Evidence in practice — number 6: tympanic membrane thermometers

Clinical question — during the examination of children in general practice does an infrared tympanic thermometer accurately measure fever when compared with a mercury thermometer?

THE EVIDENCE

Craig JV, Lancaster GA, Taylor S, *et al*. Infrared ear thermometry compared with rectal thermometry in children: a systematic review. *Lancet* 2002; **360:** 603–609.

BACKGROUND

The assessment of unwell children is a fundamental part of general practice and measurement of temperature is often necessary. My concern regarding the choice of equipment stems from an occasion when I used a tympanic membrane thermometer to measure the temperature of a child who appeared febrile. The first reading was recorded as normal, yet the reading from the other ear was elevated.

After the consultation, I was able to demonstrate a similar discrepancy on measuring my own tympanic membrane temperature on both sides. This caused me concern as I had presumed the reading that the thermometer gave me was accurate and reproducible. I decided to look for evidence about the use of tympanic membrane thermometers and their accuracy.

STUDY DESIGN

This study was a systematic review with a clear set of inclusion criteria for studies and a comprehensive search strategy. Two reviewers independently appraised the methodological quality of the studies. Thirty-one studies were included in the meta-analysis, looking at 4441 children, and there is clear information provided about the age, number of children, population and the type of thermometer used.

OUTCOME MEASURE

The detection of fever using a tympanic membrane thermometer compared to the temperature measured rectally with a mercury thermometer (taken as the reference standard).

RESULTS

These are presented in a Cochrane plot and display the mean temperature difference between the tympanic and rectal temperature. The tympanic membrane thermometers were used in several modes in the different studies. (This means that the temperature recorded at the tympanic membrane is transformed to correspond with the temperature that would be recorded at a particular site in the body, for example rectal, core, oral, tympanic.) The results were separated out according to this and then pooled. There was significant heterogeneity between the studies which affects the pooling of the results.

The overall pooled mean temperature difference (random effects due to large heterogeneity between the studies) was 0.29ºC. The 95% confidence interval for agreement was wide — from -0.74ºC to 1.32ºC — indicating that the tympanic membrane thermometer was as likely to record a temperature above the rectal temperature as to record a temperature below. The pooled mean difference of temperature was smallest when the ear thermometer was used in rectal mode, giving a potential range of temperatures from 37.04ºC to 39.20ºC for a rectal temperature of 38ºC.

COMMENTARY

This study included children in a range of settings including A&E, paediatric clinics and the community. There is no strong reason to suggest that these children would be significantly different from the patients I see in general practice, although the children seen in the A&E department may be more seriously ill; possibly with hypothermia, an uncommon presentation in general practice. These results create difficulties in my practice, as I use a tympanic membrane thermometer, but the temperature it records has poor agreement with the rectal temperature. It is not as practical or acceptable to use a mercury thermometer to measure temperature.

Having considered the evidence, I will continue to use my tympanic thermometer, as it is acceptable to patients and convenient to use. However, I will maintain awareness that it may not always be accurate.

BOTTOM LINE

Tympanic membrane thermometry has poor correlation with rectal temperature measured using a mercury thermometer.

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