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A Novel Clinical Grading Scale to Guide the Management of Crusted Scabies

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Abstract

Background: Crusted scabies, or hyperinfection with Sarcoptes scabiei, occurs in people with an inadequate immune response to the mite. In recent decades, data have emerged suggesting that treatment of crusted scabies with oral ivermectin combined with topical agents leads to lower mortality, but there are no generally accepted tools for describing disease severity. Here, we describe a clinical grading scale for crusted scabies and its utility in real world practice.

Methodology/Principal Findings: In 2002, Royal Darwin Hospital (RDH), a hospital in tropical Australia developed and began using a clinical grading scale to guide the treatment of crusted scabies. We conducted a retrospective observational study including all episodes of admission to RDH for crusted scabies during the period October 2002–December 2010 inclusive. Patients who were managed according to the grading scale were compared with those in whom the scale was not used at the time of admission but was calculated retrospectively. There were 49 admissions in 30 patients during the study period, of which 49 (100%) were in Indigenous Australians, 29 (59%) were male and the median age was 44.1 years. According to the grading scale, 8 (16%) episodes were mild, 24 (49%) were moderate, and 17 (35%) were severe. Readmission within the study period was significantly more likely with increasing disease severity, with an odds ratio (95% CI) of 12.8 (1.3–130) for severe disease compared with mild. The patients managed according to the grading scale (29 episodes) did not differ from those who were not (20 episodes), but they received fewer doses of ivermectin and had a shorter length of stay (11 vs. 16 days, p = 0.02). Despite this the outcomes were no different, with no deaths in either group and a similar readmission rate.

Conclusions/Significance: Our grading scale is a useful tool for the assessment and management of crusted scabies.

Introduction

Scabies is a parasitic infestation caused by the mite Sarcoptes scabiei var hominis. Globally, over 300 million people are estimated to be affected [1]. The mite is endemic in disadvantaged and impoverished communities [2,3]. In Australia Indigenous people suffer a significant disadvantage in health outcomes compared with non-Indigenous Australians [4,5], and scabies is endemic in many Indigenous communities in northern Australia, with a recent survey demonstrating a mean prevalence of 13.4% in five remote Indigenous communities [6].

Crusted scabies (also known as “Norwegian scabies”) is hyperinfection with the Sarcoptes scabiei mite, and is characterized by a non-protective host immune response, the development of hyperkeratotic skin crusts and skin fissuring [7]. It is a severe disease with a significantly higher mortality than ordinary scabies. Unlike ordinary scabies, where there are usually less than 20 mites on the host’s entire skin, individuals with crusted scabies can have up to 4000 mites per gram of skin and are extremely infectious to others [8,9]. Despite the severity of the disease there is significant variability in the clinical presentation, and there is currently no generally accepted method of describing the severity of a crusted scabies infection.

The optimal treatment for crusted scabies has not been subjected to a comparative trial and is generally based on expert opinion [10,11]. However observational data suggest that the use of multiple doses of oral ivermectin as therapy for crusted scabies can lead to a significant decline in mortality [9,12,13]. In an attempt to formalize and improve the treatment of crusted scabies, we developed a grading scale, based on our clinical experience in managing such patients. This was introduced into routine clinical use at our hospital in 2002, and has been used since this time to titrate the duration of ivermectin and topical therapy to illness severity.

Here, we describe the grading scale and our experience with it over the first eight years of its use. We aimed to evaluate the utility of the grading scale, including its correlation with other putative markers of illness severity, the safety of its use and the effect on length of stay and relapse rates.
Author Summary

Crusted scabies is a severe skin condition caused by a microscopic parasitic mite. It occurs in people whose immune system does not react properly to the mite and it leads to crusting and cracking of the skin and can cause death. The usual treatment for crusted scabies is a tablet called ivermectin combined with anti-scabies skin creams. However, there is no current method of measuring the severity of crusted scabies and thus deciding how long to continue the treatment for. We have developed a grading scale based on examination of the skin, which classifies patients as mild, moderate or severe, and uses this grading to suggest the duration of treatment. We have trialed this grading scale over an 8-year period in 49 episodes of crusted scabies requiring hospital admission, and have found that it leads to a shorter length of hospital stay and treatment, but equivalent outcomes compared to those who were treated without the use of the grading scale.

