Clinical Effects of Steam Rock Bathing in Saiboku Hot Spring for Allergic Rhinitis

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Abstract
**Background:** Hot spring inhalation and rock bathing are widely practiced in Europe, and immersion in water up to the shoulders is popular in Japanese balneotherapy. We designed a combination therapy of steam rock bathing and immersion in an open-air hot spring pool for allergic rhinitis.

**Methods:** Data were obtained by anonymous questionnaires from 19 participants with perennial allergic rhinitis who underwent the combination therapy for several days during the spring-pollen season. The participants immersed themselves in a sitting position in Saiboku hot spring water (sodium salt hot spring) at 41°C up to the shoulder level for 10 min in the open-air and then lay on a floor paved with small rocks in a supine position for 20 min in a room filled with the steam from hot springs, then immersed themselves again in the hot spring water for 10 min, and finally rested and sat on a chair for 20 min in a comfortable room. The hot spring water circulated through tubes with small holes that were embedded under the floor, which was paved with small rocks consisting of tourmaline and lime stones. Steam from the hot spring water penetrated through the floor and vaporized in the room. The rock bathing room was 40°C in temperature and 75% in humidity.

**Results:** Clinical symptoms were alleviated in 17 of 19 participants. Watery rhinorrhea, eye itching, sneeze, and sore throat were improved in 100%, 75%, 40%, and 100% of the participants, respectively, compared with symptoms during the previous several years. No adverse effects were observed in any participants.

**Conclusion:** Steam rock bathing, combined with immersion in an open-air hot spring pool, is useful in ameliorating the focal and systemic symptoms of allergic rhinitis.

Key words: steam inhalation, rock bathing, allergic rhinitis, sodium salt hot spring

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1 Introduction

Rock bathing (resting on rocks warmed by hot springs) is widely used for various diseases today, although its effects and mechanism remain uncertain. Steam bathing (inhalation of air containing steam from hot springs in a room) has been used in patients with nasal and bronchial diseases for a long time in Europe\(^1\)-\(^3\). Steam from water containing sodium and sulfur salts is reported to be beneficial for patients with bronchial asthma, bronchitis, and rhinitis\(^4\),\(^5\). Allergic rhinitis is increasing in prevalence and its symptoms range from local symptoms such as nasal itching to whole-body symptoms such as headache and

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fatigue. Previous studies have shown the effect of steam inhalation on nasal symptoms, but few studies have reported the clinical effect of steam inhalation on systemic symptoms of allergic rhinitis. Recently, facilities with hot springs located in cities far from a volcanic zone have been increasing in number in Japan. Most facilities in cities use sea water containing sodium salt that was embedded deeply underground in ancient times, in contrast to the hot spring facilities using water with sulfur salts generated from volcanic activity. Few studies have reported on nonvolcanic hot spring facilities in the city. We studied the clinical effects of the combination therapy of steam rock bathing and immersion in an open-air hot spring pool on local and systemic symptoms in participants with allergic rhinitis in a nonvolcanic hot spring facility.

II Participants and Methods

Participants with allergic rhinitis were recruited by a notice in the Saiboku (renamed Kacho-Fugetsu) hot spring facility, Hidaka city, Saitama prefecture, Japan. This facility is in a nonvolcanic zone with an elevation of 150 m and an annual average temperature of 16℃. The participants had been diagnosed with spring-seasonal allergic rhinitis at least 3 years previously and prescribed anti-allergic agents but no steroids. They did not have any other diseases or complications and continued to take the same agents during the study. Data on symptoms and outcomes were obtained by an anonymous questionnaire before and after the study. The questionnaire asked for information on age, sex, number of years since diagnosis, drug usages, frequency of using the facility, symptoms, and adverse effects. The symptoms were assessed from the participants’ questionnaire according to the guideline of allergic rhinitis proposed by the Practical Guideline for the Management of Allergic Rhinitis in Japan, 2002. The participants visited the Saiboku hot spring facility, paying the admission fee, several times during the 19 days of the study period from February 23 to March 13, 2005, which is the period of major pollen dispersal, and followed our bathing protocol without randomization (Fig. 1). The study was performed with the participants in a comfortable room for resting, an open-air bathing pool, and a rock bathing room filled with steam from the hot springs. The participants rested on a chair in the comfortable room at 25℃ for 20 min and then walked to the open-air bathing pool, where they remained in a sitting position for 10 min immersed up to the shoulder level in the hot spring water at 41℃ (Figs. 2 and 3). The depth of the bathing pool was 70 cm and its surface area was 60 m². The average temperature of the open air around the bathing pool was about 20℃. After 10-min of immersion, the participants walked to the rock bathing room and rested for 20 min in a supine position on a towel spread on the floor (Fig. 3). The rock bathing room was 4.0 m high, 8.0 m wide and 8.1 m long and had four wooden walls, a wooden roof, and a floor paved with small rocks (tourmaline and lime stones). Hot spring water (temperature 56℃, pH 8.1, sodium concentration 0.687%) circulated under the floor in long winding tubes with many holes 0.5 cm in diameter (Fig. 4). The steam released from the holes, passed through the small rocks of the floor, and vaporized in the rock bathing room (Fig. 5). The temperature of the rock bathing room was about 40℃, the humidity was about 75%.

