

Sweat Test with Water-erasable Ink

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Accepted November 1, 2011.

There are many methods for assessing abnormalities in perspiration, including practical, qualitative, and quantitative methods. Among the methods of visualizing local and generalized perspiration, the Minor, or starch-iodine, test is widely used to identify areas of excessive or low production of sweat (1). However, the preparation required for the test is rather cumbersome. Starch-iodine stains the clothes and surrounding area and occasionally causes skin irritation or an allergic reaction.

METHODS

A sweat test was performed in 3 normal volunteers using a water-erasable ink pen. A sweat test with this ink pen was performed and the starch-iodine test was attempted in a patient with hypohidrosis and cholinergic urticaria. The ink used in this study has passed European and the American toy safety standards, EN71 part 3 and ASTM F963-91, respectively. Before the test, lines were painted on the subjects' dry skin surface. The volunteers and the patient then spent time in a hot (38°C) humid room.

RESULTS

In normal volunteers, the trace lines of the neck, upper trunk, and axillae began to fade within 5 min and disappeared within 10–30 min, while subjects remained at rest, although the time required to disappear varied according to the part of the body (Fig. 1). In the patient with hypohidrosis, neither the trace lines of the water-erasable ink nor starch-iodine showed any change except for the axilla and palm (Figs 2 and 3). The test was stopped after 10 min, because the patient reported discomfort due to hyperthermia and developed urticaria.

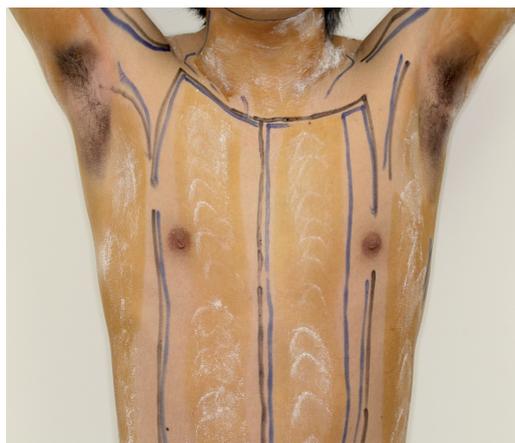


Fig. 2. Test in the patient with hypohidrosis. The lines crossing the lines of Blaschko were painted to detect segmental hypohidrosis. Neither the lines (blue and black) of water-erasable ink nor the yellow-brown area of starch-iodine showed any changes except on the axilla (10 min after entering a hot room).

DISCUSSION

Water-erasable ink is used in some marker pens intended for writing and painting. Although the ink does not rub off easily after it dries, it disappears once it is touched by water. The ink is composed of a complex of electron-donating colouring compounds and an electron-accepting colour developer. Although these two agents are colourless before contacting each other, they can form a specific colour after chemical binding. However, when the complex is touched by water, the electron-accepting colour developer loses its ability as a colour developer and the ink thus returns to a colourless state. This type of ink was developed in the 1990s and has since then been refined for safety.

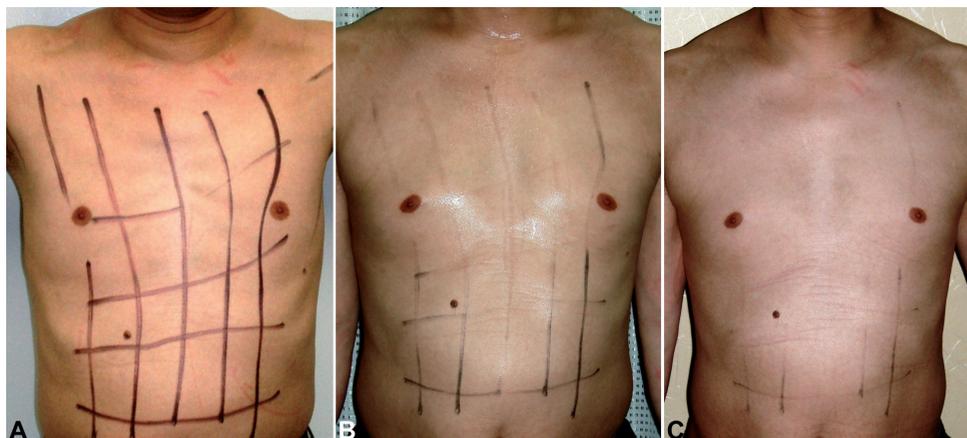


Fig. 1. Test in a normal volunteer. (A) Before test; (B) 10 min after entering a hot room; and (C) 10 min after B. (C) The lines disappeared or faded.

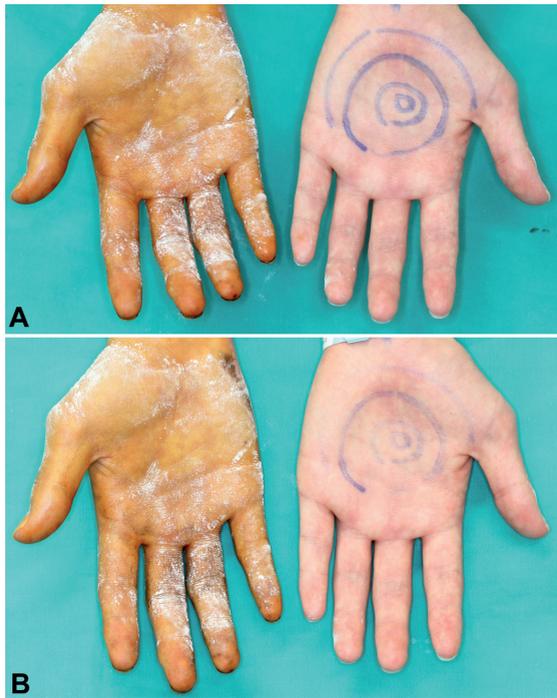


Fig. 3. Test on the patient's palm (A) before the test and (B) after 10 min. A mild change in the periphery was observed in starch-iodine test (right hand). Water-erasable ink was more sensitive than Minor's test, with fading seen in (B) (left hand).

Water-erasable ink pens are easily obtained, and sweating can be confirmed simply by observing the fading of lines drawn on the body. Furthermore, the

time required for the ink to disappear could be used as a scale to assess sweat activity. Although this method, as well as the Minor test, is not helpful in the diagnosis of hyperhidrosis, it could be useful for screening of asymmetrical sweating in neurological and dermatological diseases, assessing the results of sweat stimulation tests in local areas, and determining areas to be treated with botulinum toxin in patients with local sweat abnormalities (2–4). Further research is necessary to evaluate the indications for this method, and its sensitivity and utility must be further compared with the Minor test.

ACKNOWLEDGEMENT

We thank Ms C. Uhara for her contribution to the selection of the ink.

The authors declare no conflicts of interest.

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