Magnetic resonance imaging in deep brain stimulation

Many centers are hesitant to perform clinically indicated MRI in patients who have undergone deep brain stimulation (DBS). Highly restrictive guidelines prohibit the use of most routine clinical MRI protocols in these patients.

Boutet et al. goals were to assess the safety of spine magnetic resonance imaging in patients with implanted DBS devices, first through phantom model testing and subsequently through validation in a DBS patient cohort.

A phantom was used to assess DBS device heating during 1.5-T spine MRI. To establish a safe spine protocol, routinely used clinical sequences deemed unsafe (a rise in temperature > 2°C) were modified to decrease the rise in temperature. This safe phantom-based protocol was then used to prospectively run 67 spine MRI sequences in 9 DBS participants requiring clinical imaging. The primary outcome was acute adverse effects; secondary outcomes included long-term adverse clinical effects, acute findings on brain MRI, and device impedance stability.

The increases in temperature were highest when scanning the cervical spine and lowest when scanning the lumbar spine. A temperature rise < 2°C was achieved when 3D sequences were modified to 2D and when the number of slices was decreased by the minimum amount compared to routine spine MRI protocols (but there were still more slices than allowed by vendor guidelines). Following spine MRI, no acute or long-term adverse effects or acute findings on brain MR images were detected. Device impedances remained stable.

Patients with DBS devices may safely undergo spine MRI with a fewer number of slices compared to those used in routine clinical protocols. Safety data acquisition may allow protocols outside vendor guidelines with a maximized number of slices, reducing the need for radiologist supervision.Clinical trial registration no.: NCT03753945 (ClinicalTrials.gov)¹⁾.

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Boutet A, Elias GJB, Gramer R, Neudorfer C, Germann J, Naheed A, Bennett N, Li B, Gwun D, Chow CT, Maciel R, Valencia A, Fasano A, Munhoz RP, Foltz W, Mikulis D, Hancu I, Kalia SK, Hodaie M, Kucharczyk W, Lozano AM. Safety assessment of spine MRI in deep brain stimulation patients. J Neurosurg Spine. 2020 Feb 14:1-11. doi: 10.3171/2019.12.SPINE191241. [Epub ahead of print] PubMed PMID: 32059193.

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