'Wake sign': an important clue for the diagnosis of scabies

J. Yoshizumi and T. Harada*

*Yoshizumi Dermatology Clinic and *Department of Dermatology, Tokyo Women's Medical University, Medical Center East, Tokyo, Japan*

doi:10.1111/j.1365-2230.2008.03010.x

Summary

Japan is currently experiencing many outbreaks of scabies, occurring mainly in long-term care facilities. Scabies burrows, the only pathognomonic lesion for scabies, often occur on the creases of the palms, and are followed by a pattern of scale reminiscent of the 'wake' left on the surface of water by a moving bird or a ship (wake sign).[1–4] The wake sign is useful because (i) it is specific for scabies, (ii) it is sufficiently large to be found by the naked eye and (iii) it points towards the location of the mite and its products. Examination of patients' palms to look for this sign is a simple and efficient way to make a diagnosis of scabies throughout the course of an infestation.

Japan is currently experiencing outbreaks of scabies, mainly in long-term care facilities. It has been reported that scabies burrows, the only pathognomonic lesion for scabies, are often found on the creases of the palms in elderly patients, and are followed by a pattern of scale reminiscent of the 'wake' left on the surface of water by a moving bird or a ship (wake sign).[1–4]

In our experience, > 20 cases have been seen in which the wake sign led to the finding of scabies burrows efficiently and effectively.

Report

Patient 1 was a 94-year-old woman with dementia,[1] who was routinely examined on admission to a long-term care facility. Three wake-shaped scales were found on the creases of her right palm (Fig. 1). Samples of stratum corneum from the area to which the wake-shaped scales were pointing, were removed and examined under a microscope. Scabies mites and their eggs were found in every sample. Red papules were scattered over the patient's arms and back; neither mites nor eggs were found from these. The patient did not report any itchiness except when she was undressed for bathing, and thus scabies was not suspected until the examination was carried out.

Patient 2 was an 11-year-old girl, who presented with very itchy, red papules on her arms and thighs. She had received treatment with steroid ointment for a few months elsewhere, with no evident benefit. On examination, a wake sign was found on the crease of her left palm (Fig. 2). The wake-shaped scale extended into a linear lesion, which terminated as a tiny brown, triangular spot. Microscopical examination of the stratum corneum scraped from the entire linear lesion showed a scabies mite and its eggs. The patient was unaware of either itchiness or lesions on her palms.

Patient 1 was the first case in which scabies burrows were seen to be followed by the wake-shaped scale.[1] She was seen in a long-term care facility with 120 residents in Tokyo, which had previously experienced an outbreak of scabies in 2003. In retrospect, it is believed scabies was brought to the facility by a new female resident, whose itchy skin had been treated elsewhere by steroid ointment. About 1 month after her admission, the nurses noticed that other residents were scratching. By that time scabies had already spread to several residents.

Scabies in elderly patients with dementia or who are bed-ridden is often missed or misdiagnosed, because (i) there is an incubation period of 1–2 months, (ii) patients may not develop the typical itchy red

Correspondence: Dr Junko Yoshizumi, Yoshizumi Dermatology Clinic, 2-24-15 Nishigahara, Kita-ku, Tokyo, 114-0024, Japan.
E-mail: cecilia@kitanet.ne.jp

Conflict of interest: none declared.

