Journal of Hainan Medical University

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Effect of Ginkgo biloba extract in combined with prednisone on the arterial blood gas and pulmonary function in patients with idiopathic pulmonary fibrosis

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ARTICLE INFO

Article history:
Received 3 Aug 2016
Received in revised form 18 Aug 2016
Accepted 11 Aug 2016
Available online 24 Aug 2016

Keywords:
EGb
Prednisone
IPF
Arterial blood gas
Pulmonary function

ABSTRACT

Objective: To explore the effect of Ginkgo biloba extract (EGb) in combined with prednisone on the arterial blood gas and pulmonary function in patients with idiopathic pulmonary fibrosis (IPF). **Methods:** A total of 76 patients with IPF who were admitted in our hospital from March, 2015 to March, 2016 were included in the study and randomized into the observation group and the control group. The patients in the two groups were given oxygen inhalation, bronchodilator agents, phlegm dissipating and asthma relieving, anti-infection, and other supporting treatments. The patients in the control group were orally given prednisone (0.5 mg/kg.d), continuously for 4 weeks, then in a dose of 0.25 mg/kg.d, continuously for 8 weeks, and finally the dosage was reduced to 0.125 mg/kg.d. On this basis, the patients in the observation group were given additional EGb, i.e. Ginkgo leaf capsule, 1 g/time, 3 times/d, continuously for 12 weeks. The efficacy was evaluated after 12-week treatment. PaO2, PaCO2, P(A-a)O_2, and SaO_2 before and after treatment were detected. FVC, FEV1/FVC, MVV, TLC, and DLCO before and after treatment were determined. **Results:** PaO_2, $PaCO_2$, and SaO_2 after treatment were significantly elevated, while P(A-a)O_2 was significantly reduced when compared with before treatment. The comparison of PaO_2 and P(A-a)O_2 between the two groups was statistically significant, while the comparison of PaCO2 and SaO_2 between the two groups was not statistically significant. After treatment, FVC, FEV1/FVC, MVV, TLC, and DLCO in the two groups were significantly elevated when compared with before treatment, and those in the observation group were significantly superior to those in the control group. **Conclusions:** EGb in combined with prednisone in the treatment of IPF can effectively improve the arterial blood gas indicators and pulmonary function, and enhance the patients' living qualities; therefore, it deserves to be widely recommended.

1. Introduction

Idiopathic pulmonary fibrosis (IPF) is a kind of disease characterized by alveolar structure disorder, diffused pulmonary alveolitis, interstitial pneumonia, and pulmonary fibrous tissue proliferation, with clinical manifestations of progressive and aggravated dyspnea, and restrictive ventilatory function, and can cause cardio-pulmonary failure to death in the advanced stage[1]. Currently, there is no special treatment for IPF. Anti-fibrosis, glucocorticoids, and immunosuppressants are mainly involved in the treatment of IPF, but the adverse reactions are great, and the treatment compliance is poor[2]. Recent researches demonstrate that Ginkgo biloba extract (EGb) can resist the pulmonary interstitial fibrosis, and is widely applied in the clinic, with a satisfactory effect[3,4]. The study is aimed to explore the effect of EGb in combined with prednisone on the arterial blood gas and pulmonary function in patients with IPF.

2. Materials and methods

2.1. General materials

A total of 76 patients with IPF who were admitted in our hospital

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Foundation Project: The study was supported by the Scientific and Technological Achievement Awards Project of Hebei Province with the number of 20120150.

from March, 2015 to March, 2016 were included in the study, among which 52 were male, and 14 were female; aged from 41 to 72 years old, with an average age of (53.7±8.4) years old. All the patients were in accordance with the diagnostic criteria of IPF[5]. Exclusion criteria: (1) those who had pulmonary fibrosis caused by connective tissue diseases and drugs; (2) those who were merged with heart, liver, kidney, and other serious complications; (3) those who were accompanied by bronchial asthma, bronchiectasis, and other respiratory system diseases. The patients were randomized into the observation group and the control group with 38 cases in each group. The comparison of the general materials between the two groups was not statistically significant (P>0.05).

