PO-RD-03 Variation in head and trunk staff exposure to magnetic fields in 1.5T interventional MRI

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Résumé

Purpose: Percutaneous procedures, such as thermal ablations or biopsies, are increasingly performed under real-time MRI-guidance. During the interventional MRI procedure, physicians are continuously exposed to electromagnetic fields (EMF) generated by the MRI scanner, during the active MRI-guided insertion as well as during "passive" times such as higher resolution 3D acquisitions or therapy. The European union has suggested electromagnetic field (EMF) threshold values to not be overtaken [1]. These values require EMF assessment methods, thus, in a previous study, EMF exposition variation between head and trunk have been observed in a 3T clinical MRI [2]. We now want to focus on these variations for interventional MRI staff.

Material and method: An in house developed MR *exposimeter* [3] has been designed allowing 3D monitoring of magnetic field, and storage of the information at a 60Hz sampling rate for a complete working day. Two MR *exposimeters* were placed simultaneously on the headband of ear defender and the "thoracic pocket" of two interventional MR radiologists at 1.5T. Physicians were monitored during two tumor cryo-ablations that lasted about 3 hours each. Magnetic field normalized vector is used to compare MR exposure. Exposure curves and comparative measurements were performed: mean, peak and cumulative (time integration) assessment of magnetic field (B) and time derivative magnetic field (dB/dt).

Results: Comparison of head and trunk exposures are shown in Table 1. Higher peak exposure is seen for the head (red curves) than for the trunk during active needle insertion, while during wait times higher trunk exposure is measured. Overall, a higher mean of exposure is found for trunk than for head.

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Conclusion and discussion: In this study, as expected and shown in 3T [2], the head is exposed to greater magnetic field during staff motion in the vicinity of the bore. Indeed during needle introduction, the radiologist bends inside the bore leading to higher head exposure peaks. While during wait times when physician stand next to the bore, their trunk is directly inside magnetic field lines explaining its higher exposition compared to the head. These wait times are specific to the interventional MRI staff compared to clinical MRI staff that directly leaves the room after patient setup. Therefore, global exposure (mean and cumulative values) measured for the trunk is higher in interventional MRI when the opposite tendency was found in 3T clinical staff [2]. These tendencies are expected to vary with physician height and posture. This is why monitoring both head and trunk magnetic field exposures seems better than a unique trunk assessment. Indeed ear defenders wore by staff during interventional MRI appears as an optimal support for head MR *exposimeter* devices.

Mots-Clés: MRI workers exposure, static magnetic field measurement, 2013/35/UE