

## Non-contact method of controlling heated area using developed rectangular resonant cavity applicator

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We had already developed a rectangular resonant cavity applicator for heating deep tumors without contact between the human skin surface and the applicator. The basic heating characteristics of the applicator were demonstrated.

In this study, a method for controlling the heated area by providing a pair of inner electrodes with different diameters inside the rectangular resonant cavity for the purpose of effectively heating tumors at various locations is proposed.

A patient is placed in the gap of the inner electrodes and is heated with electromagnetic field patterns which are generated inside the cavity without physical contact between the body surface and the applicator. We conducted heating experiments on applicators having three different inner electrode diameters. In case 1, the diameter of the upper and lower inner electrodes were 50mm, and the object to be heated was set at the center of the gap between these electrodes. In case 2, the upper and lower inner electrode diameters were 90mm and 50mm, respectively. The object was set at the center of the gap between these electrodes. In case 3, in addition to case 2, the object was placed 15mm below the center of the gap and was heated with the lower inner electrode length of 175mm. The heating power was 50W and the heating time was 30 minutes. The thermal images of the sagittal slice of the agar phantom were taken by an infrared thermal camera after 30 minutes of heating. Fig. 1 shows the profiles along the z-direction in the agar phantom. In Fig. 1, the vertical axis represents the normalized temperature increase ( $\Delta T/\Delta T_{max}$ ). From these results, it was found that the heated area could be controlled without physical contact using the proposed rectangular resonant cavity applicator.

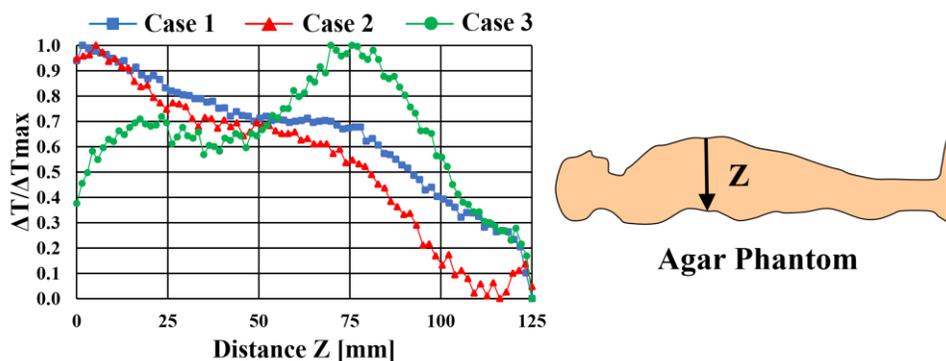


Figure 1. Normalized temperature profile

In this study, it was found that the proposed rectangular resonant cavity applicator system could be useful for effective hyperthermia treatments.