

Subthalamic Deep Brain Stimulation for Parkinson's Disease— An Unexpected Encounter in the Lead Trajectory

Dear Sir,

Deep brain stimulation (DBS) is currently the standard of care for patients with Parkinson's disease (PD) experiencing motor complications.^[1] The subthalamic nucleus (STN) is the most widely used target for DBS in PD.^[2] We present an interesting case of successful bilateral STN-DBS surgery for PD, in a patient in whom a brain lesion was incidentally detected close to the trajectory.

A 51-year-old gentleman with advanced PD of 11 years duration, with motor fluctuations and dyskinesias, was referred to us for considering DBS. The symptoms had started on the left side and became bilateral over the years. He was found suitable and was selected for bilateral STN DBS. In the preoperative magnetic resonance imaging (MRI), an incidental well-defined rounded non-enhancing lesion

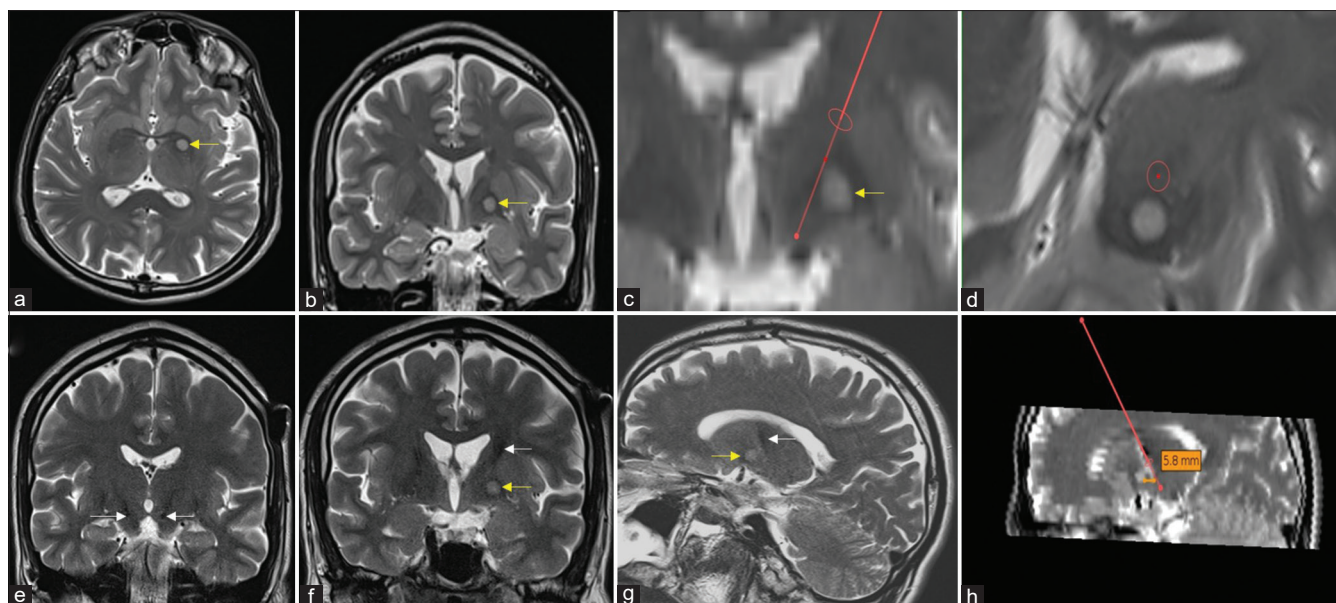


Figure 1: (a) Hyperintense lesion in axial and (b) coronal pre-DBS T2-MRI at left GP. (c) Planned trajectory abutting the lesion (d) planned trajectory in probe's eye view, (e) Post-operative MRI showing, STN tip in the subthalamic area (f) 2-year follow-up scan highlighting trajectory of the DBS lead (white arrow) and the lesion (yellow arrow) (g) T2-sag MRI at 2-year follow-up highlighting stable lesion size and lead trajectory, (h) sagittal plane showing the distance between the final lead trajectory and GP lesion margin

which was isointense in T1 and hyperintense in T2 and FLAIR sequences was detected in the left globus pallidus (GP) [Figure 1a and b]. The lesion did not show restricted diffusion or blooming in susceptibility-weighted sequences. The lesion was abutting the planned lead trajectory [Figure 1c and d]. The distance between the initial planned trajectory and the GP lesion margin was 1.2 mm with trajectory traversing the mid sagittal plane at 26° and the axial plane at 50° . It was decided to go ahead with surgery, after modifying the trajectory, considering the benign appearance of the lesion on MR imaging.