Accepted for publication 14 June 2008

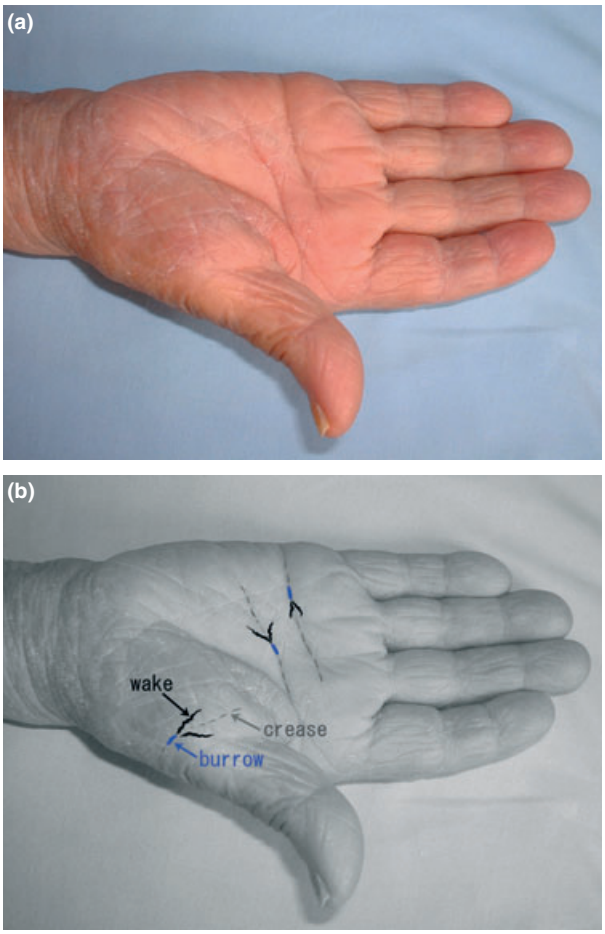

Figure 1 Patient 1, a 94-year-old woman. (a) 'Wake' on the creases of the palm. (b) Black and white image of (a) showing the burrows and the wakes outlined in blue and black, respectively. The burrow and wake together make a Y-shaped lesion. The wake points to the location of a burrow with a mite at its end. Reproduced by kind permission of Kyowakikaku Co., Ltd, Tokyo, Japan.

papules, (iii) patients do not seek help, and (iv) it is often difficult for a dermatologist to undress and examine such patients completely, and to find lesions with scabies mites and their eggs.

In an attempt to prevent further outbreaks, a routine procedure was established in the facility. Every new

