PAPER

Different patterns of medication change after subthalamic or pallidal stimulation for Parkinson's disease: target related effect or selection bias?

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Background: Bilateral subthalamic nucleus (STN) deep brain stimulation (DBS) is favoured over bilateral globus pallidus internus (Gpi) DBS for symptomatic treatment of advanced Parkinson's disease (PD) due to the possibility of reducing medication, despite lack of definitive comparative evidence.
Objective: To analyse outcomes after one year of bilateral Gpi or STN DBS, with consideration of influence of selection bias on the pattern of postsurgical medication change.
Methods: The first patients to undergo bilateral Gpi (n = 10) or STN (n = 10) DBS at our centre were studied. They were assessed presurgically and one year after surgery (CAPIT protocol).
Results: Before surgery the Gpi DBS group had more dyskinesias and received lower doses of medication. At one year, mean reduction in UPDRS off medication score was 35% and 39% in the Gpi and STN groups, respectively (non-significant difference). Dyskinesias reduced in proportion to presurgical severity. The levodopa equivalent dose was significantly reduced only in the STN group (24%). This study highlights the absence of significant differences between the groups in clinical scales and medication dose at one year. In the multivariate analysis of predictive factors for off-state motor improvement, the presurgical levodopa equivalent dose showed a direct relation in the STN and an inverse relation in the Gpi group.
Conclusion: Differences in the patterns of medication change after Gpi and STN DBS may be partly due to a patient selection bias. Both procedures may be equally useful for different subgroups of patients with advanced PD, Gpi DBS especially for patients with lower threshold for dyskinesia.

Bilateral deep brain stimulation (DBS) in the subthalamic nucleus (STN) or globus pallidus internus (Gpi) is currently used for the symptomatic treatment of advanced Parkinson's disease (PD). Although there has been no definitive clinical demonstration that one approach is superior to the other, STN DBS is increasingly widely used and has become the procedure of choice at many centres. This preference is based on its supposed superiority in improving motor manifestations of the disease, permitting a major reduction in the dosage of antiparkinsonian medication.[1–5] However, we should be cautious about ruling out Gpi DBS as a treatment option. In fact, Gpi DBS has also proved to be an effective procedure and the differences with STN DBS have not been definitively established.[6 7] Only randomised studies with adequate patient samples and long term follow up will eventually determine the superiority of one target over the other in the treatment of advanced PD.

Part of the appeal of STN DBS is undoubtedly the possibility of reducing or even suspending antiparkinsonian medication, which is not normally possible with Gpi DBS.[1–5] This advantage is consistently reported in the literature, although it has not been established whether this difference results from the superiority of the STN target or is at least partly due to a possible bias in the selection or postoperative management of the patients.

Our objective was to analyse the results at one year of follow up of bilateral Gpi and STN DBS in two cohorts of patients with advanced PD, with consideration of the influence of selection bias on the difference in the patterns of medication change after the surgery.

METHODS

Patients

In 1995, an open prospective study began at our centre to evaluate the results of DBS in patients with advanced PD. The inclusion criteria for surgery were: (*a*) diagnosis of idiopathic PD according to the core assessment program for intracerebral transplantations (CAPIT) protocol[8]; (*b*) age between 35 and 75 years; (*c*) a history of the disease for more than five years; (*d*) presence of motor complications (motor fluctuations and/or dyskinesias) causing functional disability and not satisfactorily controlled by pharmacological treatment; and (*e*) levodopa test with an improvement of at least 33% in part III (motor subscale) of the Unified Parkinson's Disease Rating Scale (UPDRS). The exclusion criteria were: (*a*) presence of other diseases with poor medium term survival or functional prognosis, or those that increased the surgical risk; (*b*) dementia or severe cognitive impairment; (*c*) major psychiatric comorbidity such as severe depression or active psychosis; (*d*) any other condition compromising the patient's ability to provide freely given informed consent or to cooperate during surgery or postoperative management; and (*e*) need for heart pacemaker or presence of any other contraindication for neurostimulation. All patients gave their written informed consent.

