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Myocardial microcirculation impairment in subjects with diabetic peripheral neuropathy

Aims: Diabetic peripheral neuropathy (DPN) has been shown to be independently associated with cardiovascular events and mortality; however, the mechanisms behind this link are still not clear. This study aimed to quantitively evaluate myocardial microcirculation and left ventricular (LV) function using cardiovascular magnetic resonance (CMR) in patients with and without DPN.
Methods: CMR imaging from 123 individuals with type 2 diabetes (T2D) and without DPN, 54 with DPN and 60 healthy controls were retrospectively analysed. LV myocardial perfusion parameters at rest, including upslope, time to maximum signal intensity (TTM), max signal intensity (max SI), and myocardial strains, including global radial (GRS), circumferential (GCS) and longitudinal strain (GLS), were calculated and compared among the groups. DPN was diagnosed clinically according to American Diabetes Association.
Results: The GLS, upslope and max SI were significantly reduced in DPN subjects compared to controls and patients without DPN (all P<0.001). TTM was increased and GRS and GCS were decreased in T2D individuals with and without DPN *vs* controls (all P<0.05). Univariable and multivariable regression analyses revealed that both DPN and chronic kidney disease were associated with perfusion impairment. In details, DPN was independently associated with reduced upslope, max SI and GLS (β = − 0.360, − 2.503 and 1.113, p=0.021, 0.031 and 0.010, respectively). When the perfusion indices upslope and max SI were included in the multivariable analysis for LV deformation, DPN and upslope were significantly associated with GLS (β = 1.057 and − 0.870, p = 0.020 and 0.018, respectively).
Conclusions*:* More severe myocardial microvascular impairment and deformation dysfunction in T2D patients with DPN have been documented. Further, deteriorated subclinical LV systolic dysfunction was associated with myocardial microvascular dysfunction.

Comments. It is known that microvascular dysfunction evaluated by PET correlates with cardiac mortality in both general and diabetic population (Murthy VL et al *Circulation. 2012;126:1858–68*). In this context, also the CMR might allow a quantitative assessment of myocardial perfusion (*Jerosch-Herold M. J Cardiovasc Magn Reson. 2010;12:57*). Interestingly, CMR may offer important advantages like the absence of ionizing radiation, high spatial resolution, and different contrast. The present study considered 3.0 T CMR method to evaluate myocardial microcirculation and the association with DPN, demonstrating significantly reduced first-pass resting myocardial perfusion in both T2D patients without and with DPN compared with controls. Additionally, the presence of neuropathy resulted in further deterioration of subclinical LV systolic dysfunction. Considering the limitations, a detailed description of the DPN diagnosis is lacking. Furthermore, the cross-sectional nature of the study does not allow to determine the causal relationship between LV myocardial dysfunction and microvascular dysfunction. Thus, longitudinal studies are needed to explore the prognostic value of impaired myocardial perfusion and deformation in T2D patients with DPN.

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Reference. Li XM, Shi R, Shen MT, Yan WF, Jiang L, Min CY, Liu XJ, Guo YK, Yang ZG. Subclinical left ventricular deformation and microvascular dysfunction in T2DM patients with and without peripheral neuropathy: assessed by 3.0 T cardiac magnetic resonance imaging. Cardiovasc Diabetol. 2023 Sep 21;22(1):256. doi: 10.1186/s12933-023-01981-7. PMID: 37735418; PMCID: PMC10514942.
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