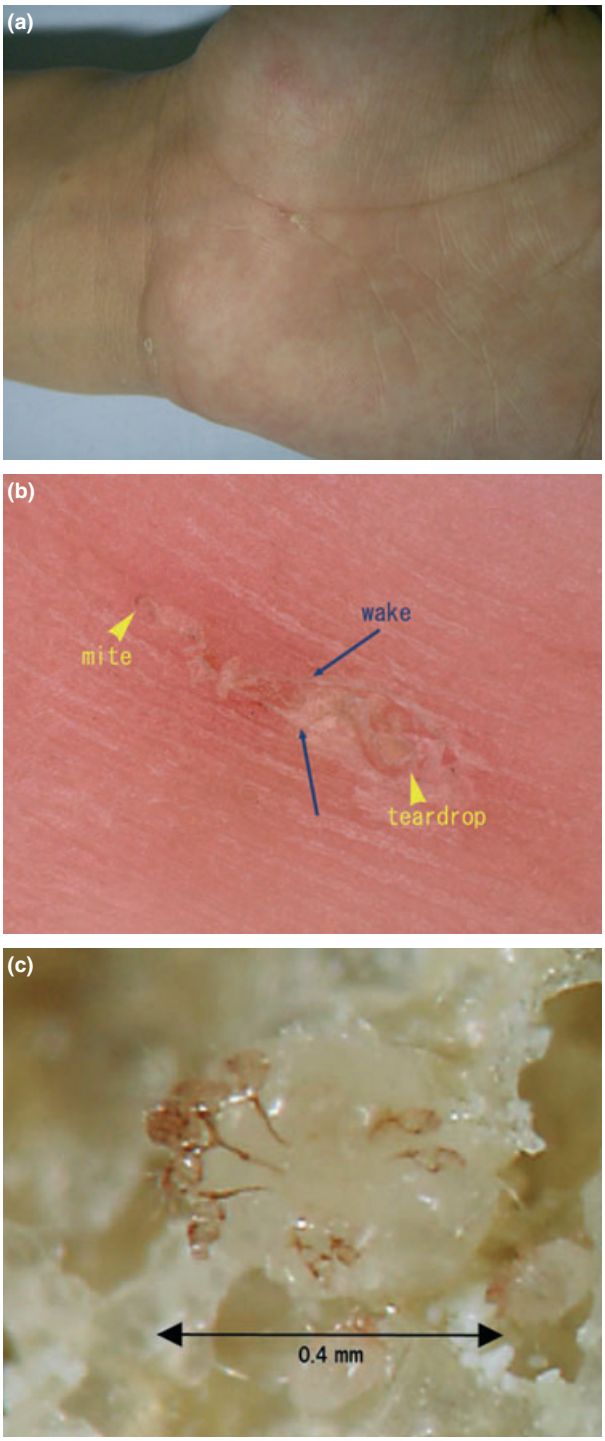

Figure 2 Patient 2, an 11-year-old girl. (a) 'Wake' on the crease at the centre of the palm. (b) Enlarged image of (a), showing a tiny brown triangular spot at the end of the burrow, which is the anterior part of the mite. Teardrop-shaped crust at the end of the wake, which points to the location of the mite. (c) Incident light photomicrograph of an adult female *Sarcoptes scabiei*. The body of the mite is creamy, but her mouth parts and the base of two pairs of the anterior legs are a contrasting brown in colour, which are seen through the stratum corneum as the tiny brown triangular spot at the end of the burrow, as described in (b). A 'dry' dermoscope with polarizing filters (e.g. DermLite® DL100; 3Gen, San Juan Capistrano, CA, USA), is useful to identify the triangle. Reproduced by kind permission of Dr Yasuo Wada, Head of Dermatology Department, Ako City Hospital, Japan.

resident was examined by the dermatologist, regardless of them having any signs or symptoms on the skin. The examination covered the entire skin, but special attention was paid to the area from the wrists to the fingers to find scabies burrows, the most likely place for them to be found.[5] Examination of the area was repeated twice a month over a possible incubation period of 2 months. Examining the wrists and hands thoroughly is thought to be efficient and realistic, as it does not require undressing the patient. No case of scabies was found until that of patient 1 in 2006. On routine examination of this patient's palms by the dermatologist, the obvious wake-shaped scales (Fig. 1) attracted attention, and suggested that they might be related to scabies burrows. Microscopical examination of the stratum corneum scraped from the creases in an area to which the wake-shaped scales pointed, showed scabies mites and their eggs.

This finding led to speculation that (i) a scabies burrow may be followed by a wake-shaped scale; (ii) the burrow and the wake-shaped scale together present a Y-shaped lesion and (iii) the wake sign points to the location of the mite. Since then, there have been > 20 scabies cases that we are aware of, in which the wake sign guided the clinician towards finding the burrows, and thus to proving the existence of the mite and its eggs.

The wake sign may also be found in scabies in younger patients as shown in the case of patient 2 (Fig. 2). The teardrop-shaped crust seen at the end of the wake-shaped scale is another characteristic often found with the burrow. The brown, triangular spot found at the end of the burrow comprises the mouth parts and the base of two pairs of the female mite's anterior legs, which are brownish in colour and can be seen through the stratum corneum. The body of the mite is a creamy colour and not clearly visible.

A scabies burrow is where an adult female mite lives and burrows forward under the stratum corneum while laying her eggs behind her (Fig. 3).[4,6] It is the result of two simultaneous movements: horizontal movement of the mite and vertical movement of keratinization, with the superimposed inflammatory reaction of the skin to the presence of the mite and its products. We believe that the wake-shaped scale is formed as the mite moves forward, with the inflammatory reaction following. The area of inflammation gets proportionally wider along the length of the burrow, as the inflammation gradually spreads horizontally. This results in the formation of a wake-shaped inflamed area behind the mite, which develops pathological keratinization and eventually scales off in a 'wake' shape.