A different trajectory was planned, avoiding the lesion at a distance of 5.8 mm and the trajectory traversing the mid-sagittal plane at 30° and the axial plane at 57.7° . He underwent bilateral STN-DBS under MR-based stereotactic guidance, 5-channel microelectrode recording, and macrostimulation with clinical monitoring for benefits and adverse effects. There were no perioperative complications, and the patient reported improvement in his symptoms following programming. Post-operative MRI brain showed satisfactory placement of the DBS lead tips bilaterally in the STN [Figure 1e], with the left-sided lead traversing close to the lesion [Video 1]. Serial MR imaging studies done at 6 months and 2-year follow-up visits did not show any interval increase in the size of the lesion [Figure 1f and g]. The patient continues to have benefits in motor symptoms.

STN is a lens-shaped diencephalic structure located ventral to the thalamus, playing a fundamental role in the basal ganglia circuits. STN is located approximately 10 to 12 mm lateral, 1–4 mm posterior, and 4–5 mm inferior to

the mid-commissural point. It is obliquely located in the subthalamic area, and therefore, the trajectory should ideally have a mediolateral angle of around 15 degrees from the sagittal plane and an anteroposterior angle of 60 degrees from the anterior commissure-posterior commissure plane for getting the longest track of microelectrode recording and optimal placement of lead contacts in the motor part of the nucleus. At the same time, the sulci, blood vessels, and ventricles should also be avoided. Trajectory planning based on MRI fusion is a safe technique for lead placement.^[3]

The GP lesion in the present case was abutting the ideal trajectory, and hence, it had to be modified to ensure an adequate safe margin from the lesion. The radiological features including the well-rounded appearance, non-enhancement, and absence of restricted diffusion or blooming suggested a low-grade neoplasm. The patient had a 11-year history of typical levodopa-responsive Parkinsonism with the left-sided onset and bilateral signs, motor fluctuations, and dyskinesias at the time of presentation to us, clearly indicating that the left pallidal lesion was an incidentally detected one. This is a rare situation, and hence, there are no specific guidelines as to whether a patient can be taken up for DBS surgery in such a scenario, with an incidental lesion close to trajectory. The increasing size of the lesion later can lead to impingement on the lead, traction, or displacement from the target. However, given the benign radiological characteristics, we felt that the chances for these were low and we did not consider the presence of this lesion as a contraindication for DBS. We proceeded with surgery with a slightly modified target keeping a safe margin of 5.8 mm from the lesion [Figure 1g and h]. Our patient had significant motor improvement which persisted at

his last follow-up, 2 years after surgery. We kept him under radiological follow-up with imaging studies every 6 months as usually recommended for such incidentally detected lesions.^[4] No increase in size or change in signal characteristics was noted during the follow-up scans in our patient confirming that the lesion was benign.

There are reports of successful DBS in challenging medical co-morbidities like hemophilia, increasing the surgical risks.^[5] However, we did not find any other reports of incidentally detected tumors or other lesions close to the lead trajectory, interfering with the surgical technique. With the increasing number of DBS surgeries done globally, such unexpected encounters are likely to be happening occasionally and decisions in an individual case should depend on the neurological diagnosis, location, and radiological characteristics of the lesion.

Incidental low-grade neoplasms near lead trajectory are not a contraindication for DBS planned for neurological indications and the patients should not be denied the benefit of surgery.

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Declaration of patient consent

The authors confirm that the approval of the institutional review board was not required for this work. Written informed consent was taken from the patient. We confirm that we have read the journal's position on issues involved in ethical publication and affirm that this work is consistent with those guidelines.

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Conflicts of interest

There are no conflicts of interest.

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