Efficacy of a 20% Aluminum Chloride in Alcohol Solution in the Treatment of Hyperhidrosis: A Study Using a Hydrometer

Nam Joon Cho, M.D., Seung Hun Lee, M.D., Doo Yun Lee, M.D.*

Department of Dermatology, Thoracic and Cardiovascular Surgery*, Respiratory Center*, Yonsei University College of Medicine, Youngdong Severance Hospital, Seoul, Korea

Background: Excessive sweating, especially of the palms, soles and axillae, is a socially and an occupationally distressing, and sometimes disabling condition. A variety of treatment methods are used to reduce profuse sweating including topical agents, iontophoresis and sympathectomy.

Objective: We investigated whether a 20% aluminum chloride solution is efficient in the treatment of axillary and plantar hyperhidrosis using a skin surface hydrometer.

Methods: We treated 31 patients (7 male, 24; female) by Drysol once a day at bedtime for four weeks. We had measured the conductances on the stratum corneum of the palms, soles and axillae using a skin surface hydrometer before and after treatment every week for four week.

Result: There was a reduction of conductances after the treatment by Drysol (p<0.05). The reduction of conductances was continued for four weeks (p<0.05).


Key Words: Primary hyperhidrosis, 20% Aluminum chloride in alcohol solution(Drysol), Skin surface hydrometer.

Primary hyperhidrosis is often localized to the palms, soles, axillae, and face. This excessive sweating is precipitated by emotional factors, but the patients are not unduly neurotic. However hyperhidrosis may produce secondary negative emotional, professional, and social consequences1,2. The prevalence of hyperhidrosis is 0.6% to 1.0% in young adults1. Human beings have two functionally distinct sets of eccrine sweat glands. One populates the entire skin with the exception of the palms and soles. These thermally responsive glands play a key role in heat adaptation. In fact thermally responsive eccrine glands are a unique human attribute. The other set of eccrine gland responds only to emotional stimulation and is analogous to the glands in frictional skin of other mammals. These emotionally responsive glands are present primarily in the palms and soles. Eccrine glands in the axillae are unusual in their responsiveness to both thermal and emotional stimulation3. A large number of therapeutic options are available for the treatment of hyperhidrosis. The medical treatment of hyperhidrosis is usually ineffective in all but the mildest cases. Many topical agents have been used, including aluminum chloride, potassium permanganate, formaldehyde solution, glutaraldehyde, and various anticholinergic compounds. 20% aluminum chloride hexahydrate in absolute anhydrotic ethyl alcohol available as a commercial prescription item (Drysol8), is useful for some patients with hyperhidrosis. Anticholinergic compounds have little effect when applied directly to the skin. When
Table 1. Age distribution of hyperhidrosis patients and duration of disease

<table>
<thead>
<tr>
<th></th>
<th>Minimum (year)</th>
<th>Maximum (year)</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (n=31)</td>
<td>8.0</td>
<td>59.0</td>
<td>23.4 ± 12.1</td>
</tr>
<tr>
<td>Duration (n=31)</td>
<td>4.0</td>
<td>50.0</td>
<td>14.6 ± 10.9</td>
</tr>
</tbody>
</table>

Table 2. Sweat response with Drysol (mm by)

<table>
<thead>
<tr>
<th></th>
<th>Before Tx</th>
<th>1 week after Tx</th>
<th>2 week after Tx</th>
<th>3 week after Tx</th>
<th>4 week after Tx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palm (n=28)</td>
<td>15.7 ± 3.6</td>
<td>9.8 ± 5.3 *</td>
<td>8.3 ± 4.0 *</td>
<td>7.3 ± 3.6 *</td>
<td>3.8 ± 4.2 *</td>
</tr>
<tr>
<td>Sole (n=26)</td>
<td>8.9 ± 3.4</td>
<td>5.9 ± 2.9 *</td>
<td>5.1 ± 2.6 *</td>
<td>5.8 ± 4.5 *</td>
<td>2.6 ± 1.7 *</td>
</tr>
<tr>
<td>Axillar (n=22)</td>
<td>17.1 ± 5.2</td>
<td>11.4 ± 6.5 *</td>
<td>10.3 ± 5.8 *</td>
<td>10.3 ± 4.1 *</td>
<td>9.0 ± 5.7 *</td>
</tr>
</tbody>
</table>

Mean ± SD, *p < 0.05

taken orally the dosages required to achieve therapeutic effects are the same as those that cause side effects. The severity of these ocular and intestinal side effects limit their usefulness. A tranquilizer such as diazepam may be helpful for those patients who suffer hyperhidrosis during specific anxiety production situations. Surgical intervention is frequently offered to the patient with severe hyperhidrosis. A skin surface hydrometer can evaluate the hydration state of the skin surface quickly and quantitatively in terms of conductance to the high frequency electronic current of 3.5 MHz. In a previous study we revealed that a skin surface hydrometer is useful to evaluate the efficacy of the treatment. We performed this study to evaluate the efficacy of Drysol in the treatment of hyperhidrosis on the palms, soles and axillae.

MATERIALS AND METHODS

Patients
Among 45 patients who visited the department of dermatology at Youngdong Severance Hospital due to hyperhidrosis from July 8th to August 14th, we excluded 14 patients who could not be followed up. The patients group consisted of 24 women and 7 men aged from 8 to 59. All patients were treated by Drysol for four weeks and none of the them had underlying diseases which caused secondary hyperhidrosis.

Methods
We examined all the patients using CBC and U/A to rule out secondary hyperhidrosis. We also used DITI (digital infrared thermographic imaging) to confirm hyperhidrosis. All patients applied 20% aluminum chloride hexahydrate (Sigma Chemical Co., St. Louis, Missouri) in absolute anhydrotic ethyl alcohol at bedtime and washed it off next morning for four weeks. We used a skin surface hydrometer (SKICON-200, IBS, Inc. Japan) to quantitate the amount of sweating before and after treatment every week for four weeks. Before measuring the patients, they had rested for at least five minutes at room temperature.

Statistical analysis
We did a statistical analysis of efficacy of Drysol by repeated measures of ANOVA using the SAS (statistical analytic system).

RESULTS
The mean duration of hyperhidrosis was 14.6 years and mean age of the patients was 23.4 (Table 1). Twenty eight patients had palmar hyperhidrosis and 26 patients had plantar hyperhidrosis. Twenty two patients had axillary hyperhidrosis. There was a significant reduction of sweating on the palms (15.7 to 9.8), soles (8.9 to 5.9) and axillae (17.1 to 11.4) after one week with Drysol treatment. Reduction of sweating continued for four weeks (Table 2). There were no significant complications except mild irritation and a burning sensation.

DISSCUSSION

Hyperhidrosis or sweating in amounts greater than that required for insensible loss or physiological