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Management of Cutaneous Erythrasma

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Contents

Abstract

Corynebacterium minutissimum is the bacteria that leads to cutaneous eruptions of erythrasma and is the most common cause of interdigital foot infections. It is found mostly in occluded intertriginous areas such as the axillae, inframammary areas, interspaces of the toes, intergluteal and crural folds, and is more common in individuals with diabetes mellitus than other clinical patients. This organism can be isolated from a cutaneous site along with a concurrent dermatophyte or *Candida albicans* infection. The differential diagnosis of erythrasma includes psoriasis, dermatophytosis, candidiasis and intertrigo, and methods for differentiating include Wood's light examination and bacterial and mycological cultures.

Erythromycin 250mg four times daily for 14 days is the treatment of choice and other antibacterials include tetracycline and chloramphenicol; however, the use of chloramphenicol is limited by bone marrow suppression potentially leading to neutropenia, agranulocytosis and aplastic anaemia. Further studies are needed but clarithromycin may be an additional drug for use in the future. Where there is therapeutic failure or intertriginous involvement, topical solutions such as clindamycin, Whitfield's ointment, sodium fusidate ointment and antibacterial soaps may be required for both treatment and prophylaxis. Limited studies on the

efficacy of these medications exist, however, systemic erythromycin demonstrates cure rates as high as 100%. Compared with tetracyclines, systemic erythromycin has greater efficacy in patients with involvement of the axillae and groin, and similar efficacy for interdigital infections. Whitfield's ointment has equal efficacy to systemic erythromycin in the axillae and groin, but shows greater efficacy in the interdigital areas and is comparable with 2% sodium fusidate ointment for treatment of all areas.

Adverse drug effects and potential drug interactions need to be considered. No cost-effectiveness data are available but there are limited data on cost-related treatment issues. A guideline is proposed for the detection, evaluation, treatment and prophylaxis of this cutaneous eruption.

1. Definition and Epidemiology

Erythrasma is a cutaneous disorder the cause of which was initially identified as a Gram-positive bacillus in the diphtheroid group, later named *Corynebacterium minutissimum* in 1961, and is a member of normal skin flora.[1] The lesions of erythrasma may present as asymptomatic well-defined patches, or irregular in shape and size and red in colour. Later the lesions may become brownish in colour and appear slightly raised from the surrounding skin with the appearance of central clearing.[2] Interdigital erythrasma is the most common bacterial infection of the foot and may present as a scaling, fissuring and chronic nonresolving maceration of the toe web interspaces.[3,4] In some studies up to 30% of patients with interdigital erythrasma are found to have a coexisting dermatophyte or *Candida albicans* infection, most commonly noted in the third and fourth interspaces.[5,6]

Areas of the body that favour *C. minutissimum* growth are moist, occluded intertriginous areas such as the axillae, inframammary areas, interspaces of the toes, intergluteal and crural folds.[2,4] Factors such as a warm climate, poor hygiene, obesity, hyperhidrosis, advanced age, compromised host status and diabetes mellitus also play a role in the occurrence of this organism.[4,7,8] Somerville and Lancaster-Smith[9] examined 98 patients with diabetes of whom 44% had clinical erythrasma of the toe webs and Henslee et al.[7] noted a higher incidence of infection in patients with diabetes than in other clinic patients, 58 versus 43%, respectively ($p < 0.01$).

Of 300 consecutive patients attending a hospital dermatology clinic examined clinically and microbiologically for evidence of interdigital or plantar mycological or bacterial infections, 109 (36%) were shown by laboratory investigation to have an infection of whom only 89 (29.6%) displayed clinical signs.[10] Of the 300 patients, 42 (14%) were determined to have erythrasma alone, 42 (14%) had evidence of a dermatophyte infection alone, 12 (4%) were infected with a dermatophyte and *C. minutissimum*, 5 (1.7%) had *C. albicans* alone, 2 (0.7%) had both erythrasma and *C. albicans*, and 6 (2%) failed to grow any organisms.[10] A study of Danish military personnel, 665 recruits and 546 at the end of military service, was conducted by clinical and microbiological examination.[11] The prevalence of clinical signs, erythrasma and dermatophyte infection at the first investigation in the 665 recruits was 58.8, 51.3 and 6.2%, respectively.[11] Of the initial 51.3% of recruits with *C. minutissimum* interdigital infections, 203 (59.5%) had hyperhidrosis.[11] It was felt the increase of erythrasma from 51.3% in the initial evaluation to 77.1% on the second evaluation in the 546 personnel at the end of service was the result of a number of reasons, including the spread of infection to previously noninfected recruits, which may have resulted from their sleeping in large dormitories with adjacent communal bathrooms that created an ideal condition for repeated exposure to infected material.

