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Spa therapy is very important for the treatment of steroid-dependent intractable asthma (SDIA).
Analysis of 181 patients with SDIA.

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Abstract : Characteristics of 181 patients with steroid-dependent intractable asthma (SDIA) who were admitted to our hospital and had spa therapy for last 10 years were examined in relation to the methods of spa therapy. For last 10 years, three kinds of spa therapies were administered : spa therapy A (swimming training in a hot spring pool) in the first atage (1982-1985), spa therapy B (swimming training+inhalation of iodine salt solution) in the middle stage (1986-1989), and spa therapy C (swimming training+inhalation of iodine salt solution+fango therapy) in the last stage (1990-1991) of this study. 1. The number of patients with SDIA who were admitted to our hospital and had spa therapy tended to increase from 2 in 1986 to 35 in 1991. 2. The number of SDIA patients over the age of 60 or over the age at onset of 40 tended to increase from the first stage to the last stage. 3. The proportion of patients from distant areas (prefectures other than Tottori) was decreasing for the last stage, although the number of these patients was increasing in recent years. 4. The proportions of patients divided by serum IgE levels and by clinical asthma types did not change for last 10 years. 5. The proportion of type Ib and type II asthma was considerably high in patients with SDIA for last 10 years. 6. Clinical effects of spa therapy were observed in 21 of the 30 (70.0%) patients with SDIA in the first stage (1982-1985) with spa therapy A, 68 of the 83 (74.7%) patients with SDIA in the middle stage (1986-1989) with spa therapy B, and 61 of the 68 (89.7%) patients with SDIA in the last stage (1990-1991) with spa therapy C.

Key words : swimming training in a hot spring pool, inhalation of iodine salt solution, fango therapy, SDIA

Introduction

Pathophysiological changes in the airways of bronchial asthma, bronchoconstriction, mucus hypersecretion, and edema of mucous membrane, are often found during asthma attacks. In addition to these findings, bronchiolar obstruction is sometimes found in severe chronic asthma attacks. We have reported that asthma is classified into three clinical asthma types, Ia. simple bronchoconstriction type, Ib. bronchoconstriction + hypersecretion type, and II. bronchiolar obstruction type, according to the pathophysiological changes in the airways described above (1-8).

In recent years, clinical significance of airway inflammation in bronchial asthma has been noted (9-14), particularly in relation to the severity of asthma (15). Of these three clinical asthma types, type Ib asthma is characterized by eosinophilia in bronchoalveolar lavage (BAL) fluid and type II asthma by neutrophilia in BAL fluid. Patients with type Ib or type II asthma often require long-term glucocorticoid therapy. Our previous studies have shown that spa therapy is effective in patients with bronchial asthma (16-20), particularly even in those with steroid-dependent intractable asthma (21-25).

In the present study, backgrounds of patients with SDIA who were admitted to our hospital and had spa therapy for last 10 years were examined in relation to clinical effects of spa therapy.

Subjects and Methods

The subjects of this study were 181 patients with bronchial asthma (103 females and 78 males, mean age 55.6 years, range 16-77

years). All the subjects were diagnosed as having steroid-dependent intractable asthma (SDIA), since they had been treated with glucocorticoids for more than 2 years. All subjects were reactive to bronchodilators and glucocorticoids. However, their asthma attacks could not be controlled without glucocorticoids.

For last 10 years, different combinations of three kinds of spa therapies were administered for the treatment of bronchial asthma (26). Spa therapy A (swimming training in a hot spring pool) was performed in the first stage of this study (1982-1985), spa therapy B (swimming training+inhalation of iodine salt solution) in the middle stage (1986-1989), and spa therapy C (swimming training +inhalation of iodine salt solution + fango therapy) in the last stage (1990-1991). The backgrounds and clinical efficacy of spa therapy in patients with SDIA were examined in the three stages divided by the method of spa therapy (26, 27).

