

Fungal or bacterial?

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ABSTRACT

Mr G presented to hospital with painful, erythematous feet and significant interdigital dermal loss. Podiatry, infectious diseases and dermatology reviewed Mr G and provided a primary diagnosis of an ulcerative tinea infection with a secondary bacterial infection. Acute ulcerative vesiculopustular tinea is well documented in dermatology text; however, there is limited information on its management in severe cases and the use of Sorbact® in this presentation.

Wound management in Mr G's case aimed to manage infection and exudate, reduce pain, prevent reinfection and skin ulceration. Sorbact®, a dressing that reduces the bacterial load in a wound bed, manages exudate, and minimises pain and trauma was therefore required.

Mr G's left foot had resolved after 34 days. Mr G's right foot took a further 14 days (48 days). Appropriate wound care, antibiotics and antifungal therapy were key factors in wound healing. It is believed Sorbact®, an antimicrobial wound dressing, played a significant role in the reduction in wound bed bioburden, given the decrease in exudate, erythema and pain. Furthermore, Sorbact® was not only easy to apply between the toes, but is also safe and effective in the treatment of fungal and bacterial infections, both of which Mr G was suffering from.

Keywords: Tinea, Sorbact®, infection, wound.

PRESENTATION

Mr G, a 49-year-old male, presented to hospital in 2015 with painful, erythematous feet that were macerated interdigitally. Mr G is a storeman who spends most of his time on his feet in work boots. He has been struggling to manage his foot condition for the past six months, despite medical intervention. In late 2014, Mr G had been admitted with the same condition, and following consultation from the dermatology unit was diagnosed with tinea +/- tinea unguis, with a differential diagnosis of palmoplantar psoriasis. At this time Mr G was discharged with Lamisil® cream and Daviobet® ointment to manage the suspected tinea in conjunction with daily vinegar soaks. Unfortunately, these treatments had no success in effectively managing his foot condition and consequently Mr G presented to hospital.

MEDICAL HISTORY

Mr G has a Body Mass Index (BMI) of 52 and, according to the World Health Organisation¹ (WHO), those with a BMI of ≥ 30 are classified as obese. He also has a number of other comorbidities including hypertension, hypercholesterolaemia and ischaemic heart disease. All factors increase his risk for stroke, myocardial infarction and other vascular complications such as peripheral arterial disease (PAD), which could delay wound healing and result in recurrent infection². Mr G also has gastro-oesophageal reflux disease (GORD). Mr G denied any surgical history.

MEDICATIONS

On presentation, Mr G was taking the following medications: aspirin 100 mg daily, perindopril 2.5 mg daily, atorvastatin 80 mg daily, and atenolol 50 mg daily. These medications were prescribed to decrease Mr G's risk for stroke and myocardial infarction². He was also taking pantoprazole 50 mg daily for management of his GORD.

SOCIAL HISTORY

Mr G works as storeman on a construction site and is required to wear enclosed steel cap boots on site. Mr G's occupation, foot wearing habits, obesity and smoking put him at risk for fungal foot infections³. Mr G lives at home with his five children and partner. He is the only member of his family working and is employed on a casual contract. The entire family rely on his job for income. As a result, Mr G is reluctant to take time off work as he fears he may lose his job and will have difficulty finding new work.

Mr G also smokes 20 cigarettes per day. Smoking not only suppresses the immune system and delays wound healing, but also decreases the tensile strength of a wound and increases the risk of wound infection

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and necrosis due to decreased tissue oxygenation and perfusion⁴. Oxygen is essential for wound healing, both in preventing infection and meeting the metabolic demands of the tissues; however, nicotine, which is one of the main constituents of cigarette smoke, interferes with oxygen supply by inducing tissue ischaemia, due to its vasoconstrictive effects^{4,5}.

WOUND PROFILE

Mr G initially presented to hospital with bilateral plantar interdigital maceration, significant dermal loss with a moderate amount of serous exudate and multiple small, unbroken vesicles on the plantar surface of both feet (no image available). It was difficult to isolate and measure a single wound due to the extensive nature of the skin loss and blistering. Mr G was systemically well, with no elevated inflammatory markers (C-reactive protein of 8 mg/L) or evidence of extending cellulitis.

