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Background of the Study

Deep brain stimulation (DBS) is an effective surgical treatment used to improve motor symptoms in patients with advanced Parkinson's disease (PD). However, despite its potential therapeutic value, the treatment has two key limitations:

- DBS cannot cure or stop the progression of PD
- DBS, like any brain surgery, is a risky procedure with possible adverse effects.

As a result, it is important to ensure that the benefits of DBS outweigh the potential adverse effects and, in the long run, have an overall positive impact on patient quality of life.

Accordingly, an international team of researchers from Germany, Italy, Spain, Sweden, France, Canada, and the Netherlands conducted a recent study to evaluate how the leading types of DBS therapies affect quality of life in patients with advanced PD. The study found that while both subthalamic DBS (STN-DBS) and internal pallidum DBS (GPi-DBS) led to significant early improvements in patient quality of life, many of these initial benefits diminished after three years.

Purpose of the Study

The purpose of the study was to assess the longterm impact of DBS on patient quality of life by evaluating a group of patients who have been followed for at least 3 years after STN-DBS or GPi-DBS surgery.

Patients/Study Groups

During the study, researchers analyzed 45 patients with STN-DBS and 20 patients with GPi-DBS. To qualify for the study, patients had to meet the following criteria:

1. Patients must have participated in the study's *parent* (initial) DBS trial which evaluated the effectiveness of STN-DBS and GPi-DBS on symptoms of patients with PD.
2. Patients must have continued follow-up evaluations for a minimum of 3 years under the parent DBS trial.

Some general characteristics of patients in each study group are:

Characteristics	STN-group	GPi-group
Sex:	23Males/22Females	13Males/7Females
Average age at time of DBS surgery:	59 years old	56 years old
Average duration of diagnosed PD:	14 years	14.5 years

Study Methods

In order to determine the longterm impact of STN-DBS and GPi-DBS on patient quality of life, researchers used the following methods:

- Researchers evaluated patient scores at *baseline (start of study)*, 6 months, and 3 years on two different clinical assessments:
 - First, to assess patient motor functioning, researchers evaluated patient scores on the *Unified Parkinson's Disease Rating Scale (UPDRS)*, a clinical scale that measures the progression of PD.
 - Next, to assess patient quality of life, researchers evaluated patient scores on the *Sickness Impact Profile (SIP)*, a questionnaire that measures the total, physical, and psychosocial (mental and social) aspects of quality of life using 12 sub-categories:
 1. Alertness/Behavior
 2. Ability to Walk
 3. Body Care/Movement
 4. Communication
 5. Eating
 6. Emotional Behavior
 7. Home Management
 8. Mobility
 9. Recreation/Pastimes
 10. Sleep/Rest
 11. Social Interaction
 12. Work
- Lastly, researchers compared the baseline, 6-month, and 3-year UPDRS and SIP scores in the STN-group and in the GPi-group. During this step, researchers analyzed the average group scores, as well as the *distribution (or recurrence)* of individual patient scores over time.

Study Results

In response to the relationship between DBS and quality of life, the study data suggests that both STN-DBS and GPi-DBS are linked to significant early improvements in the quality of life of advanced PD patients. However, these improvements did not appear to be associated with motor

functioning and tended to decline after three years. This suggestion was based on a comparative analysis of UPDRS and SIP scores at baseline, 6 months, and 3 years.

According to the average UPDRS scores, both patient groups experienced significant off-period motor improvements from baseline to 6 months and continued to sustain these benefits at 3 years. Overall, from baseline to 3 years, researchers found that:

- Off-period motor symptoms improved by 50% in the STN-group and 39% in the GPi-group.
- Off-period activities of daily living improved by 45% in the STN-group and 28% in the GPi-group.

Conversely, according to the average SIP scores, both patient groups experienced significant improvements in almost all aspects and sub-categories of quality of life from baseline to 6 months, but had lost many of these benefits at 3 years. Overall, researchers found that:

- From baseline to 6 months:
 - DBS therapy had significantly improved the total, physical, and psychosocial SIP scores by 39-53% in the STN-group and 40-49% in the GPi-group
 - DBS therapy had significantly improved all SIP sub-category scores, except:
 - Alertness/Behavior in the STN-group
 - Ability to Walk and Recreation/Pastimes in the GPi-group
 - Communication and Work in both groups
- From 6 months to 3 years:
 - Significant improvements were retained in the following SIP sub-categories:
 - Body Care/Movement, Eating, Recreation/Pastimes in the STN-group
 - Social Interaction in the GPi-group
 - Mobility in both groups
 - However, the total, physical, and psychosocial SIP scores had drastically declined in both patient groups and most SIP sub-category scores had dropped to their baseline values.

Altogether, the average UPDRS and SIP scores indicate that, despite longterm improvements in motor functioning, patient quality of life declined significantly in both the STN-group and GPi-group. However, according to the *distribution (or recurrence)* of individual patient scores over time, researchers found that at 3 years after surgery, 40% of patients with STN-DBS and 24% of

patients with GPi-DBS had sustained their total SIP score at reached at 6-months. This data suggests that the average decline in quality of life was not widespread in either DBS group, but had actually affected only a subgroup of patients.

Study Discussion & Implications

Overall, the study found that STN-DBS and GPi-DBS are linked to significant early improvements in patient quality of life but, despite lasting motor improvements, many of these initial benefits are short-term. This is evident by the stability of UPDRS scores from 6 months to 3 years, but the significant decline of SIP scores from 6 months to 3 years.

Nevertheless, the loss of the initial benefits in quality of life, may only affect certain patients and not others. Researchers speculate that the decline in quality of life may reflect either the progression of the disease or a change in the patients' perception of wellbeing as they get used to their DBS-related motor improvements. However, additional studies must be conducted to identify the actual factors associated with better longterm outcomes in patient quality of life.