Swimming training was carried out in the hot spring pool at our hospital, in which temperatures of the room and hot spring water were kept at 26°C and at 30°C, respectively. The training was performed for 30 min a day and 4 times a week. Inhalation of 1.0 ml of iodine salt solution (KT 134 mg/l and NaCl 14.664 g/l) were administered twice a day every day (28). Fango therapy was performed every day: fango taken from Ningyo pass was heated to 70-80°C and packed with cloth (40-43°C); this was applied to cover patients' back; these warm packs were applied for 30 min (29).

Asthma classification was performed according to criteria modified from those previously described (1-8).

The criteria were:

Type Ia. Simple bronchoconstriction type : Patients with symptoms such as wheezing and dyspnea which are mainly elicited by bronchoconstriction. In this study, we divided this into two subtypes according to the amount of expectoration; 0–49 ml/day (type Ia-1) and 50–99 ml/day (type Ia-2).

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 mainly elicited by bronchiolar obstruction.

Clinical effects of spa therapy was assessed, marked, moderate, slight, and of no value, by evaluating improvement of clinical symptoms and findings, and reduction of the dose of glucocorticoids (27, 30). The therapy was regarded as effective when marked or moderate efficacy was shown : marked efficacy : their asthma attacks were markedly improved, and/or reduction of glucocorticoids used was attained ; moderate efficacy; their asthma attacks were clearly improved, but they had occasional slight dyspnea with wheezing, or reduction of glucocorticoids used was not attained despite improvement of symptoms ; slight efficacy : their asthma attacks were slightly improved, and they had still dyspnea with wheezing, and the dose of glucocorticoids was not reduced by spa therapy ; no efficacy : their asthma attacks and the dose of glucocorticoids were not reduced by spa therapy.

Serum IgE level was measured by radio-immunosorbent test (RIST).

Results

The number of patients with steroid-dependent intractable asthma (SDIA), who were admitted to our hospital and had spa therapy, was considerably small (less than 20 patients) from 1982 to 1986. The number of patients with SDIA started to increase in 1987, and after then tended to increase from 1988 to 1991 (Fig. 1).

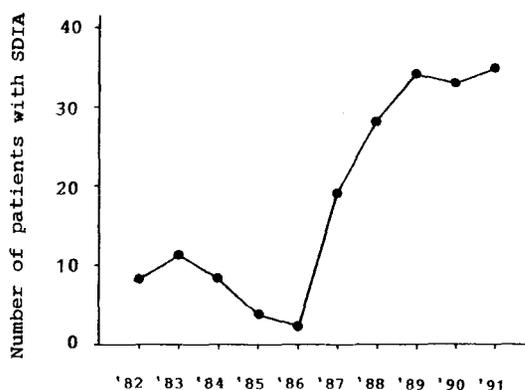


Fig. 1. Number of patients with steroid-dependent intractable asthma (SDIA) who were admitted to our hospital and had spa therapy for last 10 years.

Table 1 shows characteristics of patients with SDIA who were admitted to our hospital in the three stages of this study : first stage (1982–1985) when spa therapy A was performed, middle stage (1986–1989) when spa therapy B was performed, and last stage (1990–1991) when spa therapy C was carried out. The mean age and age at onset of the disease were low in patients who had spa therapy in the first stage compared with those in the middle and the last stages (Table 1).

Table 1. Characteristics of patients with SDIA who had spa therapy for last 10 years.

Stage	Spa therapy	No of patients	Age (Yr)	Age at onset (yr)
First stage (1982-1985)	A	30	49.7	34.3
Middle stage (1986-1989)	B	83	55.0	44.4
Last stage (1990-1991)	C	68	58.9	44.7

Spa therapy A: swimming training in a hot spring pool; B: swimming training+inhalation of iodine salt solution; C: swimming training+inhalation of iodine salt solution +fango therapy. SDIA: steroid-dependent intractable asthma.

Patient age was divided into four groups : 0-29, 0-39, 40-59, and 60 + years. The proportion of patients over the age of 40 was large, and tended to increase from the first stage (1982-1985)(80.0%) to the last stage (1990-1991)(91.2%). Particularly an increase in the proportion of patients over the age of 60 was remarkable, and the proportion was 23.3% in the first stage, 45.8% in the middle stage, and 55.9% in the last stage (Fig. 2).