AETIOLOGY

Both feet demonstrated classic signs of tinea pedis (acute vesicular tinea pedis) with multiple small vesicles, some of which had fused into bullae. There was also evidence of significant non-viable, white, macerated tissue interdigitally. Malodour, oedema and pain were also noted, which is consistent with secondary bacterial infection³. Mr G rated his pain as 9 on the Numeric Rating Scale (NRS)⁶. Mr G's pedal pulses were palpable and showed triphasic waveforms on hand-held Doppler, indicating adequate blood flow for wound healing. No further vascular studies were indicated. Mr G's sensation was also intact when tested with a 10 g monofilament and tuning fork.

Consultation between dermatology, infectious diseases and podiatry came to the primary diagnosis of a tinea infection with a secondary bacterial infection based on history, surrounding skin and wound bed appearance. Differential diagnosis included contact dermatitis, trench foot, and palmoplantar psoriasis.

INVESTIGATIONS

- A wound swab identified a heavy growth of *Pseudomonas aeruginosa* and skin flora.
- An x-ray was requested to rule out any underlying pathology and osteomyelitis. Mr G's x-rays demonstrated no abnormalities bilaterally.
- Nail and skin scrapings were also sent for fungal microbiology but no fungi were isolated. However, nails were non-pathological, so we would not have expected fungal growth.
- Laboratory investigations were organised to get an overview of Mr G's health, nutritional status and ability to heal. No nutritional deficiencies were detected and his C-reactive protein levels were within normal range, and therefore there was no indication of systemic infection⁷.
- Mr G had a glucose serum specimen test, which indicated he did not have diabetes, with a reading of 5.1 mmol/L.

- Mr G was also assessed for hepatitis and he was negative for Hepatitis B surface antigens and Hepatitis C antibodies.

TREATMENT AND MANAGEMENT PLAN DURING ACUTE ADMISSION

The objective of wound management in Mr G's case was to manage the infection, control the exudate, reduce pain, protect the surrounding skin, prevent reinfection and ultimately heal the ulcerated skin. Therefore, a dressing that reduces the bacterial load in a wound bed, manages exudate, and minimises pain and trauma on removal would be most desirable. Sorbact® ribbon gauze and Zetuvit® secured with a tubular bandage was implemented, as it was not only appropriate for the needs of the wound, but also for Mr G's general wellbeing. Sorbact® is coated with dialkylcarbamoylchloride (DACC), a fatty acid derivative that gives the dressing its highly hydrophobic properties⁸. As a result, the bacteria and fungi irreversibly bind to the dressing, which is then removed at dressing change, subsequently decreasing the microbial load in a wound⁸. Zetuvit® is an absorbent, passive dressing, suitable for highly exuding wounds and was used as a secondary dressing⁹. Mefix® and Tubifast®, a tubular bandage, was used to secure his dressing as it provided no compression and was well tolerated by Mr G.

Mr G was issued bilateral postoperative shoes to reduce constriction from tight footwear and accommodate dressings. Mr G was also reviewed by an infectious disease consultant whilst an inpatient for an opinion regarding his antibiotic therapy who prescribed him 10 days of oral antibiotics; flucloxacillin 500 mg and ciprofloxacin 750 mg as these were sensitive to the bacteria that were growing on the wound swab. Mr G was also prescribed 14 days of oral antifungal terbinafine 250 mg, given the extent and clinical appearance of his acute vesicular tinea pedis.

Mr G was discharged from hospital the following day and advised to change his dressings daily, limit his activity for at least a week and to take some time off work to improve his potential for wound healing. On discharge, Mr G was provided with a podiatry outpatient appointment within one week for a review and a dermatology outpatient appointment, who advised that he should also continue daily vinegar foot baths.

Figure 1: A) Right foot and B) Left foot at initial follow-up post inpatient admission





Figure 2: A) Right foot and B) Left foot

The following additional holistic measures were added to the patient's treatment plan:

- Wash all socks, sheets and towels in antifungal washing liquid.
- Change all footwear to exclude contact dermatitis that may be caused by chemicals that have leached into work boots when wet.
- Keep feet dry in the shower to prevent maceration and re-infection. Mr G was provided with two waterproof cast protectors to protect his dressings.
- Use antifungal body wash to remove any fungal spores from the skin and prevent spread of infection to other sites.
- Change socks twice a day, making sure they are made of natural fibres; colour was not important³.
- Elevate limbs on foot stool or with the use of pillows in bed to reduce pain and oedema when able.

