

Esophageal temperature monitoring during radiofrequency catheter ablation: experimental study based on an agar phantom model

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Abstract

Although previous studies have established the feasibility of monitoring esophageal temperature during radiofrequency cardiac ablation using an esophageal temperature probe (ETP), some questions remain regarding its efficacy. The aims of this study were to study the effect of the location of the ETP on the temperature reached, and to test the characteristics of ETP as used in clinical practice. We constructed an agar phantom to model the thermal and electrical characteristics of the biological tissues (left atrium, esophagus and connective tissue). The ETP was positioned at 6.5 mm from an ablation electrode and at distances of 0, 5, 10, 15, 20 mm from the catheter axis. A thermocouple was located on the probe to measure the actual temperature of the external esophageal layer during the ablations (55 °C, 60 s). The mean temperatures reached at the thermocouple were significantly higher than those measured by the ETP (48.3 ± 1.9 °C versus 39.6 ± 1.1 °C). The temperature values measured with the ETP were significantly lower when the probe was located further from the catheter axis (up to 2.5 °C lower when the distance from the probe–catheter axis was 2 cm). The dynamic calibration of the ETP showed a mean value for the time constant of 8 s. In conclusion, the temperature measured by the ETP always underestimates the temperature reached in the thermocouple. This fact can be explained by the distance gap between the thermocouple and probe and by the dynamic response of the ETP. The longer the distance between the ETP and catheter axis, the higher is the temperature difference.

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