43 - HISTOMORFOMETRIC STUDY OF VENTRICULAR CARDIOMIOCYTES IN WISTAR RATS SUBMITTED TO A LOW PROTEIC DIET

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INTRODUCTION

The nutritional aspects are of fundamental importance for the acting of the several systems of our nutritious organism. The assimilated starting from the digestion of the foods are used by the way organism to supply specific needs. According to NUNES(1998), the more essential is the nutrient, larger they will be the adverse effects of his absence.

The protéico-caloric malnutrition understands a series of morbid conditions that they potentate infectious processes and they increase the number of deaths (GRAHAM et al, 1963; CHANDRA, 1999). That picture, frequent in development countries in , where they are told nutritional disorders in several degrees, it can also be identified in hospitalized patients of industrialized countries (BALINT, 1998).

Numerous studies have been accomplished on the effects of the proteic malnutrition in several organs and tissues (WHARTON,1991; COTRAN et al,1994; BALINT,1998).

In spite of promoting alterations of general corporal extent, the impact of the malnutrition is not processed in the same way in the several organs and tissues of the organism, due to a selectivity (FREITAS et al,1994) that privileges indispensable organs to the survival (TAMARIN, 1963).

In the researches of KUMAR et al (1977), SACHDEV et al (1971), SIMA (1974), the interference of the malnutrition was observed in the nervous tissue and their consequences in the muscular tissue.

FREITAS et al (1994) they studied morphologically and morphometrically the alterations of the glands parotids with different degrees of malnutrition proteic, verifying discreet reduction in their general dimensions and accentuated reduction of their ducts.

HANSEN-SMITH et al (1977), MONTGOMERY (1962), NASCIMENTO et al (1990), WINICK et al (1989), studied the modifications imposed to the skeletal musculature by the nutritional lack verifying atrophy of difficult regression and muscular hipoplasy.

ZEMAN (1967), it marked the effects of the protein restriction maternal in young rats, identifying alterations in the weights: body, hepatic, renal, heart, thymic and cerebral where the first three lost temper less when compared with the suffered reductions by the last three.

On the cellular compromising promoted by the malnutrition, WINICK et al (1989) suggest that the same ones, depend on the phase of growth of the animal and of the time of malnutrition the one that was submitted.

In his work, DROTT et al (1992), affirms that the heart is exposed to the same depressive effects of the skeletal muscle, when submitted to the malnutrition processes. He points out the possibility of the cardiac risk, ascribe of the decrease of the circulatory demand imposed by the weakness of the myocardium.

The modifications in the myocardium were also studied by VANDEWOUDE (1995), as for the microvascularization and the metabolism of the undernourished miocytes.

The remodeling of the myocardium, controls a new ventricular structuring, especially of the left ventricle, analyzed by CUNHA et al (1998) and KOTHARI et al (1992), for being that cavity related to the expulsion of larger part of the blood that goes by the heart

The objective of the present work was to analyze the alterations hystomorphometrics of the ventricular cardiomicytes, especially of the left ventricle, starting from the calculation of the nuclear volume pondered medium, as well as the coefficient body weight/ heart weight, of animals submitted to an aproteic diet.

MATERIAL AND METHOD

Mice Wistar Albino were used, males and female, with 21dias of age, obtained of the Institute of Biomedical Sciences of the University of São Paulo (ICB/USP) and maintained in regime of picture period of 12hs light/12hs dark .They were distributed in 2 groups. The group control (N): animals (n=5) maintained in proteic diet and sacrificed with 21 days of age; I group and the undernourished group (D): animals (n=5) maintained in diet aproteic and sacrificed with 21 days of age. Water "*ad libitum*" second protocol of the Laboratory of Nutrition of the Department of Physiology of ICB of USP (OF ANGELIS, 1975). The animals were heavy for occasion of the euthanasia and soon after, the hearts were also heavy. After euthanasia and retreat of the hearts, with separation of the atria and ventricles, the ventricular compound was split up longitudinally, taking as reference axis the largest axis of the heart. They were fixed in Bouin and prepared for morphometric analysis according to SORENSEN et al (1989), using for such, digitals images of the material obtained through the program of image analysis AxioVision. The volume meditated nuclear medium of the ventricular myocites it was dear for the method proposed by GUNDERSEN (1988).

