

## SAFETY OF MAGNETIC RESONANCE IMAGING IN PATIENTS WITH IMPLANTED SACRAL NEUROMODULATION SYSTEMS

### Hypothesis / aims of study

Sacral neuromodulation (SNM) is an important treatment modality in a variety of refractory lower urinary tract and bowel dysfunctions. SNM implants are widely considered to be a contraindication for magnetic resonance imaging (MRI), despite an encouraging preliminary clinical study (1).

We therefore investigated, in an anatomically appropriate test object, temperature rises and neuromodulation parameter changes produced during MRI with a SNM system.

### Study design, materials and methods

A neuromodulator (InterStim<sup>®</sup> Model 3023, Medtronic) and quadripolar tined lead (Model 3093, Medtronic) were positioned on an artificial pelvis immersed in an aqueous gel with electrical and thermal characteristics similar to human tissue. MRI was performed using a Siemens 3Tesla Tim Trio VB15 system. Temperature was measured continuously at 4 positions (electrode 0 and 1, neuromodulator case, and a reference position). The number of slices was increased to achieve a scanner-reported whole-body specific absorption rate (SAR)  $\approx 2\text{W/kg}$ . All experiments were performed with the neuromodulator amplitude set to 0V and the output set at OFF.

### Results

Scanner-reported SAR varied widely with bed position (SAR 0-1.4W/kg), as did the concomitant maximum temperature rises ( $\Delta T$ s 0.1-0.7°C). For the acquisition centred on the head position,  $\Delta T$ s were  $< 0.1^\circ\text{C}$ . At other positions,  $\Delta T$  was greatest at the most distal electrode contact (i.e. electrode 0), while  $\Delta T$ s at the neuromodulator were relatively small.  $\Delta T$ s at the reference position was always  $\leq 0.2^\circ\text{C}$ . Maximum  $\Delta T$  at any position for SARs  $\approx 2\text{W/kg}$  was  $1.7^\circ\text{C}$ . On repeating the prescans in the same phantom with the implant removed the scanner-reported SARs changed by  $\leq 1\%$ . Neuromodulation parameters before and after MRI remained largely unchanged.

### Interpretation of results

For the acquisition centred on the head position, temperature rises were minimal. However, wide variation of both scanner-reported SAR and  $\Delta T$  for other positions were found.

### Concluding message

In SNM patients, SAR-restricted MRI of the brain seems to be safe but further investigations are required for other body regions.

### References

1. Elkelini MS, Hassouna MM. Safety of MRI at 1.5Tesla in patients with implanted sacral nerve neurostimulator. Eur Urol 2006;50:311-6.

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*Is this a clinical trial?*

No

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*What were the subjects in the study?*

NONE

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