Editorial

Can we predict cardiac rupture in patients with ST-segment elevation myocardial infarction?

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Cardiac rupture (CR) is a rare complication of acute myocardial infarction (AMI), especially ST-segment elevation myocardial infarction (STEMI) (1) and is a catastrophic event with mortality up to 92.5% (2-5). Early studies reported 4–24% (average 8%) incidence of CR following AMI (6). Improvements in revascularization techniques such as thrombolytics and primary percutaneous coronary intervention (PCI) decreased the incidence of CR from ~8% to 0.14–0.96% over the last decades (7,8). Delays in hospital admission and myocardial revascularization have been associated with higher incidence of AMI complications (8). Delays in AMI care during the coronavirus disease 2019 (COVID-19) pandemic led to late presentation and increased rates of catastrophic AMI complications such as CR (9,10).

Several studies have examined variables associated with CR in AMI patients. In one study, STEMI had four to five times higher risk compared with non-STEMI and unstable angina (1), and CR was independently associated with ST-segment elevation/left bundle branch block, female sex, previous stroke, older age, higher heart rate, and 30-mm drop in systolic blood pressure. Low-molecular weight heparin use and beta-blockers during the first 24-hour period were associated with lower risk of CR (1). Older age (11), first AMI (12), peak creatine kinase-MB >150 IU/L, anterior location, lateral location (12), transmural infarction, pericardial effusion of 10 mm or more (13), lower body mass index (BMI) (7), longer time to revascularization (7), have been associated with higher risk of CR. In contrast, left ventricular hypertrophy, congestive heart failure, history of previous infarcts (11), early use of beta-blockers, and timely intervention were associated with lower incidence of CR (7,14). One autopsy study reported that CR patients had heavier hearts than would be expected based on body weight; BMI was significantly associated with CR only in men, and most CR cases occurred in the anterior wall (45%), followed by the posterior (38%) and lateral (9%) wall (15).

In this issue of the *Journal of Thoracic Disease*, Xu *et al.* (16) examined various clinical and angiographic variables associated with CR in a retrospective analysis of 22,016 STEMI patients admitted to two hospitals in China between 2013 and 2021. CR occurred in 195 patients (0.9%) who were compared with 390 controls. Compared with non-CR patients, CR patients were older, more likely to be women, to have acute heart failure and cardiogenic shock, and less likely to have single lesions. They were also more likely to have lateral wall AMI as identified by the electrocardiogram (23.6% *vs.* 8.2%, P<0.001). Door to balloon time was 63 minutes in both groups and vessel distribution of culprit lesions were similar. However, the thrombolysis in myocardial infraction (TIMI) grade was lower in the CR group compared with non-CR group both before (0.20±0.40 *vs.* 0.45±0.76, P=0.003) and after (2.55±0.92 *vs.* 2.96±0.23, P=0.001) primary PCI.

On multivariable analysis female sex, older age, smoking, total chest pain time, recurrent acute chest pain, high lateral wall infarct (identified by the electrocardiogram), acute heart failure, and N-terminal prohormone brain natriuretic peptide were independently associated with CR.

In a subsequent analysis of patients who agreed to undergo primary PCI, having a single lesion and higher TIMI grade pre- or post-PCI were associated with lower risk of CR.

The authors are to be congratulated for enhancing our understanding of which AMI patients might be at increased risk for CR. However, there are certain limitations in this study. First, the derivation of the control group was not specified. Second, the sensitivity or specificity of the reported risk factors for CR was not reported. Given the low prevalence of CR (0.9%) the positive predictive value of any parameter or combination is likely to be low.

In summary, CR is an infrequent but often catastrophic complication of AMI. Although several parameters have been associated with higher CR risk, our ability of identify patients who will develop CR remains limited. Even if we could accurately identify patients who will eventually develop CR, treatment would be challenging, as preemptive cardiac surgery is not a good option. Therefore, prevention of CR remains key: achieving prompt reperfusion with primary PCI remains our best tool at hand. If CR occurs, emergent surgical repair of the ruptured myocardium offers the best chance for survival.

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