2. Quality of Life

Erythrasma is not merely an aesthetic problem, although this aspect must not be under emphasised. For many patients it is a major problem that interferes with their lifestyle. Disciform erythrasma may be one of the early signs of type 2 (non-insulin–dependent) diabetes mellitus presenting before serum glucose levels become diagnostic.[12] Pruritus ani is one of the most vexing conditions physicians must diagnose and treat, and erythrasma is documented as one of the aetiologies.[13,14] Bowyer and McColl[14] demonstrated in 81 patients with pruritus ani that 15 (18.5%) had erythrasma confirmed by a combination of clinical observation and positive bacterial cultures. Vulval erythrasma is uncommon and often misdiagnosed as persistent candidal infection. Mattox et al.[15] presented a case of non-fluorescent erythrasma of the vulva presenting as a chronic candidal infection, which was identified by microscopic examination and cleared following 4 weeks of antibacterial treatment.

Other rare but serious *C. minutissimum* infections are noted in the literature including recurrent breast abscesses,[16] septicaemia,[17] infective endocarditis,[17] central venous catheter bacteraemia[18] and costochondral abscess in a patient infected with HIV.[19] Their treatment modalities are beyond the scope of this current review but the likelihood of future reports of other extreme variations of this bacterial infection is real. Thus, this disease and the causal bacteria can compromise patient quality of life to a remarkable extent.

3. Diagnosis

The differential diagnosis of erythrasma includes psoriasis, dermatophytosis, candidiasis and intertrigo.[4,20] Usually the diseases can be distinguished by their clinical appearance but in the case of intertriginal presentation these classical signs may become altered as a result of chronic maceration. *C. minutissimum* produces porphyrins and shows coral red fluorescence upon Wood's light examination and, in an office setting, this is the diagnostic procedure of choice.[21] Microscopic examination of tissue scrapings following Gram staining under oil immersion demonstrates Gram-positive rod-like filamentous bacteria and it may also be demonstrated by Giemsa, methylene blue, periodic acid-Schiff, Ziehl-Neelsen and lactophenol-cotton blue stains.[2,4,22] Recommended bacterial culture medium is 20% fetal bovine serum, 2% agar, 78% tissue culture medium #199, and 0.05% tris(hydroxymethyl)aminomethane under aerobic conditions.[2,23] The bacterium also can be cultivated on Mueller-Hinton agar.[24] Pulsed field gel electrophoresis is a recently utilised technique to characterise *C. minutissimum* bacteraemia.[18] As discussed in previous sections, erythrasma is often found concurrently with other dermatophytes and a potassium hydroxide mount is advisable to help with the diagnosis.[5,6,10,11]

4. Pharmacotherapies

Oral, topical or adjunctive therapies are frequently used in the treatment of cutaneous erythrasma. In patients with interdigital infection, a combination of both oral and topical therapy may need to be used.[14,25,26] There is no consensus on optimal treatment of this disease. Therefore, suggested treatment options are presented in figure 1. A limitation of topical therapy is irritation of the skin with the potential of localised allergic reactions and ulcerations, and suggestions are made to optimise topical treatment. It must be stressed there are only a limited number of clinical studies available for review and from which to draw conclusions.

Reinfection from an unsuspected body source is a significant cause of therapeutic failure;[14-20] therefore, it is necessary to identify and treat these reservoirs to prevent relapse. As discussed in section 1, *C. minutissimum* can be found in unusual anatomical sites which can be overlooked. Patients with therapeutic failure challenge the clinician to consider immunosuppression, recent use of central line catheters and other potential sources as discussed in section 2. Consultation with a dermatologist or an infectious disease specialist may be re-