RESULTS

The analysis of the nuclear from cardiomyocites of the left ventricles through the light microscopy demonstrated a tendency to the increase of the nuclear volume, confirming the data obtained through the morphometric analysis. The volume meditated medium in the nurtured animals of 21 days it was of 8,59m^3 and of the undernourished animals of 21 days it was of 10,8 m^3

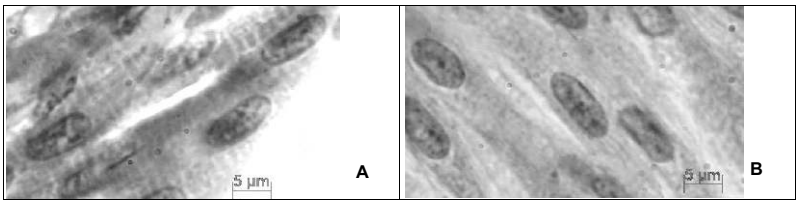


Figure 1. Photomicrography of the left ventricle of nourished (A) and undernourished (B) rats.

The undernourished mice presented corporal weight and quite reduced heart weight in relation to those nurtured ($p < 0,05$), however the relationship between the corporal weight and the weight of the heart didn't present significant difference (table 1).

Table 1: Body weight and heart weight (averages/standards deviations) of nourished (N) and undernourished (U) rat of 21 days/old.

	Body weight (g)	Heart weight (g)	Coefficient pc/pC
N	58 ± 17,77*	0,57 ± 0,13*	1,02 ± 0,19
U	14 ± 1,53*	0,12 ± 0,02*	0.88 ± 0,13

DISCUSSION

The offer of nutrients is a limiting factor and regulator of the performance of the organs and systems of the body. The nutritional lack promotes an insufficient muscular development from the intra-uterine phase in the animals (NASCIMENTO et al, 1990). As the muscular tissues are the main immediate source of protein, the compromising of the skeletal muscle represents a form efficient adaptation to the reduction of the entrance of the nutrient (DROTT et al 1992).

As well as the several fabrics and organs of our body, the heart is affected by the nutritional depletion, promoting morphologic, morphometric and biochemistries alterations, and that can modify his performance.

In our study, we verified a reduction in the heart musculature of the undernourished animals, although the coefficient body weight/ cardiac weight didn't present significant difference. That verification is contrary to CUNHA et al (1998), where the study in human adult corpse pointed coefficient larger in the undernourished ones. Maybe, the explanation for such fact, be the phase of development of the organism, in which the malnutrition was imposed, therefore, WINICK (1989) it appears that the deficiency in the growth, certain for the depletion in the diet it is dependent of the age and of the capacity of recovery of the organism. He points out that the initial malnutrition impedes the cellular division and the animal cannot retake that stage, while in a more advanced apprenticeship of the growth, it shows the reduction in the size of the cells, process that can be retaken.

In the same way as in our discoveries, the left ventricular mass was reduced in the undernourished ones compared to the controls of the studies of KOTHARI et al (1992). even so, he verified that the relationship left ventricular mass / body weigh it was significantly increased in the experimental group. Such information reinforce the considerations of DROTT et al (1992), that it mentions improvements in the left ventricular contractibility and heart global performance in patient obese submitted to the caloric restriction.

Believe the organism prioritizes the organs and survival tissues in the distribution of the nutrients in the body (FREITAS et al, 1994). In the heart tissue, it shows a significant decrease of the maximum distance of diffusion of the metabolites, improving the cellular energy provisioning and offering a relative protection in the metabolism in undernourished miocytes (VANDEWOUDE, 1995).

As the analysis of the nuclear volume pondered medium, we verified a relative increase in the undernourished group, differently of the pointed for CUNHA et al (1998), seeming because this, have used a method of image analysis computerized and no a method stereological, as the applied in that work. The increase of the nuclear volume pondered medium, it coincides with the concepts of biochemical adaptation and of heart composition already mentioned, that together, drives at the preservation of the heart function. Enhancing such concepts, KOTHARI et al (1992) concludes that the heart preservation happens in patients with malnutrition severe proteic energy, having maintenance of the systolic functions in the undernourished atrophic hearts.