PROGRESS AND FOLLOW-UP IN THE OUTPATIENT SETTING

Assessment 1

After six days, Mr G's left foot had significantly improved with a decrease in exudate and pain (2 on the NRS), and new epithelial tissue was noted. However, his right foot had not improved as significantly, and there was ongoing pain (5 on the NRS) and maceration (Figure 1).

Assessment 2

Thirteen days later, Mr G's left foot had again shown significant improvement with nil exudate, complete epithelisation and minimal



Figure 3: A) Right foot and B) Left foot

evidence of tinea vesicles. The surrounding skin had become quite dry and flaky in appearance. Mr G's right foot was also starting to show improvement with decreased exudate and pain (Figure 2).

Assessment 3

Mr G's left foot had completely recovered after 34 days. Several areas of dry, thick skin remained, although this was improving with daily moisturising (Figure 3). Mr G's right foot, however, showed limited improvements from his previous review, with ongoing pain and serous exudate.

DISCUSSION

The literature suggests that acute vesicular tinea pedis should generally be treated with a topical antifungal treatment for four weeks^{3,11-12}. However, in patients with chronic or extensive disease, oral antifungal agents such as terbinafine (250 mg daily for two weeks), itraconazole (200 mg twice daily for one week), or fluconazole (150 mg once weekly for two to six weeks) may be more effective than topical antifungals¹⁰⁻¹². Furthermore, studies have indicated that treatment with allylamines (terbinafine) produces a slightly higher cure rate than treatment with an azole and it is for these reasons that we presume that infectious diseases chose to prescribe Mr G with oral terbinafine rather than a topical antifungal¹⁰.

Appropriate wound care, antibiotics and antifungal therapy were key factors in progressing Mr G's left foot wounds to healing. It is believed Sorbact®, an antimicrobial wound dressing, played a significant role in the reduction in wound bed bioburden given the decrease in exudate, erythema and pain. In addition, Sorbact® ribbon gauze was an ideal dressing for Mr G as it was not only easy to apply between the toes, but also safe and effective in the treatment of fungal and bacterial infections, both of which Mr G was suffering from.

Mr G's right foot did eventually heal; however, this took a further 14 days in comparison to Mr G's left (a total of 48 days). It is unknown why Mr G's right foot deteriorated despite the same treatment. However, throughout Mr G's course of management he used alternative therapies in addition to our recommendations such as Condy's crystals (potassium permanganate) and Clearasil® face wash and he continued to work long days on his feet, despite our recommendations to limit his weight bearing to aid wound healing. He also smoked heavily and was not always adherent in wearing the prescribed postoperative shoes; all the above factors would have impacted on his ability to heal. Furthermore, he failed to attend his dermatology outpatient appointments following his inpatient stay.

When considering an initial treatment plan and during ongoing reviews we took into account Mr G's young age, active lifestyle and difficulty with compliance due to work and family commitments. We aimed to provide him with a simple management plan that would accommodate his lifestyle, whilst managing his concerns about wound odour, exudate and footwear. Sorbact® and Zetuvit® dressings managed these concerns and were the easiest for self-application.

CONCLUSION

Acute vesicular tinea pedis is well documented in dermatology text; however, there is limited information regarding topical management in severe cases with such significant tissue loss, and the use of Sorbact® in this presentation.

In Mr G's case there was significant tissue loss and infection, which required hospitalisation. Wound management was aimed at managing his infection, controlling the exudate, reducing pain, preventing reinfection and healing the ulcerated skin. A number of holistic treatments such as antifungal washes and footwear recommendations were also implemented to prevent recurrence and reinfection.

In this case, Sorbact®, an antimicrobial wound dressing, was an appropriate topical dressing for Mr G in the management of his acute vesicular tinea pedis, given it addressed a number of his wound-related goals, and should therefore be considered as an option in the management of vesicular tinea pedis with secondary bacterial infection.

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1: Sibbald RG, et al. *AdvSkin Wound Care* 2011;24(2): 78-84



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