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Original Article

A comparative study between topical aluminium chloride hexahydrate 20% solution (Driclor) with potassium permanganate KMnO4 solution and topical zinc acetate with erythromycin (Zineryt solution) in treatment of axillary bromhidrosis

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Abstract

Objective To evaluate and compare effectiveness of topical combined driclor solution with Potassium permanganate KMnO4 solution (1:10000) and topical zinc acetate with erythromycin (Zineryt solution) in treatment of axillary bromhidrosis.

Methods Across-sectional comparative study was carried out from march 2021 to march 2022. Group A: 25 patients treated with Driclor single night application on dry clean axilla with KMnO4 solution (1:10000) single application at day time for 30 min then wash with tape water. Group B: 25 patients treated with topical zineryt solution twice daily applications for 12 weeks. Follow up of both groups for 12 weeks after stopping the treatment.

Results There is no significant difference in mean of severity score for axillary bromhidrosis between group A and group B, before, after 6 weeks and after 12weeks.patients in group A show higher good satisfaction (72%) than group B(12%).during follow up period relapse rate was higher (72% (in group B in compare with relapse rate in group A (16%),percent reduction (response rate) for mean of severity score was 78.37±5.88% after 6 weeks and 91.89±35.29% after 12 weeks in group A and 61.76±4.08 % after 6 weeks and79.41±6.12% after 12 weeks in group B.

Conclusion Both protocol was effective in treatment of axillary bromhidrosis, but topical driclor with Potassium permanganate KMnO4 solution (1:10000) show higher response rate and lower relapsing rate when compare with topical zineryt solution.

Key words
Bromhidrosis; Driclor; Zineryt; Potassium permanganate.

Introduction

The term "bromhidrosis" describes unpleasant body odour that primarily results from apocrine and eccrine glands. Apocrine bromhidrosis is most frequently reported in the axillae. The psychological functioning of the individual may be hampered by this condition.[1] After puberty, apocrine bromhidrosis typically develops. It shows a male predominance, which may be due to men having more active apocrine glands than women.[2] The axillae have microflora that includes bacteria (Micrococcus, Staphylococcus, Corynebacterium, and Propionibacterium) because of the high humidity brought on by

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eccrine sweating and sebum production in the area. The expansion of these bacteria may be aided by an elevated axillary pH. Apocrine secretions are typically odourless, however when corynebacteria, a type of bacteria, biotransform apocrine secretions. They emit thioalcohols, 16-androstene steroids, short- and medium-chain volatile fatty acids (C2 to C10 branch length), all of which have the capacity to leave a distinct odour.[3] Deodorants and antiperspirants, frequent axillary washing, perfume application, and changing out of filthy clothing can all be beneficial. By preventing sweat and bacteria from building up on the hair shafts, shaving off axillary hair can reduce odour. Topical antibacterial treatments or antibacterial soaps may also be helpful. The injection of botulinum toxin A has been reported to successfully treat axillary bromhidrosis.[4] For treating axillary bromhidrosis, a frequency-doubled, Q-switched Nd:YAG laser (1064nm) has been successful.[5] In more recent study, bromhidrosis has been successfully managed by subdermal coagulation and elimination of apocrine glands using the 1444-nm Nd:YAG laser.[6] Those unsatisfied with conservative measures, surgical excision of axillary subcutaneous tissue has been successfully performed using a variety of surgical techniques (axillary shave and subsection of subcutaneous glands, laser ablation, intradermal alcohol injection, ultrasound ablation and liposuction), which removes both eccrine and apocrine glands.[7,8] Aluminium chloride hexahydrate (ACH) is the hydrated version of aluminium chloride (AC) salt. The use of ACH as a treatment for axillary and palmar hyperhidrosis has been shown to be successful.[9] Aluminium salts have been found in numerous investigations to block the distal sweat gland ducts. An explanation for this obstruction has been put forth: the mucopolysaccharides and metal ions precipitate, causing damage to the epithelial cells lining the duct's lumen and generating a block that stops sweat outflow.[10] The active components of Zineryt solution include erythromycin (40 mg/ml) and zinc acetate (12 mg/ml). Zinc acetate is a chemical compound with skin-healing capabilities and anti-DHT activity and erythromycin is an antibiotic.[11] The solution of potassium permanganate (KMnO4) is a potent oxidising agent that changes the DNA structure of pathogenic organisms and has potent microbicidal effects on bacteria, fungi, viruses, and protozoa.[12]

Patients and methods

Across-sectional comparative study between topical combined Aluminium chloride hexahydrate 20% solution (Driclor) with Potassium permanganate KMnO4 solution (1:10000) and topical zinc acetate with erythromycin (Zineryt solution) in treatment of axillary bromhidrosis was carried out in private outpatient clinic from March 2021 to March 2022.

