THE EFFECT OF SPORTS HEALTH TREATMENT ON REDUCING THE PREVALENCE OF HYPERTENSION

O EFEITO DO TRATAMENTO DE SAÚDE ESPORTIVA NA REDUÇÃO DA PREVALÊNCIA DE HIPERTENSÃO

EL EFECTO DEL TRATAMIENTO DE SALUD DEPORTIVA EN LA REDUCCIÓN DE LA PREVALENCIA DE HIPERTENSIÓN

ORIGINAL ARTICLE
ARTIGO ORIGINAL
ARTÍCULO ORIGINAL

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ABSTRACT

Introduction: Hypertension is a common clinical disease, which is not uncommon in the aviation industry. Pilots suffering from high blood pressure need to control high blood pressure to ensure flight safety. Exercise therapy is an effective way to control high blood pressure. Objective: To design the clinical effects of exercise intervention in the treatment of hypertension in pilots. Method: The article randomly assigned 41 pilot volunteers with hypertension to two groups: the treatment and control groups. Except for the different exercise intervention therapy, the other treatment methods are the same. After the expiration of the experiment, the volunteers were tested for their physiological and biochemical indicators. Results: After one year of strict diet and exercise intervention, the two groups of physiological and biochemical indicators were significantly different. Conclusion: Intervention of moderate-intensity exercise can reduce the body mass index, waist-to-hip ratio and blood pressure level of hypertensive patients, correct the disorder of blood lipid metabolism, and can help reduce the recurrence rate of hypertension. ***Level of evidence II; Therapeutic studies - investigation of treatment results.***

Keywords: Diet Therapy; Exercise Therapy; Hypertension; Sports; Pilots.

RESUMO

Introdução: A hipertensão é uma doença clínica comum, o que não é incomum na indústria de aviação. Os pilotos que sofrem de pressão alta precisam controlar a pressão alta para garantir a segurança do vôo. A terapia com exercícios é uma forma eficaz de controlar a hipertensão. Objetivo: Desenhar os efeitos clínicos da intervenção com exercícios no tratamento da hipertensão em pilotos. Método: O artigo distribuiu aleatoriamente 41 voluntários pilotos com hipertensão em dois grupos: os grupos de tratamento e controle. Exceto pela terapia de intervenção com exercícios diferentes, os outros métodos de tratamento são os mesmos. Após o término do experimento, os voluntários foram testados quanto aos seus indicadores fisiológicos e bioquímicos. Resultados: Após um ano de dieta estrita e intervenção com exercícios, os dois grupos de indicadores fisiológicos e bioquímicos foram significativamente diferentes. Conclusão: A intervenção de exercícios de intensidade moderada pode reduzir o índice de massa corporal, a relação cintura-quadril e o nível de pressão arterial de pacientes hipertensos, corrigir o distúrbio do metabolismo dos lipídios do sangue e pode ajudar a reduzir a taxa de recorrência da hipertensão. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Dietoterapia; Terapia por Exercícios; Hipertensão; Esportes; Pilotos.*

RESUMEN

Introducción: La hipertensión es una enfermedad clínica común, que no es infrecuente en la industria de la aviación. Los pilotos que sufren de presión arterial alta necesitan controlar la presión arterial alta para garantizar la seguridad del vuelo. La terapia con ejercicios es una forma eficaz de controlar la presión arterial alta. Objetivo: Diseñar los efectos clínicos de la intervención con ejercicios en el tratamiento de la hipertensión en pilotos. Método: El artículo asignó al azar a 41 voluntarios piloto con hipertensión a dos grupos: el de tratamiento y el de control. Excepto por las diferentes terapias de intervención con ejercicios, los otros métodos de tratamiento son los mismos. Después de la terminación del experimento, se evaluó a los voluntarios en cuanto a sus indicadores fisiológicos y bioquímicos. Resultados: Después de un año de estricta intervención de dieta y ejercicio, los dos grupos de indicadores fisiológicos y bioquímicos fueron significativamente diferentes. Conclusión: La intervención del ejercicio de intensidad moderada puede reducir el índice de masa corporal, la relación cintura-cadera y el nivel de presión arterial de los pacientes hipertensos, corregir el trastorno del metabolismo de los lípidos en sangre y puede ayudar a reducir la tasa de recurrencia de la hipertensión. ***Nivel de evidencia II; Estudios terapéuticos: investigación de los resultados del tratamiento.***

