

Metformin Improves Ventricle Size and Function in Adolescents with Type 1 Diabetes; Echocardiographic findings from the Effects of Metformin on Cardiovascular Function in Adolescents with Type 1 Diabetes (EMERALD) Study

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Background

People with type 1 diabetes (T1D) have higher rates of cardiovascular disease (CVD) despite modern advances in glucose control. Insulin resistance (IR) is known to relate to cardiovascular disease (CVD) in T1D though its relationship is inadequately understood. We previously demonstrated vascular and cardiac dysfunction in T1D adolescents, and that metformin improves BMI, body composition, insulin sensitivity, arterial stiffness, and carotid intimal media thickness. We hypothesized that metformin would improve cardiac function in T1D adolescents assessed by echocardiogram.

Methods

48 T1D youths (mean age 16.8 ± 2.5 years, HbA1c $8.6 \pm 1.5\%$, BMI 25.1 ± 4.3 kg/m², diabetes duration 7.7 ± 4.2 years) were randomized to 3 months of 2000 mg of metformin daily or placebo. 43 participants had echocardiograms available at baseline and 3 months to evaluate traditional echocardiographic measures, cardiac strain, and intraventricular dyssynchrony. One-way ANOVA and paired t-tests analyzed within and between group differences.

Results

LV diameter at end-diastole (4.45 ± 0.47 vs. 4.26 ± 0.50 cm, $p = 0.019$) and end-systole (2.89 ± 0.39 vs. 2.69 ± 0.36 cm, $p = 0.022$) and LV dyssynchrony (98.0 ± 36.9 vs. 81.7 ± 27.5 milliseconds, $p = 0.014$) improved only within the metformin group. Aortic root diameter (2.51 ± 0.39 vs. 2.73 ± 0.28 cm, $p = 0.042$) was also significantly lower in the metformin vs. placebo group post-treatment.

Conclusions

Metformin may benefit with improving or reversing early cardiovascular changes in T1D. A better understanding of T1D-related CVD and the longer-term impacts of improving insulin action in T1D warrant further investigation as potential treatment targets.