Methods

Ethics statement

The study was approved by the human research ethics committee of the Menzies School of Health Research and Northern Territory Department of Health.

Study setting

350 bed tertiary referral hospital in the tropical Northern Territory, Australia, serving a population of approximately 150,000 people spread over an area of 500,000 km², including many remote Indigenous communities. Local policies encourage the hospitalization of patients with crusted scabies for clinical management, as well as environmental health input to address the risk of ongoing transmission in an index patient’s household. The standard treatment protocol for crusted scabies includes prolonged hospitalization in a single room with contact precautions, the use of topical benzyl benzoate plus 5% tea tree oil 2–3 times per week [14], multiple doses of oral ivermectin (as described below), topical keratolytics, systemic antibacterial drugs where judged clinically necessary, and attention to medical comorbidities.

Participants

All patients admitted to our hospital with a discharge diagnosis of crusted scabies between 1st of October 2002 and 31st of December 2010 were included in the study. Crusted scabies was diagnosed based on the clinical opinion of an Infectious Diseases specialist, supplemented by skin scrapings demonstrating S. scabiei mites on microscopy.

Severity grading scale

The grading scale for crusted scabies is shown in Figure 1. It is based on clinical assessment in four key areas: the distribution and extent of crusting; the depth of crusting; the degree of skin cracking and pyoderma; and the number of previous episodes. This scale was developed in 2002 by two of the authors (JD and BC) for use with all patients hospitalised with crusted scabies. It was partly based on previous local experience that multiple doses of ivermectin in addition to topical treatment were more effective than topical treatment alone for the treatment of crusted scabies [9]. Other studies have efficacy of the combination of ivermectin and topical therapy for crusted scabies [13,15,16]. During the study period medical staff managing patients with crusted scabies were encouraged but not compelled to use the grading scale to guide management. Therefore we were able to compare those patients in whom the grading scale was applied at the time of the patient’s clinical presentation to those in whom the grading scale was not used and then calculated retrospectively by the authors.

Data definitions, collection and analysis

We reviewed clinical notes, bedside charts and the hospital’s clinical pathology database for each patient using a standardized case record form. We collected data on demographics, comorbidities, disease severity, grading scale and outcomes. Where the grading scale had not been prospectively documented, we calculated it based on the detailed clinical information found in the medical record. Each admission (rather than each individual patient) was counted as a discrete episode. Where a patient had more than one admission during the study period, it was only counted as a separate episode if at least 30 days had elapsed from the previous date of discharge. Iatrogenic immunosuppresson was defined as the use of any of the following medications within the past 3 months: prednisolone ≥0.5 mg/kg/day or equivalent for at least 14 days; immunosuppression for solid organ transplant; cancer chemotherapy; immunosuppressive monoclonal antibody use; any other use of azathioprine, methotrexate, leflunomide, cyclosporine, mycophenolate, or cyclophosphamide. Hazardous alcohol use was defined as an average of >4 standard drinks per day for a man or >2 for a woman. Chronic renal disease was defined as an estimated glomerular filtration rate of less than 30 ml/min, or the need for dialysis.

Data were entered into a purpose-built database using Epidata v 3.0 and were analysed using Stata version 10 (Statacorp, College Station, Texas, USA). Categorical variables were compared using Fisher’s exact test, and continuous using Mann-Whitney-U test. Correlations were assessed using Spearman’s rank correlation. P values of <0.05 were considered significant.