Descriptores: *Dietoterapia; Terapia de Ejercicio; Hipertensión; Deportes; Pilotos.*

DOI: http://dx.doi.org/10.1590/1517-8692202127032021_0098 Article received on 04/26/2021 accepted on 05/17/2021

INTRODUCTION

Hypertension in pilots is not uncommon in clinical practice. Generally, there are no obvious conscious symptoms. If the flight endurance is every day and the treatment effect is good, it can generally be identified as a qualified flight. Since 1998, we have used diet and exercise intervention to treat 28 cases of hypertension in pilots and achieved satisfactory results.[1] The report is as follows.

METHOD

Test object

Forty-one cases of hypertensive pilots who met the diagnostic criteria were all asymptomatic grade I hypertension. Risk stratification: 19 cases of low-risk, 18 cases of intermediate-risk, and 4 cases of high-risk. All were male, aged 36-54 years old, and the disease course was 1-18 months. Flight time 1200-5300h, aircraft type: Yun-74 cases, Yun-89 cases, Mi-85 cases, elementary education -611 cases, An-264 cases, F-74 cases, H-54 cases.[2] According to the admission order, they were randomly assigned to the treatment group (28 cases) and the control group (13 cases) at a ratio of 2:1.

TEST METHOD

Intervention methods

Each patient in the treatment group filled out a questionnaire about dietary intake and physical activity for seven consecutive days under a physician's guidance to understand their diet and exercise status and was given diet and exercise intervention treatment.

1. Diet intervention methods: Nutritional physicians educate and encourage each patient to strictly restrict dietary intake according to Chinese pilots' dietary standards.[3]

2. Exercise intervention methods: Clinicians encourage patients to appropriately increase their amateur physical activities according to their physical conditions. The first three months are required to reach 3 to 4 motor units per day, and then 2 to 3 motor units per day are required. The frequency of exercise is five times a week. The control group was given oral nifedipine 10-20mg, three times/d, the average treatment time was 25.4±2.45d, and no strict intervention was given to diet and exercise.

Monitoring and strengthening management

The intervention treatment time of the treatment group is one year. To improve treatment compliance, each patient must report the treatment status every month in the first half of the year after the start of treatment and report the treatment status every three months after half a year.[4] Collect diet and exercise record sheets.

Detection method

The following indicators shall be tested every month after the beginning of treatment and every 3 months after the treatment. Including body mass index [weight (kg)/height (m)^2], waist circumference, hip circumference, waist-to-hip ratio (waist circumference/hip circumference), systolic blood pressure (mmHg), diastolic blood pressure (mmHg); elbow venous blood check Cholesterol (TC), triglycerides (TG), low-density lipoprotein cholesterol (LDLC), high-density lipoprotein cholesterol (HDL-C), apolipoprotein A-1 (ApoA-1) and apolipoprotein B (ApoB)], hemorheology related indicators. All cases were followed up for 12 months.

IMAGE RECOGNITION OF PILOTS' HIGH-STRENGTH SPORTS INJURIES

Damage image processing

We first need to perform a grayscale conversion operation on the motion damage image. For a color image, the pixel can be characterized by using 3 bytes. Each of its bytes corresponds to the brightness generated by three components, where the three components are represented by R, G, and B, respectively. When the three components are all the same, it is a grayscale image. On the contrary, when they are different, it is a color image. The grayscale value conversion formula is as follows:

$$Gray(i,j) = 0.229 \square R(i,j) + 0.587 \square G(i,j) + 0.114 \square B(i,j) \quad (1)$$

After the conversion, the 24-bit image representation of the image remains unchanged. The primary function of the grayscale conversion is to improve the efficiency of damage recognition.

