# Dosimetric Result of Magnetic Resonance/Computed Tomography Compatible Hybrid Phantom for Magnetic Resonance Guided Radiotherapy

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**Purpose:**
The purpose of the present study was to develop MR/CT compatible hybrid phantom and tissue-equivalent materials for each MR and CT image.

**Materials and Methods:**
The essential requirements necessary for the development of a MR/CT compatible hybrid phantom was determined and development process was described. A total of 12 different tissue-equivalent materials for each MR and CT image were developed from chemical components. The uniformity of each sample was calculated. The developed phantom was designed to use 14 plugs that contained various tissue-equivalent materials. Measurement using the developed phantom was performed using a 3.0-T scanner with 32 channels and a Somatom Sensation 64. The maximum percentage difference of the SI value on MR images after adding K2CO3 was 3.31%. Additionally, the uniformity of each tissue was evaluated by calculating the %PIU of the MR image, which was 82.18% ±1.87 with 83% acceptance, and the average circular-shaped ROIs on CT images for all samples were within ±5 HU. The maximum percentage difference was 13.23% of kidney for the T2 relaxation time, and the minimum percentage difference was 0.40% of the spinal cord for the T1 relaxation time. Also, dosimetric evaluation was performed.

**Results:**
The percentage differences of each tissue-equivalent sample for average dose was ranged from -0.76% to 0.21%. A hybrid MR/CT compatible hybrid phantom for MR and CT in this field of radiation oncology and medical physics was designed and developed in this study. Our results stated that no considerable effect on MR image was observed due to the use of K2CO3 and modulation of CT images by adding K2CO3 was successfully demonstrated in our study. However, the development of tissue-equivalent materials for MR images requires further research to solve disagreement issue on the T1-T2 relaxation times.

**Conclusions:**
From this study, feasibility of development of tissue-equivalent materials on both CT and MR image, hybrid phantom was confirmed. Thus, the inhomogeneity of MR image for human body and conversion process from MR to CT image with the consideration of non-linear relation between CT and MR is required as a further study.

**Keywords:**
MRgRT, Magnetic Resonance Guided Radiotherapy