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Comparative Effects of Two Topical Antiseptics (Chlorhexidine vs KMn04) on Bacterial Skin Flora in Atopic Dermatitis

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In order to determine the efficacy and tolerance of two topical antiseptics, chlorhexidine vs KMn04 (diluted at 1:20,000), we compared their bacteriological and clinical effects in a randomized trial on 20 children with Atopic Dermatitis (AD) treated with topical steroids (desonide). After treatment, a clinical improvement was noted in the two groups, though without statistical differences. *In vivo:* Before treatment, *Staphylococcus aureus* (S.A.) density was high and predominant in both groups. After treatment, the decrease in S.A. was greater in the chlorhexidine group than in the KMn04 group, without significant difference. *In vitro:* At the clinical dilution used, there was a statistical difference ($p < 0.05$) between the number of killed bacteria in the chlorhexidine group (−3 log) and the number in the KMn04 group (−1 log). This study confirms the role and importance of the choice of a topical antiseptic in the treatment of AD. *Key words: Atopic dermatitis; Staphyloccocus aureus; treatment; Antiseptic; Chlorhexidine; KMn04.*

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INTRODUCTION

Among environmental factors of Atopic Dermatitis (AD), recent studies have emphasized the role of microbial agents, particularly *Staphylococcus aureus* (S.A.) which has a peculiar ability to colonize the skin of the atopic patient.

Antiseptics are commonly used, though no real validation has been made in this disease. To determine efficacy of two frequently applied antiseptics, we compared the bacteriological and clinical effects of two antiseptics: chlorhexidine (Plurexid®, Theraplix Rhône-Poulenc Rorer) vs KMn04 (diluted at 1:20,000), in a randomized trial on 20 children with AD.

MATERIAL AND METHOD

Twenty patients, 11 boys and 9 girls aged from 5 months to 9 years (mean = 35.5 months) who suffered from AD, were selected according to the Hanifin & Rajka criteria. After giving informed consent they were randomly distributed in two groups: ten patients were treated with chlorhexidine and the others received topical KMn04, diluted at 1:20,000. In the two groups, patients were treated once daily for 7 days with antiseptics and a topical corticosteroid (desonide).

A clinical scoring system measuring intensity and extent of lesional skin was used before and after treatment. Skin dryness, pruritus and sleep loss were also recorded. Bacterial samples were obtained using the detergent scrub technique (Williamson & Kligman (1) method modified by Fleurette (2)) from lichenified lesions before the start and at the end of the trial for a double evaluation.

In vivo: the rinsing fluid was cultured on a trypticase soybean agar medium after logarithmic dilutions of 1:10. A colony count was carried out after 48 h at 37°C.

In vitro: samples were pooled with four dilutions of the two antiseptics (1:50, 1:100, 1:200, 1:500 for chlorhexidine and 1:1,000, 1:10,000, 1:20,000, 1:50,000 for KMn04). Samples were placed on

