Tympanic Membrane Temperature as a Core Temperature Reading

White Paper

Introduction

Over the past two decades, tympanic thermometry has received a bad reputation mainly due to the use of infrared tympanic temperature measurement devices. Infrared tympanic thermometry is known for its sometimes inaccurate readings due to variability in user technique. The variability of user technique is an issue that does not affect the temperature reading with a continuous tympanic temperature measurement utilizing a 400 series thermistor. This type of tympanic temperature sensor is very accurate when placed into the ear canal and the memory cell foam expands and seals the ear canal off from ambient influences. To determine the reliability of continuous tympanic thermometry using an electronic temperature probe a review of published research studies was conducted.

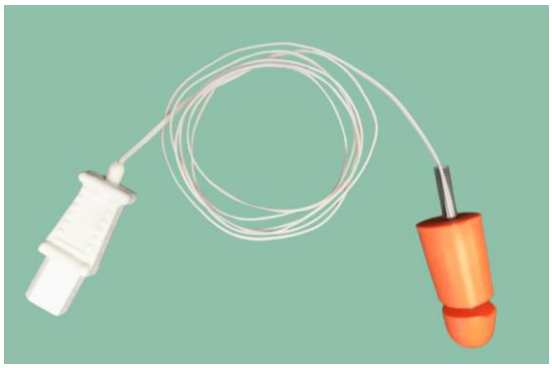
Findings

Prior to common use of a pulmonary arterial catheter to measure pulmonary artery temperature, tympanic membrane temperature was considered a gold standard and often used as the standard to compare other temperature monitoring sites to due to its high accuracy. One of the main temperature comparison studies, still referenced and quoted in Anesthesia textbooks today, used the tympanic membrane temperature as a true value for body core temperature.[1] Tympanic temperature measurement is a safe non-invasive method to monitor core body temperature. Because the tympanic membrane lies very close to the external carotid artery, the temperatures measured with a tympanic temperature sensor closely approximates core body temperature. In 2003, Lenhardt reported that pulmonary artery, tympanic membrane, distal esophageal or nasopharynx temperatures reflect core reliably.[2] Her research states "The tympanic membrane appears to be an almost ideal temperature monitoring site. It is located in close proximity to the brain and is, therefore, likely to reflect brain temperature accurately. Further evidence of the usefulness of the tympanic membrane as an accurate temperature monitoring site comes from a study of anaesthetized subject. In this study, tympanic membrane temperature accurately reflected core temperature, even when the scalp or facial skin was cooled."

Tympanic-membrane temperature has been suggested as the most ideal temperature-monitoring site. Although it is not necessary for the temperature probe to be in direct contact with the tympanic membrane to accurately reflect tympanic temperature, the external auditory canal needs to be sealed by the probe to allow the air column trapped between the probe and the tympanic membrane to reach a steady-state temperature.[3] Webb reported a close correlation was found between esophageal and tympanic membrane temperatures, even with the onset of extracorporeal circulation. He concluded that tympanic membrane temperature is reliable, safe, and clinically useful means of monitoring body temperature. [4]

Solution

We designed the Starboard Medical Tympanic probe so that it will seal off the aural canal.



Yamagishi evaluated this type of design (non-contact self-sealing tympanic probe) and found that when used correctly the tympanic temperature closely resembles esophageal temperature.[5] The Starboard Medical Tympanic temperature sensor is available in adult and pediatric configurations and is easy to insert providing for accurate and reliable temperature readings from ear canal placement.

References

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4. Webb G. Comparison of Esophageal and Tympanic Temperature Monitoring During Cardiopulmonary Bypass, Anesthesia and Analgesia, Vol. 52. No.5 Sept-Oct. 1973
5. Yamagishi A, et al. Usefulness of a noncontact continuous tympanic thermometer in patients undergoing cardiac surgery using an artificial heart-lung machine. Masui 2012, Aug;61(8):896-900

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