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Correspondence

MIBG scintigraphy of the major salivary glands in progressive supranuclear palsy and corticobasal degeneration

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1. Correspondence

The clinical distinction between Parkinson's disease (PD) and the atypical parkinsonian syndromes progressive supranuclear palsy (PSP) and corticobasal degeneration (CBD) is often difficult, especially in the early stages of disease.

Myocardial MIBG scintigraphy allows the quantification of postganglionic sympathetic cardiac innervation. In PD, alpha-synuclein deposition and associated neurodegeneration widely involves the autonomic nervous system, including the postganglionic sympathetic fibers which innervate the myocardium, and results in reduced myocardial MIBG uptake [1]. In contrast, PSP and CBD are characterized by tau protein aggregation [2,3]. Scintigraphic studies report that most PSP and CBD patients have normal cardiac MIBG uptake [1]. A recent study [4] showed that a normal myocardial MIBG uptake indicates rather an atypical parkinsonian syndrome (for example PSP or CBD) whereas PD is rather characterized by a reduced myocardial MIBG uptake.

MIBG scintigraphy also visualizes postganglionic sympathetic innervation of other organs aside from the myocardium. Recently, we found a significantly reduced MIBG uptake in the parotid and submandibular glands in PD patients compared with healthy controls [5].

In the current study, we measured MIBG uptake in the parotid and submandibular glands in PSP and CBD patients. This is the first study which measures MIBG uptake in the salivary glands in these diseases. Since cardiac MIBG findings can be biased by cardiac comorbidities, MIBG findings in other organs, e. g. the salivary glands, may represent a more bias-free approach in the aging population.

Our study involved 25 patients with PSP (12 females, 13 males, age 69 ± 7 years, mean ± SD, duration of symptoms 5.6 ± 2.7 years) and 12 patients with CBD (7 females, 5 males, age 68 ± 4 years, duration of symptoms 5.9 ± 3.1 years) who underwent MIBG scintigraphy. All patients gave their written informed consent prior to examination. The study was approved by the local Ethics committee (Ärztekammer des Saarlandes).

The patients were compared to a control group with 18 neurologically healthy patients (age 65 ± 8 years, 8 females, 10 men) with arterial hypertension who underwent MIBG scintigraphy to exclude a pheochromocytoma. The ages in the control group and the patient groups were not significantly different ($p > 0.05$, ANOVA).

The methods of MIBG scintigraphy have been described in a previous paper [5]. The sublingual glands were not measured, since they are too small and therefore their MIBG uptake cannot be accurately quantified. The MIBG uptake of each measured salivary gland was quantified as quotient $\frac{\text{average counts per pixel (salivary gland i)}}{\text{average counts per pixel (forehead)}}$..

In the control group, MIBG uptake was 3.12 ± 0.60 (mean ± S.D.) for the parotid glands and 3.44 ± 0.69 for the submandibular glands. The resulting lower norm values (= mean – 2 S.D.) were 1.92 for the parotid glands and 2.06 for the submandibular glands.

In the 25 PSP patients, MIBG uptake in the parotid glands (3.27 ± 0.54, Fig. 1) and in the submandibular glands (3.71 ± 0.61) did not differ significantly from the MIBG uptake in the controls (parotid glands: $p = 0.18$, Mann Whitney test; submandibular glands: $p = 0.70$, unpaired *t*-test).

In the 12 CBD patients, MIBG uptake in the parotid glands (3.00 ± 0.78) and in the submandibular glands (3.48 ± 0.80) was not significantly different from the MIBG uptake in the controls (parotid glands: $p = 0.33$, Mann Whitney test; submandibular glands: $p = 0.87$, unpaired *t*-test). Considering our norm values, all PSP and CBD patients had normal MIBG uptake in the parotid and submandibular glands.

Furthermore we measured the myocardial MIBG uptake in all 37 PSP/CBD patients. We found a normal myocardial MIBG uptake in 22 of 25 PSP patients and in 10 of 12 CBD patients, a reduced myocardial MIBG uptake in 3 of 25 PSP patients and in 2 of 12 CBD patients.

In a previous study [5] we measured MIBG uptake in the parotid and submandibular glands in 77 patients with PD using the same methods as described in this paper. 32 of these 77 PD patients had a rapid eye movement sleep behavior disorder (RBD). When we applied norm values of the current study, 17 of 77 PD patients had reduced MIBG uptake in at least one of the four studied salivary glands. 10 of these 17 patients with reduced MIBG uptake in the salivary glands had RBD whereas the remaining 7 of 17 patients did not have RBD.

Our results of normal salivary gland MIBG uptake in PSP/CBD patients is in accordance with previously published findings of predominantly normal myocardial MIBG uptake in this patient population [1]. In contrast, PD patients show a reduced MIBG uptake in the myocardium and the salivary glands [1,5]. Salivary gland MIBG scintigraphy may help distinguish PSP/CBD versus PD: all PSP and CBD

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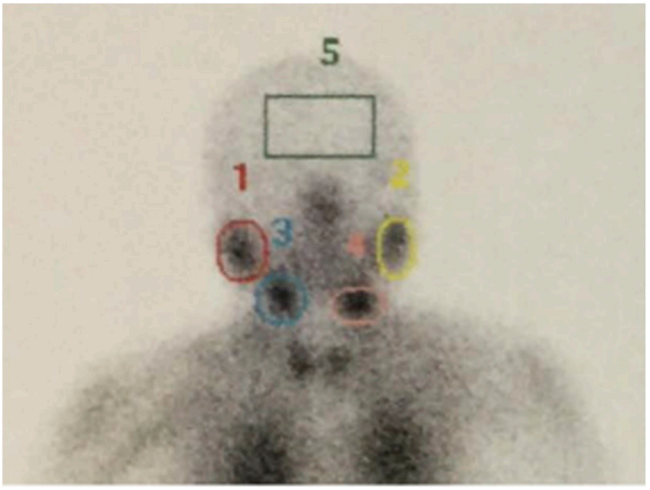

Fig. 1. MIBG scintigraphy in a 67-year old female PSP patient in the anterior-posterior direction. The regions of interest (ROI) are contoured in different colors: red = right parotid gland, yellow = left parotid gland, blue = right submandibular gland, pink = left submandibular gland, green = cerebrum behind the forehead (reference region). (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

patients had normal MIBG uptake in the parotid and submandibular glands, while 17 of 77 PD patients (from a previous study [5]) had a reduced MIBG uptake in at least one parotid or submandibular gland. Therefore, the finding of a reduced MIBG uptake in at least one salivary gland supports the diagnosis of PD and contradicts the diagnosis of PSP/CBD. But further studies with larger case numbers of PSP and CBD patients are needed to increase the diagnostic robustness of salivary gland MIBG scintigraphy.

In summary, salivary gland MIBG scintigraphy may help to distinguish PSP / CBD versus PD patients.

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Contribution of the authors

1. Research project: A. Conception and design, B. Analysis and interpretation of data C. Analysis and interpretation of data.
2. Manuscript preparation: A. Writing of the first draft, B. Review and Critique.

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Conflicts of interest

No author has any conflict of interest.

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