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Spa therapy improves ventilatory function in the small airways of patients with steroid-dependent intractable asthma (SDIA).

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Abstract

The improvement of ventilatory function by spa therapy was examined in 37 patients with steroid-dependent intractable asthma (SDIA) in relation to clinical asthma types. All subjects had been on long-term corticosteroid therapy before spa therapy. Spa therapy was found to improve the values of ventilatory parameters. The percent improvement in all subjects was +4.1% in %FVC, +8.9% in FEV1.0%, +9.8% in %PEFR, +22.0% in %MMF, +19.7% in %V50 and +28.2% in %V25, respectively. Relating to clinical asthma types, moderate improvement in %MMF and %V25 from 16.7% to 16.9% was observed in type Ia cases, and marked increase in %MMF, %V50 and %V25 was observed from 42.2% to 43.2% in type Ib cases. However, no significant increase was found in these parameters of types Ia or Ib after spa therapy. In patients with type II, a significant increase was shown in %V50 (p less than 0.05) and %V25 (p less than 0.01) after spa therapy. The results show that spa therapy improves the condition of small airways disorder in patients with SDIA.

KEYWORDS: spa therapy, bronchial asthma, ventilatory function, small airways

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Spa Therapy Improves Ventilatory Function in the Small Airways of Patients with Steroid-Dependent Intractable Asthma (SDIA)

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The improvement of ventilatory function by spa therapy was examined in 37 patients with steroid-dependent intractable asthma (SDIA) in relation to clinical asthma types. All subjects had been on long-term corticosteroid therapy before spa therapy. Spa therapy was found to improve the values of ventilatory parameters. The percent improvement in all subjects was +4.1% in %FVC, +8.9% in FEV_{1.0%}, +9.8% in %PEFR, +22.0% in %MMF, +19.7% in % \dot{V}_{50} and +28.2% in % \dot{V}_{25} , respectively. Relating to clinical asthma types, moderate improvement in %MMF and % \dot{V}_{25} from 16.7% to 16.9% was observed in type Ia cases, and marked increase in %MMF, % \dot{V}_{50} and % \dot{V}_{25} was observed from 42.2% to 43.2% in type Ib cases. However, no significant increase was found in these parameters of types Ia or Ib after spa therapy. In patients with type II, a significant increase was shown in % \dot{V}_{50} ($p < 0.05$) and % \dot{V}_{25} ($p < 0.01$) after spa therapy. The results show that spa therapy improves the condition of small airways disorder in patients with SDIA.

Key words : spa therapy, bronchial asthma, ventilatory function, small airways

Our previous studies have shown that spa therapy is effective in patients with bronchial asthma (1-4). Relating to the action mechanisms of spa therapy, direct and indirect actions of the therapy have been expected for treatment of bronchial asthma. The direct action of spa therapy on bronchial asthma is to improve the

dysfunction of airways and to suppress the bronchial hypersensitivity. The indirect action of the therapy is expected to improve adrenocortical depression elicited by long-term corticosteroid therapy.

In recent years, number of patients with steroid-dependent intractable asthma (SDIA) has been increasing. They show marked dysfunction of airways, especially small airways, and their adrenocortical function is suppressed by a long-term use of corticosteroid hormone. Spa therapy, mainly swimming training in a hot spring pool, has been demonstrated to improve ventilatory

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Abbreviations used: %FVC: % forced vital capacity
FEV_{1.0%}: % forced expiratory volume in one second
%MMF: % maximal mid-expiratory flow rate
% \dot{V}_{50} : % maximal flow rate at 50% of vital capacity
% \dot{V}_{25} : % maximal flow rate at 25% of vital capacity

function of patients with bronchial asthma (5,6).

In the present study, the action of spa therapy on the airways of patients with SDIA was studied by observing ventilatory function before and after spa therapy.

