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Main Article

Reliability of a tympanic thermometer in measuring temperatures in children after minor ear surgery

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Abstract

Aim: To evaluate the reliability of infrared tympanic thermometry in children who have undergone myringotomy with grommet insertion.

Method: Forty children who had undergone myringotomy with at least one grommet insertion had the tympanic temperature of each ear and the axillary temperature measured on admission and 30 minutes post-operatively.

Result: No difference was found between the pre- and post-operative temperatures measured by either method ($p > 0.05$, paired *t*-test, hypothesized difference of 0).

Conclusion: Infrared tympanic thermometry is reliable in monitoring body temperature in children who have had minor ear surgery.

Key words: Middle Ear Ventilation; Thermometers; Body Temperature

Introduction

Temperature measurement is an important parameter of patient assessment especially in the ambulatory post-operative setting. Infrared tympanic thermometry has gained increasing popularity in the last decade particularly for temperature measurement of paediatric patients. It offers the advantages of ease of use, improved hygiene and greater patient satisfaction.[1]

Infrared tympanic thermometers measure the radiant heat emitted from the tympanic membrane.[2] There have been concerns that minor ear operations such as myringotomy, with or without grommet insertion, may interfere with infrared tympanic thermometer function and thus that temperature measurements using these instruments may not be reliable.

Studies have compared pre- and post-operative temperatures using tympanic thermometers in children undergoing minor ear surgery and those undergoing non-ear surgery.[3,4] No studies so far have compared the reliability of tympanic thermometers with that of digital thermometers in children who have undergone grommet insertion.

We were interested to examine the consequences of tympanic membrane surgery and the placement of foreign bodies in the ear on tympanic thermometer readings as we felt that the resulting inflammation would cause the thermometer to record a artefactual increase in core temperature. The purpose of this prospective study, therefore, was to compare tympanic temperature readings with digital thermometer readings of axillary temperature in children undergoing myringotomy with or without grommet insertion.

Method

Previous literature on the subject was consulted to act as a basis for statistical sample size calculation.[4] From these data it was calculated that a minimum of 40 samples would be required for a 0.01 significance level at a power of 90 per cent, if a difference of 0.5°C between the readings of tympanic and digital thermometers was to be considered significant.[5] Paired results were obtained from each child.

The children recruited into the study were selected from the hospital waiting list; they were listed for surgery because of symptomatic otitis media with effusion. Children undergoing bilateral myringotomies with at least one grommet insertion were included in the study. Children who required the administration of topical drops were excluded. No exclusion was made on the basis of sex or ethnic origin.

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A total of 40 children participated in the study. All patients had bilateral myringotomy with at least one grommet insertion under general anaesthetic as a day case. Tympanic temperatures from each ear were measured with an infrared tympanic thermometer (First Temp; Sherwood, Davis & Geck (Sherwood, Davis & Geck, St. Louis, MO, USA). Axillary temperatures were measured with a digital thermometer (Accu-Beep-Becton Dickinson, NJ, USA). Both results were recorded on admission and 30–45 minutes post-operatively on the recovery ward. A paired *t*-test was used to compare and assess correlation between the data.

Results and analysis

There were 22 girls and 28 boys in the study, with ages ranging from three to 16 years (mean 9.2 ± 2.9 years). All the patients had at least one grommet insertion.

The mean pre-operative tympanic temperature was 36.8°C (±0.54°C); the mean post-operative result was 36.7°C (±0.44°C). The mean pre-operative digital temperature was 36.4°C (±0.43°C); the mean post-operative result was 36.2°C (±0.39°C).

No difference existed between the pre- and post-operative temperatures for either digital thermometry (mean difference 0.17°C, $p > 0.05$, paired *t*-test, hypothesized difference of 0) or tympanic thermometry (mean difference 0.18°C, $p > 0.05$, paired *t*-test, hypothesized difference of 0).

When we compared both digital and tympanic temperatures with each other both pre- and post-operatively no statistical significance could be elicited (Figure 1).

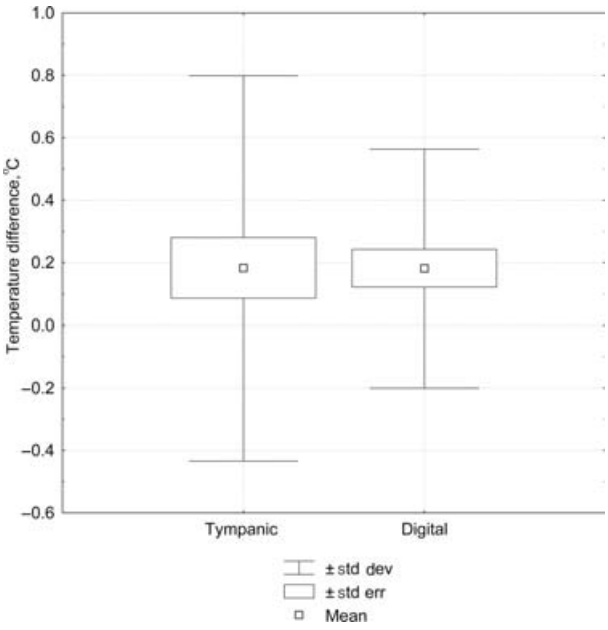

FIG. 1

Comparison of tympanic temperature differences versus digital temperature differences. Std dev = standard deviation; Std err = standard error.

Discussion

Temperature measurement is important in post-operative assessment of patients. In children tympanic and axillary temperature measurements are preferable to oral and rectal temperature measurements, as the former are less invasive and embarrassing for patients and require minimum co-operation.

It is well known that body temperature is regulated by the hypothalamus, which shares the same blood supply as the tympanic membrane. Studies have shown that the ear is therefore an excellent site for temperature measurement as it reflects the core temperature accurately.[6]

Infrared thermometers detect the infrared radiation from the tympanic membrane. The accuracy and reliability of infrared thermometers have been extensively studied.[7–10] Infrared tympanic thermometers are ideal for use in children as they are quick, easy to use, non-invasive and require minimal patient co-operation.[1,2,11]

Our study has shown that the results of aural measurements are comparable to the results of digital axillary measurements both pre- and post-operatively.

- **This study evaluates the reliability of infrared tympanic thermometry in children who have undergone myringotomy with grommet insertion**
- **Forty children who underwent myringotomy with at least one grommet insertion had the tympanic temperature of each ear and the axillary temperature measured on admission and 30 minutes post-operatively**
- **Myringotomy with grommet insertion did not change the tympanic temperature**

Conclusions

The accuracy of infrared thermometry is not affected by recent minor ear surgery. However, staff should be aware that use of topical medication could interfere with tympanic thermometer function.

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