CONCLUSION

With this work we verified a direct relationship between a diet of low calorie and the heart corporal mass, especially in the ventricular mass. However, the relationship between the body weight and the heart weight, didn't show altered. Besides, there was an expressive increase in the undernourished individuals' nuclear dimensions. Those data appear for a preservation of the heart function, guaranteeing the performance of the heart, in the submitted individuals the severe malnutrition.

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HISTOMORFOMETRIC STUDY OF VENTRICULAR CARDIOMIOCYTES IN WISTAR RATS SUBMITTED TO A LOW PROTEIC DIET

Introducion:The malnutrition affects the acting of several organic systems directly however, the effect can be several in each organ or tissues, in agreement with the importance of the same for the organism. The heart miocytes can suffer structural alterations under those conditions, modulating the heart performance during the physical activity. Objective: Analysis of the morphometric alterations of the ventricular miocytes in nuclear level, starting from the calculation of the nuclear volume pondered medium, as well as the coefficient cardiac weight /body weight of animals submitted to a aproteic diet. Methodology: Wistar Albino rats were used, males and female, born of nurtured female rats and undernourished, divided in: group control (N): animals (n=5) maintained in proteic diet and the undernourished group (D): animals (n=5) maintained in diet of low calorie (5% protein) and killed to the 21 days of age. The animals and their respective hearts were heavy and their prepared ventricles for analysis under microscopy of light second record histomorphometric. The images were obtained through the program Axiovision and analyzed by the method proposed by GUNDERSEN (1988). Results: The body and heart weights were shown decreased in the undernourished ones however the coefficient heart weight /body weight didn't present significant difference among the 2 groups. The histomorphometrical analysis revealed a nuclear increase in the undernourished animals in relation to the controls. Conclusion: The obtained data denote a direct interference of the diet of low calorie in the corporal and heart mass; however the relationship between body weight and heart weight was not altered. The increase in the nuclear volumes appears for a preservation of the heart function.

ÉTUDIEZ HISTOMORFOMÉTRICO DE CARDIOMIÓCTOS VENTRICULAIRE DE SOURIS A SOUMIS WISTAR MALNUTRITION PROTÉIC

Introducción: La malnutrition affecte directement cependant le suppléant de plusieurs systèmes organiques, l'effet peut être plusieurs dans chaque organe ou structure, en accord avec l'importance du même pour l'organisme. Les miocytes du coeur peuvent souffrir des modifications structurelles sous ces conditions, en modulant la performance du coeur pendant l'activité physique. Objective:Analiser le morfométricas des modifications du miocytes ventriculaire dans niveau nucléaire, commencer du calcul du volume nucléaire a médité moyen, aussi bien que les cardíaco/corporal du poids du coefficient d'animaux ont soumis à un aproteica de l'alimentation. Méthodologie: Souris l'Albinos Wistar a été utilisé, mâles et femme, né de rats féminins élevés et mal-nourri, a divisé dans: contrôle du groupe (N): animaux (n=5) a maintenu dans protéica de l'alimentation et le groupe mal-nourri (D): animaux (n=5) a maintenu dans alimentation de calorie basse (5% protéine) et eutanasiados aux 21 jours d'âge. Les animaux et leurs coeurs respectifs étaient lourds et leurs ventricules préparés pour analyse sous microscopie de lumière deuxième histomorfométrico du dossier. Les images ont été obtenues à travers le programme Axiovision et ont analysé par la méthode proposée par GUNDERSEN (1988). Résultats: Le corporal et poids du coeur ont été montrés diminué cependant dans les mal-nourris les corporal/poid du coeur du poids du coefficient n'ont pas présenté différence considérable parmi les 2 groupes. Les histomorfométrica de l'analyse ont révélé une augmentation nucléaire dans les animaux mal-nourris par rapport aux contrôles. Conclusion: Les données obtenues dénotent une intervention directe de l'alimentation de calorie basse dans le corporal et masse du coeur, cependant le rapport entre poids du corporal et poids du coeur n'a pas été changé. L'augmentation dans les volumes nucléaires paraît pour une conservation de la fonction du coeur.

