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MEDICINE

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

Michele Tagliati, Joseph Jankovic, Adam M. Koss, Fernando Pagan, Michael S. Okun  
and the National Parkinson Foundation DBS Working Group



## 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

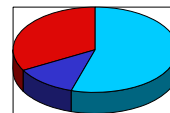
- Does your center perform MRI on patients who have implanted Deep Brain Stimulation (DBS) devices?
- If the answer to question #1 is YES, please indicate whether:
  - The center that performs the MRI is: a: Private hospital/ b: University hospital/ c: Independent MRI facility/ d: a & b/ e: b & c
  - 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.