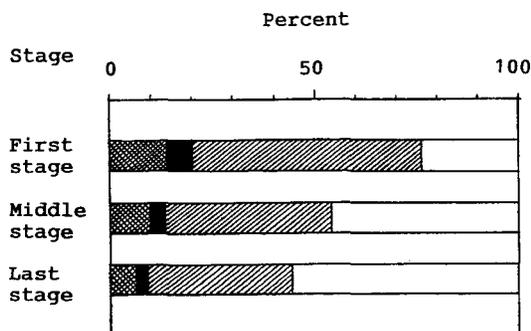


Fig. 2. Distribution of age : under age 29 (), between ages of 30 and 39 (), between 40 and 60 (), and over age 61 () in patients with steroid-dependent intractable asthma (SDIA) who were admitted to our hospital in first stage (1982-1985), middle stage (1986-1989), and last stage (1990-1991).

Age at onset of the disease was divided into three groups : 0-19, 20-39, and 40+ years. The proportion of patients over the age at onset of 40 (so-called late onset asthma) was large, 46.7% in the first stage, 65.1% in the middle stage, and 69.1% in the last stage, and tended to increase from the first stage to the last stage (Fig. 3).

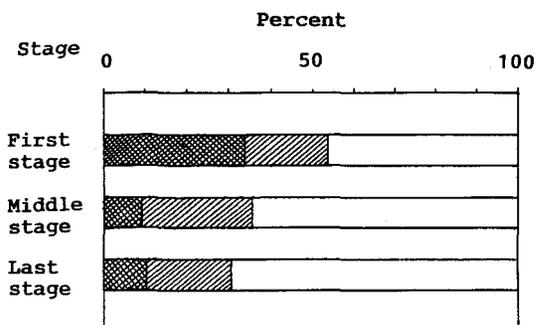


Fig. 3. Distribution of age at onset : under age 19 at onset (), between ages at onset of 20 and 39 (), and over age 40 at onset () in patients with steroid-dependent intractable asthma (SDIA) who were admitted to our hospital in first stage (1982-1985), middle stage (1986-1989), and last stage (1990-1991).

Areas of patients' residence was divided into two groups : in Tottori prefecture and outside of Tottori prefecture (distant areas). The proportion of patients from distant areas (83%) was higher than that of those in Tottori prefecture (16.7%) in the first stage. In contrast, the proportion of patients from distant areas tended to decrease from 83.3% in the first stage to 33.0% in the last stage (Fig. 4).

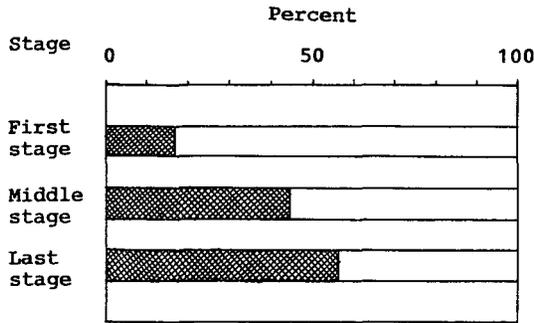


Fig. 4. Areas of patients' residence : patients in Tottori prefecture () and those from distant areas (outside of Tottori prefecture) () in patients with steroid dependent intractable asthma (SDIA) who had spa therapy in first stage (1982-1985), middle stage (1986-1989), and last stage (1990-1991).

Serum IgE levels were divided into 5 groups : 0-200, 201-300, 301-500, 501-1000, and

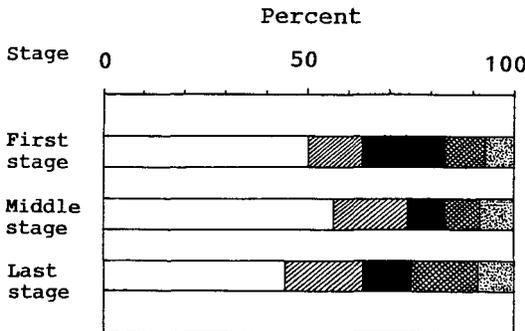


Fig. 5. Distribution of serum IgE levels : 0-200 IU/ml (), 201-300 IU/ml (), 301-500 IU/ml (), 501-1000 IU/ml () and over 1001 IU/ml () in patients with steroid-dependent intractable asthma who had spa therapy in first stage (1982-1985), middle stage (1986-1989), and last stage (1990-1991).

