Subthalamic stimulation or subthalamic lesion for Parkinson's disease? A case report

Anheim, Mathieu; Dowsey-Limousin, Patricia; Krack, Paul; Chabardes, Stephan; Benabid, Alim-Louis; Pollak, Pierre

How to cite

ANHEIM, Mathieu et al. Subthalamic stimulation or subthalamic lesion for Parkinson's disease? A case report. In: Parkinsonism & related disorders, 2015, vol. 21, n° 12, p. 1485–1487. doi: 10.1016/j.parkreldis.2015.10.015

This publication URL: https://archive-ouverte.unige.ch/unige:95948
Publication DOI: 10.1016/j.parkreldis.2015.10.015

Parkinsonism and Related Disorders 21 (2015) 1485–1487

Contents lists available at ScienceDirect

Parkinsonism and Related Disorders

journal homepage: www.elsevier.com/locate/parkreldis

Correspondence

Subthalamic stimulation or subthalamic lesion for Parkinson's disease ? A case report

Keywords:
Parkinson's disease
Subthalamic nucleus chronic stimulation
Subthalamotomy

Video is part of the manuscript. The subject gave consent for the study and to be videoed for publication. The patient gave written informed consent and local ethics committee approved the study.

Efficacy of bilateral subthalamic nucleus (STN) deep brain stimulation (DBS) in Parkinson's disease (PD) is well recognized [1]. Subthalamotomy has also shown to be effective in treatment of PD [1–4]. We report on the case of a 43-year-old woman affected for 21 years with parkin-linked PD. She had an excellent peak-dose levodopa-response, but suffered from severely disabling diphasic dyskinesias. Levodopa equivalent daily-dose before surgery was 1650 mg per day. UPDRS III score was 60/108 in off-medication and 2/108 in on-medication conditions (Video 1, segments 1–4, legend is available as an esupp file).

Supplementary data related to this article can be found online at http://dx.doi.org/10.1016/j.parkreldis.2015.10.015.

Bilateral STN electrodes were implanted in 1997 according to previously published method [5]. In the first patients operated on in our center we routinely performed in the department of neurology external stimulation with the Accupulser Signal Generator A310 from World Precision Instruments. It was a constant current stimulator used a few days after the implantation of the electrodes to check the correct electrode placement before eventually implanting the neurostimulator. In this patient however, instead of 130 Hz pulses, continuous current was erroneously delivered due to a technical defect of the external pulse generator. Amplitude was increased for each contact starting with the lower contacts up to appearance of adverse effects related to the diffusion of the current outside the STN or up to the disappearance of rigidity. The maximal current delivered was 3 mA for the two upper contacts for several minutes, leading to disappearance of tremor, rigidity and akinesia and to appearance of first mild dyskinesias and then over the following hours progressively worsening choreic dyskinesia, up to severe biballism. The patient could not lie in a bed without being held by four people and her mattress was posed on the floor in order to avoid ballism-induced injuries. All dopaminergic drugs were stopped. The patient had to be treated with haloperidol for 15 days. These clinical findings were strongly suggestive of bilateral STN lesions. Bain MRI indeed revealed bilateral signal abnormalities in the subthalamic area compatible with bilateral subthalamotomy (Fig. 1). Within two weeks of neuroleptic treatment the dyskinesias gradually disappeared and haloperidol could be stopped. As parkinsonism remained markedly improved, the patient did require neither implantation of a neurostimulator nor dopaminergic treatment.

During 1 year the patient was almost free of signs with only low doses of cabergoline (no dyskinesia, UPDRS III 2/108 in off-medication condition) (Video, segment 4, Table 1, legend is available as an esupp file). Then, parkinsonism progressively reappeared requiring higher doses of cabergoline. Disabling motor symptoms appeared after 2 more years including a marked worsening of tremor and a reoccurrence of slight dyskinesias (Table 1). Finally, in 2000, three years after the subthalamotomy, a neurostimulator (Itrel II, Medtronic°) was implanted bilaterally and electrical parameters were adjusted for STN DBS which was highly effective.

