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Pearls in Dermatology

How I measure pruritus using a wrist movement detector

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Itch is a common and annoying symptom in many dermatological and systemic diseases. Scratching is a natural response to itch and its severity can be objectively assessed by measuring the intensity of scratching as wrist movement. The use of a wrist movement detector well serves the purpose. It allows accurate evaluation of nocturnal wrist activities in itching conditions including atopic dermatitis, pemphigoid gestationis and pruritus of malignancy. This device is very easy to use non-intrusively at home by patient, obviating the need of hospitalisation.

Keywords: Itch, wrist movement, wrist movement detector

Introduction

Itch is a common and annoying symptom in many dermatological and systemic diseases. Childhood atopic dermatitis (AD), for instance, is a distressing disease associated with pruritus and sleep disturbance. Defining itch as the sensation which provokes the desire to scratch provides an objective approach for its measurement. The severity of itch is traditionally assessed by questionnaires or visual analogue scales, both rely on the assumption that the subject or the caregiver (in the case of a child) is able to relate the perceived experiences accurately.[1,2] We demonstrate that wrist activities, non-intrusively measured by the DigiTrac monitor at home, are closely correlated with the objective clinical scores, levels of peripheral blood chemokine markers for AD, neurotrophic peptides such as brain-derived neurotrophic factor and substance P, and quality of life score.[3,4]

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Methods

The patient is instructed to wear the DigiTrac monitor (IM Systems, Baltimore, MD) on his/her dominant wrist before sleeping (Figure 1). The DigiTrac provides essential data on a wide spectrum of frequencies of wrist movements and quantity of movements in term of acceleration or

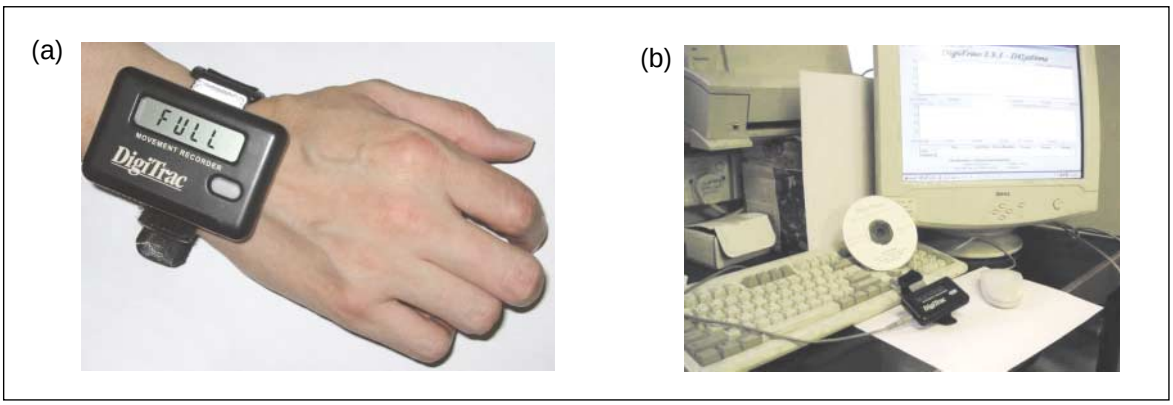

Figure 1. (a) The DigiTrac motion monitor is worn on the dominant hand before bed resting. It would continuously record wrist movements until the next morning. (b) The data is then downloading from the DigiTrac monitor to computer for analysis.

g values.[4] The monitor is programmed to record limb motion between 10 pm and 8 am the following morning. The contour can be assessed to determine different patterns of wrist movements in patients with AD and various itchy conditions. The data is then downloaded to computer using DigiTrac 3.9 (IM Systems, Baltimore, MD). Wrist activities are expressed in unit of average value of acceleration ($g.min^{-1}$).[3]

Comments

Wrist activities between 0 and 3 hertz (Hz) for the first 3 hours are a good indicator of eczema severity, nocturnal itch and sleep disturbance in children. Apart from AD, the nocturnal itch was also documented in a patient with pemphigoid gestationis.[5] The DigiTrac wrist monitor showed intensive scratching movements, which was more than double the intensity of scratching in patients with severe atopic dermatitis, with an average value of 181.00 ± 43.49 (mean ± standard error) $g.min^{-1}$ for the first three hours. Most wrist activities are slow movements at 0 to 1 Hz. This is in striking contrast to the scratching activities at 0 to 3 Hz in eczema subjects. Recently, the author also applied the monitor to evaluate a previously healthy 3-year-old girl with a 4-week history of generalised itch without a rash.[6] She subsequent presented with right hip pain and fever and was confirmed to have a rare peripheral T cell lymphoma. Her itch pattern before and after chemotherapy, as documented by the DigiTrac wrist-held movement monitor, showed a dramatic reduction of nocturnal itch. The pattern also differed from that for eczema in that the scratching was of much higher intensity but lower frequency.

The DigiTrac monitor provides Fast-Fourier-Transformation three-dimensional contourgraphy (indicating frequency of the detected movements over the selected period of time), average spectral plots (average spectral content for the entire period of time shown in the contourgraph), spectral power and a programmable start-up time. Therefore, the monitor shows both qualitative and quantitative information. The application of the DigiTrac is simple. We are currently using the DigiTrac to evaluate the clinical efficacy in itch relieving in studies on therapies for atopic dermatitis such as tacrolimus and diluted steroid wet-wrap dressings. The technology will certainly attract industrial attention in the quest of innovative therapies for itch.

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