

Detecting fever in polish children by infrared thermography

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Introduction

Recent interest in fever detection for airport screening of passengers has shown the lack of data, outside conventional clinical thermometry. Increasing use is now being made of simple ear radiometers for routine clinical temperature measurement. These devices are known to have limitations, and the technique and the variability of the human auditory canal add to the uncertainty of results.

This study has been conducted at the Paediatric Department of a major Hospital in Poland. The aim of this study is to investigate the possibilities of thermal imaging of the face being used as a reliable indicator of fever in children. In the screening context, thermal imaging has many advantages over other methods, given the need for rapid and objective evidence to exclude a travelling passenger with a raised temperature from increasing the risk of spread of infectious disease (such as H5N1 or similar viruses). In earlier reports on the SARS outbreak temperatures over 38°C were classified as febrile, and made to undergo a simple clinical examination and have temperatures confirmed by thermometry.

Methods

To date, 106 children aged from 3 months to 16 years have been tested in the clinical using a clinical thermometer in the axillary, under arm position, and thermal imaging of the anterior face. The ambient temperature has been maintained at 22 – 23°C. The subjects were seated before the camera, and in front of a cloth screen. Thermal images were recorded, and regions of interest around the eyes and centre forehead were used. Mean and maximum temperatures from these regions of interest were determined.

Results

In total, 96 of 106 subjects recorded temperatures in the normal range (defined as <37.5°C) axillary, and had no direct disease or clinical problem affecting their temperature. Ten children had raised temperatures >37.5 with 3 being 38°C and over. Forehead temperatures were consistently lower in value than the inner canthi of the eyes.

Table 1: Temperatures measured in three anatomical sites in febrile and afebrile children

| AFEBRILE CHILDREN n=96 | | | FEBRILE n=10 |
|------------------------|--------------|------|--------------|
| Anat.site | Mean temp °C | S D | Temp. range |
| Forehead | 34.9 | 0.51 | 36.3 – 37.2 |
| Inner Canthi mean | 36.4 | 0.52 | 37.3 – 38.6 |
| Axilla | 35.9 | 0.81 | 37.5 – 39.0 |

A moderate correlation was found between the canthus eye temperatures and the forehead temperatures from the analysis of the frontal face thermograms. $r=0.66$

Conclusion

Thermal Imaging of the face in children is an efficient means of identifying the presence of fever. Potential artefacts caused by sinus infection, even prolonged crying in children, and may elevate the maximum temperatures recorded over the inner canthi of the eyes. However, the use of a carefully placed clinical thermometer (oral or axillary site) is sufficient to exclude the presence of clinical fever. Further data is being collected on healthy and febrile children. Thermal imaging for screening of travelling passengers may prove to be a suitable and rapid tool, with the inner canthi being the measurement site of choice.