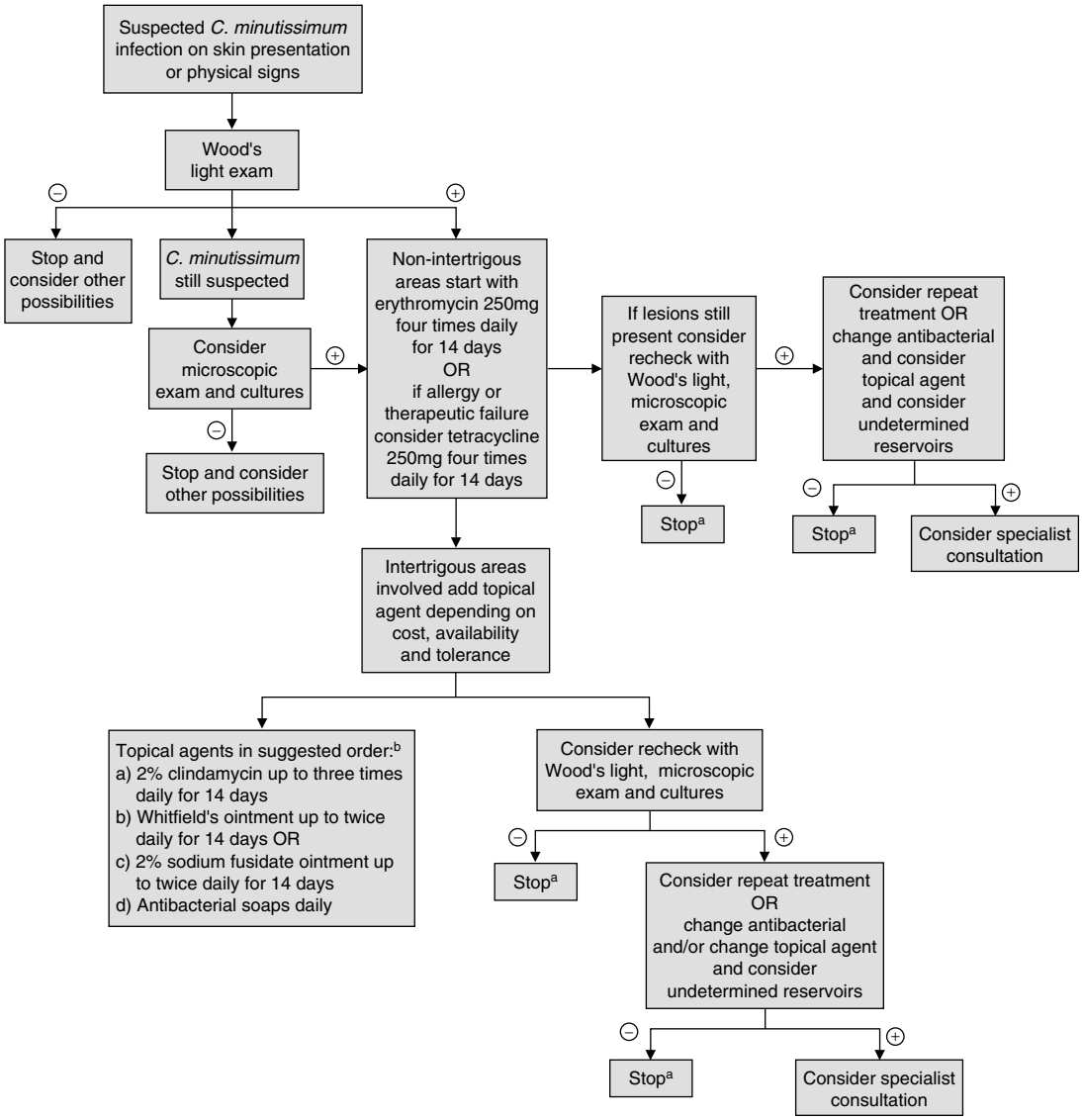

Fig. 1. Algorithm for the detection, evaluation and treatment of cutaneous erythema. **a** May want to continue topical treatment including antibacterial soaps for reduction of recurrence. There are no specific data adequately defined in the literature for the length of time of continued treatment but studies have suggested 2 weeks. Regardless, this would also depend on the possibility of repeated exposure, inadequately treated body reservoirs and other factors as discussed in the text; **b** the literature did not give any clear indication of the optimum number of times for daily application. It is suggested to start with once daily application for all agents and depending upon the response and desired effect the number of daily applications could be increased if needed. A limiting factor would be irritation of the skin from these agents.

quired to identify and remove the predisposing conditions (see figure 1).