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Abbreviations: CAPIT, core assessment program for intracerebral transplantations; CT, computed tomography; DBS, deep brain stimulation; Gpi, globus pallidus internus; MR, magnetic resonance; PD, Parkinson's disease; STN, subthalamic nucleus; UPDRS, Unified Parkinson's Disease Rating Scale

Initially, patients were not assigned to bilateral Gpi or STN DBS according to predefined criteria. The selection of the target was influenced by the availability of these procedures at our centre and by the outcomes obtained. Gpi DBS was initially introduced as an alternative to pallidotomy, which it then practically replaced, but STN DBS was not definitively incorporated as a treatment option until five years later. From that time on, the STN became the target of choice, although Gpi DBS was still considered for patients with more severe dyskinesias.

For the purpose of the present study, the one year outcomes of the first patients who underwent bilateral Gpi (n = 10) or STN (n = 10) DBS were retrospectively analysed. At the time of the study, 10 patients who had undergone STN DBS had completed a one year follow up. In order to avoid major differences of the effects of the so-called learning curve between the groups, only the first 10 patients to undergo Gpi DBS, who had also completed a one year follow up, were selected for this analysis.

Surgical technique
The stereotactic procedure was performed under local anaesthesia, using the Cosman-Roberts-Wells frame and computed tomography (CT) or CT-magnetic resonance (MR) image fusion. The anatomical target was defined using the Shaltenbrand and Wharen atlas[9] with the support of a software package (Department of Neurosurgery and Medical Physics, Virgen de las Nieves University Hospital, Granada, Spain). Bilateral 14 mm burr holes were made in the skull just in front of the coronal suture, 3 cm from the midline. The procedure continued as described below.

Gpi DBS
The anatomical target in the posteroventral part of the Gpi was selected 3 mm anterior to the mid-commissural point, 6 mm below the intercommissural line, and 20 mm lateral from the midline. The physiological identification of the definitive target was assisted by macrostimulation, considering the stimulation thresholds of the internal capsule and optic tract and the clinical effects on contralateral parkinsonian signs. All patients needed one to two tracks per side. The implanted quadripolar electrode (Model 3387; Medtronic Inc, Minneapolis, MN) was positioned with its middle contacts as close as possible to the location with the lowest threshold for motor benefit and the highest one for adverse effects.

STN DBS
The initial target was 3 mm posterior to the mid-commissural point, 4 mm below the intercommissural line, and 12 mm lateral from the midline. Physiological identification was assisted by microelectrode recordings beginning 11 mm above this theoretical target. Single unit activity along the track was recorded, and the responses to passive and active movements of the contralateral limbs were tested. Most patients needed one to three tracks per side to properly define the boundaries of the STN and identify the sensorimotor region. Microstimulation was used to determine the stimulation thresholds of the adjacent structures, and clinical effects on contralateral parkinsonian signs were tested. After considering all of the information obtained, the definitive target was selected and a quadripolar electrode (Model 3389; Medtronic Inc) was implanted. Macrostimulation was then used to test the clinical effects and thereby position the electrode so that its middle contacts were as close as possible to the location with the lowest threshold for motor benefit and the highest one for adverse effects.

For both Gpi DBS and STN DBS the procedure was then repeated on the contralateral side, and the two electrodes were connected to provisional external leads. The localisation of the electrodes was checked on the day of surgery by plain radiography and MR imaging. All patients underwent stimulation tests within the next few days using the provisional connecting leads and an external pulse generator. A few days later, an internal pulse generator (two Itrel II or one Kinetra; Medtronic Inc) was implanted into the subclavicular region under general anaesthesia. The optimal contact(s) and stimulation parameters (frequency, pulse width, and voltage) were selected to obtain the best clinical benefit in both off and on medication states, with subsequent adjustments in the following months as required. The stimulation was continuous in all cases.

Clinical evaluation
All patients were assessed before surgery and every six months after surgery in accordance with the CAPIT protocol[8] in the predefined off medication state (in the morning after 12 hours without antiparkinsonian medication) and best on medication state (period of maximal clinical benefit after usual medication dose), and with the stimulation connected in both situations. The main clinical variables recorded at each assessment were: UPDRS, Hoehn and Yahr staging, Schwab and England Scale, time spent in ''off'' (from a diary of fluctuations for the preceding week), and CAPIT Dyskinesia Rating Scale (see table 1 for definitions of these scales). Neuropsychological assessment and quality of life studies were also conducted in 10 patients.

