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Letter to the Editor: New Observation

Limb Temperature in Parkinson's Disease: Is It Symmetric?

Rebecca George[1], Kimberley P. Good[2] and Heather Rigby[1]

[1]Division of Neurology, Department of Medicine, Dalhousie University, Halifax, NS, Canada and [2]Department of Psychiatry, Dalhousie University, Halifax, NS, Canada

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Autonomic dysfunction affects almost all persons with Parkinson's disease (PD) though the symptoms vary considerably. Features of autonomic dysfunction span many systems, including gastrointestinal, urinary, pupillomotor, sexual, and thermoregulatory domains.[1] Neuropathologic correlates of autonomic dysfunction in PD includes alpha-synuclein deposition and neurodegeneration in central and peripheral autonomic structures including the hypothalamus, brainstem, peripheral autonomic plexuses, skin, and others.[1]

Common symptoms attributed to thermoregulatory dysfunction include altered sweating and hot/cold flashes.[1] The sensation of a single limb or hemi-body feeling cold is a less commonly described symptom, the frequency of which is not clear in the literature.

Asymmetry of motor dysfunction is an important feature in establishing a diagnosis of idiopathic PD. Whether asymmetry is also seen in some of the autonomic components of the disease is unclear. Several studies looking at sudomotor function have documented asymmetric impairment worse on the side more affected by motor dysfunction.[2–4] Other studies have documented no difference in autonomic function between the sides, including temperature.[5,6]

Thermography is a non-invasive imaging modality that uses infrared to capture surface temperature maps. Interest in medical applications of this technology date back decades, but there has been relatively little research published in this area at it relates to PD.[7,8] We describe a case and pilot study looking at side-to-side limb temperature differences in idiopathic PD.

A 37-year-old man presented with a two-year history of right upper extremity motor dysfunction and was found to have asymmetric rigidity and bradykinesia. The patient was diagnosed with idiopathic PD following the Movement Disorders Society criteria. This was supported by a positive DaTscan.

Approximately three years after onset of his initial motor symptoms, he developed intermittent purple discoloration of the right upper limb associated with a feeling of the extremity being cold. He had access to thermography at his place of work and was able to capture images both at rest and after exercise which documented an approximately 3-degree Celsius temperature difference (Figs. 1 and 2). Surface temperature in clinic was assessed using a cutaneous temperature probe with a similar result (29.4 vs 32.0°C, respectively). He was referred to a vascular surgeon and no peripheral vascular disease or other anatomic cause was identified.

After seeing this index case, we sought to determine if persons with PD have a measurable and significant asymmetry in limb temperature. Patients with PD were recruited by their movement disorder neurologist in Halifax, Nova Scotia. In order to reflect the diversity of the patient population our main inclusion criteria was measurable motor asymmetry. Motor asymmetry was defined as a difference greater than or equal to 1 on all of the bradykinesia components (3.5–3.8) of the MDS-UPDRS part III.

Limb temperature was recorded at eight sites total per patient (hand, forearm, foot, and ankle on both sides) using a cutaneous temperature probe as a one-time data collection point. Time of last levodopa dose was variable and patients both in the "on" and "off" state were included.

Data was prospectively collected from 13 persons with PD. Mean age was 66 years, mean disease duration was 4 years. The majority of the patients were male, only 2 were female. Eight of the PD patients had symptoms predominantly affecting the right side, and in 5 the symptoms were predominantly affecting the left side.

Affected and unaffected sides were compared using independent t-tests. In both of these analyses, there were no significant asymmetries ($p > 0.05$).

This small case series did not reveal any significant side-to-side differences in limb temperature. The notable exception in our data set was the index patient, who demonstrated a 2.6°C difference (29.4°C, 32.0°C) in his upper extremities, which corresponds closely with his thermograph (Figs. 1 and 2). This study had several limitations that decrease the generalizability of our findings. A higher powered study with appropriately matched controls would be useful to examine whether there is a correlate between limb temperature and asymmetry of motor dysfunction in PD. Furthermore, a distinctive feature of our index case was the early onset of the disease. More research will be needed to determine whether there is a relationship between age of disease onset and asymmetry of autonomic involvement.

Our index case raises the possibility that side-to-side limb temperature differences are present in a subset of people with PD. Our follow-up pilot study did not demonstrate a detectable

Corresponding author: R. George; Email: rb565338@dal.ca

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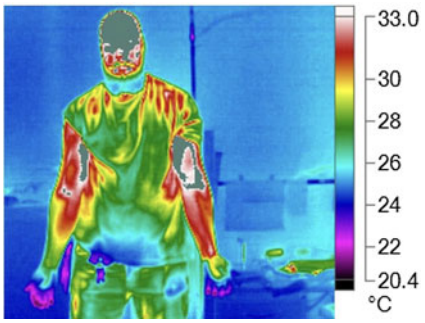

Figure 1: Thermography of index patient at rest.

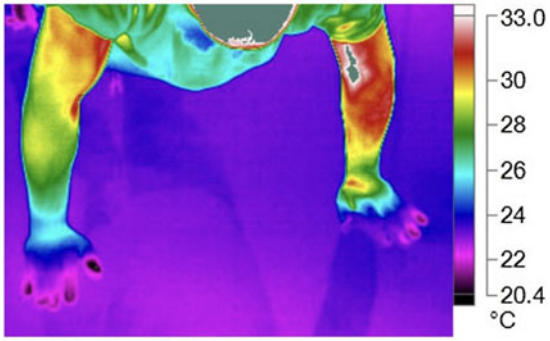

Figure 2: Thermography of index patient with exercise.

difference in the additional 13 patients we examined. Nonetheless, many patients with PD describe "cold limbs" as a symptom and further research is needed to establish whether that symptom has an objective correlate on temperature testing, either through surface temperature readings or thermography. This could be further correlated with other markers of autonomic involvement, such as the SCOPA-AUT score.

Surface temperature readings are readily available as a standard component of electromyography machines and are a non-invasive way to screen for impaired thermoregulation in patients who experience subjective limb temperature differences. There is a need for more research on asymmetric temperature regulation in PD as it could be an important non-invasive clinical biomarker of the disease.

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Competing interests. None.

Statement of authorship. RG was involved in conceptualization, data collection, literature review, drafting, and editing of the manuscript. HR was involved in conceptualization, patient selection, literature review, and editing of the manuscript. KG was involved in conceptualization, data analysis, and editing of the manuscript.

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