4.1 Oral Therapy

4.1.1 Erythromycin

Earlier studies evaluated erythromycin 250mg four times daily for 5 days;[2] however, the current recommendation is erythromycin 250mg four times daily for 14 days.[15,27] In patients with interdigital erythrasma some form of local therapy is recommended such as 2% clindamycin solution or Whitfield's ointment daily during the course of oral therapy and continued for 2 weeks after clearing of the interspaces.[4,14,26,27] The continued use of antibacterial soaps after this depends on the potential for repeat exposure, poor hygiene and other conditions as described in section 1. Other studies have also indicated oral erythromycin along with local application of 2% sodium fusidate ointment for the treatment of interdigital erythrasma.[28,29]

4.1.2 Clarithromycin

In a recent study, three patients with cutaneous erythrasma were given a single dose of clarithromycin 1g, which resulted in clinical resolution as determined by visual and Wood's light examination.[30] Only one patient had mild abdominal cramping and no other adverse effects from the single dose regimen were noted. It appears macrolides other than erythromycin may prove effective but comparative studies in this area have yet to be performed.

4.1.3 Tetracycline and Chloramphenicol

Other agents used in the past include tetracycline and chloramphenicol when patients were allergic to or did not respond to erythromycin.[1,2,31] Limited data are available for 16 patients which showed a dose of 250mg four times daily for 5 to 14 days of either of these agents resulted in complete clearance of erythrasma affecting the trunk and limbs.[32,33] However, clinical failures were noted to occur during 2 to 7 months of observation. Chloramphenicol was as effective as erythromycin or tetracycline in comparative studies but its potential toxic systemic sequelae precluded its use in such a benign dermatosis and little has been published in the literature since the early 1970s. Furthermore, this drug is no longer available in the US as an oral formulation.

4.2 Topical Therapy

4.2.1 Clindamycin

Although a search of the literature did not reveal any major drug trials, it has been shown in studies of acne vulgaris that related species of *Corynebacterium* are markedly sensitive to clindamycin both *in vitro* and *in vivo*.[34] Topical 2% aqueous clindamycin has been demonstrated effective in the treatment of cutaneous erythrasma.[2,31,35] Cochran et al.[31] demonstrated clinical and Wood's light assessed eradication of erythrasma after 1 week of three times a day application and no recurrence was noted at follow up 2 months later. The topical solution has been useful in those individuals who can not tolerate or take oral antibacterials. In addition, modification of the vehicle, such as by the addition of ethyl alcohol, was used as a way to obtain a drying effect when desired, as in interdigital infections.[31] It should be noted that topically applied clindamycin can be absorbed in sufficient amounts to produce systemic adverse effects if applied over a large body surface area.

4.2.2 Whitfield's Ointment

Whitfield's ointment consists of a preparation of 12% benzoic acid and 6% salicylic acid, and has been shown to be effective in treatment of erythrasma; however, any clinically significant effect has been attributed to a keratolytic rather than bacteriostatic action.[25,36,37] Seville and Somerville[36] observed that Whitfield's ointment applied twice daily was as effective as erythromycin and tetracycline at 250mg four times daily for 7 days for disease in the axillae, groin and feet with 9 patients in each study group. Relapse at 6 months was 40% for Whitfield's ointment, 44% for erythromycin and 100% for tetracycline. This high relapse rate was indicated to be in part due to the cessation of treatment before all the scaling had disappeared. If significant irritation of the skin oc-

curred, the ointment could be diluted to half strength for continued use.

4.2.3 Sodium Fusidate Ointment

MacMillan and Sarkany[38] demonstrated twice daily topical application of 2% sodium fusidate ointment for 2 weeks in eight individuals with erythrasma in various sites was an effective local treatment. Evaluation of the sites and subsequent follow up by clinical and Wood's light examination revealed no recurrence of erythrasma after 40 weeks. In another study, 2% sodium fusidate ointment was compared with Whitfield's ointment and a placebo following once daily application of each and evaluated via Wood's light examination.[25] The ointments were applied for 5 days to the axillae and 14 days to the toe webs. No significant difference was found between sodium fusidate and Whitfield's ointment with cure rates of 89 and 90%, respectively.

