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## Heart Rhythm

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Does the presence of Q waves on the EKG accurately predict prior myocardial infarction when compared to cardiac magnetic resonance using late gadolinium enhancement? A cross-population study of noninfarct vs infarct patients

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### Background

We hypothesize that infarct detection by electrocardiogram (EKG) is inaccurate as compared with detection by magnetic resonance imaging and is potentially independent of infarct vs noninfarct status. This might have implications for societies in which initial cardiovascular testing is uniformly EKG.

### Objective

This study aimed to relate EKG-defined scar to cardiovascular magnetic resonance imaging (CMR)–defined scar *independent* of the underlying myocardial pathology

## Methods

A total of 235 consecutive patients who underwent CMR-late gadolinium enhancement (LGE) with simultaneous EKG were screened for Q waves and compared with patients with a positive LGE pattern. The patients were divided into 3 groups: (1) patients with a positive infarct LGE pattern (LGE+/+; herein defined as LGE+), (2) patients with a noninfarct LGE pattern (LGE+/â''), and (3) patients with a negative LGE pattern (LGEâ'').

## Results

While 139 of 235 patients (59%) were either LGE+ or LGE+/â'', pathological Q waves were present in only 74 of 235 patients (31%). However, of these LGE+ or LGE+/â'' patients, only 76 (32%) had an infarct LGE pattern representing little overlap between the presence of LGE+ and Q waves. EKG sensitivity and specificity to detect infarct: 66% and 85%, respectively. However, of 24 of 74 patients (32%) with Q waves on the EKG, 66% were LGE+/â'' and 34% were LGEâ''. Importantly, 3-dimensional volume of myocardial scar was far more predictive of a Q wave than of scar transmuralty.

## Conclusion

EKG-defined scar, while ubiquitous for an infarct, has low sensitivity than CMR-LGE-defined scar. Unexpectedly, a significant number of pathological Q waves had absent infarct etiology, indicating high false positivity. Similarly, underrecognition of bona fide myocardial infarction frequently occurs, while 3-dimensional CMR volume of myocardial scar is far more predictive of a Q wave than of scar transmuralty. This suggests that the well-regarded EKG may be a disservice when applied on a population basis, leading to inappropriate over or under downstream testing with wide socioeconomic implications.



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## Abbreviations

2D, 2-dimensional; CAD, coronary artery disease; CI, confidence interval; CMR, cardiovascular magnetic resonance imaging; EKG, electrocardiogram; LGE, late gadolinium enhancement; LGE+, positive infarct late gadolinium enhancement pattern; LGE+/â'', noninfarct late gadolinium enhancement pattern; LGEâ'', negative late

gadolinium enhancement pattern; LV, left ventricular; MI, myocardial infarction; QW, Q-wave; ROC, receiver operating characteristic

## Keywords

Cardiac magnetic resonance imaging; EKG; Late gadolinium enhancement; Myocardial infarction; Nonischemic heart disease

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