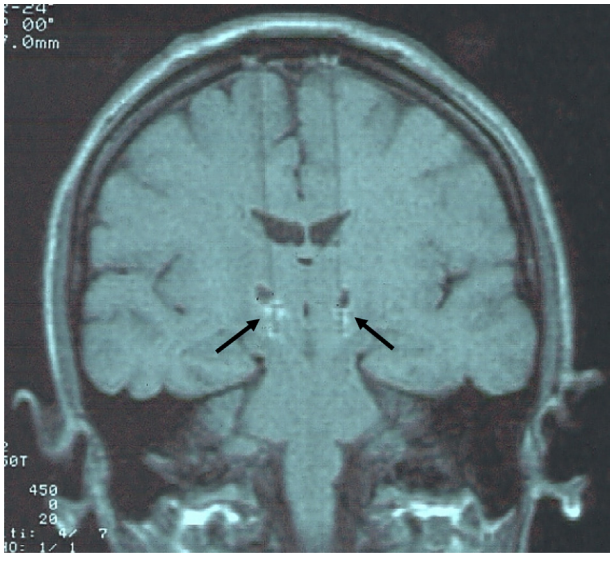

Fig. 1. T2-weighted magnetic resonance imaging coronal view following external stimulation. Lesions in each subthalamic nucleus areas (black arrows) are consistent with bilateral subthalamotomy.

http://dx.doi.org/10.1016/j.parkreldis.2015.10.015

Table 1
Clinical outcome of the patient.

	Baseline prior subthala-motomy	1 year	2 years	3 years	4 years (1 year post-STN stim)	5 years (2 years post-STN stim)	6 years (3 years post-STN stim)
UPDRS III off-med	60	2	10	49	3 on-stim	3 on-stim	3 on-stim
UPDRS III on-med	2	0	0	4	2 on-stim	2 on-stim	2 on-stim
Tremor off-med/on-med (items 20 + 21 UPDRS III)	22/0	3.5/0	8/0	15.5/0	off-med off-stim: 6 off-med on-stim: 0 on-med off-stim: 0 on-med on-stim: 0	off-med off-stim: NA off-med on-stim: 0 on-med off-stim: 0 on-med on-stim: 0	off-med off-stim: NA off-med on-stim: 0 on-med off-stim: 0 on-med on-stim: 0
Dyskinesia (items 32/33 UPDRS IV)	1/4	0/0	0/0	0/0	0/0	0/0	0/0
Dyskinesia Marconi Scale (off-med/onset of dose/ peak dose/end of dose	1.5/5/1/26	0/3.5/0/ND	2/2/1/ND	3/4/2/ND	off-med off-stim: 3 off-med on-stim: 2 on-med off-stim onset of dose: 1 on-med on-stim peak dose: 1	on-med on-stim: 0	on-med on-stim: 0
levodopa (mg)	1200	0	150	150	0	0	0
cabergoline (mg)	4.5	1	3	3	6	4	4
ropinirole (mg)	0	0	0	0	0	10	10
STN stimulation parameters (V/Hz/μsec)	–	–	–	R: 2.5/60/145 L: 3/60/160	R: 2.5/60/145 L: 3/60/160	R: 2.5/60/145 L: 3/60/160	R: 2.5/60/145 L: 3/60/160

UPRDS III score remained below 3/108 for the following 3 years (Table 1). Cabergoline was increased because of moderate apathy without appearance of dyskinesias. The marked efficacy of STN chronic stimulation was well-tolerated and long-lasting. Intraoperative stereotactic coordinates of the two electrode contacts used for chronic stimulation corresponded to average location of effective STN DBS according to the surgical technique and electrode locations previously published [5] Table 1.

Biballism is a well-known and mostly transient side effect of bilateral subthalamotomy although in some patients additional pallidotomy was required because of long lasting, disabling dyskinesias [2]. STN chronic stimulation is costly and may require frequent adjustments. Nevertheless, subthalamotomy is presently rarely performed, because of potential irreversible adverse effects in case of misplaced lesions in a strategic area. There are no studies comparing STN stimulation with STN lesion. The present case report is valuable as it allows comparing the effect of each method in the same patient with a relatively long follow-up. The benefits of subthalamotomy have been reported to persist for a follow-up of 3–6 years [2]. Some loss of benefit over time however has been noted in a subpopulation [2] whereas the benefit was maintained up to 24 months in some patients [4] while long-term STN stimulation efficacy with stable effect on tremor and rigidity has been reported with a follow-up of 5–10 years [1]. STN stimulation is a reversible and adaptable treatment and the stimulation of each STN can be separately adjusted over time, which is not possible with subthalamotomy. However, despite long-term efficacy of surgical therapies for PD, there is a progressive worsening of the disease inevitably leading to disability in the very long term related to disease progression (worsening of akinesia, postural instability, dysarthria and swallowing difficulties, cognitive deterioration) following both STN stimulation and STN lesion [1].