Although not available in the US, fusidic acid is available in European countries in oral and intravenous formulations for treatment of *Staphylococcus aureus* infections, including methicillin resistant *S. aureus*. Therefore, the potential of selecting for resistant organisms to the agent when it is used topically is of concern. However, topical fusidic acid has been widely used for over 35 years with little evidence of resistance and it has been concluded that short courses of therapy are unlikely to be epidemiologically harmful.[29]

4.2.4 Antibacterial Soaps

Dodge et al.[39] demonstrated an antibacterial soap bar containing a 2% mixture of dibromsalan, clofluocarbon and triclocarban was effective in clearing erythrasma in two double-blind studies. In the first, 13 participants lathered twice daily for 21 days and the infected areas demonstrated 75 to 100% resolution at the end of that time as evaluated by potassium hydroxide preparations and absence of fluorescence; whereas, in the control group, only one of four participants demonstrated complete resolution of the lesions. In the second study, 2600 patients used the test soap bar exclusively for daily baths for 2 months; 70 of these individuals had clinically proven erythrasma. In the group using the antibacterial soap (n = 51), all infected areas resolved, whereas infection in the control group (19) was essentially unchanged. The soap was also effective in the prophylaxis of erythrasma. On the basis of the findings in these studies,[39] the course of treatment for individuals with mild infection could start with the use of antibacterial soap. During follow up, if the infection did not respond to this regimen, systemic therapy could be added. For wide spread disease or for patients who were uncomfortable with the clinical symptoms, both therapeutic approaches could be instituted simultaneously.

4.2.5 Miscellaneous Topical Therapies

Topically administered erythromycin, tetracycline and chloramphenicol have been used but did not completely clear the lesions.[1,4,38,39] Castellani's paint containing ingredients of 1.5% phenol, resorcinol, acetone and carbol fuchsin has been described in the literature as an antiseptic and drying agent for interdigital erythrasma; however, its effectiveness has not been demonstrated in any major clinical studies.[40] Other therapies have included drying agents such as 10 to 20% aluminium chloride and aluminium acetate solutions, although limited published information concerning the effectiveness of these agents is available and relapses are common with discontinuation.[30]

Preliminary studies involving approximately 50 patients with cutaneous erythrasma receiving 1% bifonazole cream applied once daily for up to 3 weeks had documented therapeutic response rates of approximately 90%.[41] However, no subsequent studies with this drug for treatment of erythrasma have been identified in the literature since the late 1980s; therefore, its therapeutic use is inconclusive and it is not recommended. Erythrasma does not respond to griseofulvin or most topical antifungals.[40] Other antifungal agents such as tolnaftate, haloprogin, clotrimazole and econazole yield poor and inconclusive results in the treatment of interdigital erythrasma.[4,40]

Table I. Systemic adverse effects and drug interactions of clinical significance with agents used in the treatment of cutaneous erythrasma

Drug	Adverse effects	Drug interactions
Erythromycin	Pseudomembranous enterocolitis	Increases serum concentrations of theophylline, digoxin, warfarin and ergotamine
	Ventricular arrhythmias	Alters metabolism via CYP of carbamazepine, cyclosporin, phenytoin, lovastatin, terfenadine and astemizole
	Allergic reactions	
	Stevens-Johnson syndrome	
	Toxic epidermal necrolysis	
	Hearing loss in renal insufficiency	
Clarithromycin	Reactions similar to erythromycin above	Induced cardiac arrhythmias when co-administered with cisapride, pimozide and terfenadine
	Tooth discolouration	Increases serum concentrations of theophylline, carbamazepine and digoxin
	Neutropenia	
Tetracycline	Oesophagitis	Interferes with bacteriocidal action of penicillins
	Allergic reactions	Renders oral contraceptives less effective
	Phototoxic reactions	Potentiates the effects of warfarin
	Renal toxicity	
	Haemolytic anaemia	
	Pseudotumor cerebri	
	Vestibular toxicity	
	Tooth discolouration	
Chloramphenicol[a]	Bone marrow suppression	May interfere with amnestic response to tetanus toxoid
	Aplastic anaemia	Inhibits biotransformation and enhances toxicity of tolbutamide, phenytoin and dicumarol
	Herxheimer-like allergic reactions	
	Pseudomembranous enterocolitis	IV administration with paracetamol (acetaminophen) increased the half-life of chloramphenicol from 3.25h to 15h[31]
	Encephalopathy	
	Precipitates haemolytic anaemia in patients with glucose-6-phosphate dehydrogenase deficiency	
	Gray syndrome (with use in premature infants)	

a Oral drug not available in the US.