Group A: 25 patients treated with aluminium chloride single night application on dry clean axilla with KMnO4 single application at day time for 30 min then wash with tape water, this regime applied for all patients for 12 weeks.

Group B: 25 patients treated with topical zineryt solution twice daily applications for 12 weeks. Follow up of both group for 12 weeks after stopping the treatment.

Assessment of relapse with score (no relapse =0, relapse=1).

Patients satisfaction about treatments and relapse score: poor=1, fair=2 and good =3. Score of

disease severity: bromhidrosis without hyperhidrosis=1 and bromhidrosis with

hyperhidrosis =2. T test was used to compare the means of continuous variables after data analysis. By estimating the percentage change in the severity score means at 6 and 12 weeks of therapy compared to the pre-therapy baseline severity score mean, the response rate was estimated.

Results

Over study duration of one-year total of 50 patients were diagnosed to have axillary bromhidrosis, 25 patients in group A and 25 patients in group B, age range from 15years to 55 years. A mean age of group A 27.6±10.0 years, and mean age of group B mean age 30.8±10.4 years. Most age group in both groups was 15-25 years old **(Table 1)**.

Gender distribution: in group A 15 (60%) male and 10 (40%) while distribution of gender in group B: 11 (44%) male and 14 (56%) female.as shown in **Figure 1** and **Figure 2**, respectively.

Group A treated with topical aluminium chloride hexahydrate 20% solution (Driclor) with

Table 1 Age distribution in both group A and group B.

Age (years)	*Group A*	*Group B*
15-25	15 (60%)	9 (36%)
26-35	3 (12%)	8 (32%)
36-45	5 (20%)	2 (8%)
46-55	2 (8%)	6 (24%)

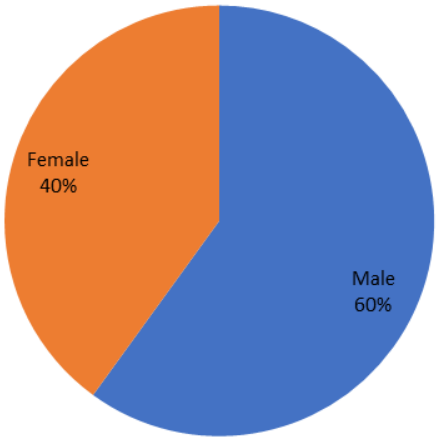

Figure 1 Sex distribution in group A.

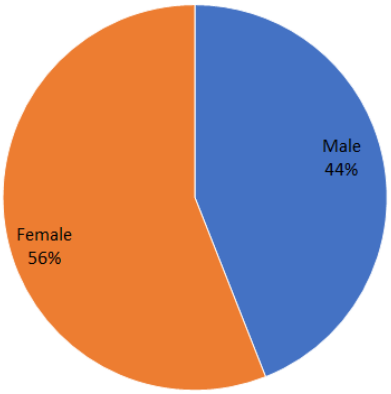

Figure 2 Sex distribution in group B.

Table 2 Effect of topical almuinum chloride hexahydrate 20% solution (Drichlor) with potassium permanganate KMnO4 solution on mean of severity score.

Group A	*Mean*	*SD*	*P value*
Before treatment	1.48	0.51	
After 6 weeks	0.32	0.48	0.0001
After 12 weeks	0.12	0.33	0.0001

Potassium permanganate KMnO4 solution, idiopathic axillary bromhidrosis presented in 20 (80%) of patients and post laser hair removal axillary bromhidrosis in 5 (20%) of patients, 21 (84%) of patients presented with bilateral axillary bromhidrosis and 4 (16%) with unilateral axillary bromhidrosis. The mean±SD of severity score before therapy was 1.48±0.51, and after 6 weeks of therapy decline to 0.32±0.48, P value <0.0001. More declines observed after 12 weeks of therapy, mean was 0.12±0.33, P value <0.0001 **Table (2)**. Percent reduction for mean of severity score(response rate) was 78.37±5.88% after 6 weeks and 91.89±35.29% after 12 weeks.

