

Original Article

The adjuvant therapeutic effect of regularly taking slow walks over the long-term on inflammation in elderly hypertensive patients

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Abstract: *Objective:* To investigate the adjuvant therapeutic effect of regularly taking slow walks over the long term on inflammation in elderly hypertensive patients. *Methods:* 83 elderly hypertensive patients were randomly selected and divided into two groups. Patients in the control group were treated with routine drugs, but those in the treatment group took regular, slow walks over the long term as the basis of their routine therapy. The treatment lasted for two years. Changes in blood pressure, blood lipids, and inflammatory factors were analyzed, and the conditions of the cardiac and cranial nerves were also evaluated at 0.5, 1, and 2 years after the initial treatment. *Results:* Before the treatment, there were no differences in blood pressure, blood lipids, or inflammatory factors between the two groups. After one year's treatment, the systolic pressure and tumor necrosis factor- α (TNF- α) levels were decreased significantly in the treatment group compared to the control group ($P < 0.05$). After two years' treatment, blood pressure, blood lipids (TC and TG), and the inflammatory factors in the treatment group were significantly lower than the levels in the control group, but, the high-density lipoprotein cholesterol (HDL-C) levels in the treatment group were significantly higher compared with the control group ($P < 0.05$). The damage rates of the hearts, brains, and kidneys in the treatment group were all significantly lower than the damage rates in the control group ($P < 0.05$). *Conclusion:* Taking regular, slow walks over the long term has a significant effect on lowering blood pressure, reducing lipids, and reducing inflammation in elderly hypertensive patients.

Keywords: Regular slow walks, elderly hypertension, inflammation, blood pressure, blood lipids

Introduction

Elderly hypertension represents a type of common senile disease, and shows an increasingly high incidence rate among the aged populations [1-3]. Elevated blood pressure, blood lipids, and inflammation are frequently found in elderly patients with hypertension [4, 5]. Clinically, hypertension is mainly treated with drugs. However, the therapeutic effect is unsatisfactory due to the requirement of continuous medication [6, 7]. At present, an emerging treatment method, taking slow walks over the long term, has been applied in the treatment of this disease [8, 9]. However, the effect of regularly taking slow walks over the long term on inflammation in elderly hypertensive patients remains poorly understood. The present study

aims to investigate the clinical therapeutic efficacy of regularly taking slow walks over the long term in elderly hypertensive patients.

Patients and methods

Patients

A total of 83 elderly hypertensive patients in our hospital from January 2016 to December 2016 were selected and randomly divided into a control group and a treatment group. Among the 40 patients in the control group, there were 28 males and 12 females aged 55-73 years, with an average age of (64.32 \pm 4.32) years, and the average duration of their hypertension was (8.43 \pm 3.63) years. Among the 43 patients in the treatment group, there were 26 males and

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Table 1. Comparison of the clinical data before treatment

Index	Treatment group	Control group
SBP (mmHg)	163.45±15.32	165.43±15.32
DBP (mmHg)	99.78±7.67	98.95±9.56
TNF-α (ng/L)	12.53±1.67	12.49±1.34
IL-6 (ng/L)	26.47±3.09	25.98±2.78
Hs-CRP (mg/L)	7.32±0.78	7.56±0.78
TC (mmol/L)	5.89±0.53	5.93±0.60
TG (mmol/L)	1.92±0.11	1.83±0.12
HDL-C (mmol/L)	1.19±0.10	1.16±0.12

17 females aged 55-72 years, with an average age of (63.02±4.62) years, and the average duration of their hypertension was (8.10±3.13) years. There were no significant differences between the two groups in their clinical data, including gender, age, duration, etc., and they were comparable. All patients were informed of the clinical protocol, and an informed consent was obtained from each of them. This study was approved by the ethics committee of our hospital.

Inclusion criteria: All patients met the diagnostic criteria of hypertension, and they had no past medical history of diseases of the vital organs, including the heart, liver, and kidneys.

Exclusion criteria: Patients with hyperlipidemia, patients who received inflammatory treatment recently, or patients with a mental disorder.

Treatment approach

Patients in the control group were treated routinely through the oral administration of 12.5 mg hydrochlorothiazide and 4 mg perindopril once daily in the morning, respectively. Patients in the treatment group took regular, slow walks twice daily (about half an hour per time) in the morning and evening on the basis of routine therapy. The slow walks were taken with the premise that no sense of fatigue was to be produced. The treatment lasted for two years.

