2016; LIU-AMBROSE ET AL., 2016).

In addition to the factor that an exercise that reaches 55% already releases noradrenaline and adrenaline 60% and this will raise your blood pressure, this should be the borderline training to train an individual with systemic hypertension diagnosed (KAUR ET AL., 2015; TODD CADE ET AL., 2016).

In a study of Castro et al (2014) analyzing the fluctuations without trends, appropriate method for non accuracy of the electrophysiological signals where on a heart healthy result is an α-DFA of 0.8, it was observed that dogs subjected to an effort to intolerance even so and realized that the α-DFA approached 0.8.

This analysis was made soon after the end of the effort including exponential decay to return to resting before the standards effort. One of the dogs submitted effort out of a α-DFA 0.5828 to 0.8147 at rest after the effort. Other studies show that this same correlation is achieved after the effort both in humans and in animals.

CONCLUSION

The effort enables hearts with mild arrhythmias or slight alterations to the normal standard because during exercise, due to the Poiseuille Law the heart has a reduced effort for resistance, despite accelerated.

It is necessary to have a care in the intensity used with a cardiac patient so that it does not exceed 55% of its maximum capacity to be no release of Nora-adrenaline and consequent rise in blood pressure.

Mathematical methods can be the new frontier for new designs of work can be essential to improving the health and living conditions among cardiac patients through exercise.

More studies are needed for more evidence.

KEYWORDS

Poiseuille; hypertension; blood flow

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Abstract

More modern methods of cardiac abnormalities detection are needed to better diagnosis of heart disease. Exercise causes profound changes in the heart during exercise and after exercise because of the Poiseuille Law. The increased flow causes reduced resistance in the walls of blood vessels sparing the heart of a larger effort to overcome the peripheral resistance. Mathematical methods like without Trend fluctuation analysis shows that exercise improves autocorrelation heart rhythms mathematically proving the regulation of heart rate with the effort. In this way, you can lower blood pressure after exercise benefit to heart health.

DIMINUTION DU SANG DE LA PRESSION APRÈS L'EFFORT PAR L'ANALYSE DE LA BIOPHYSIQUE ANALYSE DE L'HÉMODYNAMIQUE PAR LE DROIT DE POISEUILLE

RÉSUMÉ

Des méthodes plus modernes de détection cardiaque des anomalies sont nécessaires pour un meilleur diagnostic de maladie cardiaque. Exercice provoque des changements profonds dans le cœur pendant l'exercice et après l'exercice en raison de la loi de Poiseuille. L'augmentation du débit entraîne une résistance réduite dans les parois des vaisseaux sanguins épargnant au cœur d'un plus grand effort pour surmonter la résistance périphérique. Méthodes mathématiques comme sans Tendance analyse des fluctuations montre que l'exercice améliore les rythmes cardiaques d'autocorrélation prouver mathématiquement la régulation de la fréquence cardiaque à l'effort. De cette façon, vous pouvez abaisser la tension artérielle après l'exercice bénéfique pour la santé du cœur.

DISMINUCIÓN SANGUÍNEA DE PRESIÓN DESPUÉS DEL ESFUERZO POR ANÁLISIS DE BIÓFÍSICA ANÁLISIS HEMODINÁMICO POR LEY DE POISEUILLE

RESUMEN

Se necesitan más modernos métodos de detección de anomalías cardíacas a un mejor diagnóstico de las enfermedades del corazón. El ejercicio produce cambios profundos en el corazón durante el ejercicio y después del ejercicio debido a la ley de Poiseuille. El aumento del flujo provoca una menor resistencia en las paredes de los vasos sanguíneos ahorradores el corazón de un gran esfuerzo para vencer la resistencia periférica. Los métodos matemáticos como el análisis de fluctuaciones sin tendencia muestra que el ejercicio mejora el ritmo cardíaco de autocorrelación matemáticamente demostrando la regulación de la frecuencia cardíaca con el esfuerzo. De esta manera, se puede reducir la presión arterial después del ejercicio beneficio para la salud del corazón.

DIMINUIÇÃO DA PRESSÃO ARTERIAL APÓS ESFORÇO SOB ANÁLISE BIOFÍSICA DA HEMODINÂMICA PELA LEI DE POISEUILLE

RESUMO

Métodos mais modernos de detecção de alterações cardíacas são necessários para melhores diagnósticos de doenças cardíacas. O exercício físico causa alterações profundas no coração durante o esforço e após o esforço por conta da Lei de Poiseuille. O aumento do fluxo causa redução da resistência nas paredes dos vasos sanguíneos poupando o coração de um esforço maior para vencer a resistência periférica. Métodos matemáticos como as Análises de Flutuação sem Tendência mostram que o exercício melhora a auto-correlação de ritmos cardíacos comprovando matematicamente a regulação do ritmo cardíaco pelo esforço. Desta forma, é possível diminuir a pressão arterial após o esforço beneficiando à saúde do coração.