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Mitochondrial respiration pattern of peripheral blood cells in patients with Parkinson's disease

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Introduction: Mitochondrial dysfunction is a key element in Parkinson's disease (PD) pathogenesis. Accordingly, they emerge as novel potential therapeutic targets although further elucidations directly from patients are needed. Peripheral blood mononucleate cells (PBMCs) exhibit typical PD-neuropathology signatures and participate to the pathogenic cascade of the disease, representing an ideal tissue to analyze the molecular events underlying PD in vivo.

Objective: To evaluate the pattern of mitochondrial respiration in PBMCs of PD patients and the respective correlations with clinical features and levels of CSF neurodegeneration biomarkers.

Methods: Mitochondrial respirometry was conducted on PBMCs from 16 PD patients and 14 controls using Seahorse Bioscience technology. Bioenergetic parameters were correlated with clinical scores of main motor or non-motor scores and the CSF levels of α-synuclein, amyloid-β peptides, and tau proteins.

Results: PBMCs baseline oxygen consumption rate was similar between patients and controls (PD=22.4±10.6 OCR; controls=20.8±8.8). ATP-linked respiration was higher in PD (40.2±23.4) than controls (26.3±9.4), although not statistically significant. Both maximal respiration (PD=155.6±115.0; controls=79.3±29.9, p=0.038) and the spare respiratory capacity (PD=134.8±108.2; controls=58.5±28.04, p=0.02) were significantly higher in PD. The maximal respiration and the spare of respiratory capacity directly correlated with the disease duration, MDS-UPDRS part III and the Hoehn and Yahr scores; the spare respiratory capacity was directly associated with the CSF amyloid-β-42 and the amyloid-β-42/40 ratio (R=0.68, p=0.02 and R=0.66, p=0.04, respectively).

Discussion: PBMC mitochondria in PD patients had a peculiar pattern of respiration, with increased maximal and spare respiratory capacities, probably reflecting the increased energetic requirement due to the clinical–pathological progression of the disease or to compensatory adaptations.