

◎原 著

Effects of spa therapy on reduction of the costs of the drugs used for the treatment of asthma in the elderly in relation to disease severity

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Abstract : Costs of drugs used for the treatment for 1 year were compared before and after spa therapy in 16 patients with asthma in relation to disease severity. Asthma severity was classified as : stage 1 (intermittent), 2 (mild persistent), 3 (moderate persistent), and 4 (severe persistent). 1. The total cost of drugs used for each patient for 1 year clearly decreased in all groups. The %decrease of the costs of drugs in each group was 27.2% in patients with stage 1, 43.5% in those with stage 2 and 34.1% in those with stage 3-4 (mean 34.5%). The reduction of the cost of bronchodilators was predominant in patients with stage 3-4, and the decrease in the cost of corticosteroids predominant in those with stage 2. The reduction of costs of antiallergics, mucolytics, and antibiotics was predominant in patients with stage 2 and stage 3-4. The %reduction in the cost of corticosteroids was remarkable in patients with stage 2. The %decrease in the costs of mucolytics and antibiotics was predominant in patients with stage 2 and stage 3-4. The results obtained here suggest that the costs of drugs used for asthmatics could be reduced by long-term spa therapy, and the reduction of the costs was larger as asthma stage became more severe.

Key words : asthma, spa therapy, costs, bronchodilators, corticosteroids, antiallergics

Introduction

Asthma is clinically characterized by transient wheezing and dyspnea, which are elicited by bronchospasm, mucus hypersecretion¹⁾ and edema of mucous membrane. Our previous

studies have shown that spa therapy is effective for patients with asthma, in which improvement of subjective and objective symptoms^{2,3)}, and pulmonary function^{4,5)}, suppression of bronchial hyperresponsiveness⁶⁾, and improvement of suppressed function of adrenocortical glands⁷⁾.

Regarding the onset mechanisms of asthma,

IgE-mediated allergy plays an important role, in which an increase in the generation of leukotriene C4 (LTC4) related to bronchospasm⁸⁻¹⁰⁾, and leukotriene B4 (LTB4) related to bronchial hyperresponsiveness¹¹⁻¹³⁾, is observed. The leukocytes of the asthmatics generated significantly more LTB4 and LTC4 than those of healthy controls. In addition, it has been reported that there is a significant correlation between LTB4 generation by leukocytes and the degree of bronchial hyperresponsiveness to methacholine¹³⁾.

Asthma has been treated mainly with antiasthmatic drugs such as bronchodilators, glucocorticoids, antiallergic agents, mucolytics and antibiotics.

The process of development of drugs for the treatment of asthma has shown that asthma symptoms could be improved more easily with newly developed drugs such as inhaled corticosteroids and bronchodilators. However, the costs of drugs of them are relatively high, and the number of patients with asthma has been increasing in recent years. Thus, several pharmacoeconomic studies in asthma have been conducted in the USA¹⁴⁻¹⁶⁾ and Europe¹⁷⁻²⁰⁾.

In the present study, the effects of spa therapy on reduction of costs of drugs used for the treatment of asthma was studied in relation to disease severity.

Subjects and Methods

The subjects of this study were 16 patients (9 females and 7 males) with asthma. The age of all patients was over 65 years with a mean age of 71.4 years (range 65-78 years). All patients were treated with antiasthmatic drugs such as bronchodilators, corticosteroids, antiallergics, mucolytics, antibiotics, and others (physiological saline, drugs for common cold, etc) at Misasa Medical Center for 1 year. The costs of

drugs used for the treatment of asthma per patient were compared between the cost of drugs for 1 year from January to December in 1997 when spa therapy started and that from January to December in 2000 after spa therapy begun. Spa therapy, particularly, swimming training in a hot spring pool, was continued. The total costs of all drugs and the cost of each drug were expressed throughout in ¥.

Asthma severity was evaluated according to international guidelines²¹⁾. Assessments of severity were classified as: 1) intermittent; 2) mild persistent; 3) moderate persistent; 4) severe persistent. In this study, the costs of drugs used per patient for 1 year were compared among three stages; stage 1, stage 2 and stage 3-4.

