

Clinical studies of simvastatin in treatment of adult-onset obesity with asthma.

Shufang Sun¹, Wei Han², Wanming Hao^{2*}

¹Blood Donation Service Department, Qingdao Blood Center, Qingdao, Shandong, PR China

²Department of Respiratory, Qingdao University, Qingdao Municipal Hospital, Qingdao, Shandong, PR China

Abstract

Objective: To explore clinical value and significance of simvastatin in treatment of adult-onset obesity with asthma.

Methods: 82 cases of adult-onset obesity with asthma enrolled in Qingdao Municipal Hospital from Jun 2015 to Aug 2016 were selected as the study objects and randomly divide them into control group and experiment group with 41 cases each. The patients in the control group were treated with budesonide and formoterol inhalation therapy while simvastatin treatment was added in the experiment group in addition to the above therapy. Then, we evaluate Asthma Control Test (ACT) of the two groups before and after treatment within 55 d, compare the patient's pulmonary function recovery and observe serum leptin level of the two groups, record side effects and then compare the life quality of the patients.

Results: With different treatment schemes, the ACT score, pulmonary function recovery level, serum leptin level, life quality of the patients turn out to be better in both two groups, while the effects in experimental groups were more excellent with a statistical significance ($P < 0.05$); but no obvious side effects were found.

Conclusion: Simvastatin has good effect in treatment of obese adults with asthma on improving lung function, reducing the patient's serum leptin level, decreasing the incidence of adverse reactions, and improving the quality of life of the patients.

Keywords: Simvastatin, Obesity, Asthma, Pulmonary function.

Accepted on June 27, 2017

Introduction

Asthma is one of common diseases of respiratory medicine in clinic and obesity is likely to be one of the major causes and risk factors of asthma which indicates that obese people are prone to asthma. The effect of conventional therapy is not ideal and it often leads to various adverse reactions like the rising of blood sugar level or osteoporosis, result in serious harm to the patient's physical or mental health [1-3]. Statins not only have the effect of reducing blood fat in the clinical treatment, but also has anti-inflammatory effects and adjust the patient's immune function [4-6]. To explore the role of statins in asthma disease treatment, we especially select 82 cases from Qingdao Municipal Hospital to take part in this simvastatin treatment study. The research conditions are reported now as follow.

Materials and Methods

General data

82 cases of adult-onset obesity with asthma enrolled in our hospital from Jun 2015 to Aug 2016 were selected as the study objects and randomly divided into control group and

experiment group with 41 cases for each. All cases meet the requirement of diagnostic criteria of asthma and their body mass indexes were greater than 30 kg/m^2 , in line with the diagnostic criteria of obesity and all of them are treated with conventional therapies like budesonide inhalation, formoterol, salmeterol and fluticasone propionate inhalant within 3 months and turn out to suffer acute attack. Exclusion standards include the situation that patients were treated with theophylline drugs or bronchodilator treatment and the patient with complicated pulmonary infection, pulmonary tumor and bronchiectasis and major diseases such as heart, liver and kidney disease. The study was approved by ethics committee of the hospital and the patients were voluntary to participate in the study with informed consent. 80 patients were divided randomly into experiment group ($n=40$) and the control group ($n=40$). Among the experiment group there were 31 males and 10 females aged between 36 and 72 with an average of 51.4 ± 3.2 while among the control group there were 29 males and 12 females aged between 35 and 71 with an average of 50.1 ± 3.1 . Patients of two groups have no significant difference in terms of basic clinical data.

Treatment methods

Asthma treatment was conducted as usual in the control group that is to continue the previous treatment of budesonide, formoterol or salmeterol and fluticasone propionate inhalation treatment, inhaling twice a day with once inhalation for each. Oral simvastatin was added in the experiment group based on routine treatment once a day with the dosage of 20 mg for each.

Detection methods

5 ml blood sample was collected in tubes for venous blood specimen in fasting time for serum leptin test and set the radius of the centrifuge as 10 cm at the centrifugal rate of 2000 r/m. Detect the patient's serum leptin level by double antibody sandwich method.

Clinical observation index

ACT score: Evaluate the patient's control of asthma with ACT score system and the score results are positively correlated with patient's control of asthma; evaluate the pulmonary function before and after the treatment, including the Forced Expiratory Volume (FEV1) and Forced Vital Capacity (FVC) at first second; detect the patient's serum leptin level; detect drug adverse reactions; the scores of life quality include the patient's performance of physical function, emotional function, social function and mental function.

Table 1. Comparison of ACT score, pulmonary function and serum leptin level.

