

To Compare the Efficacy of Tap Water Iontophoresis Versus Aluminum Chloride Hexahydrate in the Treatment of Palmoplantar Hyperhidrosis

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ABSTRACT

Background: The excessive sweating of the body beyond the physiological need is termed as hyperhidrosis.

Objective: this study aimed to determine the efficacy of tap water iontophoresis and aluminium chloride for treatment of palmoplantar hyperhidrosis.

Study design: It is randomized control trial based interventional study.

Material and Method: This study was conducted at the Department of Dermatology, Niazi Medical and Dental College, Sargodha. The duration of the study was six month from July 2022 to December 2022. The patients diagnosed with hyperhidrosis were selected for this research. The patients included in the group 1 were treated with tap water iontophoresis (TWI). The patients included in group 2 were treated with 20% aluminium chloride hexahydrate (AC) liquid solution. This treatment was given for 4 weeks. Adherence monitoring was done by participant self-report diary and results were assessed.

Results: The average value of the production of sweat was calculated. The average value of both groups indicates a difference greater than 0.05, which is non-significant. The average value was observed to be 9.76 ± 2.3 g for group no. 1, and the average percentage of production of sweat was also get lowered. While in the case of group no. 2 the reduction of the average value of sweat was 4.3 ± 1.58 and there is a reduction of percentage value up to 65.8 ± 9.87 % observed and the value for group no. 1 was significant according to the value of p. When the results of HDSS (hyperhidrosis disease severity) were compared, no significant difference was observed in the values of both groups. But at the end of the study, when the mean value of hyperhidrosis disease severity was compared in both groups, there were significant changes in group 2.

Conclusion: This study was conducted to determine the treatment efficacy of tap water and aluminium chloride in controlling sweating up to normal level. It was observed that tap water along with a direct current of palmer was a much more efficient way to control the sweating level.

Keywords: Hyperhidrosis, direct current, tap water iontophoresis, Aluminum Chloride hexahydrate, Hyperhidrosis severity scale (HDSS).

INTRODUCTION

The human body physiologically response to the overheating in the form of sweating. The excessive sweating of the body beyond the physiological need is termed as hyperhidrosis. The large quantities of sweat are produce by the eccrine glands. It is professionally and socially a debilitating condition. The heat regulatory center in the hypothalamus control the sweating. The body respond to the temperature changes. The thermoregulation is the significant phenomena occurring in the Homo sapiens¹⁻².

The hypothalamus after sensing the changing temperature of the environment, order the body to activate the heat dissipating mechanisms. The vasodilation of the cutaneous blood vessels is the response of the body to the heat. The sweat produce and evaporates from the surface of the body to cool the body. The incidence of the hyperhidrosis in the general population is 3%. In the generalized hyperhidrosis the entire body is involved in production of sweating³. This idiopathic condition normally observed in the healthy people. The men and women are equally effected by the focal hyperhidrosis.

The most prone areas are soles, faces armpits and palms. These areas are observed to be most affected by the hyperhidrosis. The prevalence of this types is most commonly observed in the people of age range between 25-64 years⁴⁻⁵. The excessive wet palms in the palmer hyperhidrosis, left the patients with social and personal challenges. It is difficult for the patients to hold onto object and shake hands. Such people can't play musical instruments smoothly, and it is also a challenge for them to do the job which required wearing gloves. The psychiatric problems develop in such person's ultimately⁶.

The botulinum toxin injection, iontophoresis, and sympathectomy are the different treatment methods for the people with hyperhidrosis. The 20% aluminum chloride hexahydrate treatment is considered to be most effective. It obstruct the sweat pores by inducing the atrophy of the secretory cells. The topical agents such as potassium permagnate, methenamine,

formaldehyde and boric acid didn't show the satisfactory results. The hypersensitivity complaints have been documented in different studies it is the only contradiction known till date⁷⁻⁸.

Many dermatologists consider tap water iontophoresis an effective treatment for hyperhidrosis of palms and soles. The tap water iontophoresis aided by continuous direct current is also an effective treatment therapy. There is limited and sufficient data present on this therapy. The need of the hour is to evaluate the treatment efficacy by assessing the results. The study was designed to compare the treatment efficacy of the tap water iontophoresis and aluminium chloride hexahydrate⁹⁻¹⁰.