1001+IU/ml. The proportion of patients with low serum IgE levels (0-200 IU/ml) was large, 50.0% in the first stage, 56.6% in the middle stage, and 44.1% in the last stage, but did not show any definite tendency of decrease or increase. The proportion of patients with other serum IgE groups did not change for last 10 years (Fig. 5)

The proportion of clinical asthma types in patients with SDIA did not change for last 10 years : 36.7% type Ia-1, 26.7% type Ia-2, 16.6% type Ib, and 20.0% type II in the first stage, and 41.2% type Ia-1, 27.9% type Ia-2, 13.2% type Ib, and 17.6% type II in the last stage in this study (Fig. 6).

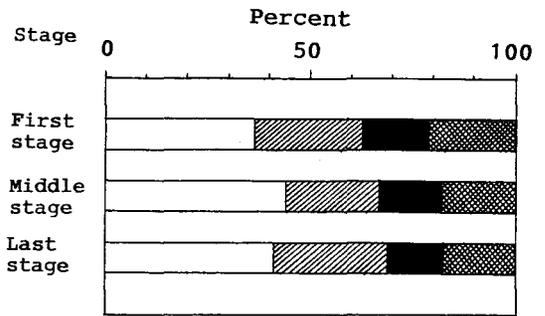


Fig. 6. Proportion of clinical asthma types, type Ia-1 (), type Ia-2 (), type Ib (), and type II () in patients with steroid-dependent intractable asthma (SDIA) who had spa therapy in first stage (1982-1985), middle stage (1986-1989), and last stage (1990-1991).

Clinical effects of spa therapy tended to increase from the first stage to the last stage. In the first stage with spa therapy A (swimming training in a hot spring pool), the therapy was marked in 7 (23.3%), moderate in 14 (46.7%), slight in 5 (16.7%), and

of no value in 4 (13.3%) of the 30 patients with SDIA. In the middle stage with spa therapy B (swimming training+inhalation of iodine salt solution), the therapy was marked in 21 (25.3%), moderate in 47 (49.4%), slight in 17 (20.5%), and of no value in 4 (4.8%), of the 83 patients with SDIA. In contrast, in the last stage with spa therapy C (swimming training+inhalation of iodine salt solution+fango therapy), the therapy was marked in 37 (54.4%), moderate in 24 (35.3%), slight in 7 (10.3%), and of no value in none of the 68 SDIA patients (Fig. 7).

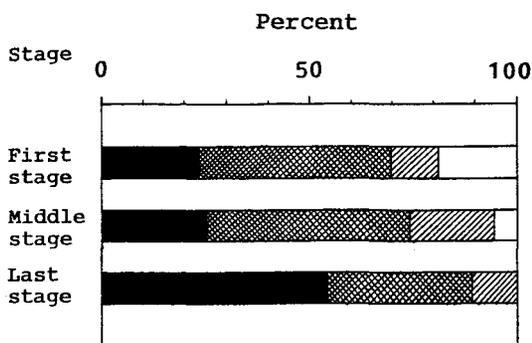


Fig. 7. Clinical effects of spa therapy : marked (■), moderate (▣), slight (▤), and of no value (□) in patients with steroid-dependent intractable asthma (SDIA) who had spa therapy in first stage (1982–1985), middle stage (1986–1989), and last stage (1990–1991).

Discussion

Despite many kinds of newly developed antiasthma drugs including antiallergic agents, there are some patients whose asthma attacks could not be controlled without glucocorticoids. Our previous studies have shown that steroid-dependent intractable asthma (SDIA) often observed in patients

with type Ib (bronchoconstriction+hypersecretion type) and with type II (bronchiolar obstruction type), classified by clinical symptoms (1–8). Our previous studies have also demonstrated that spa therapy is effective in these SDIA patients (21–25).

