

ST-elevation myocardial infarction: Is there time for Q waves?

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See related research article by Siha and colleagues on page 1135 and at www.cmaj.ca/lookup/doi/10.1503/cmaj.111683

Acute myocardial infarction (MI) is a leading cause of morbidity and mortality. A common type of MI is ST-segment elevation myocardial infarction (STEMI).¹ During STEMI, “time is muscle.” That is, the longer the infarct time, the greater the ischemia and subsequent necrosis of the myocardium. Thus, early reperfusion of the myocardium, via fibrinolytic therapy or primary percutaneous coronary intervention (PCI), is crucial for patients with STEMI. Time to treatment is believed to have prognostic value and is an important quality indicator when evaluating STEMI care programs.² Time from the onset of symptoms to treatment is an indication of ischemic time and is a surrogate for the extent of myocardial necrosis. However, the reported time of symptom onset may not always be accurate because it relies on the patient’s memory and is susceptible to recall bias. The attending physician’s estimation of infarct time and subsequent extent of myocardial necrosis can impact treatment decisions. If this estimation is incorrect, either because of insufficient information about the true time of symptom onset or poor appreciation of the extent of myocardial damage, the care provided may be suboptimal. In a related article, Siha and colleagues³ examined data derived from the PLATelet inhibition and patient Outcomes (PLATO) trial and found that the presence of baseline Q waves on an electrocardiogram (ECG) is a potential alternative to time to treatment for determining the prognosis for patients with STEMI.

During an MI, the magnitude of damage to the myocardium is determined primarily by three factors: the duration of the infarct, the size of the area of myocardium deprived of blood flow (determined by the location of the occlusion) and collateral flow.⁴ If the reported times are accurate, the time between the onset of symptoms and treatment can, at best, determine the duration of the infarct, but it cannot provide information about how much of the myocardium has been affected. In some cases, the myocardium may receive intermittent perfusion (via spontaneous recanalization, incomplete occlusion or collateral supply) between the first symptom and ST-segment resolution.⁵ Thus, the time

from symptom onset to treatment may provide a good estimate of MI severity in a population, but it may not necessarily do so for individual patients. The presence of Q waves on an ECG is generally considered indicative of myocardial injury⁶ and, thus, may better reflect the severity of MI when compared with a relatively subjective estimate of the duration of the infarct. However, in some cases, Q waves persist long after the original insult, and so their appearance may be indicative of a previous MI. This can cause challenges for attending physicians if they were to give priority to Q waves over other factors and symptoms. Furthermore, because longer time between symptom onset and treatment allows greater opportunity for cellular death, the presence of Q waves on ECG is often correlated with time to treatment. Physicians must therefore consider the prognostic value of observed Q waves in the context of time from symptom onset (and other factors), so as to avoid attributing Q waves from prior MI to the one they are currently treating.

One could imagine a scenario in which attention to Q waves on an ECG, in conjunction with symptoms and their time of onset, might impact treatment decisions in a positive way. For example, consider a patient who presents to hospital more than 12 hours after the onset of symptoms. Although immediate reperfusion therapy might not offer any major benefit to prognosis, the absence of Q waves on the ECG might indicate intermittent perfusion during the course of the MI, suggesting early stages of disease progression. In light of this information, the physician might consider primary PCI or even fibrinolytic therapy. In a second scenario, imagine a patient who presents to the emergency department with STEMI a short time after the onset of

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KEY POINTS

- The length of time between the onset of symptoms and treatment is an important quality indicator for evaluating STEMI care.
- Q waves on an electrocardiogram may have additional prognostic value for patients with STEMI.
- Q waves should be used in conjunction with, rather than as a replacement for, time from the onset of symptoms to treatment.

symptoms. Suppose that the PCI centre is located at a distance such that transfer would put the patient outside of the window during which PCI has advantages over fibrinolytic therapy. In this case, fibrinolytic therapy could be considered the best course of action. The presence of major Q waves on this patient's ECG might indicate that the onset of symptoms was earlier than reported or that MI progression is more advanced than the time frame would typically suggest. In that case, the physician might consider the patient to be high risk and transfer him either for direct PCI or pharmacoinvasive PCI after fibrinolysis because the benefits of PCI are more resilient to delays in treatment when compared with fibrinolytic therapy alone.⁷

The medical community has given great attention to ensuring timely access to reperfusion therapy, especially primary PCI, for patients with STEMI.⁸⁻¹¹ In this environment, the time from door to balloon/needle and the time from symptom onset to treatment are given priority as key quality indicators when evaluating STEMI programs. The prognostic value of Q waves gives physicians an additional tool to improve STEMI care and outcomes without additional cost or delay. The challenge to health care providers is integrating the prognostic value of Q waves into STEMI programs, such that patient outcomes can be maximized. Because all patients with STEMI can benefit from well-timed care, we must ensure that Q waves are used in conjunction with, rather than as a replacement for, time to treatment. Such programs should focus on ensuring that each patient receives the best treatment given his or her individual circumstances and that all patients can access appropriate care as soon as possible.

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