This case report illustrates potential problems of a subthalamic lesion (irreversible, severe ballism, transient benefit) and potential advantages of the stimulation procedure (adjustable over time allowing for long-lasting effect). Indeed, DBS allows decreasing stimulation parameters in case of appearance of dyskinesias or side effects and on the other hand the stimulation parameters may be increased over time, if there is a decrease of efficacy of STN DBS on levodopa-sensitive symptoms.

Outcome of off-medication UPDRS III score, on-medication UPDRS III score, tremor score of UPDRS III (item 20 + 21, maximal total score 28), dyskinesia UPDRS IV score (items 32 and 33, scoring up to 4 each), dyskinesia Marconi's scale (maximal score 28), and levodopa equivalent daily-dose at baseline just prior the subthalamotomy and 1, 2, 3 (just prior the STN DBS), 4, 5 and 6 years following baseline. off-med: off-medication condition; on-med: on-medication condition; STT: subthalamotomy; stim: stimulation, R: right; L: left; V: volt; Hz: Herz; μsec: microsecond.

Conflicts of interest

All the authors have no conflict of interest and no particular funding source to disclose.

References

[1] M.C. Rodriguez-Oroz, E. Moro, P. Krack, Long-term outcomes of surgical therapies for Parkinson's disease, Mov. Disord. 27 (14) (2012 Dec) 1718–1728.
[2] L. Alvarez, R. Macias, G. Lopez, E. Alvarez, N. Pavon, M.C. Rodriguez-Oroz, J.L. Juncos, C. Maragoto, J. Guridi, I. Litvan, E.S. Tolosa, W. Koller, J. Vitek, M.R. DeLong, J.A. Obeso, Bilateral subthalamotomy in Parkinson's disease: initial and long-term response, Brain 128 (Pt 3) (2005) 570–583.
[3] S.S. Gill, P. Heywood, Bilateral dorsolateral subthalamotomy for advanced Parkinson's disease, Lancet 350 (9086) (1997) 1224.
[4] N.K. Patel, P. Heywood, K. O'Sullivan, R. McCarter, S. Love, S.S. Gill, Unilateral subthalamotomy in the treatment of Parkinson's disease, Brain 126 (Pt 5) (2003) 1136–1145.
[5] A.L. Benabid, A. Koudsie, A. Benazzouz, J.F. Le Bas, P. Pollak, Imaging of subthalamic nucleus and ventralis intermedius of the thalamus, Mov. Disord. 17 (suppl. 3) (2002) S123–S129.

Mathieu Anheim*[1], Patricia Dowsey-Limousin[2], Paul Krack
Movement Disorder Unit, CHU de Grenoble, Grenoble Universités, France

INSERM, U836, Grenoble Institut des Neurosciences, Grenoble, France

Stéphan Chabardès, Alim-Louis Benabid[3]
INSERM, U836, Grenoble Institut des Neurosciences, Grenoble, France

Department of Neurosurgery, CHU de Grenoble, Grenoble Universités, France

Pierre Pollak[4]
Movement Disorder Unit, CHU de Grenoble, Grenoble Universités, France

INSERM, U836, Grenoble Institut des Neurosciences, Grenoble, France

[*] Corresponding author. Present address: Service de Neurologie, Hôpitaux Universitaires de Strasbourg1, avenue Molière 67098, Strasbourg, France.
E-mail address: mathieu.anheim@chru-strasbourg.fr (M. Anheim).

23 April 2015

[1] Present address: Department of Neurology, University Hospital of Strasbourg, Fédération de Médecine Translationnelle de Strasbourg (FMTS), France.
[2] Present address: Sobell Department for Motor Neuroscience and Movement Disorders, Institute of Neurology and National Hospital for Neurology and Neurosurgery, London, UK.
[3] Present address: Clinatec, LETI-Minatec; CEA-Grenoble, 17 avenue des Martyrs, 38054 Grenoble, France.
[4] Present address: Department of Neurology, University Hospital of Geneva, Switzerland.