In recent years, attention has been focused on airway inflammation in relation to the pathogenesis of asthma (9–14), and the airway inflammation is related to the severity of asthma (15). Patients with types Ib and II were characterized by marked inflammatory cell infiltration, observed in bronchoalveolar lavage (BAL) fluid : BAL eosinophilia in type Ib and BAL neutrophilia in type II (5–8). These findings suggest that future treatment of bronchial asthma should be focused on airway inflammation as the pathogenesis of asthma.

In the present study, characteristics of 181 patients with SDIA who were admitted to our hospital and had spa therapy for last 10 years were examined in relation to the methods of spa therapy administered in the three stages of this study. Spa therapy A (swimming training in a hot spring pool) was administered in the first stage (1982–1985), spa therapy B (swimming training+inhalation of iodine salt solution) in the middle stage (1986–1989), and spa therapy C (swimming training+inhalation of iodine salt solution+fango therapy) in the last stage (1990–1991).

The number of patients with SDIA who had spa therapy during hospitalization at our hospital has been increasing, and the number was 35 in 1991. These SDIA patients were characterized as follows : the number of older patients over the age of 60 and those with late onset asthma (over the age of 40 at onset) has been increasing in recent years;

the proportion of patients from distant areas (prefectures other than Tottori) has been decreasing, but the number has been increasing; the proportion of patients with low serum IgE levels (less than 200 IU/ml) are large from 44.1% to 56.6% in these SDIA patients.

The proportion of clinical asthma types is related to the severity of asthma. The proportion of Ia-2, Ib and II asthma was higher in patients with SDIA of this study than in those with usual bronchial asthma. Sixty-eight patients with SDIA who had spa therapy consisted of 41.2% type Ia-1, 27.9% type Ia-2, 13.2% type Ib, and 17.6% type II. These findings reveal that the number of asthma patients with marked inflammatory cell infiltration, who often require long-term glucocorticoid therapy, has been increasing, and that spa therapy is very important for such patients.

Clinical effects of spa therapy were different according to the methods of the therapy. The combinations (spa therapy A, B, and C) of three kinds of spa therapies (swimming training in a hot spring pool, inhalation of iodine salt solution, and fango therapy) were administered for last 10 years. The efficacy rate of spa therapy was 70% in spa therapy A between 1982 and 1985, 74.7% in spa therapy B between 1986 and 1989, 89.7% in spa therapy C between 1990 and 1991. The results suggest that spa therapy C (complex spa therapy)(27) is most suitable for the treatment of patients with SDIA.

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ステロイド依存性重症難治性喘息に対する温泉療法の重要性。過去10年間の181例を対象に。

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最近10年間に三朝分院へ入院し、温泉療法を受けたステロイド依存性重症難治性喘息181例を対象に、温泉療法の方法との関連のもとに、対象患者の背景について検討を加えた。最近10年間に3種類の温泉療法が行われた。温泉療法A（温泉プール水泳訓練）は初期（1982-1985）、温泉療法B（水泳訓練+ヨードゾル吸入）は中期（1986-1989）、また、温泉療法C（水泳訓練+ヨードゾ

ル吸入+鉍泥湿布療法）は後期（1990-1991）に行われた。1. 当院へ入院し、温泉療法を受けたステロイド依存性重症難治性喘息（SDIA）患者の数は、1986年の2例から1991年の35例へと増加の傾向を示した。2. SDIA患者のうち、60才以上の症例および40才以降の発症症例の数は、1986年以降急激な増加傾向を示した。3. 鳥取県以外の他県（遠隔地）からの入院患者の頻度は、近年減少の傾向を示したが、その絶対数は増加の傾向であった。4. 血清IgE値はいずれの時期においても200IU/ml以下の症例が多い傾向が見られた。5. 臨床病型では、通常の喘息に比べIb型およびII型の頻度が高い傾向が見られた。6. 温泉療法の臨床効果は、温泉療法Aが行われた初期では70.0%、温泉療法Bの中期では74.7%、温泉療法Cの後期では89.7%であった。

キーワード：温泉プール水泳訓練，ヨードゾル吸入，鉍泥湿布療法，SDIA