The antiparkinsonian medication was optimised in all patients during the months before the surgery. The daily levodopa equivalent dose was calculated on the basis of the following equivalences: 100 mg standard levodopa = 140 mg controlled release levodopa = 10 mg bromocriptine = 1 mg pergolide = 5 mg ropinirole = 1 mg pramipexole = 10 mg selegiline. Regardless of the procedure applied, the medication dose was only changed after the surgery when major clinical changes occurred, ordering the appropriate reduction if there was an intensification of adverse effects (mainly dyskinesias in the on medication state), or the appropriate increase if there was a rise in the severity or duration of off medication periods despite optimal stimulation adjustments. Reduction of medication was never a primary objective of the postsurgical management.

Statistical analysis
The pre and postsurgical variables of both groups (Gpi and STN DBS) were evaluated. For quantitative variables, means and standard deviations were calculated and the one sample Kolmogorov–Smirnov test of normality was applied. The two groups were compared using the Mann–Whitney U test. The magnitude of the change in each variable at one year of surgery was calculated, and pre and postsurgical values were compared within each group by means of Wilcoxon's signed rank test. A general linear model for repeated measures (analysis of variance, ANOVA) was applied to the main dependent variables (UPDRS III off medication score and levodopa equivalent dose), studying the interactions between the groups. Presurgical predictive factors for percentage change in UPDRS III were analysed by multivariate linear regression, considering interactions according to the type of surgery. All the tests applied were two tailed, and $p < 0.05$ was considered significant. The SPSS 11.0 programme (SPSS Inc, Chicago, IL) was used for the statistical analysis.

RESULTS
Baseline characteristics
The presurgical characteristics of the patients are given in table 1. The distribution of the quantitative variables in each group did not significantly differ from a normal distribution

Table 1 Presurgical characteristics of and effects at one year after the surgery in the two study groups

	Gpi DBS				STN DBS			
	Baseline	One year	Change*	p value†	Baseline	One year	Change*	p value†
No. of patients	10				10			
Sex (male/female)	7/3				5/5			
Age, years	59.00 (7.23)				62.00 (5.27)			
Duration of disease, years	15.20 (4.19)				14.80 (5.01)			
H and Y stage ''off'' (No. ⩽3/>3)	0/10	6/4			0/10	7/3		
UPDRS total score in ''off''	105.90 (24.06)	65.20 (26.05)	−38% (19.64)	0.005	99.20 (20.73)	61.40 (23.49)	−38% (20.80)	0.005
UPDRS II (ADL) score in ''off''	29.20 (6.44)	20.10 (8.16)	−32% (18.80)	0.007	29.10 (7.25)	19.40 (7.06)	−33% (21.32)	0.007
UPDRS III (motor) score in ''off''	63.40 (18.65)	39.60 (15.69)	−35% (21.08)	0.005	58.50 (13.44)	35.00 (14.21)	−39% (20.72)	0.005
UPDRS III (motor) score in ''on''	19.70 (11.40)	17.50 (7.79)	+11% (67.73)	NS	20.00 (9.44)	21.90 (15.37)	+14% (70.05)	NS
Time in ''off'', UPDRS item 39	2.60 (0.70)	1.30 (0.82)	−1.30 (0.82)	0.006	2.30 (0.48)	1.10 (0.32)	−1.20 (0.63)	0.006
Schwab and England Scale in ''off''	30 (12.47)	63 (17.67)	+33 (16.36)	0.005	27 (14.18)	69 (13.70)	+42 (15.49)	0.005
CAPIT Dyskinesia Rating Scale	3.00 (0.71)	1.35 (0.82)	−56% (30.46)	0.007	1.85 (0.97)	1.05 (0.86)	−42% (51.28)	0.034
L-dopa equivalent dose, mg/day	762 (294)	827 (337)	+9% (24.22)	NS	1394 (500)	1034 (451)	−24% (21.80)	0.017

Values are means (SD).

