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ORIGINAL ARTICLE/ARTICLE ORIGINAL

Sympathetic skin response in Parkinson's disease before and after mental stress

Réponse cutanée sympathique dans la maladie de Parkinson avant et après stress mental

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KEYWORDS
Sympathetic skin response;
Parkinson's disease;
Autonomic dysfunction;
Sudomotor function;
Arithmetic mental stress

Summary
Objectives. — This study aims to evaluate sympathetic sudomotor activity in Parkinson's disease (PD) by means of the sympathetic skin response (SSR) and explore its possible changes due to mental stress.
Methods. — Sudomotor function was evaluated using SSR in 29 patients with PD (Hoehn and Yahr stage I—IV) without any clinical evidence of autonomic dysfunction. Twenty-seven healthy matched controls were also evaluated. SSR was elicited by electrical stimulation of the right median nerve and simultaneously recorded on the palms of both hands. Arithmetic mental stress was evoked by means of the WAIS-R arithmetic subscale. Latency and amplitude of SSR were evaluated before and after arithmetic mental stress.
Results. — The SSR was obtained in all patients and controls. There were no significant differences in its mean latency and amplitude between patients and controls. SSR parameters were significantly correlated with disease duration, UPDRS score, and disease stage. There were also significant correlations with rigidity and bradykinesia, but not with tremor. Mental stress had no effect on SSR parameters in any group.
Conclusions. — SSR parameters in PD without autonomic dysfunction were comparable to matched controls. Although PD patients are sensitive to mental stress, the arithmetic task had no effect on SSR parameters. Consequently, SSR as a method of evaluation of sympathetic sudomotor function is not sufficient for exploration of subclinical autonomic dysfunction in PD, but should be combined with other tests of autonomous nervous system.

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MOTS CLÉS
Réponse cutanée sympathique ;
Maladie de Parkinson ;
Dysfonction autonomique ;
Fonction sudomotrice ;
Stress mental arithmétique

Résumé
Buts de l'étude. — Évaluer l'activation sympathique réflexe des glandes sudoripares dans la maladie de Parkinson par la mesure du réflexe psychogalvanique (RPG), ainsi que ses éventuelles modifications après stress mental.
Méthode. — Nous avons évalué le RPG chez 29 malades parkinsoniens (stade I—IV de Hoehn et Yahr) sans signe clinique de dysautonomie. Vingt-sept sujets normaux ont également été évalués. Le RPG a été induit par stimulation électrique du nerf médian droit et enregistré simultanément sur les paumes des deux mains. Le temps de latence et l'amplitude du RPG ont été mesurés avant et après qu'un stress mental arithmétique ait été évoqué au moyen de la sous-échelle arithmétique de la WAIS-R.
Résultats. — Le RPG a été obtenu chez tous les patients et les sujets témoins. Les temps de latence et amplitudes ne différaient pas significativement entre les patients et les sujets témoins. Ils étaient corrélés avec la durée de la maladie, le score UPDRS et le stade de la maladie. Des corrélations significatives ont également été trouvées avec la rigidité et la bradykinésie, mais pas avec les tremblements. Ils n'ont été modifiés par le stress dans aucun des deux groupes.
Conclusions. — Le RPG ne différait pas chez les patients parkinsoniens et les sujets normaux. Bien que les premiers soient sensibles au stress mental, la tâche arithmétique n'a eu aucun effet sur les paramètres du RPG. Par conséquent, le RPG en tant que méthode d'évaluation de la réactivité sudomotrice sympathique n'est pas suffisant pour être utilisé en vue de l'exploration de la dysautonomie subclinique dans la maladie de Parkinson et doit être combiné avec d'autres tests du système nerveux autonome.

Introduction

Parkinson's disease (PD) may be associated with several symptoms and signs of autonomous nervous system (ANS) impairment, which have been already referred since the original description of the disease by James Parkinson in 1817 [29]. Among them, sweating disorders are quite common. These essentially consist of excessive asymmetrical sweating involving the upper part of the body. They may be caused by dysfunction of either the sympathetic part of the central ANS or the postganglionic sympathetic cholinergic fibers, or correspond to compensatory reaction to coexisting hypohidrosis [17,25,30,35,37].

Sympathetic skin response (SSR) is a simple and non invasive method, which is used for the evaluation of the sympathetic cholinergic sudomotor function [32]. It is characterized by transient change in skin potential following application of variable stimuli [2,38]. It likely corresponds to a polysynaptic reflex, which is ultimately generated by the activation of sweat glands through postganglionic cholinergic sudomotor sympathetic fibers [10,38].

Several studies used SSR to investigate cutaneous sympathetic sudomotor function in PD and variable results were obtained, both qualitatively and quantitatively [3,5,7,11,14—16,25,30,31,39,41]. SSR disorders in PD patients consisted either of an increase in latency, a decrease in amplitude, an asymmetry related to the most affected side, or a loss of responses. These findings reflect disorders in the central regulation of the reflex loop up to the level of postganglionic neurons. It has been claimed that in PD, SSR disorders increase with disease duration and functional deterioration [5,7,15,16,25,30,39].

Mental or somatic stress usually activates the sympathetic system, which leads to increased alertness. Mental activity is accompanied by many psychophysiological changes. Thus, a mental test such as arithmetic has been found to cause important changes in muscular function, cardiac rhythm, and blood pressure. Furthermore, mental stress induces several other responses from ANS and can modify immune and endocrine functions [6]. There is clinical evidence that PD patients are sensitive to mental stress, as reflected, for example, by a significant accentuation of tremor [12].

This study aims to evaluate, through SSR, sympathetic sudomotor function in PD patients, especially those without any clinical evidence of autonomic dysfunction and to compare these with normal controls. We hypothesized that SSR could differentiate PD patients from normal controls. In order to increase its potential discriminative power, we included mental stress as an enhancing factor. Additionally, we explored the relationship between SSR parameters and some pertinent features of PD such as duration, motor disability, and main symptoms.

Patients and methods

Patients

Twenty-nine patients (22 males, seven females) with idiopathic PD according to UK Brain Bank Diagnostic Criteria [19] were enrolled in the study. All patients were assessed clinically by means of the Unified Parkinson's Disease Rating Scale (UPDRS, Part III) [13]. They were classified in stages according to the Hoehn & Yahr classification scale (H & Y) [18]. None of the included patients reported any symptoms and signs of ANS impairment, with an emphasis on the absence of PD-associated sweating disturbances. The examination for orthostatic hypotension was negative. We did not take into account the presence of constipation, which is a very common symptom that can even precede by many years the appearance of motor symptoms and is regarded as a premotor symptom [36]. PD patients were neither demented (Mini Mental State Examination Score > 24) or