Feasibility of Self-Collected Dried Blood Spot Samples During a 30 Day Period in Persons with and without Multiple Sclerosis

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Background

Multiple Sclerosis (MS) is a chronic progressive disease in which the immune system engages the central nervous system (CNS) resulting in the damaging of myelin sheath [1]. The unpredictability of day-to-day health makes adjustment to the condition even more difficult [2]. Therefore, each patient's case must be surveilled independently in order to monitor specific disease activity [3]. Apart from noting the varying manifestations of symptoms, tracking short term variability in disease activity biomarkers may promote early and accurate intervention, and identify time-varying triggers of the activity.

Unfortunately, short-term variability in disease biomarkers in MS has not been well-characterized, largely due to methodological issues. While dried blood spot (DBS) sampling has been used for decades to screen newborns for congenital diseases, only recently have DBS methods been used for clinical studies [4]. Advantages of DBS include easier acquisition, transport, and stability of samples. In a study of repeated sampling among transplant outpatients, patients reported a preference for DBS sampling compared to venous sampling; patients reported that DBS was simpler and less painful [5]. Furthermore, DBS sampling may reduce patient-burden related to travel to and from clinical settings for laboratory tests.

The aim of this pilot study was to assess the feasibility and acceptability of repeated, at-home DBS collection in patients with and without MS. The study also examined adherence to different frequencies of DBS collection.

Objectives

The purpose of this study was to evaluate the feasibility and acceptability of self-collecting dried blood spot (DBS) samples repeatedly during a 30-day period in Persons with MS (PwMS) and persons without MS in preparation for a study assessing time-specific biomarkers.

Aim 1: To assess the level of adherence to the 30-day blood collection protocol overall, and by frequency (every 3 days (Group A) vs. every 6 days (Group B).

Aim 2: To obtain patient perspectives on the usability and acceptability of the method, including barriers to collection.

Methods

Subjects were recruited from the Mandell MS Center at Mount Sinai Rehabilitation Hospital in Hartford, CT. Enrollment coincided with a regularly scheduled appointment. Prior to the visit, letters were sent to a randomly selected group of patients with appointments to explain the study. Flyers were also given to patients as they left appointments, and were left in the waiting room at the Mandell Center. Control subjects without MS were recruited from friends or family members of MS patients, and from flyers placed in physician offices and community sites. A research assistant met with interested individuals at regular appointments, or at a time that was convenient to screen for eligibility. English-speaking adults aged 18 or older were eligible; patients with MS must have had a confirmed clinical diagnosis. Anyone with a history of neurological impairment other than MS, unwilling to perform the fingerprick, hemophilia, on anticoagulant therapy, or with a diagnosis of clinically isolated syndrome (CIS) or neuromyelitis optica, was ineligible. Participants received $50.00 for participation in the study.

Participants were randomly assigned to collect DBS samples at home for 30 days using a HemaSpot (SpotOn Sciences) DBS kit every 3 days (Group A) or every 6 days (Group B). They were provided with bar-coded and labeled HemaSpot™ finger-stick blood collection kits and a postage-paid envelope for returning samples at the end of the collection period. During the 30 days, they were asked to completed fatigue and mobility questions from the Quality of Life in Neurological Disorders (NeuroQOL) on-line after each fingerprick. The NeuroQoL evaluates physical, mental, and social effects related to neurological conditions [6]. Following the collection period, subjects were asked to complete a questionnaire about their experiences with the DBS method. Questions used a 5-point scale to assess pain, ease of use, and convenience of the method. Anxiety about the fingerprick was measured on a scale of 0 (none) to 7 (high). Adherence was measured by return of all completed DBS kits. Data analysis included partial correlation, Chi-square, student's t-test, median test, and the Mann-Whitney U test. P-values < 0.05 (two-tailed tests) were considered statistically significant.

Results

A total of 33 individuals participated (n= 23 with MS, n=10 without MS). Of those, 17 were randomized to Group A, and 16 to Group B. Groups did not differ significantly by MS status, age, gender, ethnicity, insurance, weight, anxiety about the finger prick, fatigue, or mobility; while subjects with MS had lower self-reported mobility scores (p=0.000) and higher fatigue scores (p=0.002) than those without MS (Table 1).

Overall, 79% of participants adhered to the DBS protocol. Adherence did not differ by group or MS status. Seventy-five percent rated DBS collection as convenient and easy, and were likely to recommend the method to others (Figure 1). However, Group A (higher frequency) experienced more pain and difficulty pricking their fingers than Group B ($p < 0.05$), and subjects with MS had more difficulty filling the DBS kit ($p<0.05$). Fatigue score was positively associated with pain ($p<0.04$), while higher anxiety was associated with greater difficulty collecting the sample ($p<0.03$) after controlling for frequency, MS status and age.

