Non-Contact Infrared Thermometry in Febrile Infants

This cross-sectional study was done to find the agreement between non-contact infrared thermometry and mercury-in-glass thermometer. Two hundred and fifty febrile infants were recruited over a period of two months and axillary temperature was measured by both techniques. The mean (SD) temperature recordings of infrared and mercury thermometer were 37.6 (0.91)°C and 37.6 (2.49)°C, respectively; mean difference – 0.016 (96% CI – 0.32, 0.29). There was moderate agreement between both methods (kappa=0.602). Non-contact infrared thermometry can be used with good accuracy in febrile infants for temperature measurements.

Keywords: *Diagnosis, Mercury thermometer, Measurement, Temperature*.

Axillary thermometry is a non-invasive method for temperature measurement in sick febrile infants but may disturb the sleep of the infants and may contribute to infections by frequent direct contact. Non-contact infrared thermometry (NCIT) avoids these risks preserving the clinical accuracy of conventional methods [1-3]. It is a rapid non-invasive method for temperature measurement in febrile infants; however, with discordant results reported earlier [3,4]. The objective of this study was to study the agreement between NCIT and mercury-in-glass thermometer.

This was a cross-sectional study conducted in the pediatric department of a tertiary healthcare facility after approval from institute research and ethics committee. Written informed consent was obtained from the parents/legal representative. Infants from 1st day of life to 12 mo of age attending the pediatric outpatient department between 1st September to 31st October, 2018 were included in the study population. Sick and unstable infants were excluded. Axillary temperature was measured using mercury-in-glass thermometer (Enbee; Wuxi Moxibei Clinical Thermometer Co. Ltd.) after the axilla was wiped with a dry towel. The thermometer probe tip was placed under the axilla so that the tip was touching the skin and the temperature was measured after 5 min. Forehead temperature was recorded for NCIT with infrared thermometer Equinox EQ-IF-02 (Equinox Meditech Private Limited, New Delhi). Accuracy Range-10°C to 40°C) at approximately 0.5-1 cm distance from the glabella [5]. Measurements were taken by a trained nurse and the duty doctor from both the devices within 6 minutes.

The degree of agreement between the two methods was studied using the Bland and Altman method and the mean difference with 95% confidence limits noted for clinical consideration. SPSS 18.0 software was used to analyze the results.

Among 250 infants approached for the study, 7 (2.8%) were aged less than 28 days and 243 (97.2%) were aged from one month to one year. The mean (SD) infrared thermometer and temperature recordings of mercury-in-glass thermometer were 37.6 (0.91)°C and 37.6 (2.49) °C, respectively; mean difference -0.016 (95% CI: -0.32, 0.29). There was a significant correlation between NCIT and axillary thermometry measurements (r=0.22; P<0.001). Number of observed agreement was for 80.8% of observations, indicating moderate agreement (kappa=0.602) between both instruments (***Fig***. **1**).

The mean (SD) temperature recordings of infrared thermometer and mercury-in-glass thermometer were 37.6 (0.91)°C and 37.6 (2.49)°C, respectively; mean difference. The present study established a good correlation between NCIT and axillary thermometry. Few earlier studies revealed conflicting results about the validity and accuracy of NCIT [4,6]. However, other studies have proven the clinical accuracy of NCIT compared to digital axillary thermometry [7-9]. The accuracy and reproducibility of NCIT in different body sites in comparison to conventional thermometers was demonstrated by Osio, *et al*. [8]. Digital thermometer is safer but its clinical accuracy is considered inferior to mercury-in-glass thermometer. Thus, we compared the clinical accuracy of NCIT with that of mercury-in-glass thermometer as also conducted by Chiappini, *et al*. [10] who reported significant correlation between the two methods (P<0·0001), similar to our study.

In our study, moderate agreement between NCIT and mercury thermometry reading was demonstrated. The cost effectiveness of NCIT in resource poor settings needs to be determined. Further studies comparing NCIT with rectal thermometry which is the gold standard would support the use of NCIT in clinical settings.

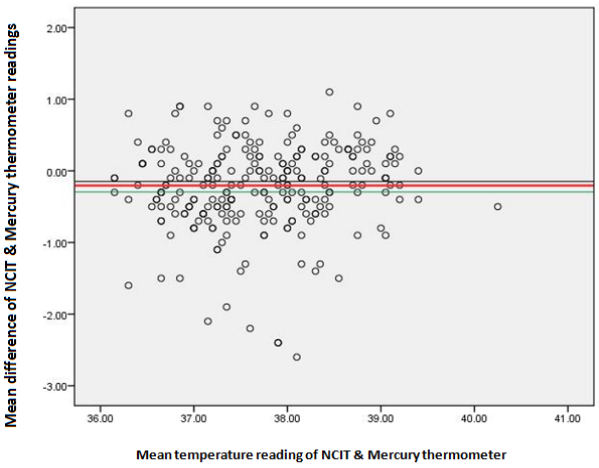

Fig. 1 *Bland altman plot showing the comparison of now-contact infrared thermometer (NCIT) and mercury thermometer readings.*

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Ultrasound Guided Confirmation of Tip of Peripherally Inserted Central Catheter in Neonates

The neonatal peripherally inserted central catheter (PICC) is commonly inserted in the neonatal intensive care unit (NICU) for long-duration intravascular access and the tip of PICC is normally placed at the junction of the right atrium and either superior or inferior vena cava [1]. Often the catheter tip is not in the correct place and requires manipulation and frequent radiographs [2,3]. In this study, we sought to determine the time taken-up by bedside ultrasound (as compared to *X*-ray) and its accuracy for PICC placement and tip confirmation.

A cross-sectional study was conducted at the neonatal intensive care unit, Manipal hospital, Bangalore from August, 2017 to September, 2018, among neonates requiring PICC line insertion as a part of their intensive care management. The study protocol was cleared by the Ethics Committee of Manipal Hospital. Data were collected in a pre-designed proforma after taking consent from parents. Neonates with major congenital anomalies involving thorax and abdomen were excluded from the study.

Objectively, the time taken during the confirmation of the tip of PICC by using bedside ultrasound and digital *X*-ray in each patient was determined, and also the number of attempts was documented. PICC line was placed by the neonatal fellow under the guidance of the consultant neonatologist. Ultrasound was performed by Philips CX50 by using an S 12-4 frequency footprint probe in the subcostal sagittal view to identifying the inferior vena cava and high parasternal view to identify superior vena cava. After the insertion of predetermined length, the tip was visualized and manipulated by using real-time ultrasound for optimal position. A small volume (1 mL) of sterile normal saline was injected to confirm the location of the catheter tip. Bedside digital *X*-ray was ordered at the same time. Time taken to confirm the position of the tip of PICC was recorded by using bedside ultrasound and *X*-ray. The start time was defined as the time of ordering *X*-ray after inserting the predetermined length of the PICC catheter. The starting time was the same for ultrasound and *X*-ray, whereas the completion time was defined as the time when ultrasound confirmed the tip of the PICC catheter and for the *X*-ray method when the *X*-ray was read by the neonatologist on-site. A single attempt was counted after the determination of tip by ultrasound and catheter fixed. The repositioning of the catheter was done if the position was not correct as confirmed by *X*-ray.

Forty neonates out of a total of 300 neonates admitted to neonatal intensive care unit during the study period which required PICC insertion; consent could not be obtained for seven neonates. For these 33 neonates (72% males, 72% appropriate for gestational age), the mean (SD) gestational age and birthweight were 29 (3) weeks and 1087 (561) g.