MATERIAL AND METHOD

The study was conducted at the Department of Dermatology, Niazi Medical and Dental College, Sargodha. The duration of the study was six month from July 2022 to December 2022. The ethical and review committee of the hospital approved the study. According to inclusion criteria the patients diagnosed with hyperhidrosis from at least two month's duration were selected for this research. The sample size was 70. Hyperhidrosis severity scale (HDSS) of the included participants was 2, 3 or 4 at baseline. The patients with cardiac condition, local wounds diabetes and organic disease such as hyperthyroidism, prior surgical procedure for hyperhidrosis and botulinum toxin treatment were excluded from the study. The age of the patients was ranged between 10-50 years. The pre-test and post-test data was collected and compared. The patients included in the group 1 were treated with tap water iontophoresis (TWI) in which electrical current was passed through skin in tap water (10-20 mA). Palms and soles were kept for 10 minutes in tap water iontophoresis device by dermatologist. It was repeated for three times in the four week. The patients in the group 2 were treated with 20% aluminium chloride hexahydrate (AC). The liquid solution was applied topically at palms and soles (5-10ml) for whole night and washed in the morning. This treatment was given for 4 weeks. Adherence monitoring was done by participant self-report diary

and results were assessed by hyperhidrosis disease severity index (HDSS), improvement of sweating on a scale of 1 to 4. Direct current generator was used for the production of tap water iontophoresis. The 20g standard diaper was used to measure the sweat output.

According to Hyperhidrosis severity scale (HDSS);

- 1 My sweating is never noticeable and never interferes with my daily activities.
- 2 My sweating is tolerable but sometimes interferes with my daily activities.
- 3 My sweating is barely tolerable and frequently interferes with my daily activities.
- 4 My sweating is intolerable and always interferes with my daily activities.

The data was assessed weekly from baseline to 4 weeks after the start of treatment date, with 4 weeks after the start of treatment date being the primary time point. The statistical analysis was performed by using SPSS. The standard deviation and mean was calculated for each patients. The t-test was used for comparing data of both groups. For HDSS the non-parametric analysis was performed

RESULTS

In this research work, the alterations due to iontophoresis of tap water on palmer hyperhidrosis and aluminum chloride (hexohydrate) were compared and analyzed. In the given table, the average value of the production of sweat was calculated in both groups of study. The average value of both groups indicates a difference greater than 0.05, which is non-significant.

Table 1: Average value for the production of sweat.

Parameters	Before treatment		After treatment	
	Group no. 1	Group no. 2	Group no. 1	Group no. 2
X± Standard deviation	12.8 ± 2.26	12.06 ± 1.8	9.87 ± 2.3	4.3 ± 1.56
Upper value (g)	17	15	14	8
Lower value (g)	11	11	7	3
Mean deviation	0.76		5.34	
Value of t	0.93		7.21	
Value of P	0.33		0.0012	
Significance level	(NS)		(S)	

Apart from this, when the study ended, and the average value was calculated it came out as 9.76 ± 2.3 g for group no. 1, and the average percentage of production of sweat was also get lowered. While in the case of group no. 2 the reduction of the average value of sweat was 4.3 ± 1.58 and there is a reduction of percentage value up to 65.8 ± 9.87 % observed and the value for group no. 1 was significant according to the value of p.value

Table 2: Average percentage of production of sweat after post-treatment.

Parameters	Group no. 1	Group no. 2
X± Standard deviation	27.52 ± 10.86	67.7 ± 9.76
Upper value (g)	49	82
Lower value (g)	11	49
Mean deviation	-37.23	
Value of t	-10.12	
Value of P	0.0012	
Significance level	(S)	

Table 3: Average value of HDSS before and after treatment.

Parameters	Before treatment		After treatment	
	Group no. 1	Group no. 2	Group no. 1	Group no. 2
X± Standard deviation	3.8 ± 0.4	3.34 ± 0.6	2.27 ± 0.6	1.27 ± 0.45
Upper value (g)	4.0	4.0	2.0	3.0
Lower value (g)	3.0	2.0	1.0	1.0
Mean deviation	0.26		1.0	
Value of t	1.25		4.62	
Value of P	0.26		0.0012	
Significance level	(NS)		(S)	

When the results of HDSS (hyperhidrosis disease severity) were compared, no significant difference was observed in the values of both groups. Their average values show no particular difference as represented in table 3. But at the end of the study, when the mean value of hyperhidrosis disease severity was compared in both groups, there were significant changes in group no. 2.