2.2. Methods

The patients in the two groups were given oxygen inhalation, bronchodilator agents, phlegm dissipating and asthma relieving, anti-infection, and other supporting treatments. The patients in the control group were orally given prednisone (produced by Zhejiang Xianju Pharmaceutical Co. Ltd, approval No. H33021207), 0.5 mg/kg.d, continuously for 4 weeks, then in a dose of 0.25 mg/kg.d, continuously for 8 weeks, and finally the dosage was reduced to 0.125 mg/kg.d. On this basis, the patients in the observation group were given additional EGb, i.e. Ginkgo leaf capsule (produced by Hunan Hansen Pharmaceutical Co. Ltd, approval No. Z20026289), 1g/time, 3 times/d, continuously for 12 weeks. The efficacy was evaluated after 12-week treatment.

2.3. Observation indicators

The full automatic blood gas analyzer was used to detect PaO_2, $PaCO_2$, $P(A\text{-}a)O_2$, and SaO_2. The pulmonary function detector was used to measure FVC, FEV1/FVC, TLC, MVV, and DLCO.

2.4. Statistical analysis

SPSS 18.0 software was used for the statistical analysis. The measurement data were expressed as mean ± SD, and t test was used. Chi-square test was used for the enumeration data. P<0.05 was regarded as statistically significant.

3. Results

3.1. Comparison of the arterial blood gas indicators before and after treatment

PaO_2, $PaCO_2$, and SaO_2 after treatment were significantly elevated, while $P(A\text{-}a)O_2$ was significantly reduced when compared with before treatment (P<0.05). The comparison of PaO_2 and $P(A\text{-}a)O_2$ between the two groups was statistically significant (P<0.05), while the comparison of $PaCO_2$ and SaO_2 between the two groups was not statistically significant (P>0.05) (Table 1).

3.2. Comparison of the pulmonary function before and after treatment

After treatment, FVC, FEV1/FVC, MVV, TLC, and DLCO in the two groups were significantly elevated when compared with before treatment (P<0.05), and those in the observation group were significantly superior to those in the control group (P<0.05) (Table 2).

4. Discussion

IPF is a serious destructive pulmonary disease characterized by excessive synthesis and deposition of extracellular matrix, with main pathological changes of inflammatory reaction, immune response, alveolar injury, and pulmonary fibrosis. It is argued that IPF is associated with the proliferation of a large amount of interstitial cells and the progressive accumulation of matrix collagen, which can affect the pulmonary ventilation and gas exchange function[6]. Some researches demonstrate that oxidative stress is involved in the intracellular oxidoreduction balance, can activate the pre-inflammatory nuclear transcription factor, induce the production of pro-inflammatory factors, intervene the cellular signal transduction pathway, alter the microenvironment balance of inflammatory cytokines, and damage the alveolar epithelial cells[7]. Lung volume in patients with IPF is reduced in a different degree, with clinical manifestations of hypoxemia, progressive and aggravated dyspnea, and finally the cardio-pulmonary failure occurs, leading to death[8]. Studies show that after being confirmed with IPF, the average survival time is 2-4 years, and five-year survival rate is 30%-50%;

Table 1.
Comparison of the arterial blood gas indicators before and after treatment.

Groups	n	Time	PaO_2 (mmHg)	SaO_2 (%)	$PaCO_2$ (mmHg)	$P(A\text{-}a)O_2$ (mmHg)
Observation	38	Before treatment	54.65±8.45	80.47±4.22	46.84±6.52	44.62±4.18
		After treatment	74.37±8.71*#	90.43±3.18*	40.73±6.21*	22.86±3.55*#
Control	38	Before treatment	54.57±7.67	80.48±4.38	46.58±8.20	44.48±4.71
		After treatment	64.71±8.14*	89.43±4.62*	41.56±5.26*	30.45±3.32*

*P<0.05, when compared with before treatment; #P<0.05, when compared with the control group.

Table 2.
Comparison of the pulmonary function before and after treatment.