ESTUDIO HISTOMORFOMÉTRICO DE CARDIOMIÓCITOS VENTRICULARES DE RATONES WISTAR SOMETIDOS A DESNUYTICIÓN PROTEICA

Introducción:La desnutrición afecta la acción de varios sistemas orgánicos directamente, sin embargo, el efecto puede ser diverso en cada órgano o tejido, de acuerdo con la importancia del mismo para el organismo. Los miocitos del corazón pueden sufrir las alteraciones estructurales bajo esas condiciones, modulando la actuación del corazón durante la actividad física. Objetivo:Analisar las alteraciones morfométricas de los miocitos ventriculares en el nivel nuclear, a partir del cálculo del volumen nuclear ponderado medio, así como del coeficiente de peso cardíaco/corporal de animales sometidos a una dieta sin proteinas. Metodología: Fueron utulizados ratones albinos Wistar, machos y hembras, nacidos de ratas hembras nutridas y desnutridas, divididos en: grupo control (N): animales (n=5) mantenidos en dieta protéica y el grupo desnutrido (D): animales (n=5) mantenidos con dieta de baja caloría (5% proteína) y eutanasiados a los 21 días de edad. Los animales y sus respectivos corazones fueron pesados y sus ventrículos preparados para el análisis bajo la microscopía de luz segundo procedimiento histomorfométrico . Las imágenes se obtuvieron a través del programa Axiovision y analizadas por el método propuesto por GUNDERSEN (1988). Resultados: Los pesos corporal y del corazón mostraron disminuidos en los desnutridos, sin embargo, el coeficiente peso del corazón/peso corporal no presentaron diferencia significante entre los dos grupos. El análisis histomorfométrico revelaro un aumento nuclear en los animales desnutridos em relación a los del grupo control. Conclusión: Los datos denotan una interferencia directa de la dieta de baja caloría en la masa corporal y del corazón, sin embargo la relación entre el peso corpóreo y peso del corazón no fue alterada. El aumento en los volúmenes nucleares indica una preservación de la función del corazón.

ESTUDO HISTOMORFOMÉTRICO DE CARDIOMIÓCTOS VENTRICULARES DE RATOS WISTAR SUBMETIDOS A DESNTRIÇÃO PROTEICA

Introdução:A desnutrição afeta diretamente o desempenho de vários sistemas orgânicos porém, o efeito pode ser diverso em cada órgão ou tecido, de acordo com a importância do mesmo para o organismo. Os miócitos cardíacos podem sofrer alterações estruturais sob essas condições, modulando a performance cardíaca durante a atividade física. Objetivo:Analisar as alterações morfométricas dos miócitos ventriculares em nível nuclear, a partir do cálculo do volume nuclear ponderado médio, bem como o coeficiente peso cardíaco/corporal de animais submetidos a uma dieta aproteica. Metodologia: Foram utilizados ratos Wistar Albino, machos e fêmeas, nascidos de ratas nutridas e desnutridas, divididos em: grupo controle (N): animais (n=5) mantidos em dieta protéica e o grupo desnutrido (D): animais (n=5) mantidos em dieta de baixa caloria (5% proteína) e eutanasiados aos 21 dias de idade. Os animais e seus respectivos corações foram pesados e seus ventrículos preparados para análise sob microscopia de luz segundo protocolo histomorfométrico. As imagens foram obtidas através do programa Axiovision e analisadas pelo método proposto por GUNDERSEN (1988). Resultados: Os pesos corporais e cardíacos mostraram-se diminuídos nos desnutridos porém o coeficiente peso corporal/peso cardíaco não apresentou diferença significante entre os 2 grupos. A análise histomorfométrica revelou um aumento nuclear nos animais desnutridos em relação aos controles. Conclusão: Os dados obtidos denotam uma interferência direta da dieta de baixa caloria na massa corporal e cardíaca, entretanto a relação entre peso corporal e peso cardíaco não foi alterada. O aumento nos volumes nucleares aponta para uma preservação da função cardíaca.