

◎総説

Action mechanisms of complex spa therapy on bronchial asthma. 2. Effects on endocrine-autonomic nerve system and psychological factors

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Abstract : Actions of spa therapy on endocrine-autonomic nerve system and psychological factors were analyzed in patients with bronchial asthma. In endocrine function, serum levels of cortisol and ACTH tended to increase after spa therapy. In autonomic nerve system, decrease in concentrations of serum adrenalin and noradrenalin was observed after spa therapy, and the difference between the initial levels before spa therapy and the levels after the therapy was significant in serum levels of adrenalin. However, serum levels of substance P and Bradykinin were not affected by spa therapy. To evaluate the action of spa therapy on mental condition in patients with asthma, four kinds of psychological tests, CMI, SDS, CAI and SD, were carried out. Improvement of mental disorders in patients with asthma is observed after spa therapy in all psychological tests. These results suggest that spa therapy acts effectively on endocrine-autonomic nerve system and improve psychological conditions.

Key words : Bronchial asthma, Spa therapy, Endocrine-autonomic nerve system, Psychological disorders

Introduction

Attacks of adult asthma patients are often chronic and sometimes severe, resulting in necessity of long-term glucocorticoid therapy. It has been suggested that chronicity and severity of asthma attacks in adult patients are closely related to airway

inflammation¹⁻³⁾, which is associated with bronchial hyperresponsiveness^{4, 5)}. Our previous studies have shown that spa therapy suppresses airway inflammation⁶⁾, and improve bronchial hyperresponsiveness⁷⁾.

Since 1982, three kinds of spa therapies; spa therapy A (swimming training in a hot spring pool, 1982-1985), B (swimming training +

inhalation of iodine salt solution, 1986–1989), and C (complex spa therapy) (swimming training + inhalation of iodine salt solution + fango therapy, 1990–) have been performed for patients with asthma, particularly those with intractable asthma^{8, 9)}. The clinical effects of each spa therapy have been evaluated by improvement of clinical symptoms^{10–12)}, ventilatory function^{13, 14)}, and bronchial hyperresponsiveness^{7, 15)}. In addition to these direct actions of spa therapy, improvement of suppressed function of adrenocortical glands is observed as indirect action of spa therapy^{16, 17)}. It has been shown from these studies that spa therapy is effective in patients with asthma.

It is well known that a health resort gives patients and/or healthy subjects mental relaxation. However, it is still unclear whether improvement of mental disorders can be observed by spa therapy at a health resort.

In the present study, effects of spa therapy on endocrine-autonomic nerve system and psychological disorders were discussed in patients with asthma.

Spa therapy and endocrine-autonomic nerve system

Endocrine-autonomic nerve system participates in the onset mechanisms of asthma attacks. The reason why asthma attacks often occur from midnight to early morning has been speculated to be due to decrease in serum cortisol levels and increased tension of parasympathetic nerve, which are often affected by psychological conditions. Thus, endocrine-autonomic nerve system and psychological conditions play important roles in the onset mechanisms of asthma attacks.

1. Serum levels of ACTH and cortisol

Our previous studies on 12 adult patients with asthma have shown that the mean level of serum ACTH increased from 21.7 pg/ml to 25.9 pg/ml after spa therapy¹⁸⁾. Function of adrenocortical glands can be evaluated by measuring serum cortisol levels. The level of serum cortisol is low in the majority of patients with steroid-dependent intractable asthma (SDIA), since they have been on long-term glucocorticoid regimen. Spa therapy increases serum cortisol levels^{16–18)} (Fig. 1).

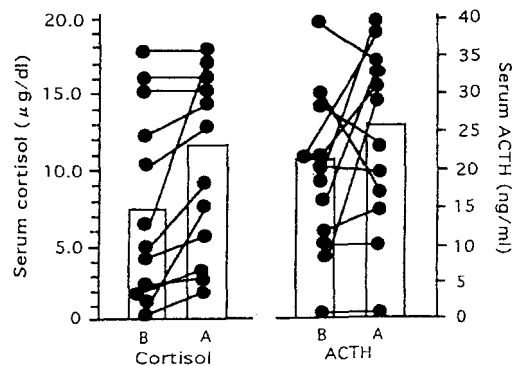


Fig. 1. Serum levels of cortisol and ACTH Before (B) and after spa therapy (A) in patients with asthma

The action of spa therapy on adrenocortical glands is speculated to be due to heat-and exercise-stimulation by the therapy.

