

Analysis of Increased Xerosis in Intensive Care Unit Patients

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Background: Xerosis is commonly seen in patients in intensive care units (ICU), and is sometimes accompanied by itching sensation and dermatitis. However, xerosis in ICU patients is often missed by doctors who are trained to attend to the more serious conditions that can become life-threatening.

Objective: The purpose of this study is to evaluate xerosis of ICU patients objectively, by measuring hydration levels of the skin.

Method: To investigate hydration levels of the skin in ICU patients, a corneometer was used to measure the skin's capacitance. The experimental group consisted of 106 ICU patients, while the control group was made up of 53 outpatients visiting the dermatology department.

Results: ICU patients showed decreased skin surface hydration, and its level was inversely correlated with the duration of ICU admission. However, no correlation between age and skin surface hydration was observed in either the ICU patients or the control group. The actual humidity of the ICU was 5% lower than that of the outpatient dermatologic clinic. The severity of systemic diseases can also influence the development of xerosis.

Conclusion: The decreased skin surface hydration in ICU patients correlated with the prolonged ICU stay, which seemed to be associated with the dry environment of the ICU or the severity of the systemic diseases causing dry skin. The increased incidence of xerosis in ICU patients can be explained by the decreased skin surface hydration.

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Key Words: Intensive care unit, Xerosis, Skin surface hydration

INTRODUCTION

Although primary dermatological conditions requiring intensive care unit (ICU) admission are rare, skin lesions caused by systemic diseases or complications in the critically ill patients are relatively common. While more significant illnesses are being treated, skin lesions are often ignored in daily clinical examinations. There have been few studies investi-

gating the skin lesions that appear in ICU patients. If any, these are dermatologic disorders and pressure sores as complications of ICU care¹⁻⁴. Dermatological problems seen in the ICU were classified by Dunnill et al.⁴ These problems included primary dermatological conditions, multi-system disorders with cutaneous signs, complications of dermatological therapy, and skin conditions developing secondary to intensive care. However this study limited itself to only serious dermatological problems, instead of more common skin disturbances.

To determine common ICU skin problems, we classified the skin lesions into five groups, including primary skin diseases requiring intensive care, dermatologic disorders due to multi-system disorders, skin diseases resulting from complications of intensive care, previously acquired coincidental dermatologic diseases, and nonspecific cutaneous mani-

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festations (including peripheral edema and xerosis), and reported the frequency of each skin problem found in ICU patients⁵. The more xerotic skin was observed in the patients with a longer ICU admission period. To evaluate ICU patients for xerosis and to correlate duration of the admission period with extent of xerosis objectively, capacitance of the skin was measured using a corneometer⁶.

MATERIALS AND METHOD

One-hundred and six patients in the ICU were investigated for xerosis between February 2004 and March 2004. There were 55 males and 51 females. The patients' ages ranged from 7 to 91 years with an average age (mean \pm SD) of 66.4 ± 13.9 years. During the same period, 53 age- and sex-matched out-patients without eczematous or inflammatory skin diseases, who visited the dermatology department, were selected for the control group. There were 29 males and 24 females. Their ages ranged from 60 to 80 years with an average age (mean \pm SD) of 67.9 ± 5.7 years. The capacitance was measured with a corneometer (CM-820, Courage-Khazaka Electronic GmbH, Germany) on the inner forearm, three separate times in each patient. For the exclusion of seasonal variation, all testing was carried out from February to March, and temperature and humidity (mean \pm SD) were maintained as 26.5°C , $43 \pm 2\%$ in the ICU and 26.0°C , $48 \pm 2\%$, in the outpatient clinic. Statistical evaluations of the results were performed using a two-sided Student's t-test, a Pearson's correlation analysis, and a simple linear regression analysis.

RESULTS

Skin surface hydration was measured in 106 ICU patients, in comparison to 53 age- and sex-matched out-patients as a control group, using a corneometer. Capacitance value, as an objective measurement of skin surface hydration, was compared in each group. The capacitance value of the ICU patients ranged from 34 to 82 AU. The capacitance value of the control group ranged from 52 to 96.7 AU. Compared with the control group, the capacitance value (mean \pm SD) of the ICU patients (59.2 ± 10.2 AU) appeared to be lower than that of the control group

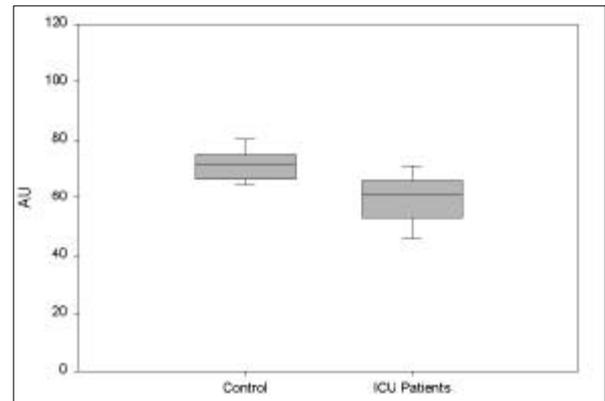


Fig. 1. Skin surface hydration of control group and ICU patients. AU, arbitrary unit; two-sided Student's t-test, $p < 0.0001$.

