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Experience with MRI safety and DBS: Data from the National Parkinson Foundation Centers of Excellence

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OBJECTIVE

- To survey safety of MRI in PD patients implanted with DBS devices.

BACKGROUND

MRI in patients with DBS implants is useful:

- To confirm DBS electrode placement.
 - To optimize programming and investigating complications.
- However, several medical centers do not perform MRI studies in DBS because of safety concerns
 - The safety profile of MRI in patients with implanted DBS devices has not been well documented in large clinical series

METHODS

42 NPF Centers of Excellence (COEs) were asked to complete a questionnaire on MRI use and DBS.

QUESTIONNAIRE

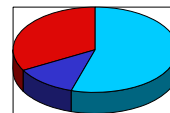
- Does your center perform MRI on patients who have implanted Deep Brain Stimulation (DBS) devices?
- If the answer to question #1 is YES, please indicate whether:
 - The center that performs the MRI is: a: Private hospital/ b: University hospital/ c: Independent MRI facility/ d: a & b/ e: b & c
 - The center performs: a. Brain MRI?/ b. MRI of other body parts?
- Do you use a specific MRI protocol for DBS patients?
- Please indicate the technical features of your MRI scanner:
- How many DBS patients have your center scanned?
- Did your center observe any complication(s) attributable to MRI scan(s)?
- Do you feel that it is safe to perform post-operative MRI on your DBS patients?
- Would you do post-operative MRI in the following scenarios (with a DBS patient)?
 - No transmit-receive head coil
 - An abnormally implanted impulse generator-or an impulse generator below the usual subclavicular location
 - If the MRI machine has not been inspected to meet Medtronic recommended safety specifications
- Do you follow the following procedure before MRI? If not, please explain.
 - Set the amplitude parameter to 0.0
 - Check the impedance and current for continuity
 - Turn the stimulator OFF
 - Obtain a consent form from the patient

RESULTS

- Investigators from 40 of 42 (95%) NPF COEs completed the survey
- 26/40 centers (65%) reported that they perform MRI in DBS patients



University Hospitals
Private Hospitals
Independent MRI facilities
No MRI



Brain MRI
Body MRI
No MRI

- * 17/40 centers (42%) not performing MRI for DBS listed the reasons for not using post-operative imaging as:
- Industry guidelines and/or warnings (53%)
 - Defer clinical decision to outside department (29%)
 - Liability/risk/safety (18%)
 - No active DBS program (18%)
 - No available MRI (12%)
 - Concerns about insurance and reimbursement (6%)

MRI protocol used for DBS patients

a) T1-FLAIR	4
b) T1-mprage (Siemens)	11
c) T1-3d fast SPGR (GE)	8
d) T1-3d_tfe (Phillips)	2
e) T2-FLAIR	9
f) T2 TSE	13
g) T2 inversion	4
h) FLAIR	8
i) Fast Spin Echo/Inversion Recovery	7
j) Other	8

Manufacturer	TESLA
GE: 12	1.0: 1
Siemens: 9	1.5: 25
Phillips: 1	
Multiple: 6	
GE & Phillips: 2	
GE & Siemens: 4	

RESULTS: COMPLICATIONS

- A total of 3,304 PD patients with one or more DBS leads had a brain MRI scan, and 177 DBS patients had MRI of other body regions.
- In one case MRI was associated with an IPG failure with no neurological sequelae after IPG replacement.
- No other complications have been reported.

RESULTS: CASE SCENARIOS

Would you do post-operative MRI in the following scenarios (with a DBS patient)?

- No transmit-receive head coil (n=24 responses)
YES: 3 NO: 20
- An abnormally implanted impulse generator-or an impulse generator below the usual subclavicular location (n=24)
YES: 19 NO: 4 Not sure: 1
- If the MRI machine has not been inspected to meet Medtronic recommended safety specifications (n=24)
YES: 8 NO: 15

Do you follow the following procedure before MRI?

- Set the amplitude parameter to 0.0 (n=24)
YES: 22 NO: 1
- Check the impedance and current for continuity (n=24)
YES: 18 NO: 6
- Turn the stimulator OFF (n=24)
YES: 24 NO: 0
- Obtain a consent form from the patient (n=24)
YES: 13 NO: 11

CONCLUSIONS

These data suggest that a favorable risk/benefit ratio for brain MRI in patients with DBS implants.

We suggest that the current safety guidelines be re-examined given this large and positive experience.