Statistically significant differences of the mean were estimated using the unpaired Student's *t* test. A *p* value of <0.05 was regarded as significant.

Results

The costs of drugs used for treatment per patient with asthma for 1 year decreased in all groups classified by asthma stage after spa therapy for 3 years, compared with the costs for 1 year when the therapy started (Table 1). The % decrease in the costs of total drugs used was the largest in patients with stage 2.

Table 1. Costs of drugs used for treatment per patient for 1 year before and after spa therapy

Drugs	Spa therapy	Asthma stage		
		1	2	3-4
Total	Before	103,350	158,990	385,900
	After	75,250	89,840	254,370

Data are presented as ¥.

The mean decrease in the costs of drugs in all groups was 34.5% (Fig. 1). The reduction of the mean cost of bronchodilators after spa therapy

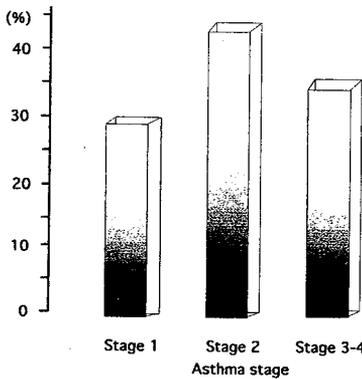


Fig. 1. The % reduction of the cost of total drugs after spa therapy compared with the costs before the therapy.

was largest from ¥108,090 to ¥66,140 in patients with stage 3-4; the difference before and after spa therapy was ¥41,950 per patient for 1 year (Fig. 2 a). However, the % reduction of

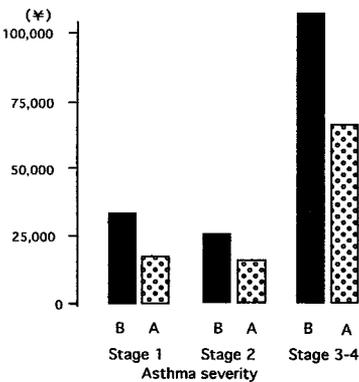


Fig. 2a. Comparison between the costs of bronchodilators before (B) and after (A) spa therapy in patients with asthma

the cost of drugs was almost similar between 32.8% and 40.0% in all groups (Fig. 2 b).

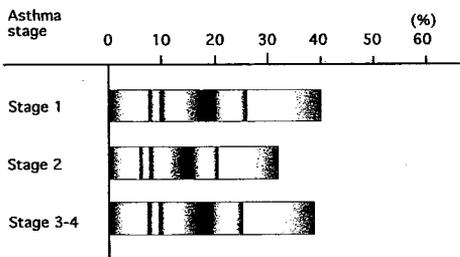


Fig. 2b. The % reduction of the cost of bronchodilators after spa therapy compared with the costs before the therapy.

The reduction of the cost of corticosteroids was the largest from ¥19,200 to ¥7930 (difference : ¥11,270) in patients with stage 2 (Fig. 3 a).

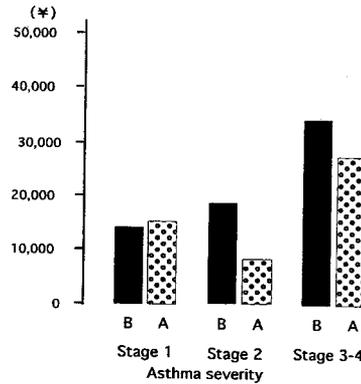


Fig. 3a. Comparison between the costs of corticosteroids before (B) and after (A) spa therapy in patients with asthma

Furthermore, the % decrease in the cost of corticosteroids was also the largest (58.7%) in patients with stage 2 (Fig. 3 b). The cost of antiallergics was also reduced after spa therapy.

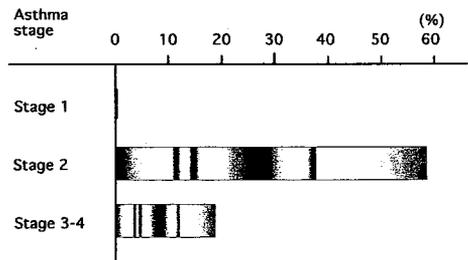


Fig. 3b. The % reduction of the cost of corticosteroids after spa therapy compared with the costs before the therapy.