Observation indexes and therapeutic effect evaluation

Blood pressure indexes: The systolic blood pressure (SBP) and diastolic blood pressure (DBP) of the patients were periodically measured during and at the end of the treatment.

Blood lipid indexes: Total cholesterol (TC), triglycerides (TG) and high-density lipoprotein cholesterol (HDL-C) were measured via enzyme-linked immunosorbent assay (ELISA) at 2 years after the initial treatment.

Inflammatory factors: Interleukin-6 (IL6) and tumor necrosis factor-α (TNF-α) were measured via ELISA, and high-sensitivity C-reactive protein (hs-CRP) was measured via turbidimetric analysis at 2 years after the initial treatment.

In addition, SBP and TNF-α were also measured at 0.5 and 1 year after initial treatment.

The damage rate of heart, brain and kidneys: Heart, brain and kidney diseases were diagnosed based on the diagnostic criteria of the WHO: damage rate = damaged case/total case.

Statistical analysis

All data were processed using Statistical Product and Service Solutions (SPSS) software. The measurement data were presented as the mean ± standard deviation (SD) and the enumeration data were presented as a percentage. Student's *t*-test was performed for the comparison of differences between the two groups. Pearson's correlation analysis was used for the correlation analysis. $P < 0.05$ indicated that the difference was statistically significant.

Results

Comparisons of clinical data before treatment

There were no significant differences in the biochemical indexes, SBP, DBP, TNF-α, IL-6, hs-CRP, TC, TGm and HDL-C between the two groups before treatment ($P > 0.05$) (**Table 1**).

Correlation of inflammatory factor TNF-α with SBP

The correlation analysis showed that there was a positive correlation between SBP and TNF-α at 2 years after the initial treatment ($r = 0.9415$, $P = 0.021$) (**Figure 1**).

Reduced SBP of patients in the treatment group after one and two years of treatment

After half a year, there was no significant difference in SBP between the two groups of patients

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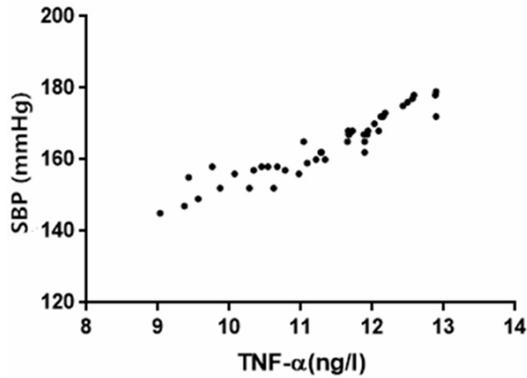


Figure 1. Correlation analysis of the inflammatory factor TNF- α with SBP.

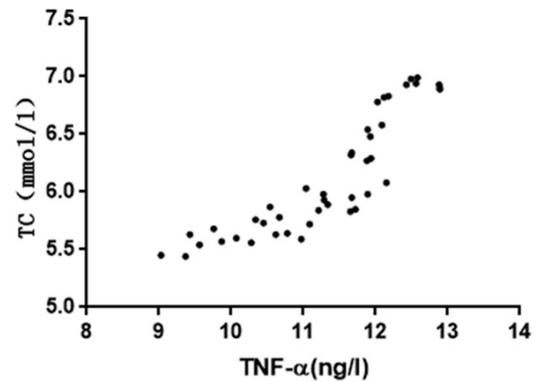


Figure 4. Correlation analysis of TC with TNF- α .

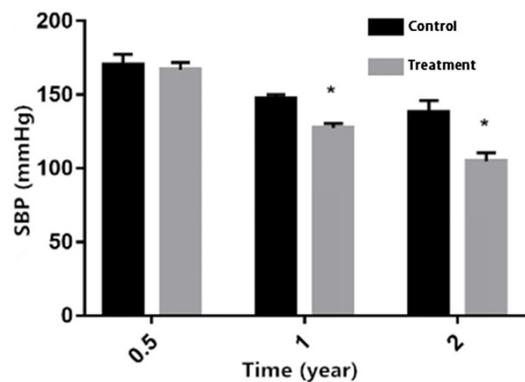


Figure 2. Comparison of SBP between the two groups of patients within two years.

