

Comparison of temporal artery to mercury and digital temperature measurement in pediatrics



Ayşegül İşler (RN, PhD), Associate Professor^{a,*}, Resmiye Aydın (RN)^b, Şerife Tutar Güven (RN)^c, Sema Günay (RN)^b

^a Akdeniz University, Nursing Faculty, Department of Pediatric Nursing, Antalya, Turkey

^b Akdeniz University Hospital, Pediatric Emergency Department, Antalya, Turkey

^c Antalya Education and Research Hospital, Pediatric Department, Antalya, Turkey

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ABSTRACT

Aim: The aim of the study was to compare the temporal artery thermometer measurements with the mercury and digital axillary thermometer measurements in children.

Methods: This study was conducted at the Pediatric Emergency Department of Akdeniz University Hospital over a three-month period in Turkey. The sample for the study comprised 218 children (aged 0–18 years). Three different methods were applied to each patient at the same time. After acquiring necessary institutional permission to conduct the study, the informed consent to participate was obtained from parents before the subjects were included in the study. The data were evaluated using general linear models. The differences between the groups were analyzed by Least Significant Difference method.

Results: The average temperature measured by temporal artery, mercury and digital thermometers were 38.9 °C, 38.3 °C and 38 °C respectively.

Conclusion: Temporal artery thermometer values might be considered as core temperature. Rectal temperature is about 2 °F (1 °C) higher than an axillary temperature. In our study the difference between the temperature measured values was found to be consistent with the range provided in the literature. Temporal artery thermometers are recommended especially pediatric emergency settings, where an accurate, quick and safe body temperature measurement is of vital importance.

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Introduction

Body temperature is considered one of the vital signs that should be monitored to ensure safe and effective care. Thus, accurate measurement and screening of body temperature is an important component of pediatric assessment, particularly in the pediatric emergency setting. An ideal instrument for temperature measurement should be accurate, reliable, noninvasive, time efficient and relatively technique-independent (Holzhauer et al., 2009; Al-Mukhaizeem et al., 2010; Carr et al., 2011).

Today, wide variations in practice exist on the methods and techniques used to measure body temperature. Numerous studies comparing rectal, oral, tympanic, and axillary thermometers have been conducted to find the most appropriate thermometer and the best anatomical site for temperature measurement (Bernardo et al., 1999; Carroll et al., 2003; Barton et al., 2003; Khorshid et al., 2005; Smith and Truscott, 2006; Duran et al., 2009; Titus et al., 2009; Fortuna et al., 2010; Carr et al., 2011). In developing countries, glass-

mercury thermometers are widely used for measuring body temperature (Oncel et al., 2013). Although axillary thermometry is less invasive, it does not reflect core temperature, and it is largely influenced by ambient temperature and vasoactivity (Bernardo et al., 1999). Glass-mercury thermometers have been widely used in clinical practice, but safety concerns have questioned their continual use. The Medical Device Agency in the United Kingdom recommends alternatives that are more convenient, but there are no plans to restrict mercury (Barton et al., 2003). In our country, generally digital thermometers are widely used in clinical settings. Although the Ministry of Health restricted the use of mercury thermometers in 2009 due to the risks of exposure to mercury they are still used.

In recent years, various noninvasive electronic thermometers with advanced technology have become available. Recently the temporal artery (TA) thermometer method has been developed to meet the clinical requirements for a noninvasive, quick, accurate, and easy method of thermometry that would be suitable for all age groups (Sandlin, 2003; Roy et al., 2003; Exergen, 2005; Canales, 2007; Titus et al., 2009; Rubia-Rubia et al., 2011). Few studies have examined the feasibility or benefits of using the most recent form of TA thermometer (Holzhauer et al., 2009; Duran et al., 2009; Titus et al., 2009; Carr et al., 2011).

* Corresponding author. Address: Akdeniz University, Nursing Faculty, Department of Pediatric Nursing, 07058 Antalya, Turkey. Tel.: +90 242 310 61 24; fax: +90 242 226 14 69.

E-mail address: aisler@akdeniz.edu.tr (A. İşler).

Measuring the patient's body temperature is one of the most frequently performed clinical practices, and taking a patient's temperature has always been a fundamental nursing task. In pediatric settings, nurses are often the healthcare providers given the discretion to choose the route of temperature measurement. Factors influencing this decision might include the child's age, the parent and child's preference, and the available options for temperature measurement. In healthcare facilities, as they are responsible for measuring body temperature accurately, nurses should take into account that the reliability of the measurement depends on selecting the most appropriate anatomical site, choosing the correct equipment and procedure for temperature measurement (Sandlin, 2003; Khorshid et al., 2005; Exergen, 2005; Smith and Truscott, 2006; Canales, 2007; Duran et al., 2009; Titus et al., 2009; Fortuna et al., 2010; Carr et al., 2011; Oncel et al., 2013).