The decrease of the cost of antiallergics was predominant in patients with stage 2 (difference ¥33,450) and group 3-4 (¥48,910) as shown in Fig. 4 a. The %decrease in the cost of antiallergics was the largest in patients with stage 2 (37.3%) and the smallest in those with stage 3-4 (25.7%) (Fig. 4 b).

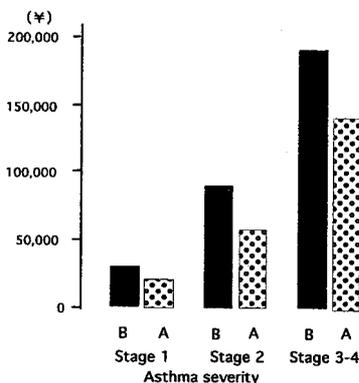


Fig.4a. Comparison between the costs of antiallergics before (B) and after (A) spa therapy in patients with asthma

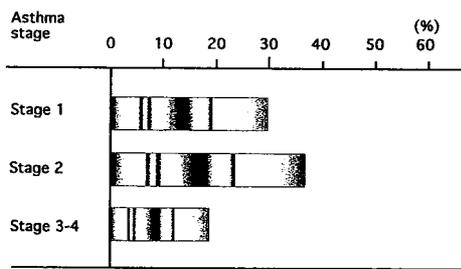


Fig.4b. The % reduction of the cost of antiallergics after spa therapy compared with the costs before the therapy.

The cost of mucolytics clearly decreased in patients with stage 2 (difference ¥11,900) and stage 3-4 (¥13,700) after spa therapy for 3 years. However, the decrease of mucolytics in patients with stage 1 was not predominant (Fig. 5 a).

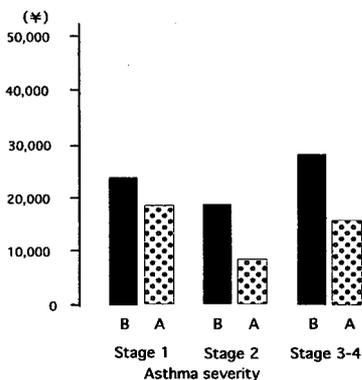


Fig.5a. Comparison between the costs of mucolytics before (B) and after (A) spa therapy in patients with asthma

The % decrease in the drug of mucolytics was also predominant in patients with stage 1 (60.0

%) and stage 3-4 (48.6%) (Fig. 5 b).

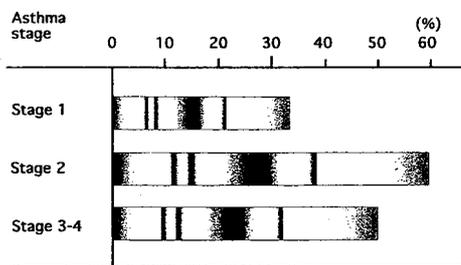


Fig.5b. The % reduction of the cost of mucolytics after spa therapy compared with the costs before the therapy.

The cost of antibiotics significantly decreased in patients with stage 2 (from ¥4,220 to 270) ($p < 0.05$) and stage 3-4 (from ¥15,110 to 2,060) ($p < 0.05$) (Fig. 6 a). The %decrease in

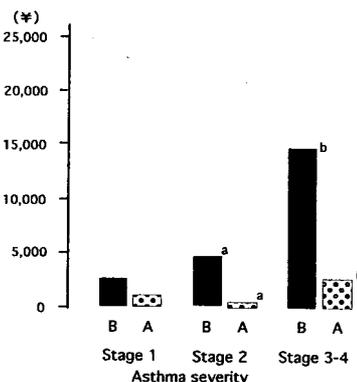


Fig.6a. Comparison between the costs of antibiotics before (B) and after (A) spa therapy in patients with asthma. a and b: $p < 0.05$.

the cost of antibiotics was also predominant in patients with stage 2 (93.6%) and stage 3-4 (86.4%) (Fig. 6 b).