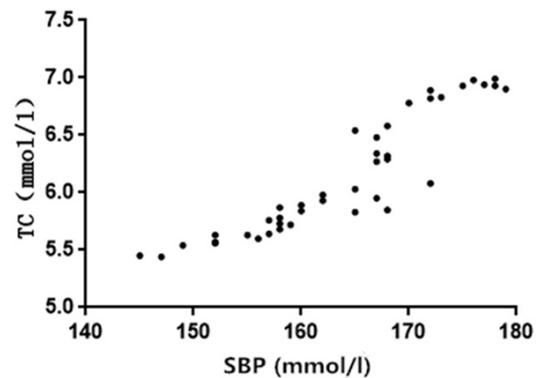


Figure 5. Correlation analysis of TC with SBP.

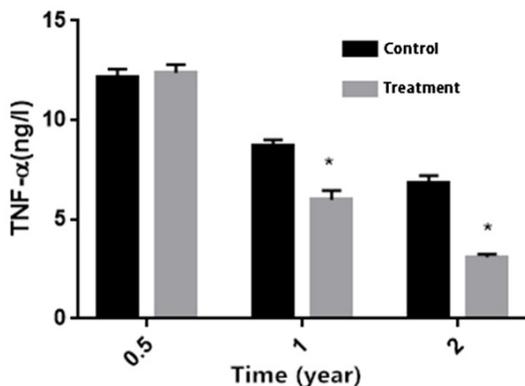


Figure 3. Comparison of TNF- α between the two groups of patients within two years.

($P > 0.05$) (Figure 2). However, after one year and two years, the patients' SBP levels in the treatment group were significantly lower than the levels in the control group ($P < 0.05$), and the level was reduced more sharply than it was in the control group (Figure 2).

Decreased TNF- α level of patients in the treatment group after one and two years of treatment

After half a year, there was also no significant difference in the TNF- α level between the two groups of patients. Nonetheless, at 1 and 2 years after the initial treatment, the levels of TNF- α in the two groups of patients were decreased, while the content was significantly reduced in the treatment group compared to that in the control group ($P < 0.05$) (Figure 3).

Correlation of TNF- α , SBP with TC

Our result showed a positive correlation between TC and TNF- α ($r = 0.8783$, $P = 0.0193$) (Figure 4), TC and SBP ($r = 0.9184$, $p = 0.0283$) (Figure 5), respectively.

Comparisons of biochemical indexes after treatment

After two years' treatment, the SBP, DBP, TNF- α , IL-6, hs-CRP, TC, and TG levels of the patients

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Table 2. Comparisons of biochemical indexes after treatment

Index	Treatment group	Control group
SBP (mmHg)	148.34±13.45	159.45±12.45*
DBP (mmHg)	82.34±8.45	98.56±8.98*
TNF-α (ng/L)	6.43±0.67	8.97±0.87*
IL-6 (ng/L)	13.27±1.34	15.56±1.23*
Hs-CRP (mg/L)	4.23±0.43	5.98±0.54*
TC (mmol/L)	4.32±0.41	4.98±0.45*
TG (mmol/L)	1.31±0.11	1.79±0.11*
HDL-C (mmol/L)	1.65±0.12	1.24±0.10*

Note: *compared with the treatment group, $P < 0.05$.

in the two groups were all reduced and were significantly lower than those in control group ($P < 0.05$). However, HDL-C in the treatment group was significantly higher than it was in the control group ($P < 0.05$) (Table 2).

Comparisons of the damage rates of the heart, brain, and renal function

In the control group, the damage rates of an abnormal ECG, left ventricular hypertrophy, coronary heart disease, acute cerebrovascular disease, and abnormal renal function were 52.5%, 20%, 7.5%, 12.5% and 15.0%, respectively, which were all significantly higher than the rates in the treatment group (20.9%, 6.9%, 4.6%, 2.3% and 4.6% respectively) ($P < 0.05$) (Table 3).

Discussion

The most common chronic disease in the aged populations is senile hypertension, and its incidence rate increases year by year, which is thought to be related to the accelerated pace of work and to the serious pollution of the living environment [10-12]. Senile hypertension often leads to elevated blood pressure and blood lipids, and even to a series of inflammatory responses in patients [13, 14]. Clinical treatment relies on drugs, such as angiotensin converting enzymes, diuretics and vasodilators. These hypotensive drugs contribute to decreasing blood pressure but can also cause unavoidable side effects in patients with senile hypertension. Moreover, due to the fact that the senile hypertension is a chronic disease, the long-term medication brings a heavy financial burden to patients [15, 16]. Nowadays, an adjuvant therapeutic method of regularly taking

slow walks over the long term is emerging in the clinic, and the therapeutic effect can be enhanced using this approach [17, 18]. In this study, patients with senile hypertension in our hospital were selected, and we investigated the clinical therapeutic efficacy of this adjuvant approach on patients with senile hypertension, based on the routine treatment.