Contour extraction and preliminary recognition of the damaged location of the image

To improve the accuracy of damage recognition, it is first necessary to extract its contours. When extracting contours, the article will use mathematical morphology and adaptive thresholding. The curve fitting method is also used to obtain a curve, which is the damaged contour.[5] Figure 1 shows the algorithm flow chart. The contour energy expression formula is as follows:

$$E(C) = [\alpha E_{in}(C) \beta E_{ex}(C) Gray(i,j) \quad (2)$$

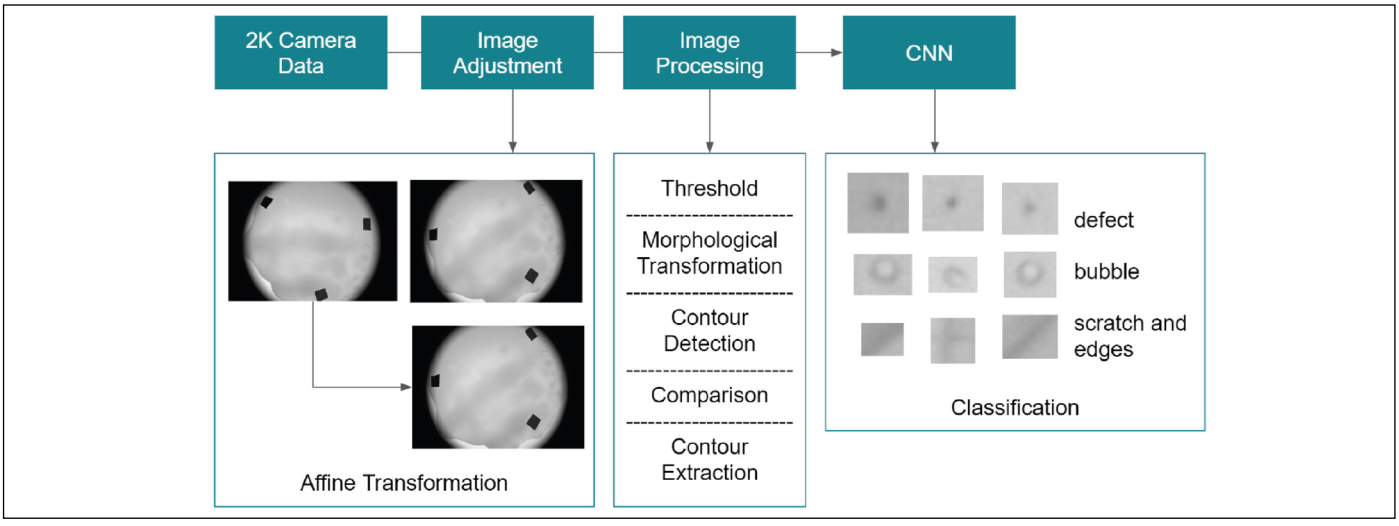

Figure 1. Contour extraction algorithm for image damage location.

Among them, α and β represent weighted values and $E_{ex}(C)$ and $E_{in}(C)$ represent external energy and internal energy, respectively. After the damage contour is obtained, the damaged part can be preliminarily identified using the K-L transformation analysis method. After obtaining the outline, the number of damaged pixels and other related information can be obtained, so the digital matrix is built using this information.[6] The sample with the smallest distance is selected as the preliminary recognition result of the sample.

$$d(x,y) = [\sum_{i=1}^{n} (x_i - y_i)^2]^{1/2} \quad (3)$$

Among them, n represents the Euclidean distance represented by the number of training samples $d(x,y)$.

Statistical processing

The measurement data is represented by $\overline{x} \pm s$, and the cases lost to follow-up are not included in the statistical analysis, and the F test is used for the significance test.

