ASMRM & ICMRI 2020 November 03 - 04, 2020 Virtual Congress http://2020.ksmrm.org



MR Safety and High Field SY03-1

## Magnet and Gradient Safety

Seung-Kyun Lee

1Biomedical Engineering, Sungkyunkwan University, Suwon, Korea, 2Center for Neuroscience Imaging Research, IBS, Suwon, Korea

Modern MRI scanners employ strong static magnetic fields and high performance (amplitude and slew rate) gradient coils for high-resolution imaging with fast acquisition and enhanced tissue contrasts. In human clinical imaging, 7 tesla scanners have recently obtained regulatory approval for clinical imaging in the head and extremities, while the standard gradient pulse amplitude has steadily increased from around 30 mT/m to 80 mT/m over the past 20 years. Notably, the maximum gradient pulse slew rate has remained relatively unchanged at about 200 T/m/s in the past decade for a whole-body scanner.

The purpose of the talk is two-fold. First, the basic architecture of the MRI magnet and gradient coils are outlined to explain their essential functions and performance constraints. Second, the safety issues related to imaging a human subject in a high-field MRI scanner with high-speed gradient coils are discussed. The issues include human physiological interaction with a strong static magnetic field, peripheral nerve stimulation due to pulsed gradient magnetic fields, and the acoustic noise during fast-acquisition scans. It is emphasized that modern whole-body scanners are operated near the magnet and gradient safety limits in several aspects.

In the last part of the talk I will also mention some of the recent trends and developments in magnet and gradient technologies including new magnet configurations and compact MRI scanners.

Keywords: Magnet, Gradient, Safety