2. Serum concentrations of adrenalin and noradrenalin

Autonomic nerve system have effects on tension of smooth muscle in the airways. Adrenalin and noradrenalin are released from adrenomedulla glands and sympathetic nerve ending. Beta receptor, which is sympathetic nerve ending, is highly observed in bronchopulmonary tissues^{19, 20)}, and adrenalin rapidly and strongly improves bronchoconstriction during asthma attacks. Serum concentration of adrenalin significantly decreases after spa

therapy, and that of noradrenalin tends to decrease after the therapy¹⁸⁾ (Fig. 2).

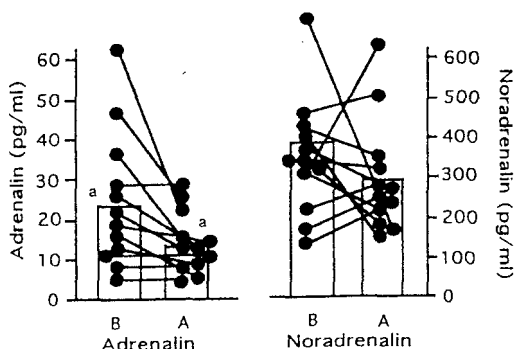


Fig. 2. Serum concentrations of adrenalin and noradrenalin before (B) and after spa therapy (A) in patients with asthma. $a:p < 0.05$.

These results suggest that increased tension of sympathetic nerve system is suppressed by spa therapy.

3. Serum substance P and bradykinin levels

Substance P has various actions such as bronchoconstriction, hypersecretion, cough induction, neutrophil activation, and histamine release from mast cells.

Bronchoconstriction induced by substance P is very weak in human. However, this agent is speculated to cause bronchoconstriction and hypersecretion²¹⁾. It has been shown that the serum level of bradykinin is higher in patients with asthma than in healthy subjects^{22, 23)}. The agent stimulates sensory nerve and induces bronchoconstriction^{24, 25)}. The serum level of substance P was not affected by spa therapy¹⁸⁾. In contrast, the mean level of bradykinin tended to increase after spa therapy, however, this was not significant, and some of patients showed decreased level of the agent after the therapy (Fig. 3)¹⁸⁾. Thus, the action of spa therapy on substance P and bradykinin are not analyzed clearly.

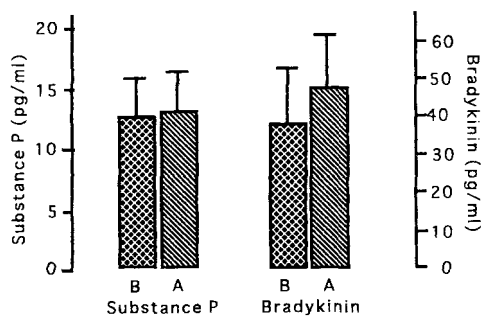


Fig. 3. Serum levels of substance P and bradykinin before (B) and after spa therapy (A) in patients with bronchial asthma.

Spa therapy and psychological disorder

Psychological factors are closely related to endocrine-autonomic nerve system, and even immunity. The mental conditions of asthma patients can be estimated by different psychological tests; CMI (Cornal Medecal Index), SDS (Selfrating Depression scale), CAI (Comprehensive Asthma Inventory), and SD (Semantic Differential).

1. CMI test

The mean points of physical, respiratory symptoms, CIJ symptoms representing various complaints from psychological disorders, and psychical symptoms decreased after spa therapy²⁶⁾. The mean improvement rate was 60.0% in respiratory symptoms, 66.8% in GIJ symptoms, and 46.7% psychical symptoms (Fig. 4).

2. SDS test

SDS test is carried out to evaluate depressive mental state. Ten of 15 patients studied (66.7%) showed a point more than 40, suggesting that many patients with depressive mental state were included in the study. In fact, the majority of the subjects in the study were patients with steroid-dependent