Subjects and Methods

The subjects were 37 patients with steroid-dependent intractable asthma (SDIA), who had been on corticosteroid therapy for longer than two years. Of these, 16 were females and 21 were males. Their mean age was 55.9 years with a range of 24 to 70 years. All of them entered Misasa Branch Hospital, Okayama University Medical School for one to three months and had spa therapy; a combination of swimming training in a hot spring pool, fango therapy and inhalation therapy with iodine salt solution, which are accepted as effective treatment for bronchial asthma (7-9),

Ventilatory function was tested in all subjects at the beginning of spa therapy and at the end of the therapy using Box-Spiro 81 (Chest Co. Japan). The results were compared between the two stages. Other forms of spa therapy such as taking a hot spring bath and drinking hot spring water were also carried out, but the effect was unclear for bronchial asthma.

The subjects with SDIA were classified into three clinical types according to criteria previously described (10,11), as follows.

Type Ia. Simple bronchoconstriction type: patients with symptoms such as wheezing and dyspnea, which are elicited mainly by bronchoconstriction.

Type Ib. Bronchoconstriction + hypersecretion type: patients with symptoms due to hypersecretion (more than 100 ml/day of expectoration), in addition to bronchoconstriction.

Type II. Bronchiolar obstruction type: patients with symptoms elicited mainly by bronchiolar obstruction.

In the diagnosis of each asthma type, type Ia was assessed as a fundamental type. When hypersecretion or bronchiolar obstruction was present in addition to the symptoms of the type Ia, the patient was evaluated as type Ib or type II. Patients with hypersecretion and bronchiolar obstruction were classified as type II.

Results

Spa therapy improved ventilatory function of the subjects with SDIA. Of the six ventilatory parameters, the percent improvement in % MMF, % \dot{V}_{50} and % \dot{V}_{25} after spa therapy was higher in all subjects compared with the improvement in % FVC, FEV_{1.0}% and % PEFR (Table 1).

The nature of the improvement of ventilatory function after spa therapy varied among three clinical asthma types. In type Ia, the improvement in % MMF and % \dot{V}_{25} was higher than the improvement of the other ventilatory parameters, although the percent improvement was not so high (less than 20 %) compared with that of types Ib and II. Increased values of these ventilatory parameters after the therapy was not significantly different from those at the beginning of the therapy, because a wide variety in the improvement of the parameters was present among the subjects of type Ia. The ventilatory parameters such as % MMF, % \dot{V}_{50} and % \dot{V}_{25} , which represent the narrowing and obstruction of small airways, were remarkably improved in patients with type Ib after the therapy. The percent improvement in % MMF, % \dot{V}_{50} and % \dot{V}_{25} was 43.2 %, 42.4 % and 42.2 %, respectively. The

Table 1 Improvement of ventilatory function in patients with SDIA* after spa therapy

Spa therapy	% FVC	FEV _{1.0} %	% PEFR	% MMF	% \dot{V}_{50}	% \dot{V}_{25}
Before	91.7 ± 22.7**	60.7 ± 15.7	70.2 ± 27.5	34.5 ± 23.5	26.8 ± 21.4	20.9 ± 15.9
After	95.5 ± 23.1	66.1 ± 12.5	77.1 ± 27.4	42.1 ± 25.6	32.2 ± 22.1	26.8 ± 16.8
% Improvement	+4.1	+8.9	+9.8	+22.0	+19.7	+28.2

*Steroid-dependent intractable asthma. Other abbreviations are explained in the footnote. **Results are expressed as mean ± SD.