Group B treated with topical zineryt solution twice daily application, idiopathic axillary bromhidrosis presented in 23 (84%) of patients and post laser hair removal axillary bromhidrosis in 5(20%) of patients, 21(92%) of patients presented with bilateral axillary bromhidrosis and 2(8%) with unilateral axillary bromhidrosis. The mean±SD of severity score before therapy was1.36±0.49, and after 6 weeks

Table 3 Effect of topical zinc acetate with erythromycin (Zineryte solution) on mean of severity score.

Group B	*Mean*	*SD*	*P value*
Before treatment	1.36	0.49	
After 6 weeks	0.52	0.51	0.0002
After 12 weeks	0.28	0.46	0.0001

Table 4 Comparison between the effectiveness of treatment in both groups.

	Mean	*SD*	*P value*
Before treatment			
Group A	1.48	0.51	0.400
Group B	1.36	0.49	
After 6 weeks			
Group A	0.32	0.48	0.15
Group B	0.52	0.51	
After 12 weeks			
Group A	0.12	0.33	0.16
Group B	0.28	0.46	

of therapy decrease to be 0.52±0.51, P value <0.0002. More decline observed after 12 weeks of therapy, and the mean was 0.28±0.46, P value <0.0001 **(Table 3)**. Percent reduction for mean of severity score (response rate) was 61.76±4.08% after 6 weeks and 79.41±6.12% after 12 weeks.

There is no significant difference in mean of severity score for axillary bromhidrosis between group A and group B, before, after 6 weeks and after 12 weeks as show in **Table 4**.

In group A, Patients satisfaction was good in 18 (72%), fair in 6 (24%) and poor in 1 (4%) of patients while in group B. Patients satisfaction was good in 3 (12%), fair in 13 (52%) and poor in 9 (36%) of patients. Mild erythema and irritation developed in 5 (20%) of patients in group A, while in group B erythema and irritation developed in 13 (52%) of patients which resolved with used of topical emollient. During follow up period relapse rate was higher (72%) in group B in compare with relapse rate in group A (16%), with non relapsing rate (84%) in group A and (28%) in group B, which was statistically significant as show in **Table 5**..

Table 5 Comparison between relapsing and non relapsing rate in both groups.

	Group A	*Group B*	*P value*
Non relapse	21 (84%)	7 (28%)	
Relapse	4 (16%)	18 (72%)	0.0001
Total	25 (100%)	25 (100%)	

Discussion

From the results above it is apparent that there is no significant difference in effectiveness of treatment with topical aluminium chloride hexahydrate 20% solution (Driclor) with Potassium permanganate KMnO4 solution (Group A) and topical zineryt solution twice daily applications (Group B). However, group A Show higher response rate (91.89±35.29%) when compare with group B (79.41±6.12%), group A, also show higher percent of patients with good satisfaction (72%) compare to (12%) in group B, while relapse rate was higher (72%) in group B in compare with relapse rate in group A(16%), with non relapsing rate (84%) in group A and (28%) in group B, erythema and irritation seen in (20%) of patients in group A compare to (52%) in group B. Results in group A contributed to synergistic effect of Aluminium chloride hexahydrate 20% solution which decrease hyperhidrosis by block the distal sweat gland ducts,[10] and potassium permanganate solution ($KMnO_4$) which exerts potent microbicidal activity on bacteria.[12]

In group B contributed to synergistic effect of Erythromycin which is antibiotic and zinc acetate is a chemical complex with anti-DHT activity.[11] Group A treatments modality show response rate (91.89%) comparable to liposuction followed by curettage which show response rate of 87.5, but liposuction with curettage associated with complications such as hematoma and epidermal cyst formation.Driclor with Potassium permanganate KMnO4 solution (Group A) show higher response rate (91.89%) than A frequency-doubled, Q-switched Nd:YAG laser (1064 nm) in treatment of bromhidrosis

(81.2%),while the response rate in group B was (79.41%) comparable to that of A frequency-doubled, Q-switched Nd:YAG laser (1064 nm) in treatment of bromhidrosis (81.2%).[14]

Conclusion

Both protocol was effective in treatment of axillary bromhidrosis with mild side effects represented by mild erythema and irritation, but topical Aluminium chloride hexahydrate 20% solution (Driclor) with Potassium permanganate KMnO4 solution (1:10000) show higher response rate and lower relapsing rate when compare with topical zineryt solution, in addition, topical Aluminium chloride hexahydrate 20% solution (Driclor) with potassium permanganate KMnO4 solution (1:10000) available with low cost effectiveness.

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