VIDEOS IN CLINICAL MEDICINE
SUMMARY POINTS

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Esophageal Temperature Measurement

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The following text summarizes information provided in the video.

OVERVIEW

Hypothermia is defined as a core temperature below 35°C.[1,2] In clinical practice, hypothermia may be encountered in patients who have had accidental exposure to severely cold temperatures while outdoors or in those who require targeted temperature management as part of care after resuscitation or traumatic brain injury. Accurate estimation of the core temperature is necessary to assess the degree of hypothermia and the extent of hyperthermia resulting from heat stroke or malignant hyperthermia and serves as a guide to clinical management.[1,2] In patients with hypothermia who are awake and alert, it is usually sufficient to measure the oral temperature or the epitympanic temperature, which is measured with a thermistor probe. However, in patients with hypothermia who have a reduced level of consciousness and a secured airway, as well as in those who are in cardiac arrest, the method of choice is esophageal temperature measurement, in which the temperature is obtained in the lower third of the esophagus, which provides a measure of core temperature that is similar to that obtained with the more invasive procedure in which the temperature of pulmonary artery blood is measured. The esophagus is accessible and allows minimally invasive placement of the probe.[1,2] This supplement to the accompanying video reviews the indications and contraindications for esophageal temperature measurement as well as the equipment and technique required to perform both blind insertion of a temperature probe and insertion with laryngoscopic control.

ANATOMY

Body temperature is not distributed homogeneously. There is generally a temperature gradient between the colder periphery and the warmer core.[2] The core temperature corresponds to the temperature of the central blood and the deep internal organs, such as the liver. Hypothermia is defined as a drop in core temperature below 35°C. Given the anatomical proximity of the lower esophagus and the left atrium, the temperature in the lower third of the esophagus provides a good estimate of the core temperature (Fig. 1).[1]

INDICATIONS

Assessment of esophageal temperature may be indicated for the diagnosis and staging of moderate and severe accidental hypothermia.[2] The esophageal temperature can be used to monitor the temperature in patients who are receiving treatment for accidental hypothermia and in those who are undergoing therapeutic hypothermia.

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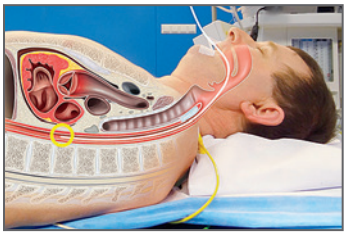

Figure 1. Position of the Esophageal Probe.

The distal tip of the esophageal temperature probe (encircled in yellow) should be placed in the lower third of the esophagus. Given the anatomical proximity of the lower esophagus and the left atrium, the temperature in the lower third of the esophagus provides a good estimate of the core temperature.

CONTRAINDICATIONS

Insertion of the esophageal probe can induce vomiting and aspiration.[2] Therefore, the procedure is contraindicated in conscious patients as well as in unconscious patients with an unsecured airway who are not in cardiac arrest. Since the nasal insertion of a temperature probe may increase the risk of bleeding, oral insertion is preferred.

EQUIPMENT

The equipment recommended to obtain the esophageal temperature includes a flexible temperature-monitoring probe, lubricant, and a properly calibrated thermometer that can register low temperatures accurately. A laryngoscope and angled forceps (often called Magill forceps) should also be at hand. Typically, patients are monitored noninvasively, with electrocardiography, pulse oximetry, and blood-pressure measurement. The equipment needed for cardiopulmonary resuscitation, including a defibrillator, should be readily available. Defibrillator pads should be placed before insertion of an esophageal probe in patients in whom severe hypothermia, defined as a temperature below 28°C, has been diagnosed clinically with the use of field staging or an epitympanic, low-reading thermometer.

PREPARATION

Place the patient's head in a neutral position. Verify that the patient is deeply sedated or paralyzed with muscle relaxants to ensure that the patient cannot bite the operator's finger. The target position of the tip of the probe is the lower third of the esophagus.[1,2] In an adult patient of average size, this corresponds to a distance of approximately 40 cm from the incisors.[3,4] The insertion depth of the esophageal probe can also be determined by laying the probe on the patient. This approach is especially beneficial in patients who are not of average size.[4] If the probe is not marked, mark it with a piece of adhesive tape that will be at the level of the incisors once the probe has been inserted to the appropriate depth. Wash your hands and put on nonsterile gloves. Make sure that all required equipment is ready and that the team is aware of the steps involved in the procedure.

Figure 2. Blind Insertion of the Esophageal Probe.

Insertion of the probe is accomplished by first opening the patient's mouth and depressing the tongue inferiorly with the index finger so the tongue does not hinder insertion. The probe is then inserted into the mouth with the other hand. Once the tip of the probe is in the patient's mouth, the probe is advanced posteriorly and inferiorly toward the esophagus.

PROCEDURE

Begin by lubricating the probe. Among the several techniques that may be used to insert an esophageal probe, the more common are blind insertion and insertion with laryngoscopic control, guided by either a finger or Magill forceps. If a supraglottic device with a suction canal has been used to secure the airway, the suction canal can be used as a conduit for the probe.

To perform blind insertion, open the patient's mouth. With the index finger of one hand, depress the tongue inferiorly so that it does not hinder insertion of the probe. Introduce the probe into the mouth with the other hand. Once the probe tip is in the patient's mouth, direct and advance the probe posteriorly and inferiorly toward the esophagus (Fig. 2). If there is any resistance, do not push forward — simply retract the probe slightly and change its direction. The probe should move forward smoothly. Continue to advance the probe to the desired depth.

If you have difficulty inserting the esophageal probe, several techniques may be useful. A common technique is laryngoscopy, which can be used to insert the esophageal probe under visual guidance (Fig. 3). Laryngoscopy can be used in the first attempt at insertion or after blind insertion has failed. Insert the probe into the esophagus under direct observation. Angled forceps may facilitate the insertion of the probe. Once the probe is in the esophagus, advance it to the desired depth.

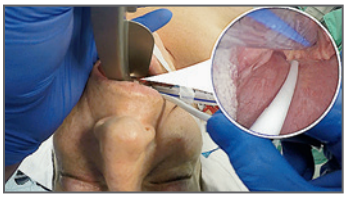

Figure 3. Insertion of the Esophageal Probe with Laryngoscopy.

The probe is inserted under direct visual guidance. The use of angled forceps may facilitate the insertion of the probe into the esophagus. Forceps may be used on the first attempt to insert the probe or after an attempt at blind insertion is unsuccessful.

When the probe has been positioned correctly, secure it with adhesive tape and connect it to the monitor. It may take a few minutes for temperature equilibration to occur. Since the esophageal probe is not easily discerned on chest radiography, the use of imaging is not recommended to confirm the position of the probe.

COMPLICATIONS

Placement of an esophageal temperature probe is rarely associated with complications. Vomiting and aspiration may occur,[2] and the probe may be misplaced in the trachea.

There is a risk of bleeding. The risk can be minimized lubricating the probe generously and by inserting it gently. On very rare occasions, insertion of the esophageal probe in patients with severe hypothermia may provoke arrhythmias and cardiac arrest. It is important to have all the equipment required for resuscitation at hand and to make sure that the team is prepared to address potential complications.

SUMMARY

In patients with hypothermia, measurement of the esophageal temperature is frequently performed to assess the degree of hypothermia and to guide treatment. The probe should be inserted by the oral route with the distal tip placed in the lower third of the esophagus.

No other potential conflict of interest relevant to this article was reported.
Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

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