COMPARATIVE DOUBLE-BLINDED STUDY BETWEEN MUPIROCIN AND TETRACYCLINE OINTMENTS FOR TREATING SKIN INFECTIONS

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ABSTRACT

A double-blinded study was conducted to compare the effects of mupirocin and tetracycline ointments in the treatment of skin infections. 111 patients were available for clinical assessment, of which 53 were treated with mupirocin and 58 treated with tetracycline.

Clinically, both groups were improved, and there was no significant difference. Bacteriological assessment however revealed a better response to mupirocin.

Staphylococcus aureus and Streptococcus pyogenes were the most common organisms isolated. 99% of Staphylococci were sensitive to mupirocin compared with 61% to tetracycline and 29% to penicillin G. 57% of Group A beta haemolytic Streptococci were resistant to tetracycline compared to 14% to mupirocin. Gram-negative organisms were mostly resistant to both preparations. No side effects were observed in both treatment groups.

This study suggests that mupirocin is a safe and effective topical preparation for treating most of our common skin infections.

Key Words: Skin Infections, Mupirocin, Tetracycline

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INTRODUCTION

Mupirocin is a newly developed antibacterial compound for the treatment of skin and soft tissue infections. It is pseudomonic acid A on a polyethylene glycol base, and acts by inhibiting protein synthesis in bacterial cells. It is rapidly metabolised in the systemic circulation and cannot be used as a systemic antibiotic (1). This also means that it has minimal systemic toxicity when absorbed from the skin. It is effective against most skin pathogens and has been demonstrated to rarely produce resistant strains (2). Previous reports have indicated its effectiveness against major skin pathogens, staphylococci and streptococci, at concentrations achievable in the skin. The purpose of this study was to compare the effectiveness of mupirocin to the commonly used topical antibiotic tetracycline in patients with skin infections suitable for topical therapy.

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MATERIAL AND METHODS

From April 1986 to July 1987, patients seen at Middle Road Hospital with skin infections which were amenable to treatment with a topical antibiotic were admitted into the study. Patients were excluded if they required systemic antibiotics for extensive infections, or if they have received other topical or systemic antibiotics in the previous 24 hours. All suitable patients were randomly distributed into two treatment groups and were assessed clinically and bacteriologically on a double-blinded basis. For each patient, a standard protocol was completed during the first visit, and a swab from infected lesions was taken for bacteriological culture. All patients were instructed to apply the given creams two to three times daily, and to return for clinical assessment after one week of treatment. Swabs for bacteriological culture were repeated on the second visit if indicated. Those who violated the protocol by receiving other forms of treatment or failed to return for follow up were removed from the study.

All bacteriological specimens were sent for culture and sensitivity tests at the Department of Pathology. Bacterial isolates were identified, and their sensitivities to mupirocin, tetracycline and other commonly used antibiotics were determined by the NCCLS (Kirby-Bauer) disc test. Gram positive and Gram negative organisms were tested with mupirocin 5 ug and 200 ug discs respectively.

Fisher Exact Probability Test was used to test the statistical significance of observations.

TABLE 1
PATIENT DETAILS

Patient/Details	Patients treated with		Total
	Mupirocin	Tetracycline	
No. of Patients	53	58	111
Sex	M = 35 F = 18	M = 38 F = 20	M = 73 F = 38
Mean Age (years)	17.4	19.0	
Chinese	40	38	78
Malay	8	9	17
Indian	3	7	10
Other	2	4	6

RESULTS

Out of 134 patients recruited into the study, 23 patients were excluded from the final analysis because 21 of them failed to return for follow-up and 2 patients were given oral antibiotics during the study period. Details of the 111 patients who completed the study are summarised in Table 1. There were no significant differences between the two treatment groups with respect to numbers, sex, age, or race.

Fifty-one patients (46%) had primary skin infections and sixty patients (54%) had secondary infections (Tables 2 & 3). The most common primary infections were furunculosis and impetigo. The most common secondary infections were infected eczema and dermatitis. Patients with fever and/or lymphadenopathy were defined as having a more severe grade of infection. There were 13 such patients (25%) treated with mupirocin (3 patients with fever and 10 with lymphadenopathy) compared to 18 such patients (31%) treated with tetracycline (4 patients with fever and 15 with lymphadenopathy). The sites of lesions are shown in Table 4. The distribution was also similar in both treatment groups.

The predominant presenting symptoms were pain (82%) and itching (18%), both symptoms being evenly distributed between the treatment groups. Most patients received adjunctive therapy of some sort. Eusol was most commonly prescribed (56% of patients) followed by Eusol plus chlorpheniramine (13%). Other adjunctive therapy included cetrimide, chlorhexidine and potassium permanganate.

TABLE 2
TYPES OF PRIMARY INFECTION

Type of Primary Infection	Patients treated with		Total
	Mupirocin	Tetracycline	
Furunculosis	13	13	26
Impetigo	6	8	14
Ecthyma	1	4	5
Folliculitis	4	1	5
Paronchynia	0	1	1
Total	24	27	51

TABLE 3
TYPES OF SECONDARY INFECTION

Type of Secondary Infection	Patients treated with		Total
	Mupirocin	Tetracycline	
Eczema/ Dermatitis	16	19	35
Bites	4	5	9
Ulcers	2	0	2
Abrasions	2	0	2
Others	5	7	12
Total	29	31	60

TABLE 4
DISTRIBUTION OF LESIONS

Location of Lesions	Patients treated with		Total
	Mupirocin	Tetracycline	
Limbs	35	37	72
Head/neck	6	8	14
Trunk	6	5	11
Flexures	3	0	3
More than 1 location	3	8	11

Bacteriology

144 positive bacterial cultures were obtained from 96 patients (Table 5), while specimens from 15 patients failed to yield any growth. Staphylococcus aureus and Streptococcus pyogenes were most frequently isolated. Other organisms isolated were Acinobacter species, Pseudomonas aeruginosa, Proteus species, Streptococcus faecalis, and enteric species.