Table 1: Patient Characteristics

Variable	Overall	Group A	Group B	p-value	PwMS	No MS	p-value
Median age in Years (n=28)	40.0	47.5	37.0	0.06	40.0	38.0	0.90
Gender (n=33)							
Female (%)	69.7	11,75	12, 69.7	0.71	78.3	50.0	0.22
Ethnicity (n=28)							
White (%)	72.7	50	50	0.57	81.0	100.0	0.67
MS status (n=33)							
PwMS (%)	69.7	23.5	37.5	0.31	---	---	---
BMI & Weight Status (n=28)							
Median BMI (kg/m^2)	29.8	28.4	32.9	0.71	32.4	25.8	0.08
Healthy Weight (%)	18.2	21.4	21.4	0.657	19.0	28.6	0.07
Overweight (%),	24.2	35.7	35.7	---	19.0	57.1	---
Obese (%)	42.4	42.9	57.1	---	61.9	14.3	---
Insurance Status (n=33)							
Private (%)	54.5	64.7	43.8	0.20	52.2	60.0	0.49
Public (%)	45.5	6, 23.3	56.3	---	47.9	40.0	---
Anxiety, Fatigue, Mobility							
Anxiety Score </=2 (n=28)	78.6	71.4	85.7	0.32	57.1	85.7	0.14
Median QOL Fatigue (n=29)	50.4	47.1	50.6	0.57	52.1	41.2	**<0.001**
Median QOL Mobility (n=29)	47.7	48.4	48.7	0.75	40.4	57.1	**<0.001**

Citations
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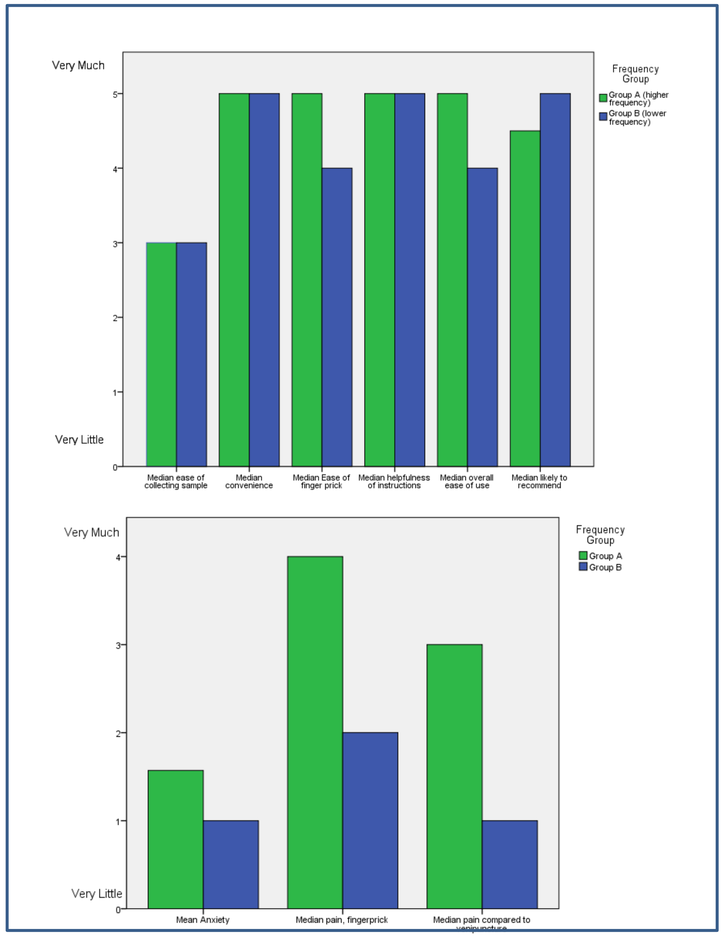
Figure 1. Perceptions of DBS Method



Discussion

The 79% adherence rate, and the majority of patients that were willing to recommend DBS collection method to other people, suggests that DBS collection is a viable method for collecting blood samples from patients with MS. Limitations to the study include potential selection bias and difficult collection times (once a week may be better for patients vs. 3 or 6 days). Nevertheless, a high adherence rate and willingness to mail blood samples to a research center suggest that DBS method for collecting blood samples may be superior to conventional venipuncture.

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