In clinical practice, slow walking is a kind of medical exercise therapy method, and also an aerobic exercise from the point of view of sports, which can expand the capillaries, accelerate the internal metabolism, and enhance enzyme activity [19]. Among the elderly hypertensive patients, there are abnormalities in blood pressure, blood lipids, and inflammation. Blood lipids are the pathogenic factor of hypertension. The rising content of TG is accompanied by a reduction in the activity of the fibrinolytic enzyme, leading to an increase in blood viscosity. Also, the excess blood lipids attach to the vascular wall, contributing to risk factors for atherosclerosis. The main inflammatory factors in elderly hypertensive patients are TNF-α, IL-6, and CRP, which are closely associated with hypertension. In the clinic, the severe condition of hypertension is associated with higher levels of TNF-α, IL-6, and CRP. TNF-α is mainly responsible for the production and release of a growth factor, and it also accelerates the secretion of endothelin and the release of angiotensin II. Elevation of TNF-α results in a thickening of the arterial wall, further increasing blood pressure. IL-6 leads to vasoconstriction through the stimulation of the proliferation of smooth muscle cells, thus elevating blood pressure. CRP refers to a reactive protein, and the overexpression of CRP is reported to be capable of causing an overgrowth of vascular endothelial cells and the thickening of artery walls in patients, thus increasing peripheral resistance. CRP is also a risk factor for hypertension. Patients with hypertension tend to suffer from heart, brain and renal complications, and the long-term condition of SBP in hypertension patients is the main cause of heart, brain, or renal damage. The overload of SBP leads to excess secretion of renin in the body and produces a retention of sodium and water. Hypertension increases the incidence rates of stroke and cardiac insufficiency in patients and reduces the self-regulation ability of cardiac function, so it can give rise to the sudden death of patients [20].

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Table 3. Comparisons of the damage rate of the heart, brain and renal function in the different groups

Group	Case	Abnormal ECG	Left ventricular hypertrophy	Coronary heart disease	Acute cerebrovascular disease	Abnormal renal function
Control group	40	21 (52.5)	8 (20.0)	7 (7.5)	5 (12.5)	6 (15.0)
Treatment group	43	9 (20.9)*	3 (6.9)*	2 (4.6)*	1 (2.3)*	2 (4.6)*

Notes: *compared with the control group, $P < 0.05$.

In this study, we found correlations among blood pressure, blood lipids, and inflammatory factors. Moreover, after one year's treatment, the blood pressure, blood lipid (TC and TG), and inflammatory factors in the treatment group were significantly lower than the corresponding levels in the control group, indicating that regularly taking slow walks over the long term, as an adjuvant therapeutic method, can lower blood pressure and blood lipids and exert an anti-inflammation effect. After long-term exercise, the fat metabolism of the body is increased, contributing to reducing the release of TC and inhibiting HDL-C. Therefore, the viscosity of blood can be avoided, which is beneficial in improving the elasticity of the vascular wall and lowering the blood pressure. The reduction of inflammatory factor content can lower the secretion and release of angiotensin II to improve the vascular systolic function. The damage rates of the heart, brain, and kidneys in the treatment group were significantly lower than those in the control group. Down regulation of inflammatory factors via reducing the blood pressure and lipids can also reduce the damage to the heart, brain, kidneys and other relevant organs.

Conclusion

In conclusion, taking regular slow walks over the long term presents a significant adjuvant therapeutic effect on elderly hypertensive patients by lowering blood pressure, reducing blood lipids, and improving the symptoms of inflammation.

Disclosure of conflict of interest

None.