*''Change'' refers to the mean (SD) of the individual changes in paired comparisons between the baseline and one year evaluations. Minus sign denotes reduction and plus sign increment.

†p value was calculated from paired comparisons between baseline and one year evaluations (Wilcoxon's signed rank test). NS, not significant.

H and Y: Hoehn and Yahr Stage (1–5, from lesser to greater severity).

UPDRS: Unified Parkinson's Disease Rating Scale; total score has a range 0–199, part II (ADL, activities of daily living) score 0–52, and part III (motor) score 0–108 (with higher levels indicating greater severity).

''Off'' and ''on'' refer to medication effect (see Methods section).

Time spent in ''off'' state (UPDRS item 39): from 0 to 4 (1 = 1–25% of waking time; 2 = 26–50%; 3 = 51–75% and 4 = 76–100%).

Schwab and England scale: from 0 (maximal functional disability) to 100 (normal function).

CAPIT Dyskinesia Rating Scale: arithmetic mean of intensity (0–5) and duration (0–5).

L-dopa equivalent dose: see Methods.

(one sample Kolmogorov–Smirnov test). Patients who underwent Gpi DBS and those who underwent STN DBS only significantly differed in the CAPIT Dyskinesia Rating Scale score (mean 3 v 1.8, respectively; p = 0.013) and levodopa equivalent dose (mean 763 mg/day v 1395 mg/day, respectively; p = 0.004).

Clinical effects

The values of the main clinical variables at one year after surgery and the magnitude of the changes are displayed in table 1. Both groups showed a statistically significant reduction in the UPDRS off medication score, in the time spent in the ''off'' state and in the CAPIT Dyskinesia Rating Scale score. The mean reduction in the UPDRS III off medication score was 35% (95% confidence interval (CI) 20% to 51%) in the Gpi DBS group and 39% (95% CI 25% to 54%) in the STN DBS group, with no statistically significant difference between the groups (see parallel lines in fig 1A). There were also no differences between the groups in improvement in the tremor, rigidity, akinesia, and gait subscales (data not shown).

The CAPIT Dyskinesia Rating Scale reduced by 56% (95% CI 35% to 78%) in the Gpi DBS group and by 42% (95% CI 5% to 79%) in the STN DBS group. Although the absolute reduction was significantly greater in the Gpi DBS than in the STN DBS group (p = 0.046), the difference in percentage improvement between the groups was not significant.

The levodopa equivalent dose did not change significantly in the Gpi DBS group, whereas the STN DBS showed a reduction of 24% (95% CI 9% to 40%; p = 0.017). (See convergent lines in fig 1B.)

These results highlight the absence of significant differences between the groups at one year after surgery in any of the clinical scales or in the levodopa equivalent dose they received. The intensity of motor fluctuations (difference in UPDRS III scores when patients passed from ''off medication'' to ''on medication'') was greater in the Gpi DBS group (see fig 1A), although statistical significance was not reached (p = 0.063).

Regarding the predictive factors for percentage change in UPDRS III off medication score, there was interaction in the multivariate model between the presurgical levodopa equivalent dose and type of surgery (p = 0.036). A greater motor improvement was significantly associated with a higher dose in the STN DBS group but with a lower dose in the Gpi DBS group.

Adverse events

Adverse events directly related to the surgical procedure were: intracranial haemorrhage in one STN DBS patient, which resolved without sequelae and did not limit the therapeutic efficacy, and a single epileptic seizure in one Gpi DBS patient, which occurred immediately after the operation and was not related to intracranial structural lesions.

Delayed adverse events related to the devices were frequent; three patients in the present study required further intervention for infection (n = 2) or electrode fracture (n = 1). In the long term follow up (range 1–8 years), two further patients underwent surgery for skin erosions at two and three postoperative years, respectively.

Adverse events related directly or indirectly to the electrical stimulation appeared only in the STN DBS group (p = 0.086, Fisher's exact test for comparison of proportions between groups): one patient had dyskinesias and another had paraesthesias, which prevented the programming of a more effective voltage; one patient had apraxia of lid opening and another developed mood change with apathy.

