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Original article

Relationship between QRS duration and left ventricular mass and volume in patients at high cardiovascular risk

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Contributors Dr Stewart designed the substudy, oversaw ECG analysis, supervised statistical analysis and drafted the manuscript. He is guarantor. Drs Young and Cowan undertook all MRI analysis and contributed to the design of the substudy. Dr Jennings was primary investigator for the substudy and responsible for overall design and conduct of the study. Drs Anderson and Teo were principal investigators for the ONTARGET Study and contributed to design, conduct and management of the study. All authors contributed to the design, analysis plan and critical review of results; provided critical input to the manuscript; and approved the final version for submission.

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Abstract

Objective Longer QRS duration on the ECG is associated with increased cardiovascular (CV) mortality. To evaluate potential mechanisms, we examined in this study the relationship between QRS duration and left ventricular (LV) mass and LV end systolic and end diastolic volume in patients with known CV disease or high-risk diabetes.

Methods In a substudy of the ONTARGET/TRANSCEND (Ongoing Telmisartan Alone and in Combination with Ramipril Global Endpoint Trial/Telmisartan Randomised Assessment Study in ACE Intolerant Subjects with Cardiovascular Disease) clinical trials, 368 patients had a cardiac magnetic resonance scan to measure LV mass, LV end systolic volume, LV end diastolic volume and LV ejection fraction at baseline and after 2 years of follow-up. Relationships between QRS duration on the 12-lead ECG and LV mass and volumes were evaluated at both assessments.

Results Each 10-ms increase in QRS duration both within and above the normal reference range was associated with an 8.3% (95% CI 6.7% to 9.9%) increase in LV mass, a 9.2% (95% CI 7.4% to 10%) increase in LV end diastolic volume and a 7.8% (95% CI 6.4% to 9.3%) increase in LV end systolic volume. QRS duration increased with body size, but associations with LV mass and volumes remained strong after indexing measurements to height$^{2.7}$ ($p<0.001$ for all) and were similar for subjects with an otherwise normal and abnormal ECG.

Conclusion A longer QRS duration both within and above the normal reference range is associated with a greater LV mass and larger LV end systolic and end diastolic volumes. This may explain the known association of longer QRS duration with increased CV mortality.