Practical application of emotional sweating to evaluate procedural pain in full–term newborns

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Abstract

Emotional sweating is a physical reaction that occurs with pain and other acutely stressful situations. Very few studies have directly evaluated emotional sweating to monitor pain reception in full–term newborns. The aim of study was to examine whether emotional sweating could appicale for evaluating procedural pain by heel lance in full–term newborns. Eight full–term newborns participated on the fourth day after birth in this study. We examined whether the amount of sweat secretion changed during blood collection procedure. The sweating reaction was recorded continuously from the start of the blood collection until blood collection was finished, using the probe of a portable perspiration meter against the newborn's palm. As a result, the amount of emotional sweat significantly increased in perspiration accompanied the heel lance, compared to the baseline before blood collection. These finding suggest that emotional sweating could be used as an objective index of procedural pain in full–term newborns.

Keywords
Human neonate; Pain assessment; Pain monitoring; Pricking pain

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Introduction

Although pain is a subjective sensation, newborns are unable to verbalize their experience of pain. Therefore, the objective measurements of pain in newborns are needed; however, there are currently few practical methods available. We chose to focus on the emotional sweating that accompanies pain perception. However, very
few studies have directly evaluated emotional sweating in an effort to monitor pain reception in newborns, although the electrodermal activity methods such as skin conductance and skin impedance has been used to frequently evaluate procedural pain in newborns. This study aimed to examine whether emotional sweating could applicate for evaluating medical procedural pain in full–term newborns.

Methods & Materials
This study was approved by the ethics committee of Kawasaki University of Medical Welfare in Japan. And, written and verbal informed consent was obtained from each parent of newborns before this study. This study performed in air–conditioned birthing rooms at Kaneko maternity hospital in Japan (temperature 27.1 ± 0.95 degree, humidity 43.1 ± 2.88 %). Eight full–term newborns between the 37 and 39 weeks’ gestational age (2673 ± 276.1 g) participated on the fourth day after birth in this study. All subjects had no external injuries or abnormalities involving the central nervous, circulatory, or respiratory systems; and were calm prior to the blood collection. Blood sampling was taken from the right–foot sole for a Guthrie test. During the test, portable
A perspiration meter (TS–100; Techno Science Japan Co., Ltd) was used to measure emotional sweating chronologically. Perspiration response was observed by the adherence of a probe to the right–hand palm. In general, secretion of emotional sweat is limited to the hand palms and the feet soles against detrimental condition such as acute stress and pain. Additionally, a newborn’s palm is extremely small. We therefore modified a measurement probe by cooperating with the Techno Science Japan CO., Ltd (Fig.1). Using the temperature and humidity of the measurement environment as data points, a portable perspiration device uses a difference equation to measure the perspiration that evaporates from the body surface. During the measurement, a fixed amount of air circulates between the main body of the device and the measurement probe. Differences in the moisture content of this air represent the amount of perspiration. The data could be collected via the attachment of a measurement probe to the body surface in newborn. All the data were expressed as the mean ± standard deviation of the mean. The difference between the peak sweating amount in the post–lancing condition associated with heel lance and the baseline sweating amount in the pre–lancing condition before blood collection was analyzed by using the Wilcoxon's Signed Rank test. The level for statistical significance was set at 0.05.

**Results**

The amount of emotional sweating in peak latency significantly increased in perspiration accompanied the heel lancing, compared to the baseline value before blood collection (pre–lancing: 0.12 ± 0.08 mg/cm²/min; post–lancing: 0.17 ± 0.07 mg/cm²/min, \( z = -2.521, P = 0.012 \), Effect size \( r = -0.89 \) (Fig.2). Perspiration was also prolonged during blood collection, though the midwife squeezed the heel area to quickly obtain the blood sample. None of the newborns demonstrated anything unusual while the emotional sweating was being measured. No particular problems or inconveniences occurred while the researcher was holding the probe against the newborns’ skin. We could easily and continuously measure the emotional perspiration that accompanied pain perception in full–term newborns.

**Discussion**

The amount of emotional sweating significant increased after post–lancing in full–term newborns. Our results corresponded with past findings that clear increases in palmar water
loss were observed in newborn with a gestation age over 36 weeks or more \(^1\). And, emotional sweating itself can be measured noninvasively, while the measuring of electrodermal activity by electric current method requires low current in order to pass through the skin. We suggest the monitoring emotional sweating is a useful parameter and would evaluate pricking pain safely. Content-wise, our findings agreed with previous study that skin conductance response to pain by heel lance was extended by squeezing of the heel in newborns \(^2\). Therefore, to avoid additional pain in newborns, squeezing of the heel should be a minimum.

In conclusion, these findings suggest that emotional sweating would be useful as an objective index of medical procedural pain in full-term newborns.

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