MR Safety case study

IMPROVING MR SAFETY FOR NEUROMODULATION

Neuromodulation as a treatment for pain syndromes, epilepsy, movement disorders and more has become more widespread over the last decade. Development includes new classes of device (figure 1) and treatment, MR safety enhancements and advances in the methods for assessing MR safety. The result is a wide variety of devices, with differing susceptibilities to the MR Environment. Patients may also have an increased need for diagnostic MRI, e.g. patients with chronic pain due to spinal disease may require additional spinal MRI to monitor disease progression or complications. It is important not to deny access to MRI for any clinically relevant indication (related or not to the past medical history) where it can be performed practically and safely.
Patients and referrers may have an incomplete understanding of MR safety, and it is important to communicate reasons for not scanning or reduced availability of diagnostic information.

Involving the clinical team

- Patients and implanting clinicians benefit from an understanding of any limitations to MR access
- The clinical team is a key point of access when determining device information and configuration (e.g. implant location, accessories) when protocolling an examination
- Device manufacturers can provide technical support as well as information on new products before they are implanted. They can also alert the department to changes in conditions.

A standard operating procedure

Due to the variety of devices, no single protocol is acceptable. Instead, the key is to robustly identify a device and its associated conditions, and provide clear instructions on how to meet those conditions. The development of such a procedure requires involvement of an MRSE or other person knowledgeable on MR safety. A core team should vet and perform these examinations. The following describes a procedure used at the author's institution.

Booking: Booking staff identify the presence of a device from the request, RIS alert or through patient contact. If a device is present, the clinical team are contacted and asked to return full details via a standard pro forma. If a device test or aftercare is needed, then a neuromodulation clinic appointment is booked to coincide.

Protcolling: A radiologist protocols the examination with reference to the manufacturer's documentation or for the most commonly seen devices, an in-house (regularly updated) device specific protocol form, and selects a protocol which meets the conditions.

Examination: The radiographer follows a device specific checklist, which provides a point-by-point procedure for the device which includes patient preparation and positioning; technical parameters e.g. B0, SAR, dB/dT, dB/dx; and aftercare. Scanners are pre-programmed with sequences tested for specific MR conditions (e.g. $B1_+$rms limits, local Tx/Rx coils), avoiding the need for ad hoc parameter changes.

A pain physician wished to start using a new peripheral nerve stimulation device, which boasted conditions permitting full body MRI at 1.5T and 3T. He approached the MRI department for clarification.

The manufacturer provided the conditions, which were complex with exclusions and severe limitations when scanning near the stimulator. The conditions were severely limiting at 1.5T and unachievable at 3T.

The physician was able to use this information to inform treatment options and obtain informed consent.

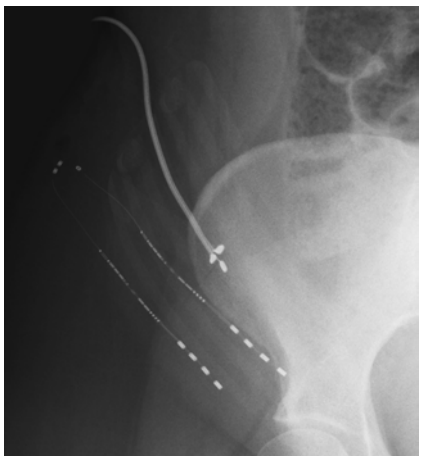

Figure 1 – Peripheral nerve stimulators have often not included MR conditions for scanning near the device. Newer devices (such as that shown) may correct this omission, but the conditions can be complex.

The British Institute of Radiology
48-50 St John Street
London
EC1M 4DG

T : +44(0)20 3668 2220
E : admin@bir.org.uk

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