Unfortunately, a limited number of studies have been conducted regarding the use of TA thermometer in pediatrics. In addition, there is no published study in the literature, which compares TA thermometer measurements to mercury and digital thermometry measurements in children. In our country, glass-mercury thermometers are still used in all clinical environments. The use of temporal artery thermometer has only recently begun in pediatric settings. Thus, the purpose of this study was to compare TA thermometer measurements to mercury and digital thermometry measurements in children.

Methods

Study design

This is a prospective and comparative study of three different methods (temporal artery, mercury and digital axillary thermometers) of body temperature measurement in pediatrics.

Sample and setting

The aim of the study was to compare the temporal artery thermometer measurements with the mercury and digital axillary thermometer measurements in children. The study was conducted over a period of three months at the Pediatric Emergency Department of Akdeniz University in Turkey. All measurements in this study were performed by the charge nurse of the clinic. The charge nurse works from 08:00 to 16:00 during the day in the clinic. So, all measurements in this study were performed from 08.00 to 16.00 during the day in the clinic over a period of three months. No sampling was made and a total of 218 children aged 0–18 years were included whose parents agreed to participate in the study. The inclusion criterion for the convenience sample was skin integrity on the forehead (where the measurements were taken). After acquiring necessary institutional permission to conduct the study, informed consent to participate was obtained from parents before the subjects were included in the study. There was not parent who did not agreed to participate in the study.

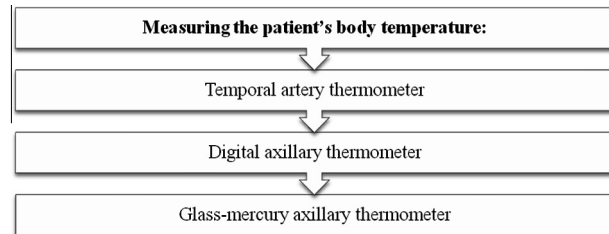
Procedures

The Pediatric Emergency Department of Akdeniz University Hospital was using digital axillary thermometer for body temperature measurement. Prior to this study, the department had not used temporal artery thermometers. All measurements in this study were performed by the charge nurse of the clinic, who had been working at the pediatric emergency department for 10 years. This nurse received training on how to use temporal artery thermometer. In the study, brand new digital axillary and glass-mercury thermometers were used for each patient. The unit of

measurement for body temperature was based on the Centigrade scale (°C). Initially, a pilot study was performed in 10 patients.

Measures

The three different temperature measurement methods were applied to each patient respectively as follows:



1. Measuring the patient's body temperature using temporal artery thermometer.

Before the procedure: The child and the parent were given information about the process. The patient's forehead was checked to see whether it is sweaty or moist. If sweaty or moist, it was dried with a cloth.

Procedure: The TA thermometer was placed at the center of the forehead, moved laterally toward the hairline, and then shortly lifted and placed on the concave depression behind the ear to complete the reading. Steps 2 and 3 are performed at the same time.

2. Measuring the patient's axillary body temperature placing a digital axillary thermometer under the armpit.

Before the procedure: The child and the parent were given information about the process. The armpit was checked to ensure it was dry and clean. If wet, it was dried with a cloth.

Procedure: The device remained under the armpit until it gives signal.

3. Measuring the patient's axillary body temperature placing a glass-mercury axillary thermometer under the other armpit.

Before the procedure: The armpit was checked to ensure it was dry and clean. If wet, it was dried with a cloth.

Procedure: In line with the guidelines found in the literature (Erdal et al., 1991; Fulbrook, 1993; Ulusoy and Görgülü, 1996; Potter and Perry, 1997) a glass-mercury thermometer was kept under the patient's other armpit for 5–10 min.

Data analysis procedures

The data obtained through the data collection form (age, gender, diagnosis, etc.), prepared by the researchers, were evaluated using number, percentage distribution, and general linear models on the SPSS 20.0 package program. The differences between the values of each group were analyzed by Least Significant Difference (LSD) method.

Human subjects protection

The parents were given information about the aim and content of the study, and informed consent of all parents was obtained before starting the study. The participants were free to withdraw from the study at any time and that all information collected about the individual would be kept strictly confidential.

Results

The average age of the participants (218 children aged 0–18 years) was 4.03 ± 3.62 years. Of the 218 subjects, 45.4% were

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