Almost all staphylococci isolates (99%) were sensitive to mupirocin whereas 73% showed resistance to penicillin G and 37% to tetracycline. Group A beta haemolytic streptococci were entirely susceptible to penicillin G as would be expected, 58% were resistant to tetracycline and 14% to mupirocin. All pseudomonas and proteus species were uniformly resistant to tetracycline and mupirocin.

TABLE 5
DISTRIBUTION OF BACTERIAL ISOLATES

Bacteria Isolated	Patients treated with		Total
	Mupirocin	Tetracycline	
Staph. aureus	33	49	82
Strept. pyogenes	17	25	42
Acinobacter sp.	8	1	9
Ps. aeruginosa	2	1	3
Proteus mirabilis	1	1	2
Strept. faecalis	1	1	2
Enteric sp.	3	1	4
Total	65	79	144

TABLE 6
BACTERIOLOGICAL ASSESSMENT

Bacteriological Assessment	Patients treated with		Total
	Mupirocin	Tetracycline	
Cure	26	21	47
Elimination	13	12	25
Replaced	2	6	8
Failed	1	10	11
Unassessable	11	9	20
Success rate	41/42 (98%)	39/49 (80%)	

($P > 0.01$ and < 0.05)

Assessment

All assessable patients were followed up on at least one occasion, the mean time to the first assessment being 9.1 days for mupirocin treated patients and 10.1 days for the tetracycline group. Twelve patients, four in the mupirocin group and eight in the tetracycline group, were seen on a second occasion more than 14 days after their initial therapy. Patients in the mupirocin group were treated for an average of 6.9 days, and those in the tetracycline group for 7.4 days.

Clinical Results

Complete clinical resolution was recorded in 33 patients (62%) treated with mupirocin and 32 patients (55%) treated with tetracycline. Another 12 patients (23%) showed improvement in the mupirocin group and 20 (34%) in the tetracycline group. These results are not statistically significant.

Nineteen patients suffering from impetigo and ecthyma were analysed as a separate subgroup. Staphylococci were uniformly isolated from all these patients, while five patients also had isolates of streptococci. All seven patients treated with mupirocin were clinically and bacteriologically cured at the end of 14 days of treatment. Twelve patients were treated with tetracycline, eight of which were clinically cured, two partially improved, and two were assessed as failures.

Bacteriological Results

Bacteriological results were assessed as follows: Cured — (no follow-up swab taken as there was complete absence of lesions), Elimination — (no organism isolated at follow up), Replaced — (original organism not isolated at follow up but replaced by another organism), Failure — (original organism isolated at follow up), and Unassessable — (no growth on pre-treatment culture or failure to take a post-treatment culture from a still existing lesion).

91 patients (82%) were bacteriologically assessable. Mupirocin was significantly superior compared to tetracycline in achieving bacteriological success. Successful results (cure, elimination and replacement) were achieved in 98% of patients receiving mupirocin compared to 80% of patients receiving tetracycline (Table 6).

Side Effects

None of the 111 patients assessed was found to have any unwanted effects from either preparation. There was no cutaneous irritation or systemic complaints in both treatment groups.

DISCUSSION

In this double-blinded study, 111 patients were assessed following 7 days therapy with mupirocin and tetracycline. There was no significant difference between the two treatment groups with respect to patient details, treatment duration, severity and types of infections. Both groups improved clinically with no significant difference. However, bacteriological assessment showed a significantly superior result for mupirocin. This discrepancy between clinical and bacteriological assessment is not uncommon. Previous studies comparing mupirocin ointment with other topical antibiotics and with its own vehicle have shown similar results (4) (5), but generally bacteriological changes have been much more markedly in favour of mupirocin. Clinical improvement is probably influenced by a number of factors such as education in personal hygiene, and is not simply a matter of one topical antibiotic versus another agent. Furthermore, most of these skin conditions are self-limiting in nature, which makes clinical evaluation of an agent's effect on them difficult.

This study confirms that staphylococci and streptococci are the most common skin pathogens in our community. Both organisms were shown to be much more sensitive to mupirocin than to tetracycline. It is interesting to note that mupirocin gave 100% cure rate in treatment of seven patients with impetigo and ecthyma compared to 67% among twelve patients treated with tetracycline, though the number of patients was too small to yield a significant difference between the two groups.

Nowadays, dermatologists are inclined to treat most skin infections with systemic antibiotics. These usually work fairly efficiently, and have the theoretical advantage of preventing post-streptococcal nephritis. On the other hand, topical mupirocin offers a safe and equally rapid solution to eliminating skin pathogens without the fear of any systemic side effects. The relative merits in choicing a topical or systemic antibiotic in the treatment of a mild to moderate skin infection should be considered on a case to case basis.

In conclusion, mupirocin is a safe and effective topical preparation for treating most of our common superficial bacterial skin infections.

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