

Donovan, S., Lim, C., Diaz, N., Browner, N., Rose, P., Sudarsky, L.R., Tarsy, D., Fahn, S., Simon, D.K. (2011). Laserlight cues for gait freezing in Parkinson's disease: an open-label study. *Parkinsonism & Related Disorders*, 17(4): 240-245.

### **Background of the Study**

*Freezing of gait (FOG)*, or a sudden, brief inability to start or maintain normal stepping movements, is prevalent symptom of Parkinson's disease (PD) that affects about 32% of patients with PD. Unfortunately, unlike other symptoms of PD, FOG is resistant to Parkinson's medications and shows little improvement with ordinary walking aids. Since FOG often leads to falls and can contribute to disability and quality of life impairment in patients with PD, there is a significant need for more effective strategies for controlling FOG in PD.

Accordingly, a recent study conducted by researchers of the Harvard Medical School (Boston) and Columbia University (New York), establishes that the use of *laserlight visual cues* (laserlight "rods" or horizontal floor markers that help to signal or initiate walking) is an effective strategy for managing FOG and reducing falls in patients with PD. This suggestion was based on a comparative analysis of freezing and fall frequency in patients with FOG in PD when using a standard walking aid (i.e. cane and/or walker) and when using a walking aid with a laserlight feature.

### **Purpose of Study**

The purpose of the study was to assess the effectiveness of laserlight visual cues for controlling FOG in 26 Parkinson's patients with FOG.

### **Patients/Study Group**

During the study, researchers analyzed a total of 26 PD patients with FOG from the Movement Disorders Centers at Beth Israel Deaconess Medical Center (BIDMC, Boston), Brigham and Women's Hospital (Boston), or Columbia University Medical Center (CUMC, New York). To qualify for the study, patients had to meet the following criteria:

- Meet the diagnostic criteria for dopamine-responsive PD, according to the study's movement disorders specialists
- Be able to walk independently and without personal assistance (i.e. not bed-ridden)
- Use a cane and/or walker

- Meet the clinical criteria for FOG, according to the “Questionnaire Used to Identify Freezing of Gait in PD Patients”
- Experience FOG episodes at least once per day the week before the initial study visit.

Some general characteristics of the patients in the study group are:

- Of the total 26 participants, 21 were male & 5 were female
- The average patient age was 71 years, ranging from 58-92 years of age
- The average duration of diagnosed PD was 10.5 years, ranging from 4-25 years
- 16 patients used a cane, 5 used a walker, and 5 used both
- The average patient motor score on the Unified Parkinson's Disease Rating Scale (UPDRS) was about 26 (“on” PD medications) at study entry, indicating mild to moderate motor impairment.
- The average patient score on the Hoehn & Yahr Scale was 3 (ranging from 2-4) at study entry, indicating balance impairment and mild to moderate PD.

### Study Methods

In order to determine the overall impact and effectiveness of laserlight visual cues on FOG in patients with PD, researchers used the following procedure:

- First, patients underwent a 1- or 2-month *baseline period* (study period before receiving treatment) using an ordinary U-Step cane and/or walker without a visual laserlight cue:
  - Group1: 1-month baseline period
  - Group2: 2-month baseline period
- Afterwards, researchers activated the laserlight feature on each patient's U-Step walking aid and patients underwent a 1-month period using the laserlight visual cue
- Then, to assess patient FOG and overall mobility during the course of the study, researchers took the following measurements:
  - Patients completed a weekly *FOG Questionnaire (FOGQ)*, a 6-question assessment that measures the severity and frequency of several different FOG symptoms
  - Patients completed the *Timed Gait Test (TGT)*, a physical test used to measure lower body dysfunction and walking impairment, at study visits 2 and 3
  - Patients kept a daily log (i.e. record) of falls that occurred during the study
- Finally, to evaluate the therapeutic benefit of laserlight visual cues for FOG in PD, researchers compared the patient data from baseline to the 1-month period with the laserlight visual cue:

