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The Measurement of Sweat Intensity Using a New Technique

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Abstract: In this study, a new technique developed by us, called the "pad glove method" was used to measure sweat intensity in the palms of 15 patients with palmoplantar hyperhidrosis, and of 15 control subjects. Quantitative results in the hyperhidrosis group 2.1861±0.0836 grams/hour for the right hand and 2.2478±0.0961 grams/hour for the left hand, while in the control group were 0.3278±0.0419 grams/hour and 0.371±0.0501 grams/hours, respectively. Data were analyzed by Student's t test. The sweat intensities in the hyperhidrosis group were found to be significantly higher than in the control group in both hands ($p<0.001$). This technique was found suitable for measuring sweat intensity in the hands of palmoplantar hyperhidrosis patients.

Key Words: Hyperhidrosis, Sweat gland, Sweat-test, Sweat-secretion.

Introduction

Many diseases increase sweat secretion or alter its composition. Measurements of the amount of sweat produced in a set time and the ion composition of sweat provide needed information for physicians and researchers who deal with conditions in which oversweating occurs, e.g., essential (idiopathic) hyperhidrosis and cystic fibrosis.

Idiopathic hyperhidrosis localized in the palms, soles and axilla is a common problem. Patients with palmoplantar hyperhidrosis are unable to perform certain activities with their hands. They also experience anxiety when shaking hands with someone. This is a major problem in these patients social life, and sometimes infection may occur on a wet area of the skin surface (1-5). Starch-iodine paper, starch-iodine paint, plastic imprint, collection of sweat accumulated either under metallic oil, skin resistance or potential recording, and sweat imprint viewing by video camera are used for measuring the sweat intensity of the palms in order to support diagnosis of hyperhidrosis and peripheral neuropathy. They also help to determine the effectiveness of therapy in these cases (1, 4, 6-9).

Material and Method

Fifteen patients (7 male, 8 female) aged 16 to 25 with palmoplantar hyperhidrosis and fifteen control subjects (7 male, 8 faemale) aged 17 to 25 were included in the study. A new technique called the pad glove method was used to measure sweat intensity in the palms of both groups. This technique that we have developed includes one pair of pad gloves (Figure 1). It involves weighing the gloves before and after one hour of wearing on the hands in order to measure the sweat intensity of the palms.

Pad gloves of adequate size made from gauze material and surgical gloves were prepared and weighed on an electronic scale with 0.0001 gram sensitivity (Sauter K.L.D.7470). The participants then put the pad gloves on both hands. Over these, they put the surgical gloves. They waited in a comfortable, stress-free room for an hour. The temperature and humidity of the room ranged between 19-22°C and 45-55%, respectively. At the end of this period, we carefully removed the gloves, not to allow sweat evaporation, and immediately re-weighed them. Differences between initial and final measurements of both gloves were noted in terms of grams/hour for sweat intensity of the hands. Arithmetic means and standard deviations of the sweat intensity values were calculated.

In addition to sweat intensity measurements, in order to determine any temperatur excess that might cause increased sweat production in the hands due to packing with pad and surgical gloves, we had participants put a

Figure 1. View of pad gloves, made from gauze material and surgical glove (1-Pad gloves, 2-Surgical glove).

Table 1. Sweat intensities (grams/hour) of hands measured by pad glove method in control and hyperhidrosis group.

	Right hand grams/hour	Left hand grams/hour
Control group (n=15)	0.3716±0.0501	0.3278±0.0419
Hyperhidrosis group (n=15)	2.1861±0.0836***	2.2478±0.0961***

***p<0.001 Difference from control group

Table 2. The recorded temperature values (M±SD) from different areas in the control and hyperhidrosis groups.

	Temperature (°C)			
	Covered hand	Uncovered hand	Earlobe	Room
Control n=15	31.35±1.36	31.24±1.73	31.32±1.83	19.08±0.24
Hyperhidrosis group n=15	32.33±1.52	29.52±1.35	31.07±1.54	19.02±0.58

glove on one hand while leaving the other uncovered. We measured the temperatures of the covered and uncovered hands, the earlobes, and the environment for 15 minutes using a fluoropic thermometer (LUXTRON 3100). Temperature values were recorded by computer every 30 seconds. The average values and standard deviations of the temperatures were calculated for each area in both the control and hyperhidrosis groups. Results were analyzed by Student's t test.

Results

The average age was 21.5 year in the control group and 20.5 year in the hyperhidrosis group. Sweat intensities of patients with palmoplantar hyperhidrosis were 2.1861±0.0836 grams/hour for the right hand and 2.2478±0.0961 grams/hour for the left hand. In the control group, the results were 0.3278±0.0419 grams/hour and 0.3716±0.0501 grams/hour, respectively. These values are shown in Table 1.

There was a significant difference in sweat intensity between these two groups in both hands ($p<0.001$), while no significant differences were found in sweat intensity between the right and the left hands of either group ($p>0.05$).

The average values and standard deviation of the temperatures for each area in both groups are shown in Table 2.

No significant differences in temperature were found

between covered and uncovered hands in either group ($p>0.05$).

Discussion

Quantitative measurement of sweat output in human subjects is of course more valuable than qualitative measurement. Most methods of determining sweat output give qualitative results, and the few methods giving quantitative results require instrumentation and are expensive.

Starch-iodine methods are commonly used to estimate the intensity of sweat (1, 5). The duration of these measurements varies from three to five minutes. Since the intensity of sweat follows a paroxysmal path, it is hard to determine a distinct sweating period. In addition, rather than actually collecting samples of sweat, the alteration of the color of moistened tissue paper can provide us only subjective information. Even though this color change may be digitalized using a densitometer and computer analysis to achieve a quantitative results, this method is troublesome and expensive.

The sweat collected by anaerobic packaging or by thin pipets under metallic oil can be analyzed biochemically (6). This method does not give a quantitative result regarding sweat output.

By using plastic impression or silastic imprint methods, ducts of sweat glands can be observed and counted (4). However, collecting sweat samples and measuring the quantity of sweat cannot be carried out simultaneously.

Using absorbent paper to soak up sweat and then weighing this paper is another method used (3). As in some of the other techniques, time limit is again a critical factor. A certain amount of the sweat sample is lost through evaporation. The evaporation of sweat inhibits the accuracy of the measurements and also effects the concentration of the sample.

In the method of anaerobic packaging of the region, the sweat collected on the hand cannot be absorbed absolutely (6), and thus some is lost.

Skin resistance and potential recording and sweat imprint viewing by video camera give quantitative results but require expensive instruments. Because of indirect calculation of results in the video camera technique and the effect of humidity on skin resistance or potential recording techniques, these methods are not reliable for quantitative measurements (7, 8, 9).

Sweat intensity measurements by the pad glove method is more successful than others, because it provides a quantitative result. In this method, the period of time is longer than in the others. This is an advantage for analyzing sweating in at least one paroxysmal attack. The method of estimation is also much more simpler. In our view, this method is more conducive to standardization, and therefore more reliable. It is a more suitable method for use in clinics and research laboratories in order to identify idiopathic hyperhidrosis and to observe the efficacy of therapy, including direct current administration and sympathectomy, for palmar hyperhidrosis.

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