DISCUSSION

The one year outcomes of bilateral Gpi or STN DBS were studied in two cohorts of patients with advanced PD to determine the influence of selection bias on the different patterns of postsurgical medication change. When Gpi DBS became available at our centre in 1995, a high proportion of the patients initially selected for this surgery had severe dyskinesias, probably influenced by the already established antidyskinetic effect of pallidotomy. STN DBS was not introduced as an alternative approach until five years later,
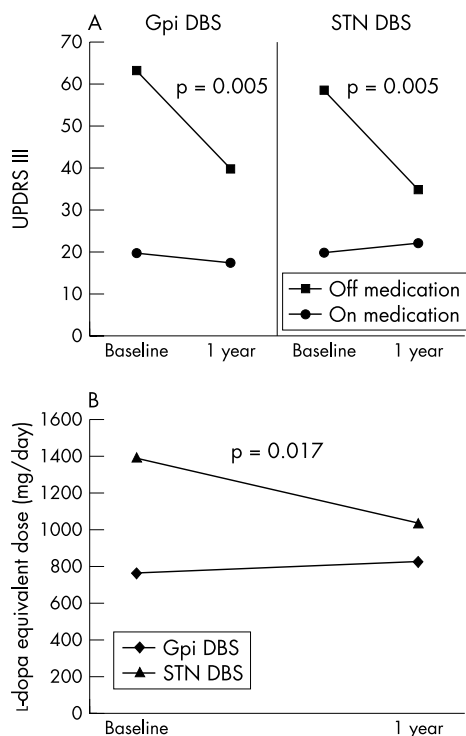
Figure 1 Profile plots of the main dependent variables in both groups, Gpi and STN DBS. Values are estimated marginal means. (A) UPDRS III: see table 1 footnote. (B) L-dopa equivalent dose: see Methods section.

when it became the procedure of choice although Gpi DBS was still considered for patients with more severe dyskinesias. Undoubtedly, this history explains the presurgical differences between the groups observed in this study, with more dyskinesias and lower doses of medication (that is, a lower dyskinesia threshold) in the Gpi DBS group than in the STN DBS group. Although this selection bias evidently limits direct comparison between these surgical targets, it does not compromise the specific aim of the present study, which was to determine the influence of this bias on changes in postsurgical medication. In this context, we consider the comparative description of outcomes in the two groups to be illustrative.

Both patient groups showed a comparable degree of improvement in the severity and duration of off periods at one year after surgery. In both groups, the dyskinesias reduced in proportion to the presurgical severity. However, the medication was only significantly reduced in the STN DBS group, so that the effect on dyskinesias may be partly indirect in these patients. These results are consistent with those of other published long term studies[1 4 10–23] (although with differences in the magnitude of changes, discussed below) and could be interpreted as supporting the widespread view that STN DBS is the best approach in advanced PD.

Nevertheless, and taking into account the presurgical differences between the patient groups, this study highlights the point that there were no significant differences in the motor situation or medication dosage between the groups at one year after surgery (see fig 1). Therefore, the supposed advantage of STN DBS in reducing medication may in part be due to the higher presurgical medication doses of this group. In other words, the outcomes at our centre indicate that the difference in the patterns of medication change after Gpi and STN DBS is at least partly due to a bias in the selection of

patients for one or the other target. Indeed, both procedures may be equally useful, bringing different types of patient to an equally favourable motor situation receiving the same optimal medication dosage. When other variables were controlled for, our analysis of the predictive factors for motor improvement showed that the presurgical levodopa equivalent dose was directly related to motor improvement in the STN group and inversely related to it in the Gpi group.

These findings suggest the hypothesis that Gpi and STN DBS are distinct procedures which may be useful for different subgroups of patients with advanced PD. It also appears that the presurgical levodopa equivalent dose (related to the dyskinesia threshold, among other factors) may be an indirect marker of these subgroups. Evidently, this hypothesis needs to be tested by clinical studies of appropriate design and adequate statistical power. In the meantime, our data indicate that Gpi DBS may also be a valuable option, especially for patients with a lower threshold for dyskinesia.