- Changes in FOGQ scores:
  1. To evaluate the change in FOG associated with laserlight visual cues, researchers measured the average change in:
    - a) The total FOGQ score from baseline
    - b) The FOGQ scores for each of the 6 separate questions from baseline
  2. To determine whether laserlight visual cues have a lasting/long-term effect on FOG, researchers measured the change in the total FOGQ score from baseline to each of the 4 weeks following visit 2 (i.e. 1-month period with laserlight cue)
  3. To assess whether FOG improves over time with an ordinary walking aid, researchers compared the change in the FOGQ scores from the 1<sup>st</sup> to 2<sup>nd</sup> month of the study for patients in:
    - a) Group1: 1<sup>st</sup> month without laserlight cue, 2<sup>nd</sup> month with laserlight cue
    - b) Group2: 1<sup>st</sup> and 2<sup>nd</sup> month without laserlight cue
- Change in TGT performance: To assess the impact of laserlight visual cues on TGT performance, researchers measured the average change in the time to complete the TGT from study visit 2 to 3
- Change in fall frequency: To assess the impact of laserlight visual cues on fall frequency, researchers measured the change in the number of falls from baseline to the period with the laserlight cue.

## Study Results

In response to the overall impact and benefit of laserlight visual cues for FOG in PD, the study data suggests that laserlight visual cues are an effective strategy for overcoming FOG and reducing falls in Parkinson's patients. This suggestion was based on statistical analyses comparing patient FOGQ scores, TGT performance, and fall frequency with and without the use of laserlight visual cues.

According to the average changes in FOGQ scores from baseline to the 1-month period with the laserlight visual cue, researchers found that:

- The total FOGQ score had improved (i.e. lowered) by 1.25, representing an average improvement of 6.6% from the patients' baseline FOGQ score
- The separate FOGQ scores for Question 3 (frequency of FOG) and Question 5 (duration of *start hesitations*, or freezing when initiating walking) significantly improved from baseline
- There was a significant improvement in the total FOGQ score from baseline to weeks 1 and 3 of the 1-month period with the laserlight visual cue
- The FOGQ scores from the 1<sup>st</sup> to 2<sup>nd</sup> month of the study significantly improved for Group 1 patients (who used the laserlight cue during month 2), whereas the FOGQ scores for Group 2 patients (who continued using the ordinary walking aid) did not significantly improve.

Altogether these study findings suggest that: 1) patients experienced a modest (yet considerable) reduction in FOG with the laserlight feature, which was not associated with improvement over time using an ordinary walking aid, 2) laserlight visual cues may help patients overcome FOG episodes more quickly and reduce the frequency of FOG, 3) the tendency towards FOG improvement at each of the 4 weeks using the laserlight feature suggests lasting benefits with the laserlight visual cue.

Furthermore, according to the change in the number of falls recorded in patient daily logs with vs. without the laserlight visual cue, patients also experienced a significant reduction in fall frequency after the laserlight feature was activated on their U-Step walking aids. Overall, from the 23 patients who maintained their daily fall logs throughout the study, researchers found that:

- 13 patients experienced no falls throughout the entire study duration
- 10 patients experienced 1 or more falls per week throughout the entire study, with the average number of falls decreasing by a total average of 40% (or 3.23 to 2.12 falls per week) from baseline to the 1-month period with the laserlight visual cue.

Conversely, in terms of patient TGT performance with vs. without the laserlight visual cue, researchers found no significant difference in the average time needed to complete the TGT from baseline (68.5 seconds) to the 1-month period with the laserlight cue (56.7 seconds).

### **Study Discussion & Implications**

Overall, the study data suggests that the addition of a laserlight visual cue to a patient cane and/or walker may modestly, yet effectively, help Parkinson's patients to overcome FOG and may significantly reduce the number of falls experienced in PD. This is evident by the improvement in FOGQ scores and fall frequency after patients with FOG had the laserlight feature activated on their U-Step walking aid. Based on these study results, researchers recommend that laserlight visual cues should be considered as a potential therapeutic strategy for patients with FOG in PD. However, due to the short study duration (only 1 month of patients using the laserlight visual cue) and the limited number of study participants, researchers suggest that additional studies be conducted to further evaluate the effectiveness of laserlight cues for FOG in PD.