Index		Experiment group	Control group	t	P
ACT score	Before treatment	18.2 ± 3.01	17.5 ± 2.97	1.06	0.29
	After treatment	23.4 ± 2.41	20.7 ± 2.16	5.34	0
FEV1	Before treatment	1.55 ± 0.75	1.54 ± 0.73	0.61	0.95
	After treatment	1.99 ± 0.45	1.62 ± 0.51	3.49	0
FVC	Before treatment	2.18 ± 0.51	2.16 ± 0.48	0.18	0.86
	After treatment	2.86 ± 0.43	2.23 ± 0.35	7.28	0
Serum leptin level	Before treatment	13.7 ± 1.31	13.2 ± 1.28	1.75	0.08
	After treatment	11.5 ± 1.05	14.7 ± 1.32	12.15	0

Table 2. Comparison of drug adverse reactions (n, %).

Group	Gastrointestinal reaction	Elevated aminotransferase alanine	Elevated aminotransferase aspartate	Total adverse reaction rate
Experiment group	1 (0.24%)	1 (0.24%)	0 (0.00%)	2 (4.88%)
Control group	1 (0.24%)	2 (0.48%)	1 (0.24%)	4 (9.76%)
χ^2	-	-	-	0.719
P	-	-	-	0.396

Statistical analysis

Count data was described as percentage (n, %) and measurement data as mean ± S. Chi-square test and T-test, χ^2 test were applied with statistical significant of $P < 0.05$. Statistical software: SPSS 19.0 and Microsoft office excel.

Results

Comparison of ACT score, pulmonary function and serum leptin level

With different treatment schemes, the ACT score, pulmonary function recovery level, serum leptin level, life quality of the patients turn out to be better in both two groups, while the effects in experimental groups were more excellent with a statistical significance (Table 1).

Drug adverse reactions

There is no significant difference in drug adverse reactions after treatment between the two groups (Table 2).

Quality of life scores

The quality of life scores after treatment in the experiment group are obviously higher than those of the control with statistical significance ($P < 0.05$) (Table 3).

Table 3. Comparison of quality of life scores.

Group	Physical function	Emotional function	Social function	Mental function
Experiment group	92.13 ± 3.48	91.14 ± 3.17	93.33 ± 3.48	92.38 ± 3.39
Control group	88.12 ± 2.05	85.15 ± 2.65	86.03 ± 2.18	87.18 ± 2.58
t	6.357	9.283	11.383	7.816
P	0	0	0	0

Conclusion

Simvastatin has good effects in treatment of obese adults with asthma and needs more case studies in clinic for the further research.

Discussion

Asthma and inflammation diseases among the obese people are different from those among of the ordinary patients with more severe clinical manifestations, conventional treatment of asthma in obesity has poor prognosis, so obesity becomes a special phenotype of asthma in clinic [7-10].

Statins has the effect of anti-inflammatory and immune regulation. Simvastatin is a competitive inhibitor of Hydroxymethylglutaryl-CoA reductase (NADPH) with good inhibition of cholesterol biosynthesis for patients and accelerates metabolism and decomposition of low density lipoprotein [11-13]. In clinical researches, simvastatin is mainly used in the treatment of cardiovascular and hyperlipidaemia disease and foreign related research results also shows that the application of statins in asthma therapy can reduce the incidence of acute asthma and hormone dosages. But there are no clear research results in the simvastatin's application effects in the treatment of bronchial asthma [14-17].

Adipose tissue of obese patients produces inflammatory factors and cytokines, results in decreasing of the immune system tolerance and then raising the risk of asthma [18]. Obesity tissue will play a role in airway inflammation of asthma through its fat factor with the regulation of fat metabolism, which may become the new targets for the treatment of asthma with obesity [19].

With a large number of clinical studies, some experts indicate that statins inhibit the progression of airway inflammation in such approaches as MAPK pathway and pathway of small G-protein and nuclear factor-kB to inhibit allergic reaction of inflammation, reduce the release of cytokines and aggregation of acidophilic granulocyte or inhibit the secretion and release of interleukin 5, thus relieving disease conditions by alleviating the patient's airway inflammation response [20,21].

The increase of serum leptin level suggests a metabolic disorder and serves as a pathological basis for systemic inflammatory response, under normal circumstances, however, the obese have a higher level of serum leptin than the ordinary with normal body mass. Leptin in lung tissue and its receptor have good inhibitory effects in neutrophil apoptosis through

MAPK pathway and also promote cytokines release of inflammatory cells [22].

With different treatment schemes, the patients of the two groups turn out to get better in ACT score, pulmonary function recovery and serum leptin level. Quality of the effects of the experiment group patients is more significant and excellent with a statistical significance. This suggests this method could be a novel and efficient treatment method in clinic.