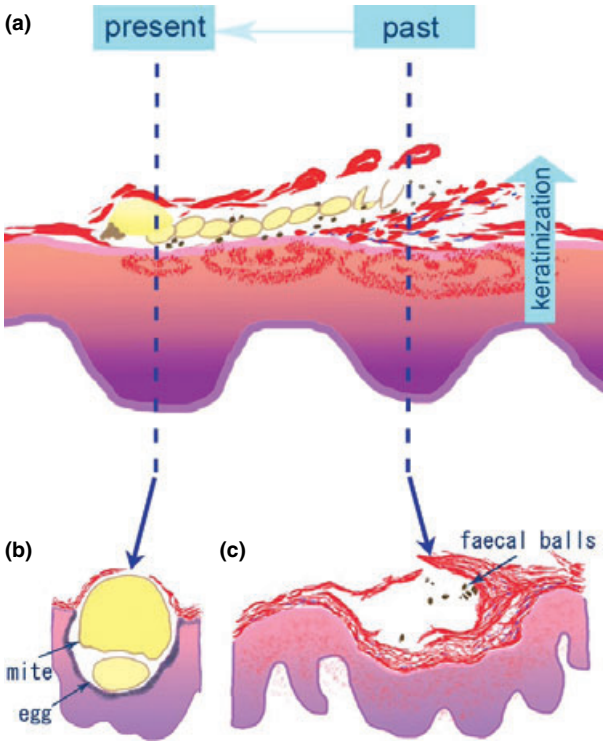

Figure 3 Diagrams of a scabies burrow. (a) Longitudinal section. An adult female mite burrows forward under the stratum corneum while laying her eggs behind her. The time elapsed since the mite started burrowing is proportional to the degree of keratinization, and to the extent of the inflammation caused by the mite and its products. (b) Transverse section of the end of the burrow. The mite and its egg are seen. The floor of the burrow is a compact granular layer. The roof of the burrow is orthokeratotic stratum corneum. The width of the burrow is limited to that of the mite. Little inflammation is seen. (c) Transverse section of the older part of the burrow. Only faecal balls are present in the burrow. The floor of the burrow is hyperkeratotic and parakeratotic meshed stratum corneum. The roof of the burrow is hyperkeratotic stratum corneum. The width of the burrow is much wider, and extensive inflammation is seen in the epidermis and dermis under the burrow. The drawings (b) and (c) are based on photomicrographs of a biopsied specimen of a burrow published by Heilesen in 1946.[6] Reproduced by kind permission of Shujunsha Co., Ltd, Tokyo, Japan.

The wake sign is useful because (i) it is specific for scabies, (ii) it is sufficiently large to be found by the naked eye, (iii) it points towards the location of the mite and its products, and (iv) it is often the first sign found during the incubation period and also the last sign to be found during the course of the treatment, when there are no longer any itchy papules on the skin, especially in elderly patients. The wake sign on the creases of the palms and soles[3] is useful to guide and assist in the diagnosis of scabies throughout the course of an infestation.

Acknowledgement

We thank Emeritus Professor R. J. Marshall, Department of Medical Illustration, University of Wales College of Medicine, Cardiff, UK for support, advice and encouragement.

References

1 Yoshizumi J. Scabies love creases – follow the 'wake' left by the mite (in Japanese). *Pract Dermatol* 2006; **28**: 343–50.
2 Yoshizumi J. Follow the wakes scabies leave: a guide to the burrows. *Proceedings of the 15th Congress of the European Academy of Dermatology and Venereology, Rhodes, Greece*. 4–8 *October* 2006; 573–6.
3 Yoshizumi J. Scabies in the elderly. *The Age of Skin* 2008; **9**: 7–8.
4 Yoshizumi J. Scabies in the elderly (in Japanese). In: *All About Scabies* (Nanko H, ed.). Tokyo: Shujunsha Co. Ltd. 2008: 254–9.
5 Johnson CG, Mellanby K. The parasitology of human scabies. *Parasitology* 1942; **34**: 285–90.
6 Heilesen B. Histological examinations of the scabies burrow and the eruption in the ordinary scabies. *Acta Derm Venereol Suppl* 1946; **14**: 223–40.