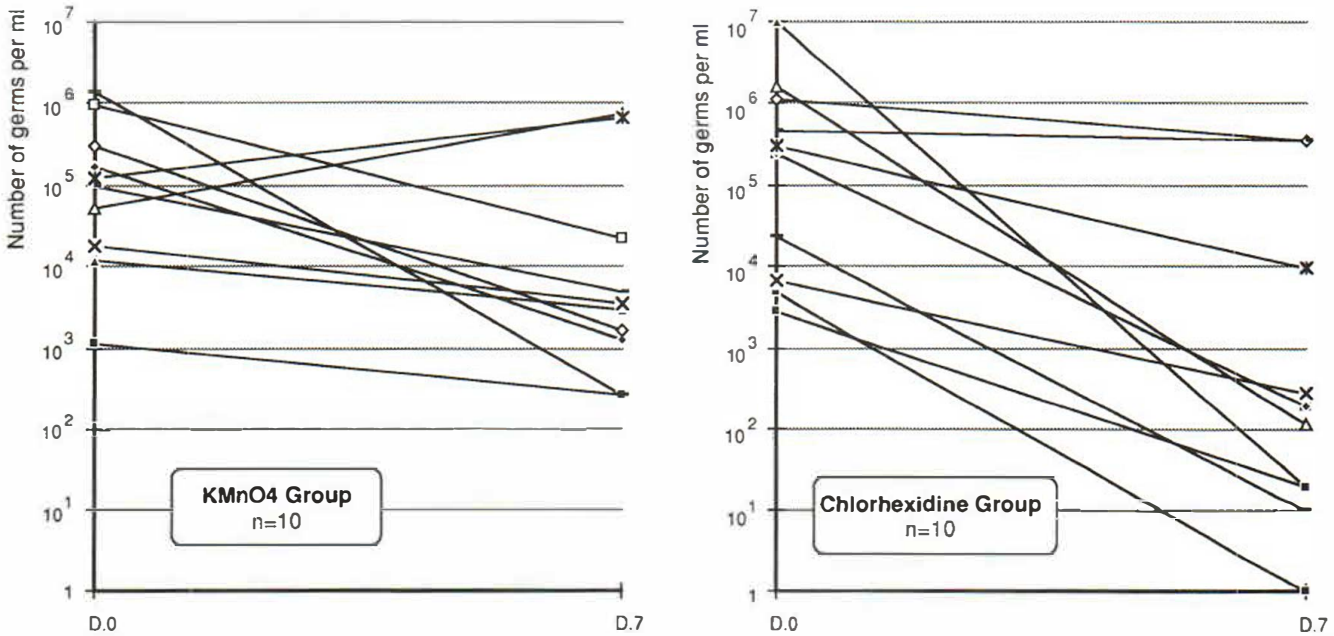

Fig. 1. Individual evolution of the number of *Staphylococcus aureus*.

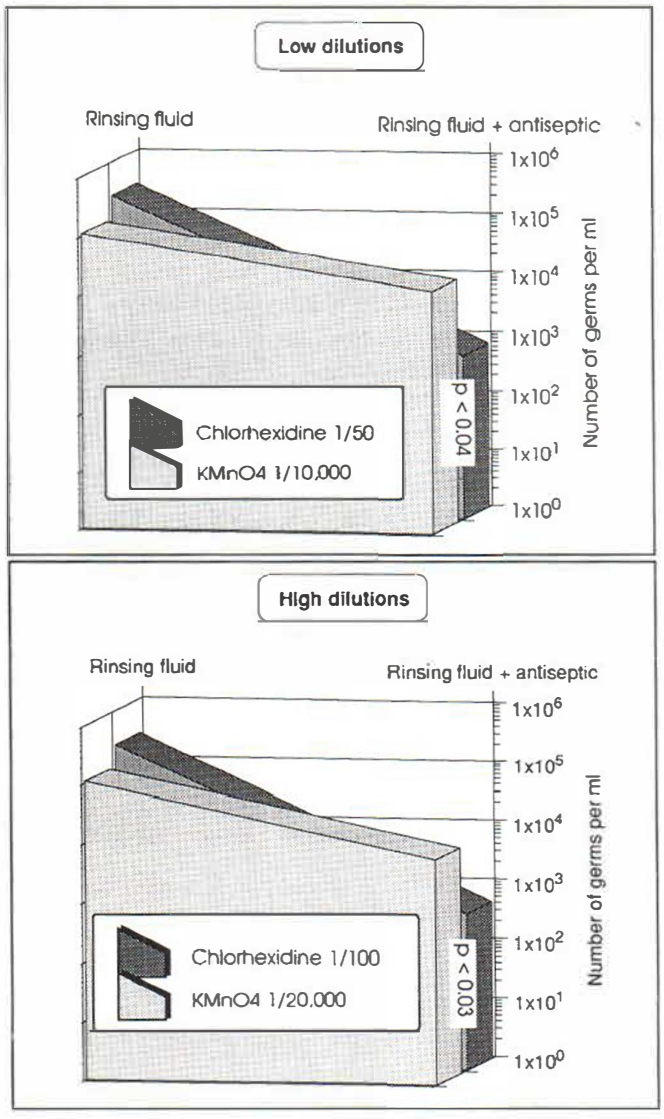

Fig. 2. Evolution of median values of *Staphylococcus aureus* after 5 min of contact with different concentrations of antiseptics.

selective media containing a neutralizing agent, 5 min after contact with the antiseptics.

Results are expressed in vivo in S.A. density (log 10 of the number of bacteria/ml) and in vitro by the number of bacteria killed after 5 min of contact with the two antiseptics at different concentrations.

Statistical analysis was performed using the χ^2, Fisher and Student's *t*-tests.

RESULTS

Clinical results

At inclusion, the intensity score and the number of localizations were the same in both groups. After 7 days of treatment, all clinical scores (intensity, extent, associated symptoms) were improved in both groups. In the chlorhexidine group, the improvement percentage was higher (though without significant difference) with respect to the KMn04 group (Table I). Clinical tolerance was good in both groups. Irritation was noted in 2 patients in the KMn04 group and one patient in the chlorhexidine group.