RESULTS

In the treatment group and the control group, 2 cases and 1 case withdrew from the treatment halfway, and the remaining 26 cases and 12 cases completed the treatment. They were included in the result analysis.[7]

Changes in physical examination indexes of the two groups of hypertensive pilots before and after treatment

The body mass index and a waist-to-hip ratio of the treatment group began to decrease after one month (P<0.01), and the systolic blood pressure and diastolic blood pressure began to decrease after two months (P<0.01). After one year of follow-up, the physical examination indicators were found to be 56.48±9.45. The recurrence rate between the two groups was significantly different (i2=6.51, P<0.01). (Table 1)

Comparison of related indexes of blood lipids and hemorheology between two groups of hypertensive pilots before and after treatment

Except for ApoA-1, after one month in the treatment group, TC, TG, LDL-C, and ApoB began to decline (P<0.01), and HDL-C began to rise (P<0.01). After one year of follow-up, it was found that there was one exception. There were no repetitions in the four indexes of blood lipids. There was no significant change in blood lipid-related indexes in the control group (P>0.05). (Table 2)

DISCUSSION

Risk factors of hypertension in pilots

Pilots are a particular group, and most of their hypertension is asymptomatic grade I (mild) hypertension. If the flight endurance is every day and the treatment effect is good, it can generally be identified as a qualified flight, but it will affect the flight and even ground the flight if it is not treated in time. The lack of genes increases the genetic susceptibility of some individuals to some diseases. Still, individuals with the same genotype have different incidence rates, indicating that environmental factors also play an essential role in addition to genetic factors. It has a positive effect and can still effectively prevent and treat hypertension. High-salt, low-potassium, low-calcium diet, sitting lifestyle, moderate or above drinking, occupational characteristics, overweight and obesity may be the main risk factors for hypertension in pilots. Among them, dietary nutrition and physical strength are two of the environmental factors. Reducing risk factors is the primary mechanism of non-drug treatment of hypertension.

The influence of diet and exercise intervention on blood pressure and blood lipids

The results of this study show that after about one month of diet and exercise intervention treatment for hypertension in pilots, blood pressure, blood lipids and blood rheology related indicators have been significantly improved (P<0.01), and after 11 months of maintenance treatment, all

Table 1. Comparison of physical examination indexes of two groups of pilots before and after treatment.

	Number of cases (n)	Body mass index BMI (kg/m²)			
		When joining the group	One month later	Two months later	One year later
Therapy group	26	24.5±2.1	22.4±1.9	22.1±1.8	22.0±1.7
Control group	12	24.5±2.2	24.3±2.3	24.2±2.2	24.2±2.3
F		1.84	3.28	7.58	7.83
P		>0.05	>0.05	<0.05	<0.01
	Number of cases (n)	Waist to hip ratio WHR			
		When joining the group	One month later	Two months later	One year later
Therapy group	26	0.9±0.0	0.8±0.0	0.8±0.0	0.8±0.1
Control group	12	0.9±0.1	0.9±0.0	0.9±0.1	0.8±0.1
F		1.79	8.64	9.62	8.46
P		>0.05	<0.01	<0.01	<0.01
	Number of cases (n)	Systolic SBP (mmHg)			
		When joining the group	One month later	Two months later	One year later
Therapy group	26	148.8±7.8	142.3±7.3	133.2±6.4	132.6±6.5
Control group	12	148.3±7.7	134.3±6.6	132.6±6.4	131.7±6.3
F		3.28	3.42	2.95	2.67
P		>0.05	>0.05	>0.05	>0.05
	Number of cases (n)	Diastolic blood pressure DBP (mmHg)			
		When joining the group	One month later	Two months later	One year later
Therapy group	26	95.6±4.6	89.4±4.3	82.4±4.0	82.2±4.1
Control group	12	95.5±4.6	83.5±4.6	81.9±4.2	81.6±4.2
F		1.99	7.86	1.74	1.64
P		>0.05	<0.01	>0.05	>0.05

Table 2. Changes of blood lipid indexes of two groups of pilots before and after treatment.