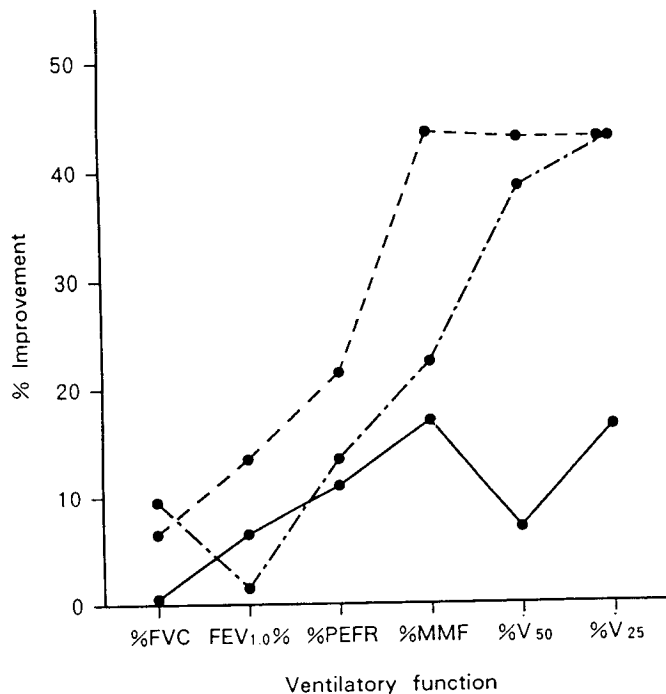


Fig. 1 Improvement of ventilatory function in clinical types. Ia (●—●), Ib (●- -●) and II (●- · - ·●) of the subjects with steroid-dependent intractable asthma (SDIA). Other abbreviations are explained in the footnote.

increase of these parameters after spa therapy and after the therapy (Fig. 1). was not significant.

The ventilatory function of patients with type II was also improved by the therapy. The increase in ventilatory parameters of type II cases after the therapy was different from that in types Ia and Ib. The increased value of %FVC was the highest in type II compared with types Ia and Ib. Of the other parameters, the increase in % \dot{V}_{25} of type II cases after the therapy was the most remarkable, and significantly higher than the value before the therapy ($p < 0.01$). The value of % \dot{V}_{50} of type II before spa therapy also significantly increased after the therapy ($p < 0.05$). The percent improvement in %MMF (22.2%) was found, although no significant difference was present between the values before

and after the therapy (Fig. 1).

Discussion

Bronchial asthma is one of the chronic obstructive lung diseases (COLD). The ventilatory function of bronchial asthma is a measure of obstructive ventilatory disorder. The values of ventilatory parameters such as %PEFR, FEV_{1.0}%, % \dot{V}_{50} and % \dot{V}_{25} , which represent obstructive airway disorder, will decrease with the narrowing and obstruction of airways. In advanced stages of bronchial asthma restrictive airway disorder is observed. The obstructive airway disorder is shown in two ways, medium or large airways represented by FEV_{1.0}% and %

PEFR, and small airways by %MMF, % \dot{V}_{50} and % \dot{V}_{25} .

In the present study the improvement of ventilatory function after spa therapy was examined in patients with SDIA (13) and compared to the results of other studies of the clinical efficacy of spa therapy on asthmatics (1-4). The improvement of ventilatory function after spa therapy was more remarkable in %MMF, % \dot{V}_{50} and % \dot{V}_{25} in three clinical asthma types, although the increase in these parameters was different among them. In type Ia cases, the increased values after spa therapy was moderate from 10.2% to 16.9% in %MMF and % \dot{V}_{25} and slight from 0% to 6.4% in the other parameters.

All of ventilatory parameters showing the dysfunction of small airways, %MMF, % \dot{V}_{50} and % \dot{V}_{25} , were markedly improved and the other parameters were not so clearly improved in type Ib group after the therapy. The improvement by spa therapy was different among ventilatory parameters in type II cases. The increase in % \dot{V}_{50} and % \dot{V}_{25} after spa therapy was significantly higher compared with the values before the therapy (% \dot{V}_{50} ; $p < 0.05$, % \dot{V}_{25} ; $p < 0.01$). In patients with type II, the value of %FVC was also improved after the therapy, although it did not increase so markedly.

The results obtained here show that spa therapy improves ventilatory function, especially values of %MMF, % \dot{V}_{50} and % \dot{V}_{25} showing ventilatory disorder of small airways, in patients with SDIA.

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