The use of wearable sensors in management of motor symptoms in Parkinson’s Disease: a real-life study.

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Objective

to explore the usefulness of wearable sensor data to inform treatment decisions in Parkinson’s Disease.

Background

Wearable sensors are becoming increasingly incorporated into clinical care surrounding Parkinson’s Disease (PD). Parkinson’s Kinetigraph (PKG) is a remote monitoring device currently validated for use in PD. Cross-sectional data demonstrates PKG to be effective at remote measuring of daytime bradykinesia and dyskinesia and potentially provide surrogate markers for non-motor symptom monitoring. Nevertheless, the use of remote objective monitoring in longitudinal clinical setting remains largely unexplored.

Methods

- We analysed an unselected cohort of 100 people with idiopathic PD.
- Wearable sensor data included measures of bradykinesia (BK) and dyskinesia (DK). For each patient, demographic data and changes to dopaminergic medication regime, informed by the PKG, were recorded.
- BK and DK scores were presented as an average of a six-day recording period between the hours of 5am and 10pm (figure 2).
- Patients who had their medication regime changed (group 1, n=29) were compared to those with no change (group 2, n=71) using Mann-Whitney U test and intergroup changes were assessed by the Wilcoxon signed rank test.
- Patients were asked to wear the PKG watch for a period of 6 days prior to coming for a routine follow-up in an outpatient clinic and then again within 3-6 months, prior to the next follow up visit. Figure 1 demonstrates how a PKG report is obtained.

Results

- Data is presented as mean ± standard deviation.
- At baseline, patients (57 male, 43 female) had an average age of 66.2 ± 9.3 years, and disease duration of 8.8 ± 6.4 years. The cohort was followed up for 2.9 ± 0.8 months.
- No differences were observed in baseline demographics between groups (p≥0.06).
- At baseline, average BK score was 29.6 ± 8.8 (medication changed) and 27.3 ± 8.6 (medication unchanged) (p=0.26) (Figure 3).
- At baseline average DK score for medication change group was 3.0 ± 3.9 and 5.9 ± 18.2 for medication unchanged group (p=0.68)(Figure 4).
- In group 1, BK significantly improved by 11.0% (p=0.001) while DK worsened by 112.9% (p=0.011), yet still remaining within the non-troublesome range.
- No group differences were observed in BK and DK scores at follow-up (p=0.34).
- Severe bradykinesia (BKSIII) improved in group 1 but not group 2 (p=0.006).

Conclusions

The study shows that wearable sensors are sensitive to motor changes after dopaminergic medication changes and can detect relatively small changes in patients’ motor symptoms. This indicates that wearable sensors can be used for long-term monitoring of motor performance in PD.

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