	Number of cases (n)	Total cholesterol TC (mmol/L)			
		When joining the group	One month later	Two months later	One year later
Therapy group	26	6.15±1.15	4.67±1.06	4.62±0.96	4.65±1.03
Control group	12	6.14±1.17	6.13±1.09	6.08±1.17	6.01±1.03
F		0.58	7.61	9.05	9.18
P		>0.05	<0.05	<0.01	<0.01
	Number of cases (n)	Triglyceride TG (mmol/L)			
		When joining the group	One month later	Two months later	One year later
Therapy group	26	2.04±0.43	1.67±0.36	1.63±0.33	1.64±0.29
Control group	12	2.05±0.51	2.02±0.48	2.03±0.43	1.98±0.39
F		1.09	8.13	10.25	9.37
P		>0.05	<0.01	<0.01	<0.01
	Number of cases (n)	Low-density lipoprotein cholesterol LDL-C (mmol/L)			
		When joining the group	One month later	Two months later	One year later
Therapy group	26	4.51±1.03	3.09±0.49	3.03±0.38	3.06±0.41
Control group	12	4.49±1.15	4.46±1.07	4.43±1.04	4.45±1.07
F		0.96	8.25	10.36	11.53
P		>0.05	<0.01	<0.01	<0.01
	Number of cases (n)	High-density lipoprotein cholesterol HDL-C (mmol/L)			
		When joining the group	One month later	Two months later	One year later
Therapy group	26	0.65±0.16	0.81±0.13	0.85±0.15	0.84±0.20
Control group	12	0.66±0.19	0.67±0.21	0.64±0.15	0.70±0.23
F		0.87	7.47	8.15	7.73
P		>0.05	<0.05	<0.01	<0.05
	Number of cases (n)	Apolipoprotein A-1 ApoA-1(g/L)			
		When joining the group	One month later	Two months later	One year later
Therapy group	26	1.13±0.18	1.12±0.14	1.09±0.12	1.11±0.16
Control group	12	1.14±0.24	1.13±0.19	1.10±0.26	1.09±0.22
F		0.89	0.97	0.92	0.9
P		>0.05	>0.05	>0.05	>0.05
	Number of cases (n)	Apolipoprotein BApoB (g/L)			
		When joining the group	One month later	Two months later	One year later
Therapy group	26	1.59±0.54	1.25±0.03	1.23±0.05	1.24±0.06
Control group	12	1.61±0.55	1.57±0.06	1.55±0.07	1.50±0.08
F		1.94	8.16	8.74	9.06
P		>0.05	<0.01	<0.01	<0.01

indicators remain at this level, indicating that strict diet and exercise intervention are effective measures for the treatment of hypertension in pilots. Studies have confirmed that scientific and reasonable physical exercise can improve cardiac output self-regulation, increase myocardial contractility, and decrease blood pressure. On the one hand, this may be because exercise enhances the vague-insulin system's activity, forming a vague advantage, which reduces the sensitivity of the myocardium to vasoconstrictor substances, increases the sensitivity to vasodilator substances, and has a strong vasodilation ability.[8]

Foreign studies have pointed out that reducing salt intake, maintaining an average weight, increasing protein intake, and avoiding large amounts of alcohol can reduce blood pressure. There are also studies in my country that after adjusting gender and average body mass index of the population, the average fish and fruit intake of the population is negatively correlated with the average systolic and diastolic blood pressure of the population, and the average salt and animal fat intake of the population the amount was positively correlated with the average systolic and diastolic blood pressure of the population. From the results of this study, strict diet and exercise intervention can lower blood pressure and lower TC, TG, LDL-C and increase HDL-C.

CONCLUSION

Aerobic exercise can significantly increase the activity of LPL. On the one hand, the increase in LPL activity increases the decomposition of body fat during and after exercise and increases the use of fat as energy; on the other hand, it also increases the transfer of triglycerides' surface components to LPL.

The author declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: The author made significant contributions to this manuscript. Li Xiao: writing and performing surgeries; data analysis and performing surgeries; article review and intellectual concept of the article.

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