In comparison with other published data,[4 10–23] the mean reduction in the UPDRS III off medication score at one year was modest in both our groups (35% and 39% in the Gpi and STN groups, respectively), probably because they were the first patients to undergo either technique at our centre. Undoubtedly, an underestimation of the benefits of the surgery is a drawback of this design, because initial surgical experience is associated with greater variability in outcomes. Furthermore, the first patients to undergo a newly available technique tend to be more severely affected, and surgery is likely to show lesser efficacy in these patients. At any rate, their higher presurgical score on the UPDRS III would have produced a lower percentage improvement for the same absolute reduction in the score on this scale.

After bilateral STN DBS, the mean reduction in medication at one year (24%) was also lower in our patients than reported in other published studies.[4 11–23] Although this difference might also have been influenced by the fact that they were the first patients treated with this approach, it could primarily be due to the distinct postsurgical management of the patients. At our centre the medication was only modified when major clinical changes occurred (see "Methods"), whereas at other centres there was a systematic reduction or even withdrawal of the medication after STN DBS.[19 21]

With respect to the surgical technique, it is to be noted that microelectrode recordings were only used in the STN surgery, representing a substantive difference between the two groups. This may have produced differences in the target accuracy and, therefore, in the clinical outcomes. At any rate, both groups in our study showed a comparable degree of motor improvement.

At our centre DBS surgery has an acceptable safety profile with a complication rate within the range reported in the literature. Nevertheless, we had a high rate of delayed complications related to the devices (25% of patients in our series during the long term follow up). Although this may be related to the learning curve, other experienced groups have reported a similar percentage in long term follow up studies,[24] so these complications may have been previously under-recognised in the short to medium term studies. We observed a strong tendency in the STN group towards a greater incidence of adverse events related to electrical stimulation. This finding may be explained by the smaller size of the STN, so smaller deviations from the target are more likely to stimulate adjacent structures.[25]

The superiority of bilateral Gpi or STN DBS in advanced PD remains controversial. In terms of medium/long term motor effects and changes in medication, the available clinical evidence can be summarised as follows:

- The sole randomised comparative study published to date[1] included only four Gpi and five STN patients with a one year follow up, making it difficult to draw definitive conclusions.

- The DBS Study Group multicentre study[2] had the largest patient sample, but the study was not designed for direct comparison. At six months, the median reduction in UPDRS III off medication score was 33% in the Gpi DBS group and 51% in the STN DBS group, with a reduction in the medication dose only in the STN DBS group. The patients were assigned to one or the other approach according to the experience and preference of the investigator (several centres only used one of these targets), so that these differences may have partly resulted from the variability in surgical practice, patient selection, or postsurgical patient management among these centres.

- Other studies, including the present one, provided a comparative description of the two procedures at a single centre. Krack et al[3] retrospectively analysed outcomes in patients with young onset PD, five stimulated in Gpi and eight in STN. At six months, the STN group showed a greater reduction in UPDRS III off medication score (71% v 39% in Gpi group), with a mean reduction of 56% in the medication dose. The Gpi group appeared to reflect the same selection bias as in the present study, with more dyskinesias and a lower levodopa equivalent dose (mean difference of 690 mg/day, although this difference was not significant, possibly due to the small sample size). On the other hand, Gpi DBS patients were operated on at a later time, after there had been greater experience with STN DBS. Volkmann et al[4] reported outcomes in 11 Gpi DBS and 16 STN DBS patients. At one year, the mean reduction in UPDRS III off medication score was somewhat greater in the Gpi DBS group (67% v 60% in STN DBS group), whereas the reduction in medication was greater in the STN DBS group (65% v 16% in Gpi DBS group). Krause et al[5] described the outcomes at one year in five Gpi and 11 STN DBS patients. The results in the Gpi DBS group were disappointing except for alleviation of dyskinesia. According to the authors, this result could be attributed to the stimulation of a different target within the Gpi.