CYP = cytochrome P450 enzymes; **IV** = intravenous.

5. Comparative Efficacy

Limited studies have been performed to investigate the efficacy of the agents described in section 4. In general, it is difficult to compare the cure rates established in different studies, primarily because the end points are defined differently, for example as clinical (either partial or complete) cure rates, mycological and bacterial cure rates, or a combination thereof. Another point that should be taken into account is disease relapse rates following successful treatment with the different agents. Knowledge of relapse rate is important for assessment of overall efficacy and cost-effectiveness. Relapse rates vary to a large extent between different studies, generally reflecting cure rates, but in some studies follow up was not performed. Therefore, final judgement on the merits of these agents is only possible on the basis of direct comparative studies with an adequate follow up.

Oral erythromycin has been known to be consistently effective for treatment of this disease with cure rates (both clinical and bacteriological) as high as 100%.[1,14,31,36,38,39] In a study by Seville and Somerville,[36] oral erythromycin was more effective than oral tetracycline in axillae and groin lesions, 90 versus 70%, respectively, and approximately equally effective as tetracycline in the toe webs, 56.5 versus 50%, respectively. Although chloramphenicol has been mentioned in the literature, comparative studies with this agent were not be identified.

Clindamycin completely suppressed the *in vitro* growth of *Corynebacterium acnes*.[34] Whitfield's ointment was found to be equally effective as systemic erythromycin in axillae and groin lesions, 95 versus 91%, respectively, and more effective than erythromycin in the toe webs, 100 versus 56.5%, respectively.[36] Compared to oral tetracycline, Whitfield's ointment was more effective in lesions of the axillae and groin, 95 versus 70%, respectively, and far superior in toe web lesions, 98 versus 50%, respectively.[36] In a double-blind trial comparing 2% sodium fusidate ointment to Whitfield's ointment, Somerville et al.[25] demonstrated comparable cure rates for this disease in axillae, groin and toe web lesions, 89 versus 90%, respectively. This was after once daily application of the ointments to the axillae and groins for 5 days and to the toe webs for 14 days. Sodium fusidate ointment, however, was less effective than Whitfield's ointment in removing scaling in the groin and toe webs. The antibacterial soap discussed in section 4.2.4 was demonstrated to more effectively resolve erythrasma lesions than non-antibacterial soap.[39]

6. Adverse Effects and Drug Interactions

Every effective drug administered systemically possesses the potential for adverse effects and interactions with concomitantly administered drugs. Fortunately, oral agents used for the treatment of cutaneous erythrasma are administered for only short durations, thereby reducing the risk of adverse effects and interactions. Table I contains a brief list of the oral drugs, the clinically significant adverse effects associated with their use, and a brief list of major drug-drug interactions.

The topical agents are much less likely to result in significant adverse effects and drug interactions other than localised dermatitis and ulcerations, and these are dependent on the time of exposure and solution strengths. However, topically applied clindamycin can be absorbed in sufficient quantities to produce systemic adverse effects.[34,35] Table II contains a brief list of adverse drug effects and significant drug interactions of the topical solutions discussed in sections 4 and 5.

In general, adverse effects such as nausea, vomiting, gastric pain and headaches can occur with use of the various agents discussed.

7. Cost Effectiveness

The relative cost effectiveness of different treatment approaches is a significant issue and one that must be addressed. Unfortunately, no formal evaluation of any agent is available in the literature on cutaneous erythrasma. Regardless, a survey in the New Orleans area of the acquisition costs of the agents discussed in this article is presented in table III. Erythromycin is four times less expensive than a single dose of clarithromycin, yet the duration of erythromycin therapy is 13 days longer. Furthermore, it should be pointed out that no long-term studies with clarithromycin have been performed

Table II. Adverse effects and drug interactions of note with topical treatment options for cutaneous erythrasma

