

RESONANCE CIRCUIT FOR IMPLANT HYPERTHERMIA AFFECTED BY RADIOFREQUENCY PULSE OF MAGNETIC RESONANCE IMAGING UNIT

T. Niwa, MD¹, Y. Takemura, PhD², T. Inoue, MD³

- 1) Department of Radiology, Yokohama City University, School of Medicine, Japan
- 2) Department of Electrical and Computer Engineering, Graduate School of Engineering, Yokohama National University, Japan
- 3) Department of Radiology, Bio-functional Medicine, Yokohama City University Graduate School of Medicine, Japan

Purpose

To assess generation of heat of resonance circuit as implant hyperthermia device affected by radiofrequency pulse of magnetic resonance imaging (MRI) unit.

Materials and Methods

The resonance circuit consisting of a closed connection of coil and capacitor was used for heating device. Its resonance frequency was set to 63.9 MHz to react and generate heat by 1.5-T MRI unit. The circuit was placed in the MRI unit with optical thermometer, and temperature rise was monitored during procedure. Standard imaging MRI sequences including fast low angle shot gradient echo (FLASH), T1-weighted image (T1WI), and Half Fourier single shot spin echo (HASTE) were used continuously to produce radiofrequency pulse affecting the resonance circuit. The parameters of MR sequences were set to produce center frequency of magnetic field. Temperature rise on each imaging sequence was monitored for 5 minutes.

Results

The temperature was gradually rose during all MRI sequences. The temperature rise of the resonance circuit ranged from 7.2 to 12.6°C. The highest temperature rise was obtained with HASTE, followed by FLASH, and T1WI.

Conclusion

Resonance circuit affected by radiofrequency pulse of MRI unit may have potential for implant hyperthermia, which may provide low-invasive anticancer therapy as well as simultaneous imaging analysis.