New-onset type 2 diabetes in heart failure: impact of heart failure and death versus ischemic events – a Danish nationwide cohort study

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Background: Development of type 2 diabetes (T2D) is common in patients with heart failure (HF), but knowledge of future cardiovascular events is lacking.

Purpose: We compared risk of heart failure hospitalization (HFH) or death versus ischemic events in real-life HF patients with new-onset T2D, prevalent T2D and no T2D.

Methods: Using the Danish nationwide registers, we identified all patients with HF between 1998–2016. The patients were separated in two different HF cohorts based on the status of T2D. One cohort consisted of HF patients with either prevalent or absent T2D at the time of HF diagnosis. The other cohort consisted of HF patients, who developed new-onset T2D, included at time of diagnosis. The two HF cohorts were analyzed separately. Outcomes for both cohorts were analyzed as time-to-first event as either an ischemic event (i.e. composite outcome of fatal and non-fatal myocardial infarction, stroke, and peripheral artery disease), HFH, or event-free death (not related to HFH or the ischemic event). For each cohort, we estimated the five-year absolute risk of ischemic event, HFH and event-free death, along with five-year risk ratio of HFH or event-free death versus ischemic events. Effects among subgroups were investigated by stratifying both cohorts based on age, gender and comorbidities present at inclusion.

Results: A total of 139,264 HF patients were included between 1998 and 2016, of which 29,078 (21%) patients had prevalent T2D at baseline. A total of 11,819 (8%) developed new-onset T2D and were included in the second cohort. The median duration of time between HF diagnosis and new-onset T2D diagnosis was: 4.1 years (IQR:1.5; 5.8). The absolute five-year risk of an ischemic event in patients with new-onset T2D, prevalent T2D and no T2D was: 17.9% (95% confidence interval (CI): 17.2; 18.6), 26.1% (95% CI: 25.6; 26.7), and 18.8% (95% CI:18.6; 19.0). Corresponding estimates for HFH were: 31.5% (95% CI: 30.6; 32.3), 33.6% (95% CI: 33.0; 34.2), and 30,7% (95% CI: 30.5; 31.0). The absolute five-year risk of event-free death among patients with new-onset T2D, prevalent T2D and no T2D was: 20.9% (95% CI: 20.2; 21.7), 18.9% (95% CI:18.4; 19.3), and 18.6% (95% CI: 18.4; 18.8) (see Figure). The five-year risk ratio of experiencing HFH or event-free death versus an ischemic event was: 2.9 (95% CI: 2.8; 3.1), 2.0 (95% CI:2.0; 2.1), and 2.6 (95% CI: 2.6; 2.7) for patients with new-onset T2D, prevalent T2D and no T2D, respectively. Similar results of absolute and relative risk were present across all subgroups.

Conclusion: In our population of HF patients, 8% developed new-onset diabetes. Development of T2D in patients with HF increases the risk of HFH and mortality three-fold. The increased risk of new-onset T2D is higher than the importance of prevalent T2D in patients with HF.

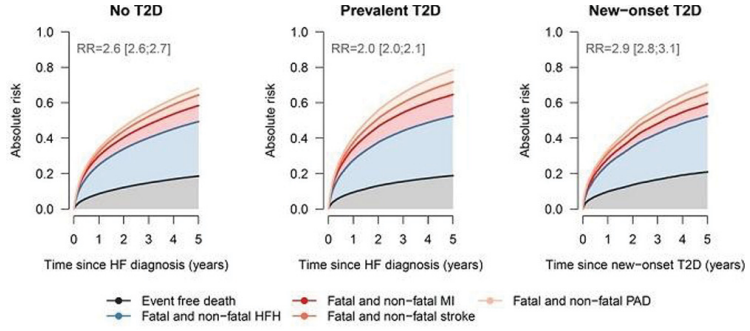

Figure: Stacked cumulative incidence plots of the risk of experiencing an ischemic event, HFH or event-free death as the first event. The size of each coloured area represents the risk of the event. Risk ratios with 95% confidence intervals represent the risk of experiencing HFH or event-free death versus an ischemic event. T2D: type 2 diabetes, HF: heart failure, HFH: heart failure hospitalization, MI: myocardial infarction, PAD: peripheral artery disease, RR: risk ratio.