Table I. *Evolution of clinical scores.*

	Chlorhexidine group ($n = 10$)	KMn04 group ($n = 10$)	p
Number of localizations			
at D0	3.4 ± 1.4	3.9 ± 1.3	
at D7	2.5 ± 1.4	3.4 ± 1.6	
Evolution from D0 to D7	−0.9 ± 1.3	−0.5 ± 1.4	0.52
Intensity score			
at D0	5.4 ± 2.7	7.2 ± 2.5	
at D7	3.2 ± 1.7	5.4 ± 3.5	
Evolution from D0 to D7	−2.2 ± 2.3	−1.8 ± 2.7	0.73
Total score			
at D0	8.8 ± 4.1	11.1 ± 3.6	
at D7	5.7 ± 3.1	8.8 ± 5.0	
Evolution from D0 to D7	−3.1 ± 3.4	−2.3 ± 4.0	0.63

Bacteriological results

In vivo: The median value of S.A. at D.O. was 267,500/ml in the chlorhexidine group and 110,000/ml in the KMn04 group.

After 7 days of treatment, the decrease in the number of S.A. was more significant in the chlorhexidine group than in the KMn04 group. No statistical difference was noted (Table II). Individual curves confirm more important S.A. destruction in the chlorhexidine group (Fig. 1).

In vitro: The in vitro study count of the surviving S.A. after contact with different antiseptic concentrations was carried out on the samples taken at D.O. (Table III).

At the usual clinical concentrations the decrease in the bacteria is more important and statistically different ($p < 0.05$) in the chlorhexidine group than in the KMn04 group (Fig. 2).

DISCUSSION

The prevalence of S.A. on the surface of atopic skin is constant (3), and, among the symptomatic treatments of D.A., antiseptics are frequently used (4).

Although efficacy of antiseptics is recognized in theory from in vitro bacteriologic testing on collection strains, their clinical efficacy still remains poorly evaluated.

Our study was based on Staphylococci collected from lesional atopic skin which enabled us to test the bacteriologic efficacy in vivo of two routinely used antiseptics, KMn04 and chlorhexidine.

On a clinical level, improvement was observed in both groups without significant difference. Local corticotherapy

Table II. *Development in the number of germs in the rinsing fluid (number per ml).*

	Chlorhexidine group ($n = 10$)	KMn04 group ($n = 10$)	p
Number of germs at D0	267,500* [2,870;10*10⁶]	110,000* [1,170;1.37*10⁶]	0.37
Number of germs at D7	160* [0;350,000]	3,300* [270;720,000]	

* median values.

Table III. *Number of surviving germs at different antiseptic concentrations after 5 min of contact (number per ml).*

	Chlorhexidine group ($n = 10$)	KMn04 group ($n = 10$)
Untreated rinsing fluid	267,500* [2,870;10*10⁶]	110,000 [1,170;1.37*10⁶]
Plurexid dilution		
1/50	430* [0;9,800]	–
1/100	690* [0;15,000]	–
1/200	10,400* [0;880,000]	–
1/500	26,000* [0;1.1*10⁶]	–
KMn04 dilution		
1/1,000	–	20* [0;12,000]
1/10,000	–	6,300* [73;460,000]
1/20,000	–	14,000* [300;610,000]
1/50,000	–	33,500* [1,000;720,000]

* median values.

was undoubtedly the reason for these results. Tolerance to the two antiseptics on evolving skin lesions was good in both groups.

On a bacteriologic level, the number of germs at D.O. is comparable in terms of median values. The reduction in the number of in vivo S.A. after 7 days of treatment was greater in the chlorhexidine group than in the KMn04 group. This difference is not significant due to the small number of patients enrolled in the study.

The in vitro study, based on Staphylococci taken from lesional skin, allowed us to test the bactericidal effect of the two antiseptics at different concentrations. Results showed good antiseptic bactericidal action on S.A. for certain dilutions (1:50, 1:100 for chlorhexidine and 1:1,000 for KMn04).

These results confirm the efficacy of chlorhexidine used in clinical concentrations (pure, 1:50, 1:100). On the other hand, the only dilution (1:1,000) allowing decrease of 2 log of S.A. is not clinically practicable in children due to the side effects.

At the commonly-used dilution rates of 1:10,000 and 1:20,000, KMn04 reduces the number of S.A. by less than one log. This is insufficient especially in the atopic patient where germ concentration is greater than $10^5/cm^2$) (5).

Results show that chlorhexidine and KMn04 are well tolerated antiseptics and when used with local corticotherapy reduce the concentration of S.A. on the atopic skin surface. Chlorhexidine is active in vitro in clinical concentrations, whereas KMn04 at a dilution of 1:20,000 has a significantly lower bactericidal activity.

This study confirms the role and importance of the choice of a topical antiseptic in treatment of atopic dermatitis.

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