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References

- [1] Hu J, Zhu F, Xie J, Cheng X, Chen G, Tai H and Fan S. Structural and functional changes of the coronary arteries in elderly senile patients with essential hypertension. *Mol Med Rep* 2013; 8: 1385-1389.
- [2] Hou PH, Chen GL, Gu WL, Wang DW, Wang XF, Zhao XH, Xu T and Shi ZX. [Distribution laws of Chinese medical syndrome types and analyses of risk factors in senile hypertension patients: a clinical study]. *Zhongguo Zhong Xi Yi Jie He Za Zhi* 2014; 34: 536-540.
- [3] Liu P, Wang SJ and Zhang Y. [The relationship between resting heart rate and target organs damage in senile essential hypertension]. *Zhonghua Xin Xue Guan Bing Za Zhi* 2005; 33: 49-53.
- [4] Duan X, Yang D and Sun X. [Effect of yimai jiangya extract on plasma neuropeptide Y level in patients of senile hypertension with qi-deficiency and blood stasis syndrome]. *Zhongguo Zhong Xi Yi Jie He Za Zhi* 2000; 20: 750-752.
- [5] Li H, Liu F and Cui L. [Effect of jiangya capsule on levels of serum nitric oxide synthase activity, malondialdehyde, plasma neuropeptide Y and homocysteine in patients with senile simple systolic hypertension]. *Zhongguo Zhong Xi Yi Jie He Za Zhi* 2003; 23: 898-901.
- [6] Tao C. How to give TCM differential treatment for senile severe hypertension? *J Tradit Chin Med* 2007; 27: 236-237.
- [7] Wang J, Xiong X and Yang X. Is it a new approach for treating senile hypertension with kidney-tonifying Chinese herbal formula? A systematic review of randomized controlled trials. *Evid Based Complement Alternat Med* 2014; 2014: 473038.
- [8] Mobasser M, Yavari A, Najafipour F, Aliasgarzadeh A and Niafar M. Effect of a long-term regular physical activity on hypertension and body mass index in type 2 diabetes patients. *J Sports Med Phys Fitness* 2015; 55: 84-90.
- [9] Ghadie AS and Saab B. Evidence for exercise training in the management of hypertension in adults. *Can Fam Physician* 2015; 61: 233-239.
- [10] Yi Q, Yang Y, An R, Huang H, Ouyang M and Dai J. [Effect of the integration pattern of hospital-community on the grade-based management for hypertension in elders]. *Zhong Nan Da Xue Xue Bao Yi Xue Ban* 2015; 40: 1258-1263.

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- [11] Coppell KJ, Abel SL, Freer T, Gray A, Sharp K, Norton JK, Spedding T, Ward L and Whitehead LC. The effectiveness of a primary care nursing-led dietary intervention for prediabetes: a mixed methods pilot study. *BMC Fam Pract* 2017; 18: 106.
- [12] Lian XL, Zhang YP, Li X, Jing LD, Cairang ZM and Gou JQ. Exploration on the relationship between the elderly osteoporosis and cardiovascular disease risk factors. *Eur Rev Med Pharmacol Sci* 2017; 21: 4386-4390.
- [13] Hu J, Zhu F, Xie J, Cheng X, Chen G, Tai H and Fan S. Structural and functional changes of the coronary arteries in elderly senile patients with essential hypertension. *Mol Med Rep* 2013; 8: 1385-1389.
- [14] Casanova MF. The pathology of paraphrenia. *Curr Psychiatry Rep* 2010; 12: 196-201.
- [15] Raza ST, Abbas S, Chandra A, Singh L, Rizvi S and Mahdi F. Association of angiotensin-converting enzyme, CYP46A1 genes polymorphism with senile cataract. *Oman J Ophthalmol* 2017; 10: 21-25.
- [16] Glick ID, Murray SR, Vasudevan P, Marder SR and Hu RJ. Treatment with atypical antipsychotics: new indications and new populations. *J Psychiatr Res* 2001; 35: 187-191.
- [17] Walther D, Curjuric I, Dratva J, Schaffner E, Quinto C, Schmidt-Trucksass A, Eze IC, Burdet L, Pons M, Gerbase MW, Imboden M, Schindler C and Probst-Hensch N. Hypertension, diabetes and lifestyle in the long-term - Results from a Swiss population-based cohort. *Prev Med* 2017; 97: 56-61.
- [18] Shiotani H, Umegaki Y, Tanaka M, Kimura M and Ando H. Effects of aerobic exercise on the circadian rhythm of heart rate and blood pressure. *Chronobiol Int* 2009; 26: 1636-1646.
- [19] Strasser B, Geiger D, Schauer M, Gatterer H, Burtscher M and Fuchs D. Effects of exhaustive aerobic exercise on tryptophan-kynurenine metabolism in trained athletes. *PLoS One* 2016; 11: e0153617.
- [20] Nieman DC, Capps CL, Capps CR, Shue ZL and McBride JE. Effect of 4-week ingestion of tomato-based carotenoids on exercise-induced inflammation, muscle damage, and oxidative stress in endurance runners. *Int J Sport Nutr Exerc Metab* 2018; 28: 266-273.