Groups	n	Time	FVC(L)	FEV1/FVC(%)	TLC(L)	MVV(L/min)	DLCO(mL.min-1.mmHg-1)
Observation	38	Before treatment	2.08±0.51	56.39±7.45	3.21±0.58	62.77±11.21	11.31±3.54
		After treatment	2.88±0.87*#	84.37±9.66*#	3.89±0.87*#	76.45±11.66*#	16.07±5.31*#
Control	38	Before treatment	2.06±0.62	56.22±8.34	3.24±0.59	62.53±11.37	11.45±3.47
		After treatment	2.50±0.51*	76.45±9.37*	3.61±0.35*	69.82+10.41*	11.42±4.61*

*P<0.05, when compared with before treatment; #P<0.05, when compared with the control group.

therefore, early diagnosis and treatment is especially important[9]. The key treatment for IPF is to effectively control the inflammatory reaction in order to reduce the alveolar epithelial injury, and delay entering the remodeling stage with abnormal proliferation of fibroblasts[10].

Glucocroticoid is mainly involved in the treatment of IPF in that it can effectively inhibit the inflammatory immune reaction, the infiltration of neutrophils and lymphocytes, activation of macrophages and lymphocytes, differentiation and proliferation of fibroblasts, and delay the progression of fibrosis, but application of IPF in a large amount for a long-time can produce large toxic and side effects, including hypoimmunity, double infection, abnormal blood sugar metabolism, osteoporosis, electrolyte disturbance, and poor efficacy[11].

In recent years, various researches demonstrate that EGb in the treatment of IPF has a significantly efficacy, can effectively improve the lung function and enhance the living quality, but the pathogenesis is not yet clear[12]. EGb, an effective component extracted from the dry leaves of Ginkgo biloba, mainly including flavonoid, terpene lactones, and organic acids, has various and complex biological effects, with main pharmacological effects of lung moistening, cough and asthma relieving, improving the microcirculation, expanding the blood vessels, reducing the serum lipid, anti-arteriosclerosis, resisting platelet activating factor, regulating the immunity and the release of excitatory amino acid, antioxidation, and eliminating the oxygen free radicals[13]. Some researches demonstrate that EGb can effectively regulate the pulmonary function, and improve PaO_2, proving that EGb has an important clinical value in the treatment of IPF, and the pathogenesis is probably is that EGb can reduce the exudation of inflammatory cells, and improve the expression of cell immune factors in order to improve the clinical symptoms[14]. Some scholars study the clinical efficacy of EGb in the treatment of IPF, and it is found that EGb can preferably improve the pulmonary function PaO_2, reduce the expression of TNF- , and improve the clinical symptoms; therefore, it is argued that EGb in the treatment of IPF has an important application value[15]. Flavonoids in EGb can effectively eliminate the excessive oxygen free radicals, and avoid the damage on cells to a certain degree to prevent the occurrence of IPF[16]. EGb can also regulate the high viscosity and hypercoagulation of blood in patients with IPF, prevent the endothelin, expand the blood vessels, regulate the microcirculation state, contribute to improve the arterial blood gas indicators and pulmonary function[3].

The results in the study showed that PaO_2, $PaCO_2$, and SaO_2 after treatment were significantly elevated, while P(A-a)O2 was significantly reduced when compared with before treatment (P<0.05), the comparison of PaO_2 and P(A-a)O_2 between the two groups was statistically significant (P<0.05), while the comparison of $PaCO_2$ and SaO_2 between the two groups was not statistically significant (P>0.05); after treatment, FVC, FEV1/FVC, MVV, TLC, and DLCO in the two groups were significantly elevated when compared with before treatment (P<0.05), and those in the observation group were significantly superior to those in the control group (P<0.05), indicating that EGb in combined with prednisone in the treatment of IPF has an accurate efficacy, and can improve the arterial blood gas indicators and pulmonary function.

In conclusion, EGb in combined with prednisone in the treatment of IPF can effectively improve the arterial blood gas indicators and pulmonary function, and enhance the patients' living qualities; therefore, it deserves to be widely recommended.

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