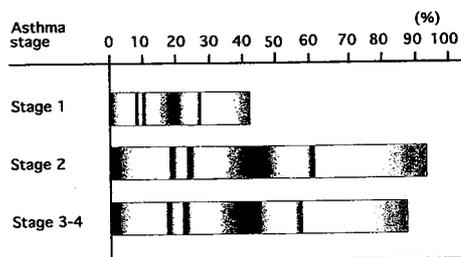


Fig.6b. The % reduction of the cost of antibiotics after spa therapy compared with the costs before the therapy.

Discussion

In recent years, the number of patients with asthma, particularly elderly asthmatics, has been increasing. Furthermore, many antiasthmatic drugs such as inhaled sympathomimetics, inhaled corticosteroids and leukotriene C4 receptor antagonists have been developed. Due to the newly developed drugs, the treatment of asthma has become more easily, and more patients with asthma has become to be controllable by drugs. However, the costs of these newly developed drugs are in general considerably high. Particularly, the use of prescribed inhaled sympathomimetics and corticosteroids has been increasing with severity of illness^{14,15}. In addition, the number of patients with asthma, particularly, of elderly asthmatics, has been increasing in recent years in Japan.

Our previous studies have shown that spa therapy is effective in patients with asthma by improving subjective and objective symptoms^{2,3}, pulmonary function^{4,5,22-24}, an increased bronchial hyperresponsiveness⁶, and suppressed function of adrenocortical glands⁷. In the present study, the effects of spa therapy on reduction of the costs of drugs used for the treatment for asthma were examined.

Regarding the costs of medication for asthma treatment, several reports suggest a close correlation between the costs of medication and disease severity in asthma. The most empirical data, for 1995-1996, clearly showed an increased costs depending upon illness severity¹⁶. Other reports have also demonstrated an enormous increase as total costs as asthma severity increases^{14,20}. It has been also reported that pharmacotherapy for asthma is underused or in adequate. In particular, treatment with inhaled corticosteroids is insufficient. In contrast, short-

term sympathomimetics are excessively prescribed. Only one-third of asthma patients were treated according to asthma guidelines¹⁴.

In this study, the reduction of the costs of drugs used for the treatment of asthma by spa therapy was examined in 16 patients with asthma. The results obtained here demonstrated that the total costs of drugs for asthma such as bronchodilators, corticosteroids, antiallergics, mucolytics, and antibiotics clearly decreased after spa therapy for 3 years. The mean %decrease in the costs of all drugs was 34.5%. Regarding the reduction of the costs of drugs, the reduction in the cost of bronchodilators was found to be remarkable in patients with stage 3-4. The decrease in the costs of corticosteroids was remarkable in patients with stage 2. The reduction of the costs of antiallergics, mucolytics, and antibiotics was remarkably observed in patients with stage 2 and stage 3-4.

In contrast, regarding the %decrease in the costs of drugs, the decrease ratio showed almost same tendency as the reduction of the costs of drugs. However, the %decrease in the costs of bronchodilators was not different among three groups, and furthermore, the %decrease in the costs of antiallergics was predominant in patients with stage 1 and stage 2. The results demonstrated that the reduction of the costs of drugs could be attained by spa therapy and that the reduction after spa therapy was larger as asthma severity became more severe.

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温泉療法による気管支喘息に対する年間薬剤費の削減

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気管支喘息16例を対象に, 治療のために要した年間薬剤費が温泉療法により削減可能であるのかどうかについて, 国際ガイドラインの重症度分類(stage 1-4) 別に若干の検討を加えた。1. 年間の総薬剤費は重症度別の全てのグループにおいて

明らかに減少した。2. その削減率は, ステージ1で27.2%, ステージ2で43.5%, ステージ3-4で34.1%であり, その平均は34.5%であった。3. 気管支拡張剤の薬剤費の減少はステージ3-4で高度であり, 副腎皮質ホルモンの薬剤費の減少はステージ2で著明であった。また, 抗アレルギー薬, 去痰薬, 抗生物質などの薬剤費の削減は, ステージ2および3-4で高度であった。4. 削減率では, 去痰薬, 抗生物質の削減率が, 2および3-4で著明であった。

以上の結果より, 温泉療法により, 気管支喘息の治療に必要な薬剤費は削減可能であること, そして, 温泉療法による薬剤費の削減は喘息の重症度が高い症例でより高度であることが示唆された。