Results

Demographics and comorbidities

There were 49 admissions for crusted scabies in 30 patients during the eight year study period. Of the episodes, 49 (100%) were in Indigenous Australians, 29 (59%) were male and the median age at the time of the first admission within the study period was 45.4 years (Table 1). Most of the patients lived in remote areas, and iatrogenic immunosuppression was rare.

Patient management

All patients received at least one dose of oral ivermectin (with a mean of 3.2 doses, and a range of 2 to 10). 47 patients (95%) were treated with topical benzyl-benzoate in combination with 5% tea-tree oil, and the remainder with topical permethrin. In addition, all patients were treated with topical Calmudir (lactic acid and urea in sorboline cream, used as a keratolytic). Systemic antibiotics were used in 38 (79%) of episodes.

Disease severity and outcomes

According to the grading scale, 8 (16%) episodes were mild (grade 1), 24 (49%) were moderate (grade 2), and 17 (35%) were severe (grade 3). Seven episodes (14%) were complicated by bacteremia, with the causative organism being Staphylococcus aureus in 6 patients, and a mixed infection with Group A streptococcus and Escherichia coli in 1. The disease severity according to the grading scale did not correlate with the proportion of patients with bacteremia, or with the peak plasma C-reactive protein during the admission (table 2). However, there was a non-significant trend...
towards lower nadir plasma albumin and longer hospital stay with higher severity (Table 2). No patients in this cohort died during the hospital admission, but a substantial proportion (47%) required readmission for crusted scabies within the eight year study period. Readmission was significantly more likely with increasing disease severity, with an odds ratio (95% CI) of 5.9 (0.7–55.9) for moderate disease compared with mild, and 12.8 (1.3–130) for severe disease compared with mild.

Effect of prospective use of the grading scale
There was no significant difference in age, gender, location of residence or comorbidities between those patients who had the severity score calculated at the time of admission (n = 29) and those who did not (n = 20). Episodes where the grading scale was calculated at the time of admission had a significantly shorter length of stay, and received fewer doses of ivermectin than those not managed using the grading scale (Table 3). Despite this their outcomes were no different, with no deaths in either group, and a similar readmission rate in the two groups.

Discussion
This is the first published description of a clinical severity grading scale for use in patients with crusted scabies. The use of...
A Clinical Grading Scale for Crusted Scabies

Table 1. Demographics and comorbidities.

<table>
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<tr>
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<td>12</td>
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</table>

*Median [IQR].

Keywords: Ivermectin, Scabies, Severity, Comparative Study

Methods

We aimed to assess the utility of a grading scale in the management of patients with crusted scabies in a tertiary hospital setting in Australia. This grading scale was developed based on the clinical severity of the disease, including the degree of bacterial skin colonization, the presence of systemic inflammation, and the patient’s immune response. The grading scale spans from mild to severe, with each level having specific criteria for hospital admission, length of stay, and the need for readmission.

Results

In our cohort, the grading scale correlated well with the clinical outcomes, including hospital stay, the need for readmission, and the need for treatment with ivermectin. The grading scale was found to be a useful tool in predicting the severity of the disease and guiding the management of patients.

Discussion

The grading scale was found to be a useful tool in predicting the severity of the disease and guiding the management of patients. It was found to be more accurate than subjective measures, such as the patient’s perception of severity or the duration of symptoms.

Conclusion

A grading scale for crusted scabies can be used to predict the severity of the disease and guide the management of patients. It can help healthcare providers to make informed decisions about hospital admission, length of stay, and the need for readmission.

Supporting Information

Checklist S1  STROBE checklist.

(DOC)
Acknowledgments

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Author Contributions

Conceived and designed the experiments: JSD SM SYCT BJC. Performed the experiments: JSD SM. Analyzed the data: JSD SM. Contributed reagents/materials/analysis tools: SFW. Wrote the paper: JSD SM. Contributed to the final manuscript: JSD SM SYCT SFW BJC.

References