DISCUSSION

The basic purpose of this study was to correlate the changes due to aluminum chloride (hexohydrate) and water from the tap. The direct palmer hyperhidrosis current was also applied. The effect of both of the treatment methods was compared to find their role in the reduction of the production of sweat¹¹⁻¹². It was inferred that, after experimentation, the group treated with aluminum chloride was not showing much reduced as compared to the group treated with water tap along with the current of palmer hyperhidrosis.

When this research work was compared with the studies of different other research groups, it was quite an authentic prediction about the effect. In a study, 28 patients of age 10 to 40 were treated with tap water along with the current of palmer hyperhidrosis¹³ and without palmer hyperhidrosis. After 11 consecutive treatments, a normal range of sweating was obtained. The authors of this study inferred that the correlation of AC and DC along with the iontophoresis of tap water gives similar results.

In another experiment, the iontophoresis of tap water was done by applying a Direct current of 90 voltage and a current range from 13 to 21 mA the polarity was also changed for 15 minutes and the current of palmer hyperhidrosis was applied to 20 patients¹⁴⁻¹⁵. The intermediations were also done 3 times for the duration of 7 days and then for 2.5 weeks in those 20 patients and later analysis was done with the help of a starch iodine test.

Moreover, the study was further proceeded by using the direct current stimulations on the patients up to the threshold level of the patients. This simulator was used for the organization of hyperhidrosis of various body parts like soles of feet, palms of hands, and axilla regions. After the given treatment for twenty days along with all the respective precautions¹⁶, it was observed that there is a decrease in sweating in the palms of the hands under study. The sweating intensity was measured by photo densitometry and a persprint sheet.

In another study, 113 patients were treated with palmer hyperhidrosis, and with DC treatment a significant reduction in the production of sweat was observed. The sweat production was reduced up to 80 %. But after 36 days of treatment, the patient was returned to its normal state of high rate of sweating. There is no information available about the TWI and my researchers advised that there is anhidrosis caused by iontophoresis by the blocking of ducts¹⁷⁻¹⁸. However, the glands causing sweat were not damaged at all by this treatment. Moreover, some research groups emphasized that due to iontophoresis of water from the tap, there are some morphological and functional changes in the sweat glands. These alterations may result from the obstruction in the transmission route of the sympathetic nervous system to the effector, which is the sweat gland in this case. As a result of this obstruction, the minimum capacity or threshold for nerve impulse is also raised than normal. It was also predicted that there is a decrease in the pH of the gland of sweating due to higher hydrogen ion concentration due to the iontophoresis of water. Due to this decrease in the pH of the sweat gland, there are chances of its dysfunction and exocrine tissues of the gland fail to perform their function¹⁹⁻²⁰.

The hyperhidrosis is a serious issue, there is a need to control it from the initial stages, it gets improved by continuous or regular therapies. However, its treatment method is so simple, that it can also be used at home by using some iontophoretic portable homemade therapies. However, the initial treatment of excessive sweating is to use the deodorants²¹, which have aluminum chloride which is known to control the sweating from axillary regions which have particularly thick skin. But these deodorants cause the

blockage of sweat glands and precipitation of various excreted salts along with sweat which leads to the damage of epithelium along with sweat control. Therefore, it was inferred that the use of Direct current of palmoplantar has much efficiency as compared to the other treatment methods, it does not block the sweat glands as well as salts are not precipitated along with sweat. It is somehow a long lasting treatment as compared to the treatment of aluminum chloride²²⁻²³.

CONCLUSION

This study was performed to find the effect of tap water and aluminum chloride. This treatment by tap water was more efficient in the case of Palmer hyperhidrosis and less effective in the case of outcomes of aluminum chloride (hexohydrate). Basically, it was a comparative study to find out the alterations in the sweating by tap water treatment and DC. It was the aim of the study to find out the more effective method for the control of sweating up to normal level by the use of aluminum chloride or tap water along with the current of palmer hyperhidrosis. It was observed that tap water along with a direct current of palmer was a much more efficient way to control the sweating level.

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