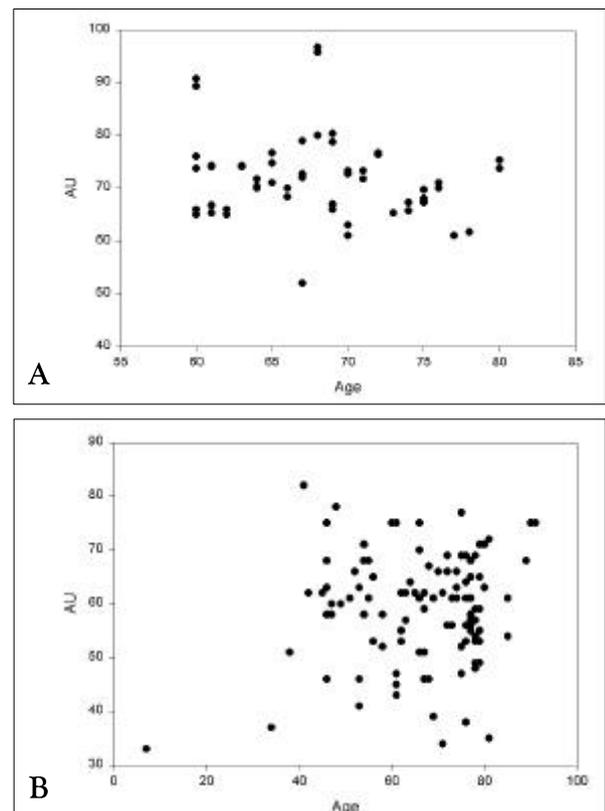


Fig. 2. Changes in skin surface hydration of (A) control group and (B) ICU patients depending on age. AU, arbitrary unit; Pearson's correlation analysis, $p > 0.05$, respectively.

(72.0 ± 8.2 AU) ($p < 0.0001$) (Fig. 1). Humidity difference between the ICU and the out-patient

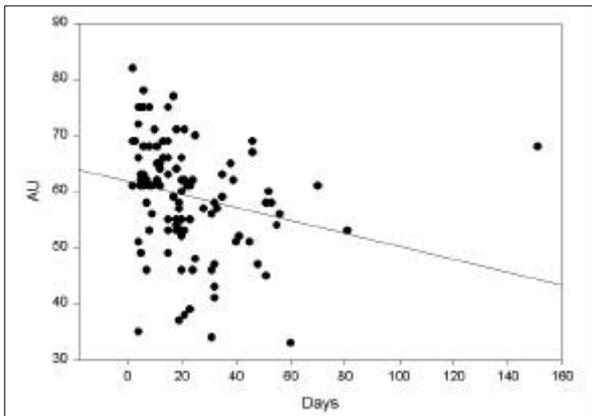


Fig. 3. Changes in the skin surface hydration of ICU patients depending on length of ICU stay. AU, arbitrary unit; simple linear regression analysis, $R^2=0.0541$, $p=0.0164$.

clinic may have been a factor affecting the difference in capacitance value, because the humidity in the ICU was 5% lower than that in the outpatient clinic. In addition, no correlation between age and skin surface hydration was observed in either the ICU patients or the control group ($p > 0.05$, respectively) (Fig. 2). This suggested the difference in age did not affect skin surface hydration in each group. However, the level of skin surface hydration in ICU patients was inversely correlated with the period of admission ($R^2=0.0541$, $p=0.0164$) (Fig. 3). Therefore this explains that the patients staying in the ICU longer tend to develop a higher incidence of xerosis.

DISCUSSION

In a previous study, the skin manifestations of ICU patients were classified into five groups, and the cutaneous problems were observed in 80.5% of the ICU patients⁵. According to these results, the most common dermatologic manifestations in the ICU patients were nonspecific skin lesions such as peripheral edema and dry skin. The severity of systemic diseases such as uremia, diabetes, liver disease, thyroid disease and lymphoma can influence the development of xerosis⁷. Therefore xerosis as a nonspecific cutaneous symptom is not completely separable from the systemic diseases. Even dermatologic diseases such as atopic derma-

titis, chronic eczema, ichthyosis and psoriasis are associated with xerosis⁷. In patients older than 65, xerosis can develop without any associated disease as the cause. Therefore, the cause of xerosis in this study may be diverse.

We initially suspected that the patients under ventilator care would be more likely to develop peripheral edema and then progress to xerosis, but there was no association between the ventilatory care and the peripheral edema (or xerosis). The decreased skin surface hydration was found in ICU patients without clinically visible xerosis. Therefore, the corneometer seems to be a sensitive device to detect skin surface hydration in ICU patients. During a physical examination, xerosis appeared most frequently in the lower leg, especially in the pretibial area. Because pretibial xerosis is often observed with older age, we measured skin surface hydration at the inner aspect of the forearm. Skin surface hydration in ICU patients appeared to be lower than that of the age- and sex-matched control group. Dry skin is known to be commonly observed in the elderly⁸. Therefore, we analyzed whether there was any correlation between age and capacitance value in this study. No significant correlations were found between these conditions in either group. This suggests that the decreased skin surface hydration in ICU patients was affected by significant factors other than age.

The decreased skin surface hydration in the ICU patients could be explained by the low humidity in the ICU, as well as the exposed skin of the patients. This view is supported by a study that found skin dryness could develop in a dry environment⁹. The actual humidity of the ICU was 5% lower than that of the outpatient dermatologic clinic. It is also predicted that the longer the admission period is, the more severe systemic diseases the patients have. Therefore it seems likely that the development of dry skin may involve both the dry environmental factor and the patients' severity of primary diseases.

In conclusion, the decreased skin surface hydration in ICU patients correlates with the prolonged ICU stay, which may be associated with dry environment of the ICU or the severity of the systemic diseases causing dry skin. The increased incidence of xerosis in ICU patients can be explained by the decreased skin surface hydration.

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