Topical therapy	Adverse effects	Drug interactions
Clindamycin[a]	Allergic skin reactions	An opiate or diphenoxylate plus atropine interact with clindamycin and may result in a slowing of peristalsis
	Severe colitis	
	Neutropenia	Has neuromuscular blocking properties that may enhance action of other neuromuscular blocking agents
	Polyarthritis	
		Antagonism with erythromycin resulting in increased blood concentrations of clindamycin
Whitfield's ointment	Allergic local reactions	Unknown
	Ulcerations	
Sodium fusidate ointment	Allergic local reactions	Unknown
	Ulcerations	
Antibacterial soaps	Allergic local reactions	Unknown

a Topically applied clindamycin can be absorbed in sufficient amounts to produce systemic effects.[34,35]

Table III. Cost of agents for treating erythrasma. New Orleans, Louisiana (survey of four pharmacy retail price quotes, May 2001)

Drug treatment (duration)	Purchase cost ($US, 2001 values)	
	average	range
Erythromycin 250mg 4 times daily (14 days)	5.52	4.00-12.50
Clarithromycin 1g single dose	21.10	18.00-25.10
Tetracycline 250mg 4 times daily (14 days)	1.40	1.00-2.52
2% Clindamycin solution [30ml vial]	25.50	20.10-34.25
Whitfield's ointment [30g]	4.50	3.90-5.60
2% Sodium fusidate ointment [30g]	5.00	3.25-7.00
Antibacterial soaps [120g]	1.00	0.60-2.10

to date. Tetracycline is five times less expensive than erythromycin, yet there is a higher failure rate. Whitfield's ointment and sodium fusidate ointment appear equivalent as far as costs and effectiveness are concerned and are five times less expensive than clindamycin solution. Antibacterial soaps are certainly the least expensive treatment to minimise cutaneous eruption but the possibility of reoccurrence must be taken into consideration.

Another source of cost consideration would be the time, availability and expense of the equipment including Wood's light, microscope, bacterial and mycological culture material. In this respect, figure 1 is presented as a recommended guide to the detection, identification and treatment of erythrasma. In addition, two other factors not studied in the literature would be the expense and loss of time of failed treatment, and the hidden cost for the extra time required for the physician to provide the necessary time for counselling of proper treatment and prophylaxis therapy.

8. Conclusions

In the process of diagnosing this cutaneous disorder, differential diagnoses such as psoriasis, dermatophytosis, candidiasis, intertrigo and the co-existence of *C. minutissimum* with other infectious organisms must be considered. In patients with long standing disease, the physical presentation may not be as evident especially if chronic maceration has taken place. Thus, simply treating a rash with a topical antifungal agent, without the benefit of some further method of detection, would lead to improvement of only one third of the effected population.[4] Detection methods have been discussed in section 2 and the use of a Wood's light would be an inexpensive and quick method of screening individuals for this disease. In patients where the diagnosis was still suspected but not adequately confirmed by Wood's light, potassium hydroxide preparations, mycological and bacterial cultures could be obtained for further identification.

Although there is limited information in the medical literature, *C. minutissimum* has become a clinically significant pathogen in immunocompromised patients with disruption of the integument (e.g. central line catheter, surgery and arteriovenous fistula). In the management of such individuals, recognition should be given to the possibility of skin colonisation and local prophylaxis should be considered. Early diagnosis and therapy could prevent serious complications as previously discussed in section 2.

On the basis of the available data, it appears the initial and best choice for treatment of erythrasma is oral erythromycin with topical therapy in patients with lesions involving intertriginous areas such as the axillae, inframammary areas, interspaces of the toes, intergluteal and crural folds. In individuals where oral erythromycin is not indicated, a limited number of other agents have been suggested. The only clinical study with oral clarithromycin looks promising but further detailed investigations are needed for evaluation of its effectiveness and efficacy.

Topical therapy plays a significant role in the treatment and prophylaxis of this skin disease. In simple isolated patches of erythrasma topical therapy may be all that is needed. The duration of topical therapy for optimum treatment has been an elusive topic in the literature and further detailed studies would help decipher this question. Issues of hygiene, repeated exposure and hidden reservoirs of infection also play a significant role in treatment failure rates and need to be addressed for the successful treatment of this cutaneous disorder.

Another consideration is the cost of equipment and medications. Fortunately, a Wood's light and most of the therapeutic agents are available at reasonable cost. In section 1, risk factors that play a role in the occurrence of this cutaneous disease are identified. These underlying factors need to be addressed and modifications considered for successful treatment of this infection. Hopefully, more studies will be conducted and provide further information of this interesting and worldwide problem.

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