References

1. Xu J, Han W, Lv W. Effect of simvastatin on obese patients with asthma. *J Chin Pract Diag Ther* 2016; 30: 506-508.
2. Huang Z. Effects of related factors in life quality of adult asthma patients and analysis on nursing measures. *Guide Chin Med* 2014; 01: 186-187.
3. Wang W. Epidemiological investigation of asthma prevalence and associated risk factors among people over the age of 14 in Beijing from 2010 to 2011. *Acad Med Sci* 2013.
4. Wanghao, Shao Y. The progress of high body mass index (BMI) and bronchial asthma research. *J Harbin Med Univ* 2015; 49: 279-280.
5. Zhu Y, Hung S, Liwei. Clinical observation of balance acupuncture in treatment of impaired glucose tolerance of adult-onset obesity. *Mod Biomed Progress* 2016; 16: 6694-6697.
6. Wang L, Hu P, Xiefei. Effect analysis on group-based and stage-wise management of overweight adult's health. *Zhejiang J Prev Med* 2016; 28: 535-537.
7. Zhou S, Yuan P, Li S. Analysis of adult body mass index in Henan province from 2010 to 2012. *Chin Food Nutrit* 2016; 22: 85-89.
8. Jin J, Zhangxue, H. Relationship of adult-onset Simple obesity homocysteine levels and the metabolic pathways with coronary heart disease (CHD). *Labeled Immuno Clin Med* 2016; 23: 1291-1293.
9. Chen Q, Hua C, Zhou B. Relationship of adult-onset obesity status with diabetes, hypertension and dyslipidemia. *Shanghai J Prev Med* 2016; 28: 361-365.
10. Xie S, Hu L, Wangkun. Analysis on obesity prevalence survey among the obese older than 40 in Nanjing. *Int J Endo Metab* 2016; 36: 145-148.
11. Ma R, Yang Y, Yang Y. Effect evaluation of comprehensive health management intervention on the improvement of body fat rate for the obese. *Mod Prev Med* 2016; 43: 1191-1195.

12. Li N, Niu J, Chen B. Oral naltrexone or bupropion SR in treatment of obesity. *Clin Med J* 2016; 14: 84-88.
13. Li L, Zhang J, Fang L. Function of rowel nutrition meal in comprehensive health management of overweight and obese patients. *Clin Edu Gen Pract* 2016; 14: 369-373.
14. Ye C, Zhang G. Contrastive analysis on curative effects of Salbutamol sulfate aerosol inhalation and controlled-release theophylline in treatment of acute asthma in elderly. *Chin J Biochem Pharma* 2014; 01: 116-117.
15. Wang X, QI J. Contrastive analysis on curative effects of Salbutamol sulfate aerosol inhalation and controlled-release theophylline in emergency treatment of elderly asthma. *Mod Chin J Integr Med* 2015; 01: 880-881.
16. Caihuan, Lu Z, Zhnangqu. 56 cases of comfortable nursing combined with aerosol inhalation in treatment of elderly asthma. *Chin Pharma* 2015; 24: 195-196.
17. Zhou W, Ke H, Liyang. Curative effect of aerosol inhalation of glucocorticoid in treatment of long-term elderly asthma. *Chin J Geriatrics* 2015; 34: 711-714.
18. Jiang Y. Clinical efficacy comparison of curative effects of Salbutamol sulfate aerosol inhalation and controlled-release theophylline in treatment of acute asthma in elderly. *Chin J Mod Drug Appl* 2015; 04: 136-137.
19. Wang D, Chen S, Zhang G. Influence of budesonide combined with and formoterol therapy on elderly asthma patients and COPD inflammatory cytokines. *Pract Pharma Clin Rem* 2015; 18: 1310-1313.
20. Wangsheng, Xiong L, Dengxue. Effects of aminophylline and simvastatin on such chronic obstructive pulmonary diseases as high airway inflammation and airway mucus secretion in rats. *J Central South Univ* 2016; 41: 37-43.
21. Liu J, Liu G, Tian F. Research of simvastatin inducing BMSC's steogenic differentiation through p38MAPK signalling pathway. *Chin J Osteop* 2016; 22: 125-130.
22. Wu L, Qian M. Role of gypenosides in PCSK9 gene expression and simvastatin's hypolipidemic effects. *Chin J Pathophysiol* 2017; 33: 79-85.

***Correspondence to**

Wanming Hao

Department of Respiratory

Qingdao University

Qingdao Municipal Hospital

Shandong

PR China