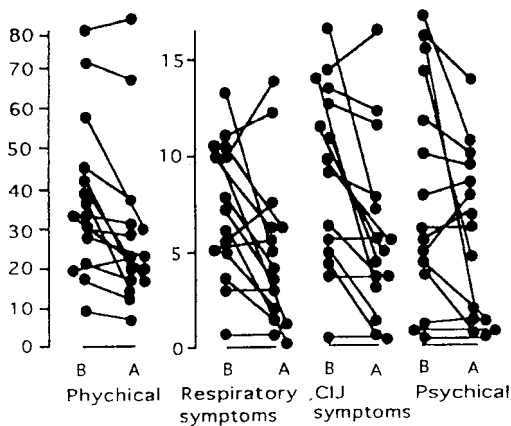


Fig. 4. Evaluation of spa therapy by a CMI method before (B) and after spa therapy (A) in patients with bronchial asthma.

intractable asthma (SDIA)²⁶⁾. The mean point in SDS test decreased from 42.9 to 40.7 after spa therapy. However, this decrease was very slight, demonstrating that it is very difficult to improve the mental state of these patients by spa therapy.

3. CAI test

CAI test is performed to evaluate subjective symptoms due to psychological disorders. Categories of mental state; extent of conditioning, suggestion, fear of expectation, dependency, frustration, flight into illness, distorted life habits, negative attitudes towards prognosis, and decreased motivation towards therapy, were clearly improved by spa therapy, as shown in Fig. 5 a and 5 b. The score, average of points in each category, decreased from 36.7 to 28.3 after spa therapy.

4. SD test

The results of SD test revealed that character of patients changed with beneficial trend for therapy of asthma after spa therapy.

These results show that psychological

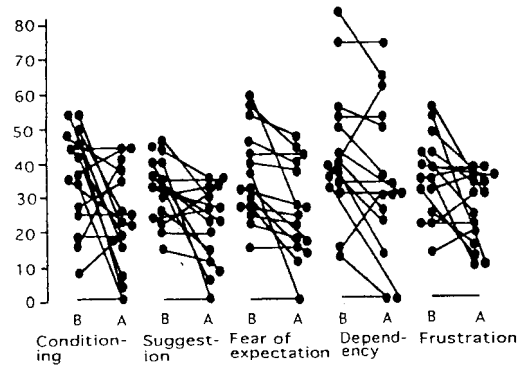


Fig. 5 a. Evaluation of spa therapy by a CAI method before (B) and after spa therapy (A) in patients with bronchial asthma.

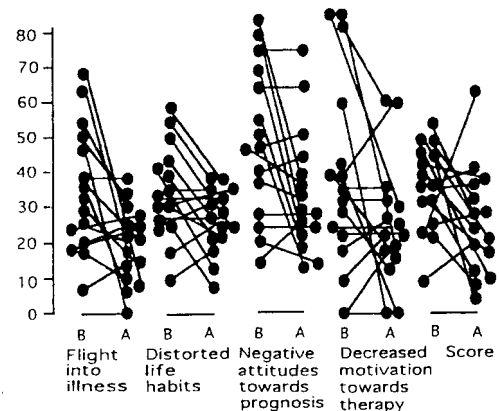


Fig. 5 b. Evaluation of spa therapy by a CAI method before (B) and after spa therapy (A) in patients with bronchial asthma.

disorders in patients with asthma are improved by spa therapy.

Conclusion

Actions of spa therapy on endocrine-autonomic nerve system and on psychological disorders were discussed in patients with asthma. Beneficial changes in endocrine-autonomic nerve system and improvement of psychological disorders were observed after spa therapy.

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気管支喘息に対する複合温泉療法の作用機序

2. 内分泌・自律神経系および心因的要素に対する効果

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内分泌・自律神経系および心因的要素に対する温泉療法の効果が、気管支喘息を対象に検討された。内分泌系では、血中コーチゾールおよびACTH値が、温泉療法後に上昇することが示された。また、自律神経系では、血中アドレナリンおよびノルアドレナリン濃度が温泉療法により

減少することが示され、特に、血中アドレナリンは温泉療法前後の濃度に有意の差が見られた。しかしながら、血中サブスタンスPおよびブラジキニン濃度には、温泉療法による有意の変動は見られなかった。

心因的要素に対する温泉療法の作用を検討するため、CMI, SDS, CAIおよびSDの4種類の心身医学的検査が行われた。その結果、いずれの心身医学的検査においても、温泉療法により疾患に不利に働く心因的要素が改善する傾向が見られた。

これらの結果より、温泉療法が内分泌・自律神経系に対して有用な作用を有し、また、疾患に不利な心因的要素を改善させる作用を有していることがある程度示唆された。

索引用語：気管支喘息, 温泉療法, 内分泌・自律神経系, 心因的要素