Fig. 1 Protocol of the combination hot spring therapy.

Fig. 2 Open-air bathing pool. The participants enter the hot spring pool by descending the stairs and immerse their bodies up to the shoulder level in a sitting position. The hot spring water has a temperature of 41℃ and a pH of 8.1.
and the pH was 7.0. The temperature of the small rocks was 47℃. After 20-min of rest in the rock bathing room, the participants walked to the open-air bathing pool again, where they spent 10 min in a sitting position immersed up to the shoulders in hot spring water at 41℃. After 10-min of immersion, they came out of the hot spring water and walked to the comfortable room again where they rested sitting on a chair for 20 min. The main dissolved components of the hot spring water were sodium ions (2,452 mg/kg) and chloride ions (4,095 mg/kg); the total concentration of dissolved components was 6,965 mg/kg (Table 1). Airborne pollen levels determined by the automatic pollen sensor with laser light method were obtained from the Ministry of the Environment. Informed consent was obtained from all participants. This study was a retrospective review using data from an anonymous questionnaire that was answered voluntarily by the guests of the hot spring facility without randomization and the study was performed according to the guideline of Institutional Review Board of our university.

III Results

Nineteen subjects (4 men and 15 women) aged 20 to 60 years with spring-seasonal allergic rhinitis participated in this study. None dropped out of the study. The average number of days spent visiting the facility during the 19-day study period was 7.3 (1-9). The allergen was cedar in 17 participants, Japanese cypress in 7, white birch in 1, rice plant in 2, ragweed in 7, and others in 4. The period from the onset of the disease to this study was 3 to 30 years (average 14.7). The period from onset and the clinical stage are shown in Table 2. There was no association between disease history and clinical stage. Clinical effects were observed in 17 participants. Complete disappearance of symptoms,
marked improvement, moderate improvement, slight improvement, no change, and undetermined effect were observed in 0, 5, 9, 3, 1, and 1 participants, respectively (Table 3). A trend toward an increase in clinical effects was noted in cases with more severe symptoms. Among the 19 participants, rhinorrhea was alleviated in 11, nasal obstruction in 13, eye itching in 12, sneeze in 14, and chapped skin in 13. As for systemic symptoms, headache, heavy headedness, stiffness of the shoulder, extremity pain, and gastrointestinal symptoms were ameliorated in one participant each. No adverse effects were noted in any participants.

Airborne pollen levels ranged between 12 and 889/m³ during the study period in this area.

IV Discussion

This study suggests that the combination therapy consisting of inhalation of sodium salt steam from hot springs by rock bathing and immersion in an open-air hot spring pool is useful for treating perennial allergic rhinitis. Clinical symptoms were ameliorated in participants with a long standing history of severe allergic rhinitis, compared with their symptoms before the hot spring therapy. Systemic and nonspecific symptoms were also improved. No adverse effects were seen in any participants. We used a newly designed vaporizing system, in which the steam is generated from hot spring water circulating in metallic tubes with small holes embedded under the floor, which is paved with small tourmalines and lime stones. The participants were warmed as they lay down on the hot pavement during inhalation, and hyperthermia was maintained by the combination therapy of inhalation and immersion.