- Numerous open studies have evaluated the results of one or the other procedure, but few studies included 10 or more patients with a one year follow up (especially of bilateral Gpi DBS patients). In these studies, the reduction of UPDRS III off medication score ranged from 41% to 67% for bilateral Gpi DBS[4 10] and from 38% to 67% for bilateral STN DBS.[4 11–23] The medication changed little after Gpi DBS, but was reduced by 38–79% after STN DBS,[4 11–23] with a total withdrawal of medication in some patients.[17 19 21]

The variability in outcomes can be largely attributed to the surgical procedures, but also to differences in the selection and postoperative management of the patients. This hampers the comparison of results, because the relative influence of these factors is not precisely known. In this regard, a greater standardisation of the procedures is desirable in future studies, including the use of specific protocols for changes in medication after the surgery. It is also important to know whether the different patterns of medication change observed by other groups are also partly explained by a patient selection bias. Centres with adequate experience in both techniques may possibly have a selection bias similar to that shown in our study, although other factors may modify its influence on the results.

Further issues to consider in the comparison between Gpi and STN DBS are the effects of the stimulation on non-motor aspects and the incidence of adverse effects. Mood, behavioural, and neuropsychological changes have been more frequently reported with STN DBS than with Gpi DBS,[4 7 26] and it has even been suggested that the global results of STN DBS may not be as impressive as previously reported.[27] Evidently, there may be a publication bias because of the greater number of studies of STN DBS. On the other hand, several possible explanations have been proposed for these differences. Mood changes may be more readily induced in these patients because of the smaller size of the STN.[25] It has also been proposed that the marked reduction in or withdrawal of medication after STN DBS may cause some of these changes, calling into question the appropriateness of this strategy.[28 29]

In summary, there has been no definitive clinical demonstration to date of the superiority of bilateral Gpi or STN DBS in the symptomatic treatment of advanced PD. The most consistent clinical argument in favour of STN DBS has been the possibility of reducing or even suspending the medication. However, this difference may be in part due to a selection bias and to the distinct postsurgical management of the patients. Finally, it is debatable whether a reduction in medication should be the sole criterion of clinical superiority, given the possibility of a higher incidence of mood and neuropsychological changes in patients after STN DBS.

CONCLUSION
Our study suggests that the difference in the patterns of medication change after bilateral Gpi and STN DBS may in part be due to a bias in the selection of patients. In fact, both procedures may be equally useful for different subgroups of patients with advanced PD. Gpi DBS may also be a valuable option for patients with a lower dyskinesia threshold. Further studies are needed to properly evaluate the superiority of one target over the other in the symptomatic treatment of advanced PD.

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Announcement

British Neuropsychiatry Association (BNPA) is pleased to announce its 2005 meeting to be held at the Institute of Child Health, London on 9/10/11 February.

Wednesday February 9th 2005
Dementia – from local to global (in collaboration with Institute of Social Psychiatry)
This meeting is especially directed at clinicians (in old age psychiatry, geriatric medicine, neurology), allied health, and other professions seeking a broad understanding of and update on dementia, its treatment, and impact. Topics will cover psychological treatments, impact on carers, epidemiology, neuropsychology, and dementia around the world. Speakers will include: Bert Hofman, Rotterdam; Donald Stuss, Toronto (tbc); Clive Ballard, KCL and the Alzheimer's Disease society; Sube Banerjee, IoP; Alistair Burns, Manchester; Martin Prince, IoP.

Thursday February 10th 2005
The neuropsychiatry of the dementias
Speakers will include: John Hodges, Cambridge – The neuropsychology of focal dementia; Nick Fox, ION – Advances in neuroimaging in dementia; Clive Ballard – Non-Alzheimer's dementia; Alistair Burns – Current treatment approaches to dementia.

Friday February 11th 2005
Topics will include: ***Child psychiatric disorders in adult life*** (speakers to include Eric Taylor, London); ***Catatonia*** (with special guest speaker Max Fink (USA); and ***Neuropsychiatry and literature*** (with guest authors).

Discounted attendance fee for BNPA members.

Further details: Gwen Cutmore, BNPA Conference Secretary, Landbreach Boatyard, Chelmer Terrace, Maldon, Essex, CM9 5HT. Tel/fax: 01621 843334; email: gwen.cutmore@lineone.net.

Are you a health professional or academic interested in neuropsychiatry? Join the BNPA today! Consult our website: http://www.bnpa.org.uk