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Relationship of myocardial scar with cardiovascular disease risk factors in the diabetes control and complications trial (DCCT)/epidemiology of diabetes interventions and complications (EDIC) study

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Introduction

Type 1 diabetes is associated with an increased risk of myocardial infarction. Risk factors related to the presence of myocardial scar detected by MRI have not been explored in patients with type 1 diabetes.

Purpose

To determine the prevalence of myocardial scar and to examine cardiovascular disease (CVD) risk factors associated with myocardial scar in a large multi-center study.

Methods

The EDIC study is the observational follow-up (1994-present) of the DCCT cohort. The DCCT (1983-93) was a controlled clinical trial of intensive versus conventional diabetes treatment in 1441 type 1 diabetic subjects. A total of 1019 DCCT/EDIC subjects underwent cardiovascular MRI at 28 centers in the USA and Canada during the 14th year of EDIC. MRI examination, centrally read, included left ventricular (LV) mass, volume and myocardial scar evaluation. A total of 757 eligible patients underwent 15 minute myocardial delayed enhancement MRI following intravenous administration of 0.15 mmol/kg dose of gadolinium contrast. Subjects with gadolinium allergy, dialysis, transplant or GFR < 60 mL/min/1.73 m^2 were excluded from the gadolinium study. Images were evaluated for the presence and absence of myocardial scar as well as typical (infarct related) and atypical (non-infarct related) pattern of scar.

Results

743 studies were available for evaluation of myocardial scar (14 non-diagnostic studies). The mean age was 49 ± 7 years, 58% were men, and diabetes duration was 27 ± 5 years. The prevalence of any myocardial scar was 4.3% (32/743) with 16 typical and 16 atypical patterns. Men had a higher prevalence of scar compared to women (5.8% vs. 2.2%, respectively; $p < 0.05$). Older patients and those with hypertension, lower ejection fraction, increased LV mass and higher albumin excretion rate had a significantly higher risk of myocardial scar than those without. The weighted mean hemoglobin (HbA1c) level was also associated with the presence of myocardial scar, while HbA1c prior to examination was not. Adjusted odds ratios* and 95% confidence intervals for presence versus absence of myocardial scar are shown in Table 1.

Conclusion

The DCCT/EDIC is the first and largest cohort of type 1 diabetic patients evaluated by MRI for myocardial scar.

Table 1: Adjusted odds ratios* and 95% confidence intervals for presence versus absence of myocardial scar

Covariate	Adjusted odds ratio*	95% confidence interval	p - value
Males vs. Females	2.51	(1.07 - 5.90)	0.035
Age (years)	1.08	(1.02 - 1.15)	0.008
Hypertension (yes vs. no)	2.76	(1.20 - 6.36)	0.017
Hyperlipidemia (yes vs. no)	2.02	(0.80 - 5.09)	0.136
LV Mass(g/m^2)	1.03	(1.01 - 1.06)	0.014
EF < 50 (yes vs. no)	10.51	(4.17 - 26.88)	<0.0001
Weighted mean HbA1C	1.49	(1.02-2.19)	0.042
Albumin Excretion Rate (AER) > 300 (mg/24 hr)	3.84	(1.34 - 10.96)	0.012

* All except for gender and age were adjusted for age and gender. Gender was adjusted for age, age was adjusted for gender.

Overall, the prevalence of myocardial scar in DCCT/EDIC was 4.3%. Traditional CVD risk factors (age, gender and hypertension) as well as abnormal LV mass and function, weighted mean HbA1c levels and macroalbuminuria were risk factors for myocardial scar in this multi-center cohort with type 1 diabetes.