Inhalation therapy has been widely used in Europe and has demonstrated clinical usefulness especially in rhinitis and bronchitis by using hot spring water rich in sulfur and carbon dioxide. Some authors have
reported that inhalation of steam from sodium-enriched water had clinical effects in patients with allergic rhinitis, and others have reported no effect\(^8\rightarrow\(^1\)). Our study showed that inhalation of steam from hot spring water containing sodium salts, combined with immersion in a hot spring pool, improved the clinical symptoms of perennial allergic rhinitis during pollen season. Obstulowicz et al. reported that subterranean therapy in a salt chamber increased nasal flow and decreased nasal edema in patients suffering from allergic rhinitis\(^12\). Tanizaki demonstrated that complex spa therapy, including inhalation, fango (mud), and swimming was useful in treating bronchial asthma\(^13\). They explained that the effects might result partly from the combination of hyperthermia by fango therapy, therapeutic exercise by swimming, and decreased airway sensitivity by inhalation of iodine salt solution. In general, the clinical action of hot spring inhalation is enhanced by various factors, such as hyperthermia, exercise, fango, bathing, the autonomic nervous system, and others. Combination therapy, therefore, is recommended for allergic rhinitis.

Some authors have demonstrated that inhalation of sulfur-enriched water results in immunomodulation. Salami et al. showed that this treatment lowered serum levels of IgE and increased serum levels of IgA\(^9\). Pagani et al. demonstrated that saline solution treatment by inhalation lowered the levels of interleukin (IL)-3 and IL-5 in the nasal lavage fluid in patients with allergic rhinitis\(^10\). They suggested that saline salt inhalation ameliorated allergic rhinitis by inhibiting eosinophils and mast cells and lowering some cytokines in the nasal mucosa. Choi and Park reported that inhalation of aromatherapy oil relieved the symptoms of perennial allergic rhinitis. They suggested that the clinical effects of aroma oil and of monoterpenes such as 1,8-cineol, α-terpineol, and α-pinene might be partly by modulation of the autonomic nervous system\(^11\). Since the water of our hot spring does not contain sulfur or aroma oil, the clinical effects of our treatment would be derived mostly from the combination of inhalation and immersion in the open-air pool rather than the sodium salt itself.

In conclusion, we suggest that the combination therapy of inhalation by steam rock bathing and immersion in the open-air hot spring pool using hot spring water containing sodium salts is useful for alleviating the clinical symptoms of perennial allergic rhinitis in the pollen season.

Study limitations: Our study used data from an anonymous questionnaire administered to guests visiting a hot spring facility of their own will without randomization. Further study will be needed for a firmer conclusion.

An abstract of this study was presented at the 76th annual meeting of the Japanese Society of Balneology, Climatology and Physical Medicine in Kirishima, Japan in May 2011.

Conflict of Interest
Shizuo Sasazaki is the chief executive officer and Eiji Yamada is a chief researcher of Saiboku Hot Spring. Saitama Livestock Farm Co. Ltd., founded in 1946, which is capitalized at 92 million yen and has 580 employees. The other authors state that they have no conflicts of interest.

References


サイボク温泉における岩盤蒸気浴がアレルギー性鼻炎に及ぼす臨床的効果

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抄録
【背景】温泉吸入療法と蒸気浴療法は欧州で幅広く行われているが、日本の温泉療法では肩までの全身入浴が一般的である。私たちはアレルギー性鼻炎に対して岩盤蒸気浴と露天風呂の全身入浴を組み合わせた温泉療法を考案した。
【方法】春季花粉飛散期の数日間に本温泉療法を行ったアレルギー性鼻炎19例に対して匿名のアンケート調査を行った。対象者は41℃のサイボク温泉（ナトリウム-塩化物泉）の露天風呂に10分間座位で肩まで入浴し、次に温泉蒸気の充満する部屋で、小石を敷き詰めた床の上に20分間仰臥位となり、その後再び露天風呂に10分間座位で肩まで入浴し、最後に休憩室の椅子に座って20分間過ごした。床にはトルマリン石と石灰岩を含む小石を敷き詰め、小さな穴のあいた金属管を埋め込み、その中に温泉水が循環している。温泉水から放出された蒸気は床を通して室内に充満する。岩盤蒸気浴室の温度は40℃で湿度は75%であった。
【成績】臨床症状は19人中17人で改善した。鼻水・鼻詰まり、眼のかゆみ、くしゃみ、咽頭痛みは、本温泉療法前と比較して、それぞれ100%、75%、40%、100%の対象者で軽快した。副作用はみられなかった。
【考察】岩盤蒸気浴と露天風呂入浴を組み合わせた温泉療法はアレルギー性鼻炎の局所症状および全身症状を軽減するのに有用と思われる。

キーワード：蒸気浴、岩盤浴、アレルギー性鼻炎、塩化物泉

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